Basel III: Implications of Capital and Liquidity Regulations on Financial Stability during Economic Depression.

Hassan, Ali

https://doi.org/10.34737/w41z9

UNIVERSITY OF WESTMINSTER

Basel III: Implications of Capital and Liquidity Regulations on Financial Stability during Economic Depression

Ali Hassan

School of Finance & Accounting

Westminster Business School

University of Westminster

A thesis submitted in partial fulfilment of the requirements of the University of Westminster for the degree of

Doctor of Philosophy in Finance

June 2023

Declaration of Authenticity and Copyright Permissions

This is to certify that this thesis titled “*Basel III: Implications of Capital and Liquidity Regulations on Financial Stability during Economic Depression*”, presented for the examination of PhD in Finance at the University of Westminster, is solely my own work, except where specific references are made to the work of others.

I hereby declare the content of this thesis to be original and has not been tendered elsewhere in part or whole at the University of Westminster or any other institution for the award of a degree or any other qualification.

This thesis contains approximately 72,600 words, excluding the declaration of Authenticity and Copyright Permissions, Table of Contents and References.

Name: Ali Hassan

Sign: Ali Hassan

Date: 14/06/2023

Acknowledgements

I wish to acknowledge my appreciation to all the people who have accompanied me during this journey of producing this thesis in very challenging and trying times of a pandemic. It is hard to find enough words to thank my supervisory team Dr Abdelhafid Benamraoui, Dr Stefan Van Dellen, and Dr Issam Malki. Each of them allowed me to explore the magnificence of research in their own context by providing ample feedback, challenging my research output, and assessing & advising on the development of financial econometric models. This thesis would not have been possible without their guidance and support. They all taught me to find my own research path from abstracts to notes & research themes and into this final thesis output.

I would also like to pass on my sincere gratitude to Dr Abdelhafid Benamraoui for being a great supervisor, encouraging, motivating, and critically assessing my research to enhance the research quality of this thesis from the initial phase until the final submission. I would also like to extend this gratitude to the university support team, particularly Dr Dominic McLounglin, for providing well-being support during the midst of the pandemic when I was on the verge of giving this up whilst my dad was in ICU for 19 days due to Covid-19 with no cure available at that time, equally to my senior PhD fellow now Dr Sam Opio a full-time lecturer at the School of Applied Management, University of Westminster for his practical assistance and emotional support in time of need throughout his time in the PhD office.

I am thankful for the support given to me by Dr Stefan Van Dellen, particularly in providing comments on enhancing the work on bank systemic risk measurement models and providing a list of alternative databases for data collection during the lockdown. Moreover, I am also grateful for the support given by Dr Issam Malki for explaining to econometric models when I had doubts, assessing the empirical results produced as well during the construction phase of econometric models, along with useful comments and feedback on the overall chapters, equally to Dr David Coker for taking out time to provide training on Bloomberg Terminals for data extraction as well to the library support team for arranging remote access to Refinativ Eikon and Bloomberg Terminal during the lockdown.

I would like to thank my Annual Progression Review (APR) Assessors, Dr Basel Arwatani and Dr Sovan Mitra, for providing valuable feedback on enhancing my research during APR 1, APR 2, and APR 3. I would also like to express my gratitude to my PhD viva examiners, namely external examiner Professor Yacine Belghitar, Cranfield University and internal examiner Dr Julie Ayton, University of Westminster, for taking their time to go through this thesis and providing feedback on areas that could be further enhanced, added or clarified. I would also like to extend my appreciation to the chair and doctoral coordinator, Dr Kristina Vasileva, for her support during the pandemic, her advice and guidance during Doctorial Research Development Program (DRDP) meetings and workshops, as well as to the Graduate School Director, Professor Leigh Wilson, and Graduate School Manager, Richard Mccormack, to ensure smooth progression during my PhD journey.

I am also thankful to the student development team at the University of Westminster for providing me with a grant to undertake training in R Language. I would also like to pass on my thanks to PhD representative Coralie Guedes and equally to Claire Li (Jing Li) and Sonila Malko at the PhD Office in the Garden Room for all your intellectual discussions and support. Moreover, I would also like to pass on appreciation to my friend Hayk Sargsyan pursuing his PhD at Universitat Pompeu Fabra, for providing invaluable advice during my studies. I would like to thank all my friends outside of the University of Westminster for your generosity in giving me time and energy in reviewing drafts and providing networking opportunities.

I would like to pass on my sincere gratefulness to my parents for supporting me in this journey financially & emotionally and being the source of my strength despite very challenging times. Moreover, the family appreciation would be imperfect without mentioning the good deeds presented to me by my immediate relatives such as uncles, aunties, cousins, brothers, and sisters. My source of strength for my studies stems from my parents, who have always reminded me that to achieve success, hard work, patience, and determination are paramount to reap the benefits and rewards.

Abstract

The dynamic global financial system has made it necessary to implement adequate regulatory measures that can effectively guarantee financial stability at the national and international levels. This thesis consists of three self-contained analytical chapters that focus on the effectiveness of evolving financial regulations in addressing systemic risk within the financial system. Despite numerous regulatory reforms introduced following the 2008 GFC, they are still concerns over the role of these regulations in mitigating complex issues related to systemic risk. The first study focuses on international and national regulatory frameworks in the context of conventional, hybrid, and Islamic banking. It analyses the guidance provided by the Basel Committee on Banking Supervision (BCBS) and the Islamic Financial Services Board (IFSB) and examines the differences in the treatment of credit, liquidity, and systemic risk across four countries. The IFSB converts BCBS guidance to ensure compliance with Sharia principles for Islamic banks. Further insights show variations in liquidity and capital requirements imposed on banks in different countries, highlighting the need for country-specific regulations to address the unique risks. The second study uses data from emerging market economies to investigate the relationship between capital and liquidity regulations under Basel III and their impact on default risk and systemic risk. The study addresses whether the new liquidity and capital requirements, such as the net stable funding ratio and higher capital adequacy ratio, contribute to alleviating the default risk and systemic risk in emerging market economies. The third study focuses on the relationship between credit and liquidity risks and their impact on bank default risk. It also addresses the effect of bank liquidity creation on systemic risk across different types of banks. The findings suggest that while credit and liquidity risks are positively related, no significant relationship exists. The impact of credit and liquidity risks on bank default risk is significant for conventional and hybrid banks, while bank size and capital adequacy ratio play a greater role in the stability of Islamic banks. The joint interaction between credit and liquidity risk negatively influences banking stability. The key findings demonstrate that Basel III's liquidity requirements, such as the Net Stable Funding Ratio (NSFR), play an important role in forecasting banks' default probability and mitigating systemic risk. The insights gathered emphasise the importance of incorporating new mitigating measures, including NSFR, leveraging requirements, countercyclical buffers, and

globally systemically important institution surcharges to promote financial stability. Additionally, it demonstrates the relevance of liquidity creation in determining bank stability and its implications for systemic risk. This study offers substantial contributions to the growing body of literature by highlighting the differences in regulatory frameworks, the importance of this approach in developing bank risk profiles, and how they are adequately addressed. The study also contributes to understanding how financial stability can be enhanced while reducing systemic liquidity risk. The study shows that banks, regulators, and policymakers must collaborate adequately across all levels to align risk management and improve regulations and guidelines. This includes sharing information and fostering coordination at the international level.

Keywords: Emerging Markets, Credit Risk, Liquidity Risk, Liquidity Creation, Systemic Risk, Financial Regulations

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ABCP - Asset-Backed Commercial Papers

ABS - Asset-Backed Securities

ASF - Available Stable Funding

ANN - Artificial Neural Networks

AT1 – Additional Tier 1 Capital

BCBS – Basel Committee on Banking Supervision (*interchangeably used as* BIS – Bank for International Settlements)

BBLC - Berger–Bouwman Liquidity Creation measure (BB measures)

BHC - Bank Holding Companies

BoE - Bank of England

BCB - Banco Central do Brasil

BNM - Bank Negara Malaysia

BN - Bayesian Networks

CAMELS - Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity approach

CAR - Capital Adequacy Ratio

CBIRC - China's Banking and Insurance Regulatory Commission

CBRA - Chinese Banking Regulatory Authority

CCoB - Capital Conservation Buffer

CCR - Counterparty Credit Risk

CCyB - Countercyclical Capital Buffer

CD - Certificate of Deposits

CDO – Credit Debt Obligations

CDS - Credit Default Swaps

CET1 – Common Equity Tier 1

CMA – Capital Markets Authority

CPP - Capital Purchase Program

CP – Commercial Papers

CoCo Bonds - Contingent Convertible Bonds

CoVaR – Conditional Value at Risk model

CRA - Credit Rating Agencies

CRD IV - Capital Requirements Directive IV

CRM – Credit Risk Mitigation

CR – Credit Risk

CRR – Cash Reserve Requirement

DD – Distance to Default Model

D-SIB - Domestically Systemic Important Banks

DGSE - Dynamic Stochastic General Equilibrium models

DCR - Displaced Commercial Risk

EAD - Exposure At Default

ECAI – External Credit Assessment Institutions

ECB - European Central Bank

EMEs – Emerging Market Economies

EVT - Extreme Value Theory

EWS - Early Warning Systems

FALLCR - Facility to Avail Liquidity for Liquidity Coverage Ratio

FCA – Financial Conduct Authority

FE - Fixed Effect model

FIMA - Foreign and International Monetary Authority

FMI - Financial Market Infrastructures

FPC - Financial Policy Committee

FSB - Financial Stability Board

FX - Foreign Currency exposures

GCC - Gulf Cooperation Council

GDP – Gross Domestic Product

GFC – Global Financial Crisis 2007-2008

GHOS – Governors and Heads of Supervisory agencies

GMM - Generalised Method of Moments estimation model

G-SIB - Globally Systemic Important Bank

GRACH - Generalised Auto-Regressive Conditional Heteroskedasticity model

HAR - Heterogenous Auto-Regressive model

HQLA – High-Quality Liquid Assets

HQLAAR - High-quality Liquidity Asset Adequacy Ratio

IAH - Investment Account Holders

IBA - Indicator-Based Approach

ICAAP - Internal Capital Adequacy Assessment Process

IFDI - Refinitiv Eikon Islamic Finance Development Indicator

IFIs -Islamic Financial Institutions

IFSB - Islamic Financial Services Board

IIFM - International Islamic Financial Market

IILM - International Islamic Liquidity Management Corporation

ILAAP - The Internal Liquidity Adequacy Assessment Process

ILOLR - International Lender of Last Resort

IMF – International Monetary Fund

IRB - Internal Rating-Based

KMV - Kealhofer, McQuown, and Vasicek Model developed by Moody's Analytics

LCR – Liquidity Coverage Ratio

LGD - Loss Given Default

LIBOR – London Interbank Offered Rate

LLP – Loan Loss Provisions

LMC - Liquidity Management Centre

LMR - Liquidity Matching Rate

LOLR - Lender Of Last Resort

LTV – Loan-to-Value Ratio

LR – Liquidity Risk

MBS – Mortgage-Backed Securities

MDB - Multilateral Development Banks

MENA - the Middle East and North African region

MMF - Money Market Mutual Funds

MPO - Murabahah to the Purchase Orderer arrangement

MSCI - Morgan Stanley Capital International index

MSCI EMI – Morgan Stanley Capital International Emerging Markets Index

MSF – Marginal Standing Facility

NDTL - Net Demand and Time Liabilities

NIM - Net Interest Margin

NPA - Non-Performing Assets

NPL - Non-Performing Loans

NSFR – Net Stable Funding Ratio

OBS - Off-balance Sheet Exposures

OECD - Organisation for Economic Co-operation and Development

OIS – Overnight Index Swaps

OMO - Open Market Operations

OLS - Ordinary Least Square estimation model

OREO - Other Real Estate Owned ratio

PD - Probability of Default

PDCF - Primary Dealer Credit Facility

PLS – Profit and Loss Sharing Theory

PRA - Prudential Regulatory Authority

POLS – Pooled Ordinary Least Square estimation model

PSE – Public Sector Entities

PVAR - Panel Vector Auto-Regression model

QCB - Qatari Central Banking

QFMA - Qatari Financial Market Authority

QFCRA - Qatari Financial Centre Regulatory Authority

RBI – Reserve Bank of India

RBS - Risk-based supervision

RE – Random Effects model

Repo - Repurchase agreements

ROA - Return on Assets

ROE - Return on Equity

RSF - Required Stable Funding

RWA - Risk-Weighted Assets

SAMA - Saudi Arabian Monetary Authority

SCP - Structure, Conduct and Performance Theory

SIFI - Systemically Important Financial Institutions

SIV - Structured Investment Vehicles

SMEs - Small and Medium-sized Enterprises

SLR - Statutory Liquidity Requirement/Ratio

SLOLR - Systemic Lender of Last Resort

SPARC - Supervisory Program for the Assessment of Risk and Capital

SPV - Special Purpose Vehicles

SREP - Supervisory Review and Evaluation Process

SRL - Systemic Risk-adjusted Liquidity model

SRM - Single Resolution Mechanism

SRR - Special Resolution Regime

SSM - Single Supervisory Mechanism

SLRR - Statutory Liquidity Reserve Requirements

SRL – Systemic Liquidity Risk

TARP - Troubled Asset Relief Program

TSLF - Term Securities Lending Facility

UCB - Urban Co-operative Banks

UPSIA - Unrestricted Profit-Sharing Investment Accounts

VaR – Value at Risk

VIE - Variable Interest Entities

VIX - Cboe Volatility Index

Chapter 1 – Introduction

1.1. Introduction

The financial globalisation industry has grown significantly and rapidly over the last three decades. According to Lund et al. (2013), cross-border capital flows increased from US$0.5 trillion in 1980 to a peak of US$11.8 trillion in 2007. After that, they sharply decreased. Particularly in emerging economies, cross-border banks played a significant role in the financial globalisation process (Claessens, 2017). The rate and scope at which shocks are conveyed across asset classes, and nations has expanded in parallel with financial innovation and integration (Davies and Green, 2008). Stronger international regulatory cooperation has been called for as a result of the global financial crisis of 2007–2008, which served as a stark warning that insufficient regulation and supervision in nations at the centre of the financial system can have global repercussions (Bauerle Danzman et al., 2017).

The turmoil within the U.S. financial markets in 2007 signalled the onset of the 2007–2009 global financial crisis (GFC). The GFC led to the bankruptcy and subsequent bailout of large multinational financial institutions such as Lehman Brothers and Bear Stearns. This localised crisis rapidly spread to global financial markets, producing spill over effects on various financial institutions across the globe. The rapid advancement of the GFC demonstrated how closely financial institutions are interconnected. It also drew attention to the repercussions of this interconnectedness of both national and international financial systems.

After the GFC, regulators supported better capital adequacy requirements on banks and emphasised the necessity of enhancing micro-prudential regulations to increase transparency and market discipline. National and international regulators have increased bank capital requirements in line with Basel III. In addition, banks are required to meet the Net Stable Funding Ratio (NSFR) and Liquidity Coverage Ratio (LCR) as part of Basel III's new liquidity requirements. Furthermore, to promote the safety and soundness of financial systems and address their contagion risks, banks must comply with the countercyclical capital buffers of national regulators and adhere to the Globally Systemic Important Bank (G-SIB) surcharge. These new measures were introduced to minimise the risks posed by the 'too big to fail' effect, thereby increasing financial systems' stability.

Particularly around international banking regulation, there has been a significant reform push. Although the reforms have significantly increased the solvency and liquidity of internationally systemic institutions, flaws still exist (Aikman et al., 2018). Our key claim is that, despite recent governance changes at important standard-setting organisations, a core-periphery logic still exists, leading to a predominant focus on maintaining financial stability at the core of the global economy. This emphasis on the core, while crucial, unduly pushes aside issues that are particularly pertinent to developing and emerging countries. This issue is the centre of the investigation of this thesis.

1.1.1. Capital and Liquidity Regulation in the Context of Systemic Risk

Within nearly all economies, financial intermediation between lenders and borrowers has been a primary function of banks. In other words, banks act as liquidity providers and originators in financial systems. Bank capital regulations are important in terms of their role in ensuring banks' soundness and ability to engage in risk-taking activities to compete effectively against other financial institutions. Bank capital regulations originate from the 1988 Basel Accords on international convergence of capital measurements and capital standards. The 1988 Basel Accords focused on measuring banks' capital requirements against the losses they incurred from credit risk. Since then, several changes have been made to capital requirement measurement. For instance, to comply with Basel II, banks must set aside capital to account for losses incurred from market and operational risks. However, the capital buffers undertaken by banks during the GFC failed to protect them from the unexpected costs of vast illiquid asset exposures. Policymakers reacted to this by tightening capital requirements and introducing mandatory liquidity requirements as part of financial reforms, along with other regulatory requirements under Basel III.

Banking literature has sought to examine the reasons for banks to hold capital and the reasons that regulators require banks to hold capital. For instance, Berger et al. (1995) introduced the concept of a 'safety net' to explain governmental bodies' actions to promote the safety and soundness of the banking system. These government actions include deposit insurance, payment guarantees, and access to inter-banking money markets. It is important to note that governments do not take action to regulate and enforce capital regulation. They explain that although these measures insulate financial institutions from market volatility, they do not facilitate a fine-grained approach to risk pricing. Banks have access to private information and a dynamic portfolio, which creates information asymmetry problems that complicate the process of accurately pricing risk for the loans and deposits taken on as part of a bank's portfolio. To overcome these problems, regulators require that banks hold capital. The deposit insurance scheme protects only depositors and not the troubled financial institutions during market instability. Some researchers argue that a failure of one financial institution can trigger a domino effect owing to systemic risk within the financial system. Financial institutions contribute to deposit insurance schemes to mitigate risk from depositors. However, these safety measures are not sufficient to protect banks from a moral hazard problem.

Banks can engage in risky lending activities without having to face harmful consequences because the deposit insurance scheme will step in to pay off the depositors in the event of a bank failure. Hence, to prevent banks from entering risky positions, regulators require banks to set aside capital as part of capital requirements. This promotes safety and soundness within the financial system and upholds market discipline.

Similarly, traditional banking literature has extensively researched the role of liquidity in financial institutions. However, liquidity requirements implemented post-GFC and through Basel III have renewed the debate on the function of liquidity requirements concerning capital requirements.

The difference between capital and liquidity requirements as complements or substitutes of each other is discussed in Chapter 3. The importance of bank liquidity is investigated in work conducted by Diamond and Dybvig (1983) and Diamond and Rajan (2001), which explains how banks generate value on both the asset and liability sides of the balance sheet. On the asset side, banks lend to illiquid borrowers, using illiquid positions to create liquidity. On the liability side, banks provide on-demand liquidity to depositors. This makes it difficult to balance future cashflows generated from illiquid loans and demand from depositors. Given that banks are obliged to fulfil their responsibilities as financial intermediaries, they must meet depositors' liquidity demands in good time. The failure to meet depositors' demands invites speculation about liquidity issues, which could lead to a bank run. This could result in losses for banks on account of them having to engage in fire sales of illiquid assets for less than their realised value.

Liquidity risk was a key contributor to the meltdown of numerous financial institutions during the GFC. Some banks were exposed to immense amounts of risky illiquid assets, while others relied heavily on the interbank market to cover their short-term liabilities. Using data on the GFC to research US banks, Chen et al. (2021) have shown that different types of financial crises have different relationships to liquidity risk. For instance, liquidity risk hurts banking performance more when the safety and soundness of a financial system are the objects of wider public concern. Liquidity risk cannot be characterised as the sole contributor to banks' insolvency issues. Instead, it stems from low capital ratios and higher credit risk. These two factors act as a catalyst for bank liquidity risk. Liquidity risk diminishes a bank's survival prospects in a financial crisis, whereby banks with a low capital requirement and higher credit risk suffer more.

1.1.2. Research Motivation and Research Gaps

This section is divided into three subsections, which discuss the research motivation and gaps for each chapter of this thesis.

Chapter 2 - Regulatory Frameworks for Credit and Liquidity Risk Management Across Developing and Emerging Economies

The first and primary motivation underlying this chapter comes from the need to address concerns over the adequacy of Basel III requirements to mitigate systemic risk in conventional, Islamic and hybrid banks in emerging economies. The Basel III was issued by the BCBS as a new international regulatory framework in the aftermath of the GFC. It aims to mitigate systemic risk and increase banks' safety and soundness with enhanced capital adequacy requirements. Additional measures, including new liquidity requirements, were designed to mitigate the liquidity risk to which banks were exposed in the GFC.

Despite ongoing reforms post-GFC, international regulatory bodies such as the BCBS and the Financial Stability Board (FSB) have received significant attention from researchers and national regulators, who scrutinised the effectiveness of new regulations on financial institutions in developed and developing markets (Hsieh and Lee, 2020). This scrutiny comes from research findings which reveal that despite having high capital levels, many banks across the globe were subject to instability, and the scale of exposure forced a few to file for insolvency. A high capital level, therefore, might not be adequate to reduce systemic risk.

This perceived inadequacy has been studied by researchers and regulators, leading to the development of additional regulations imposed at a national level, such as the Dodd-Frank Act (US), Ringfencing (UK), The Internal Capital Adequacy Assessment Process (ICAAP) and the Internal Liquidity Adequacy Assessment Process (ILAAP) (EU) (Tarullo, 2019). However, little is known about the additional national regulations and structural systems implemented in emerging markets. In addition, there are no Islamic banks in the G-SIBs list, banks owning more than 15% of the market share are domestically systemically important banks (D-SIBs) according to IFSB guidelines (IFSB, 2015). Equally, a financial stability assessment conducted by the IMF (2017) on the Saudi Arabian financial sector highlights various deficiencies: inadequate stress testing to address systemic risk, weak financial reporting to measure systemic risk, and limited guidance for mapping risk profiles to the Basel III framework. This is because the Saudi Arabian Monetary Authority has not yet developed a systemic risk framework. Likewise, neighbouring GCC countries (such as Kuwait and Qatar) lack adequate centralised shariah supervisory boards or adequate fiscal policy frameworks within central banks to deal with Islamic banks and enhance financial stability (IMF, 2019a; IMF, 2019b).

After examining liquidity regulations in the Indian banking sector, the RBI required that banks hold at least 4% of their assets in cash reserve ratio and hold Statutory Liquidity Ratio (SLR) across multiple asset classes. However, these additional requirements were based on limited research, and banks were already required to meet LCR and NSFR requirements as part of the Basel III liquidity risk framework. The 2013 Chinese inter-banking liquidity crisis was caused by regulators' failure to identify contagion risks in banks. Billions of dollars of emergency liquidity were injected into the interbank market to alleviate liquidity shortages (Chen et al., 2020). Chen et al. (2020) argue that Chinese markets' liquidity management would be improved by Basel requirements and liquidity measures introduced by the Chinese Banking Regulatory Authority (CBRA), such as High-quality Liquidity Asset Adequacy Ratio (HQLAAR) and Liquidity Matching Rate (LMR). Although Chen et al. (2020) address the main cause of the 2013 inter-banking liquidity crisis, they do not explore the roles of HQLAAR and LMR in improving bank liquidity. Therefore, research is lacking as it pertains to the adequacy of Basel III to address systemic risk and other country-specific risks and measures taken by regulatory bodies in developing countries. Chapter two aims to fill the literature gap by exploring various regulatory systems used to manage capital and liquidity risk in emerging markets from the perspective of single regulatory systems and dual regulatory systems, which include Islamic banking.

Since the release of Basel III for implementation, several events have taken place, which have introduced macroeconomic concerns that might influence the date and extent of Basel III implementation. Moreover, the Covid-19 pandemic presented unique challenges that might complicate contextual factors, giving regulators the opportunity to use innovative practices to meet Basel III requirements. These challenges might be elevated in dual banking systems, which involve both conventional and Islamic banking institutions (Abdul Ganiyy, Zainol, and Ahmad, 2017). These challenges might be further increased when a government or state-owned banks have higher inherent risks than privately owned banks.

Research has examined how the implementation of Basel III differs across various countries (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2018; Samanta, 2015). These studies highlight the impact of the Basel III implementation on investment and capital flow into the economy, profitability, and risk factors in banking (Rizvi et al., 2018; Samanta, 2015; Upadhyay, 2021). Some of these studies highlight that Islamic banks face particular challenges with Basel III compliance, which are created by the non-uniformity and voluntariness of IFSB rule application, and difficulties conforming to liquidity guidelines (Hidayat et al., 2018; Zainudin et al., 2019). Furthermore, studies highlight that Basel III implementation generates cost and readiness concerns for conventional banks (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2021). However, these studies fail to consider that banking supervisors adjust Basel III requirements in response to the unique set of risks faced by Islamic or state-owned banks (Jarbou and Niyama, 2020; Mohd Amin and Abdul-Rahman, 2020; Rashid, Rahman, and Markom, 2018). Chapter two fills this gap by examining how regulators adapt their laws to facilitate Islamic and state-owned/public sector compliance with Basel III.

Chapter 3 - Basel III: Implications of Capital and Liquidity Regulations on Financial Stability During an Economic Depression

This chapter starts by reviewing the existing literature on the effects of underlying liquidity risk drivers on additional bank risks in the context of amplified systemic risk during the GFC. Funding liquidity risk is crucial for the maintenance of financial stability. Liquidity risk can increase market illiquidity and thus block the transmission channel between illiquid markets.

These cause credit risk, as witnessed in the GFC (Brunnermeier and Pedersen, 2009; He and Xiong, 2012). Hence, understanding the origins and dynamics of liquidity risk is paramount for banks that seek to limit their liquidity risks and for regulators and policymakers who aim to maintain and promote financial stability (Bechtel et al., 2019). Financial institutions gain liquidity risk from the liquidity mismatch between their assets and liabilities (Diamond and Dybvig, 1983). Banks finance their long-term assets with short-term liabilities. Through dependence on volatile sources of funding, for instance, using customer deposits for consumer lending or short-term interbank lending, these activities expose banks to liquidity shocks (Diamond and Dybvig, 1983; BCBS, 2013). Liquidity shocks thus take various forms; large value payment systems, unexpected deposit withdrawals, margin calls in stockbroking, credit line drawdown by corporate clients, and contingent payments as a result of the failure of payment and settlement systems (BCBS, 2013).

Although Basel III is firm-specific and risk-sensitive and can counter systemic risk, critics argue that financial reforms risk limiting credit availability and economic growth (Allen et al., 2012). For instance, these reforms forbid asset-driven liability structures, where banks compete for a larger share of the lending market to boost their assets, assuming that they will receive funding from wholesale markets. Banks would have to return to liability-driven asset structures (similar to those used in the 1960s before global financial deregulation), where before lending, banks must compete for larger shares of stable long-term deposits and funding to strengthen their balance sheets. These changes to regulatory reforms force banks to review internal processes and undertake new business responsibilities, such as the approval of consumer loans and credit, to effectively communicate changes to the business model; to provide opportunities for investors to gain stable long-term financing; and shift risky loans to long-term institutional investors who are better placed to absorb risks. The issue here is not the cost of higher capital and liquidity requirements but rather the operational challenges and consequences posed by stringent regulations, which threaten to starve the economy while Basel III is still incomplete, given that the economy relies heavily on credit. If implemented for an extended period, the alleged cure to the financial crises will become a risk to the financial system (Allen et al., 2012).

Banjaree and Mio (2018) examine the effect of stringent liquidity regulation in the UK with control variables such as asset returns; Tier 1 capital ratio; short-term interbank funding to total asset ratios; foreign deposit to total asset ratios; quarterly asset growth rate; and individual liquidity guidance ratios (similar to LCR). They use the Ordinary Least Square (OLS) regression model to estimate the impact of liquidity regulation on UK banks. Their findings indicate that banks bound by stringent liquidity requirements did not change their balance sheet size but instead changed their asset and liability structures to meet Basel III's requirements. Financial institutions facing higher liquidity requirements found alternative sources of stable funding rather than relying on retail deposits, non-financial corporate deposits, or interbank banking markets. In 2010, BCBS proposed two standards for managing liquidity risk and reducing systemic risk after a GFC. The liquidity requirements under LCR and NSFR rest on largely untested assumptions about the rate of cash outflow and inflows and (in NSFR's case) the percentage of stable and less stable deposits; hence, the use of historical data can shed light on underlying assumptions and policy implications (Hong et al.,2014). However, new liquidity regulations have been studied from different standpoints, such as their implications on lending, profitability, and default risk. But research into the implications of new liquidity regulation on systemic risk remains scarce. Moreover, given the different implementation dates provided by BCBS for NSFR, the post-effect of NSFR on bank default risk within emerging markets has not been fully studied. Chapter three of this thesis fills this gap by investigating the implications of capital and liquidity regulations on bank stability and contribution towards systemic risk. It starts by reviewing the existing literature on the effects of capital and liquidity requirements on bank risks in the context of systemic risk.

Chapter 4 - Credit Risk, Liquidity Risk, Liquidity Creation, and Their Joint Implications on Systemic Risk

This chapter was motivated by examining the intensifying pressure financial institutions face during crises to act as liquidity providers and absorb the negative implications of economic shocks and downturns. It is crucial to understand what causes liquidity and credit risk within a bank and how these two risks interact. We define liquidity risk as "the risk when a large institution runs out of reserved liquid assets and is unable to meet its obligations upon maturity (due to illiquid market conditions that prevent it from converting its illiquid assets to liquid assets), triggering a bank run and consequent liquidation, which exposes the financial system to systemic risk". Similarly, credit risk is the loss-given default arising from a counterparty's inability to meet its obligations, which, following the terms and conditions, results in credit issuers bearing losses (Spuchľáková et al., 2015). However, financial intermediation theory emphasises that banks play a key role in risk transformation because they accumulate liquid deposits on their liabilities and generate profits by issuing illiquid assets and off-balance sheet activities (Diamond, 1984).

Holding higher liquid assets and investments does not make financial institutions immune from credit and default risks. Acharya et al. (2012) explore the link between cash holdings (i.e., liquid assets) and credit risk and default risk. They explain that the firm's short-term default probability reduces when liquid asset reserves are held. However, over a one-year horizon, the relationship between liquidity and default probability becomes positive because the firm faces a difficult choice between maintaining liquidity positions and investing to generate future cash flows. This increases firms' credit spread, thereby resulting in higher credit risk and forcing banks to face the direct and indirect impacts of default risk (Acharya et al., 2012). A bank's decision to adjust its liquidity holdings is a direct impact of short-term default risk. An indirect impact of default risk is the diminishing future cash flow faced by banks, which leads to a higher default probability and amplifies credit risk. Acharya et al. (2012) argue that when default risk increases, firms' responses to increasing liquidity may only partially decrease risk because a firm's stability and risk depend on its asset and liability structure.

Acharya and Thakor (2016) provide a theoretical model for the relationship between bank leverage, liquidity creation, and systemic risk. They argue that higher leverages that arise from banks' lending activities foster liquidity creation, which indirectly increases systemic risk by making financial contagion and bank runs more likely. In contrast, Davydov et al. (2021) examine the effect of liquidity creation on systemic risk, using four different BB measures and covering liquidity creation both on- and off-balance sheets. They use Extreme Value Theory (EVT) to measure banks' systemic risk, tail risk, and systemic linkage. The study uses controls for size, asset volatility, balance sheet composition, and bank-specific measures. Their findings show that liquidity creation decreases systemic risk. Moreover, Acharya and Thakor (2016) argue that on an individual level, high liquidity creation decreases a bank's systemic risk contribution. However, these findings do not consider bank leverage or the risk of a bank run which might significantly affect the findings, as evidenced by GFC. Their study also ignores the impact of credit and liquid risk on bank default risk.

1.1.3. Importance of Research and Significance

This study has significant ramifications for academics and researchers interested in understanding how capital and liquidity risks interact with systemic risk within emerging markets in the aftermath of the GFC and in light of international regulatory reforms. In addition, this research offers significant insights that can help international regulatory organizations develop future international regulatory directives regarding capital and liquidity regulations aiming to reduce financial contagion inside the global financial system. In a similar vein, national regulators in emerging markets should consider this research as it will help them better manage country-specific risks and reduce the likelihood of financial contagion among financial institutions operating in developing countries, as well as better align their regulatory frameworks with regard to capital and liquidity regulation in alleviating financial contagion.

By utilising Basel III, this study expands upon the body of literature that already exists in the fields of credit, liquidity, and systemic risk. However, there have been numerous studies done on credit and liquidity issues in the context of developed economies since the GFC. However, although fulfilling the role of financial intermediation as defined by Diamond and Dybvig (1983), banks operating in emerging economies are very different from their counterparts in the West in terms of their exposure to underlying risks and the nature of their banking operations.

A portion of the literature that already exists examines the distinction between conventional and Islamic banking, the latter of which has a stronger domestic presence in some emerging nations. For example, Azmat et al. (2020) contend that the primary driver of financial intermediation within conventional banks is a consideration of risk and rewards, which leads to asset bubbles within the financial system. By contrast, Islamic banking caters to a religiously inclined audience rather than just a concept of risk and reward. Due to this, a contract for Islamic financing must be risk-sharing in nature or based on the sale or purchase of a real asset (Elnahas et al., 2017). The ability of Islamic banking deposits to be converted into risky lending is constrained due to this difference in nature. This difference in nature means that the conversion of Islamic banking deposits into risky lending is limited.

Another body of research examines the causes of high nonperforming loans (NPLs) on the balance sheets of domestic and international banks in emerging nations. Compared to their counterparts in developed economies, where a few major players control a sizable portion of the market share, the competitive environment for banks in emerging nations is comparatively high (Claessens and van Horen, 2015). Likewise, the presence of foreign banks affects the financial stability of the host country through various channels. For instance, a financial crisis in the home country of a foreign bank can influence the domestic financial stability of the host country due to the contagion spill over effect (Popov and Udell, 2012). Likewise, the influence of foreign banks on credit risk in host nations depends on whether or not they employ "cherry-picking" techniques or make use of high-quality screening technology. If foreign banks implement cherry picking strategy to attract only high-quality borrowers, this will, in turn, result in domestic banks being forced to expand their loan portfolios towards risky borrowers (Natsir et al., 2019). This strategy can lead to higher levels of NPLs across domestic banks and also increase overall credit risk within the host country. In contrast, several researchers (Anginer et al., 2014; Noman et al., 2017) have argued that the relationship between banking competition and systemic risk is negative, as higher competition within banks encourages managers to diversify their risks, thereby reducing financial fragility within the system. Countries with weak supervision and regulations, poor private monitoring mechanisms, state-owned banks and policies restricting competition are more prone to bank systemic risk.

1.1.4. Research Questions and Contributions to Knowledge

This section presents the overarching research question for this research and each chapter's underlying research questions and contribution to knowledge.

The fundamental overarching research question we attempt to address in this thesis is:

Do changes to capital and liquidity requirements in the global financial regulatory framework lessen systemic risk and bank default risk in developing markets?

Chapter 2 further investigates two pressing underlying research questions:

- First, are standardised capital and liquidity regulations better placed to mitigate risks faced by banks?
- Second, whether country-specific regulatory frameworks are needed to cater for additional risks that banks may face while operating within emerging markets?

Since the release of Basel III for implementation, several events have taken place, which have introduced macroeconomic concerns that might influence the date and extent of Basel III implementation. Moreover, the Covid-19 pandemic presented unique challenges that might complicate contextual factors, giving regulators the opportunity to use innovative practices to meet Basel III requirements. These challenges might be elevated in dual banking systems, which involve both conventional and Islamic banking institutions (Abdul Ganiyy, Zainol, and Ahmad, 2017). These challenges might be further increased when the government or state-owned banks have higher inherent risks than privately owned banks.

Research has examined how the implementation of Basel III differs across various countries (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2018; Samanta, 2015). These studies highlight the impact of the Basel III implementation on investment and capital flow into the economy, profitability, and risk factors in banking (Rizvi et al., 2018; Samanta, 2015; Upadhyay, 2021). Some of these studies highlight that Islamic banks face particular challenges with Basel III compliance, which are created by the non-uniformity and voluntariness of IFSB rule application, and difficulties conforming to liquidity guidelines (Hidayat et al., 2018; Zainudin et al., 2019). Furthermore, studies highlight that Basel III implementation generates cost and readiness concerns for conventional banks (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2021). However, these studies fail to consider that banking supervisors adjust Basel III requirements in response to the unique set of risks faced by Islamic or state-owned banks (Jarbou and Niyama, 2020; Mohd Amin and Abdul-Rahman, 2020; Rashid, Rahman, and Markom, 2018). This study examines how regulators adapt their laws to facilitate Islamic and state-owned/public sector compliance with Basel III. This chapter contributes to literature and practice by filling these gaps. It uses qualitative analysis, compares BCBS and IFSB regulation with four countries' national regulatory guidance and regulations, and investigates factors that account for the different risk outcomes between Islamic and conventional banks and private vs public banks.

Chapter 3 examines post-GFC regulatory reforms, investigating Basel III's new capital and the effect of liquidity requirements on systemic risk in the financial system. This chapter makes three contributions to financial risk management literature.

- First, there has been emerging research conducted on Basel III's new minimum liquidity requirements and its ability to predict banks' default probability on a bank-specific level (Hong et al., 2014; Chiaramonte and Casu, 2017; Cuong-Ly et al., 2017; Bai et al., 2018). However, to the best of our knowledge, this chapter is the first to study banks' default probability using the components of NSFR liquidity requirements. In its examination of the impact of NSFR requirements on default risk in the post-transition regulatory landscape, this study uses the Morgan Stanley Capital International (MSCI) index, bank-level data on emerging markets, and the Z-source method, along with the new liquidity measures such as NSFR.
- Second, this chapter makes a novel contribution to the investigation of new liquidity requirements' impact on systemic risk. Although Cuong-Ly et al. (2017) attempt to examine systemic risk, they do not fully consider new mitigating measures such as NSFR, leverage requirements, countercyclical buffers, and globally systemically important institution surcharges. These are important measures to promote financial stability and reduce systemic liquidity risk. This study uses similar MSCI emerging market data, employing CoVaR methodology (Adrian and Brunnermeier, 2009) to study financial institutions' contribution towards systemic risk and to gauge new liquidity requirements' effectiveness at mitigating systemic risk.
- Finally, this chapter's third contribution is its scope. It studies emerging market economies that have thus far been ignored in the literature. Liquidity requirements play a crucial role within these markets where capital markets are underdeveloped, more volatile and not less liquid than their Western counterparts.

Chapter 4 considers two main research questions:

- First, it examines the role of credit and liquidity risk on bank stability.
- Second, it studies the extent to which bank liquidity creation affects systemic risk. The research fills the gaps identified in the existing literature (Davydov et al., 2021; Zheng et al., 2019; Ghenimi et al., 2017; Imbierowicz and Rauch, 2014; Diamond and Dybvig, 1983).

Most of these studies are conducted in developed markets, but there are few such studies being conducted in an emerging market setting post-GFC (Ghenimi et al., 2017). Ghenimi et al. (2017) investigate the effect that credit and liquidity risk have on bank stability in the Middle East and North African (MENA) region, studying 49 banks in eight countries. However, they do not distinguish Islamic banking from traditional banking in that region in their empirical analysis. Moreover, their study does not explore the role of these risks in the bank systemic risk context.

Chapter 4 makes three contributions:

- To the best of my knowledge, it is the first study to investigate the relationship between credit risk, liquidity risk, and its implications on default risk, using a cross-country analysis of emerging markets post-GFC
- Second, the study examines the direct link between bank liquidity creation and systemic risk, which, to the best of my knowledge, remains unexplored in Emerging Market Economies (EMEs). Banks in these economies are more prone to volatile trading environments because the economies are highly dependent on banks for economic growth and are exposed to higher NPLs.
- The third contribution is this study's novel scope because it is the first study of its kind to consider cross-country EMEs. This study also investigates how systemic risk differs across conventional, hybrid, and Islamic Banks.

Gupta and Kashiramka (2020) studied liquidity creation's impact on financial stability in India. They measure liquidity creation at a bank level, with variables such as BBLC, capital ratio, NPA, ROA, deposit growth, total stock market cap, total bank credit provided, bank size, dummy, and Z-score measure. They argue that liquidity creation improves financial stability since it allows banks to perform financial intermediation effectively. However, their analysis uses Z-scores to capture the whole banking sector's financial stability rather than using systemic risk measures to capture the change in risk. They agree that the effect of liquidity creation on bank stability varies significantly between emerging and developed countries and endorse a cross-country analysis for liquidity creation in emerging markets.

1.1.4.1 Theoretical Contributions

The approach adopted in the current study focuses on gathering a wide variety of data from different sources. Therefore, the insights emerging from the study address the gaps in knowledge and contribute to a better understanding of critical issues under investigation. The study's theoretical contribution includes exploring the regulatory frameworks from international and national perspectives. The current research offers detailed insights into the regulatory frameworks for capital and liquidity requirements faced by banks and the role of regulators and policymakers in such contexts. By analysing the specifics of these frameworks, the study contributes to understanding how regulatory policies are formulated and implemented to address financial risks and how the current course of action can be improved.

The study addresses the association between regulatory frameworks and risk factors. The study focuses on various risks that emerge in the banking sector and how they integrate to affect operations. These include credit, liquidity, default, and systemic risks. By examining the relationship between regulatory measures and risk factors, the study enhances our theoretical understanding of how regulations and risk management practices influence the stability and risk profiles in the banking sector. Furthermore, the study adopts different econometric methods to assess the relationship between regulatory frameworks and risk factors. By applying these methods in the context of banking institutions in emerging economies, the study contributes to the methodological advancements in assessing the effectiveness of regulatory measures and their implications for risk management.

The study focuses on emerging economies, which the literature has not explored substantially. The investigation offers valuable information in understanding and responding to these markets' unique challenges and dynamics by highlighting the specific contexts of these countries. Subsequently, the study expands the theoretical knowledge of how regulatory frameworks and risk factors interact in different financial systems and how international systems interact with national needs.

1.1.5. Aims and Objectives

The aim of this thesis is to investigate whether the implementation of Basel III requirements by banks in emerging markets is sufficient to address bank-specific risks and systemic risks among banks in emerging markets. Based on this aim, we seek an understanding of:

- The details of the regulatory framework for the capital and liquidity requirements faced by the financial institution,

- How Basel and IFSB frameworks have an impact on credit risk, liquidity risk, default risk, and systemic risk by adopting a range of econometric methods

The first study (Chapter 2) aims to investigate the differences between the capital and liquidity regulations framework set by Basel III, IFSB, and national regulators under single and dual supervisory regimes within emerging markets. First, Basel III and IFSB standards are compared with respect to capital adequacy, credit risk, liquidity risk, and systemic risk. Then, the study investigates national regulators' management of dual supervisory regimes, focusing on capital adequacy, systemic risk, credit risk, and liquidity risk. The study then investigates the additional regulatory provisions besides the minimum provisions outlined in Basel III. To conclude the study, we analyse the differences in regulations applied to public and private sector banks within emerging market economies.

The first empirical study (Chapter 3) aims to examine the effect of capital and liquidity regulations introduced under Basel III on bank default risk and systemic risk. We use NSFR standards to study their pre and post-2018 effect on mitigating default risk and their contributions towards systemic risk. The relationship between capital and liquidity regulations is examined. Second, we evaluate NSFR for banks and their probability of default risk using the Z-score model. Third, we analyse the marginal contribution of banks towards systemic risk using Conditional Value at Risk (CoVaR).

The aim of the second empirical study (Chapter 4) is to examine the joint impact of credit and liquidity risk on bank stability and to explore the effect of liquidity creation on systemic risk. We achieve this by examining the interactions between credit and liquidity risk. Second, the impact of credit and liquidity risk on bank default risk is evaluated. Finally, the role of bank liquidity creation, and its implications for bank systemic risk, is analysed.

1.1.6. Thesis Structure

The thesis is organised as follows. Chapter 2 focuses on the regulatory capital and liquidity frameworks that national regulators impose on conventional and Islamic banks and on public and private financial institutions. We gather information from national regulators in China, India, Malaysia, and Saudi Arabia for this study. Chapter 3 investigates the newly introduced Basel III liquidity requirements' effect on bank default risk. It uses the 'difference in difference' pre and post-effect of NSFR on bank default risk and measures its impact on systemic risk using

CoVaR by employing bank-level data and available market-level data on emerging economies from Bank Focus, Refinitiv Eikon, and Bloomberg Terminals. Chapter 4 explores the effect of bank liquidity creation on bank liquidity and credit risk using three distinct banking models. Additionally, this study also uses extreme value theory to evaluate conventional, hybrid, and Islamic banks' contributions to systemic risk. Chapter 5 summarises the research findings of the thesis and gives policy recommendations.

Chapter 2 – Regulatory Frameworks for Credit and Liquidity Risk management across developing and emerging economies

2.1. Introduction

Although the exact cause of the 2008 financial crisis is still under debate, a consensus exists that explosive credit growth was a contributing factor, with credit derivatives enabling the magnification of the systemic risks linked with the housing bubble in the USA (Alessi and Detken, 2018; Cucinelli, 2016). Credit growth was enabled by the availability of liquidity in the financial institutions in the U.S., which resulted in excessive risk-taking that ultimately led to the global financial crisis (Harun et al., 2021). In this chapter, we seek to answer two sub-questions:

1. Are standardised capital and liquidity regulations better placed to mitigate risks faced by banks?
2. Are country-specific regulatory frameworks needed to cater for additional risks that banks may face while operating within emerging markets?

This study examines the regulatory frameworks by the IFSB and BCBS aimed at achieving and maintaining stability after the financial crisis. It also covers the implementation of these frameworks by national regulators, together with the innovations put in place to compensate for contextual challenges. Moreover, these issues are examined in the context of Islamic versus conventional banking systems and public or state banks versus private banks. The structure follows a view of the banking system, which differentiates Islamic versus conventional banks, private sector versus state-owned and examines changes in regulations after the GFC. Further, a detailed review of risks in the banking system is presented, followed by a theoretical framework and a description of the document analysis method. The findings that seek to answer the two sub-questions are presented, and a conclusion of the chapter is provided.

2.1.1. The Islamic versus conventional banking

The Islamic financial system emerged in the 1980s and is, therefore, relatively new (Jarbou and Niyama, 2020). The first Islamic bank was opened in Egypt in 1963, although it was closed in 1967 (Perves, 2015). The Islamic banking system has grown tremendously over the last 20 years, although the sustainability of this growth is unknown (Abdul Ganiyy, Zainol, and Ahmad, 2017; Safiullah and Shamsuddin, 2018; Sheikh et al., 2018). For instance, the total assets amounted to $195 billion in 2000, and this increased to $1.4 trillion in 2015 and currently standards at above $3.2 trillion (Misman and Bhatti, 2020; Safiullah and Shamsuddin, 2018). Between 2009 and 2012, Islamic banks in the Gulf Cooperation Council (GCC) had a 17.4% asset growth, 18.2% net lending growth and 19.9% customer deposit growth compared to conventional banks, which achieved 8.1%, 8.1%, and 10% growth within the same period (Mahmood, Gan, and Nguyen, 2018). Globally, the Islamic financial services industry experienced 8.3% asset growth in 2017 (Dhiraj, Puneri, and Benraheem, 2019). Further, considering the numerical growth of the banking system, from one bank in 1975, there are currently more than 200 Islamic banks that operate in over 80 countries (Khokher and Alhabshi, 2019).

2.1.1.1 The foundational principles of Islamic Banking

Islamic banks are like conventional banks in that they have similar objectives, the means to achieve those objectives, and legal and constitutive arrangements (Jaara et al., 2017). The difference is in their mechanism and philosophy of operations (Jaara et al., 2017). Islamic banking is based on the principles of prohibiting interest (riba), prohibiting excessive uncertainty (Gharar) and profit and loss sharing (Abdo and Onour, 2020; Bitar et al., 2018; Farhan et al., 2020; Jaara et al., 2017).

The prohibition of interest in transactions is a means to prevent exploitation (Jaara et al., 2017). The Shariah foresees situations in business where money borrowed returns a lower profit than expected or where the borrower becomes exposed to losses making them unable to pay a fixed return, all of which are prejudicial against the borrower (Ibrahim and Ismail, 2015). In a profit-sharing agreement, the money borrowed is utilized in productive projects that generate capital and profit. Thus, in the Islamic banking system, capital gain is permitted (Jaara et al., 2017). Because loss is shared between the borrower and the lender, the lender becomes an active participant and not a spectator in the investment decision, which balances the risk (Jaara et al., 2017; Radzi and Lonik, 2016). Further, beyond participating in the lending decision, the Islamic banks also act as advisers, investors, traders and agents contingent on the situation and the demands of the customer (Onagun, 2019).

The profit and loss sharing arrangement should lead to more responsible lending and greater resilience than the conventional banking system, where the lender shields themselves from risks associated with the lending decision by employing a guaranteed collateral (Jaara et al., 2017; Syamlan and Jannah, 2019). This arrangement is supported by other foundational doctrines of Islam that recognize the duties of individuals, the sanctity of contracts, property rights, and social justice (Jarbou and Niyama, 2020). Moreover, the money cannot be invested in activities prohibited by Shariah, such as gambling, pork, weapons, pornography, conventional banking, and alcohol (Jarbou and Niyama, 2020; Perves, 2015). Furthermore, the banks are obligated to give alms, fairly share their gains and losses, and encourage the productive use of funds (Farhan et al., 2020; Perves, 2015).

Under these foundational systems, Islamic banks have products (activities) just like conventional banks. These include Musharaka, Mudharaba, Murabaha, Salam, Ijara and Istina. One such product is the profit-sharing investment accounts, which is the equivalent of bank deposits in conventional banking (Baldwin et al., 2019). However, in the Islamic banking context, the underlying asset is usually originated and managed by the bank, and the bank receives a share of the profit for its role in managing the fund, but the loss is borne by the account holder. Thus, they have variable returns, and the capital is not guaranteed, thereby putting the account holders at risk (Maatoug, Ayed, and Ftiti, 2019).

Another product is the Mudarabah saving account. The cash from these accounts is invested in long-term projects, and the profits (not fixed) are shared with the depositors (Sheikh et al., 2018). Mudarabah accounts can have a restricted time and unrestricted time. For the restricted type, the bank seeks the permission of the depositor to mix their funds with their funds, while the unrestricted ones can be administered by the banks independently (Sheikh et al., 2018). In both cases, agreements are in place to share risk between the bank and the depositor.

2.1.1.2 Islamic versus conventional banks through the 2008 financial crisis

Because of the growth of Islamic banking, in many countries, there are dual banking systems – Islamic and conventional with only Iran and Sudan running full Islamic banking systems (Abdul Ganiyy, Zainol, and Ahmad, 2017; Spinassou and Wardhana, 2021). Studies show that Islamic banks were negatively impacted during the 2008 financial crisis (Hussien et al., 2019;

Olson and Zoubi, 2017). The Islamic banking system, however, by having their banking transactions all asset-linked and trade based, experienced a lesser effect of the global financial crisis (Masood and Javaria, 2017; Parashar, 2010). This could be due to generally higher liquidity levels in Islamic banks compared to conventional banks (Masood and Javaria, 2017).

2.1.2. State-owned versus private sector banks

A privately-owned bank is one in which most of the shares are owned and controlled privately by individuals or private institutions (Hussain et al., 2018). State-owned banks may have more advantages compared to their privately-owned counterparts. For instance, political connections in publicly-owned banks may lead to greater deposit collection at higher prices than their privately-owned counterparts, leading to greater market power (Risfandy et al., 2019). Another advantage that state-owned banks have over private banks is trust developed over many years from a feeling that their deposits are guaranteed (Jayawarsa et al., 2021).

Political connections and influence may be detrimental to state-owned banks. For instance, Zhang et al. (2016) indicated that in China, political influence means that state-owned banks lend mostly to state-owned enterprises, and their decisions are strongly influenced by the government. Studies reveal that CEOs of state-owned banks can make use of their political connections to influence the lending decisions of the banks, leading to the sensitivity of the bank to crises (Chen et al., 2018). Authors established that state-owned banks had higher lending during the financial crisis and, consequently, higher levels of non-performing loans (Coleman and Feler, 2015; Ekinci and Poyraz, 2019). As explained by Coleman and Feler (2015), lending is allocated inefficiently and is politically motivated.

2.1.3. Regulatory changes following the financial crisis

The BCBS was created in 1974 after the disturbances that had been witnessed in the international currency and the banking market (Hidayat et al., 2018). Its purpose then was to ensure that the banking system attains reliability (Hidayat et al., 2018). This led to the establishment of Basel I. Because of the weaknesses that remained unaddressed, the Basel II framework was introduced, enabling greater sensitivity to risk and especially the introduction of operational risk (Hidayat et al., 2018). The 2008 financial crisis revealed the failure of Basel II's ability to factor in pro-cyclicality (Hidayat et al., 2018).

Liquidity risk was among the main factors that resulted in the worldwide failure of the banking system, which called for the need for real risk management of the banking system while focusing on liquidity (Harun et al., 2021; Mennawi and Ahmed, 2020; Pushkala, Mahamayi, and Venkatesh, 2017). Indeed, the authors assert that the failure of banks was evident even with liquidity support from their countries' central banks (El-Massah, Bacheer, and Al Sayed, 2019; Jaara et al., 2017). Further, the financial crisis shed light on the need to maintain a satisfactory degree of capital for loss absorption (Spinassou and Wardhana, 2021). This highlighted the banking system's delicateness and the need for a regulatory framework that addresses stability concerns (Maatoug, Ayed, and Ftiti, 2019). Because of this, the BCBS came up with new regulations (Basel III framework) that focus on liquidity as a means of mitigating liquidity risk and restraining the probability of a bank run for the achievement of greater market stability (Harun et al., 2021; Milojević and Redzepagic, 2021).

Basel III is a voluntary and global regulatory framework for the banking system on stress testing, capital adequacy, and market LR (Jaara et al., 2017). This is already under application in different jurisdictions. For example, the US Federal Reserve has required large banks since 2012 to conduct liquidity stress testing (Marozva and Makina, 2020). Specifically, the Basel III framework contains financial reforms on leverage ratio and capital and liquidity requirements to strengthen risk management and corporate governance and improve bank disclosures and transparency to withstand the challenges of operating within a fluctuating environment (Hidayat et al., 2018; Spinassou and Wardhana, 2021). Liquidity requirements help control the risk of maturity transformation whereby a bank uses short-term deposits for long-term finance (Hidayat et al., 2018). Further, strengthening capital buffers requires the improvement of the quantity, quality, as well as reliability of capital adequacy.

The rest of the chapter is organized into four sections, including a literature review, theoretical framework, methodology and discussion and conclusion. In the literature review section, we examine the existing literature on supervisory approaches and the advantages of one approach over the other. Then we examine the literature on risk management and how risk management in Islamic banking differs from conventional banking with a focus on the challenges faced by Islamic banks. The chapter further examines the implementation of Basel III and whether differential regulations exist between Islamic and conventional banks and between state-owned and private banks. The theoretical framework draws from the literature examined and attempts to establish relationships between the concepts examined. Particularly the proposed relationship between Basel III implementation and state/private bank ownership versus implementation and Islamic/conventional banking focus. Our study suggests, through a conceptual diagram, possible relationships to be examined during data analysis.

In the methodology section, we discuss the qualitative analysis method used. Particularly, we justify the use of the qualitative approach and the accompanying techniques for data collection and analysis. Also, describe in detail the steps involved in data analysis and how validity and reliability are achieved. In the final section –discussion and conclusion – this study presents the findings and compares them with the literature. Moreover, the researcher presents the patterns established during the analysis. Further, the researcher identifies any new knowledge gained, the limitations of the research and recommendations for further studies.

2.2. Literature Review

In this section, we examine the existing literature on supervisory approaches and the advantages of one approach over the other. This is followed by an examination of the literature on risk management and how risk management in Islamic banking differs from conventional banking, with a focus on the challenges faced by Islamic banks. The chapter further examines the implementation of Basel III and whether differential regulations exist between Islamic and conventional banks and between state-owned and private banks.

2.2.1. Banking supervision

Banking supervision is based on two approaches: risk-based and compliance-based approaches. The compliance-based approach is traditional and involves checking boxes to determine whether rules have been complied with (Dalhatu and Sharofiddin, 2020). Risk-based supervision (RBS), on the other hand, is a modern approach based on principles, and its focus is on identifying areas of the highest risk within a banking system. An RBS framework is operationalized through the evaluation of the risks inherent in the banking system and the quality of the risk control measures undertaken to address these risks (Dalhatu and

Sharofiddin, 2020). It can enhance the soundness and safety of the banking system and result in increased efficiency of resource allocation (Newbury and Izaguirre, 2019).

The concept of risk-based supervision is addressed in the Basel framework. The Basel committee called for effective risk-based supervision as part of fulfilling the core requirements for regulators. This effectiveness was described as going beyond examining the balance sheet of banks to considering the wider macroeconomic environment. The Basel Framework requires the evaluation of risk from a wider perspective than the balance sheet, recommending a macro perspective (BCBS, 2021, p. 1525-1626).

The macro perspective described includes the macroeconomic environment, concentration risk build-up, and business trends. Thus, as described, achieving risk-based supervision involves examining macroeconomic trends and their potential impact on the banking sector. Further, it is achieved through early interventions as well as timely supervisory actions. The Basel framework further identifies that achieving risk-based supervision means that supervisors must do more than passive evaluation of compliance with rules.

The IFSB recognizes, advocates for, and adopts the risk-based approach (supervision). The body defines the approach as risk assessment and management by the supervisor (IFSB-16, 2014, p.2). In the IFSB-13, the body urged supervisors to use risk-based approaches. In the IFSB-16 report, it is indicated that the body recommended that supervisors review the risk-based approach and address the implications of various risk categories for supervisors. In subsequent releases, we noticed a word-by-word similarity in views about the risk-based similarity between the provisions of IFSB and BCBS.

In a study conducted by Ajibo (2015), the author examined the reliance on credit rating information and recapitalization and established that though they have relevance in the banking sector, the future of banking should lean towards a risk-based supervision (RBS) framework. The RBS framework is part of the Basel II framework that ought to have been rolled out by banks. Therefore, it is assumed that banks in emerging countries have rolled out risk-based supervision and are in the process of implementing the Basel III requirements.

Dalhatu and Sharofiddin (2020) listed the challenges of implementing RBS in the context of Islamic banks. The author argued that RBS was developed for the conventional banking system and, thus, is grossly inefficient. The author explained further that the inefficiency comes from the RBS' failure to address the unique need of the risks in Islamic banks and omit the Internal Shariah audit and the Shariah board. This view is supported by Dalhatu and Sharofiddin (2021), who termed the RBS framework as unable to accommodate the unique risks inherent in Islamic banking, as well as the unique control of risk management functions in Islamic banks. In chapter two, we only identify, where information is provided, whether the respective bank utilises the RBS framework and does not seek to establish its efficiency or deficiency in risk management.

2.2.2. Risk management in banks

Islamic banks face almost the same risks as their conventional (interest-based) counterparts (Yaacob, Rahman, and Karim, 2016). However, risk management in Islamic versus conventional banks differs because the Basel protocol cannot directly be applied to the Islamic banking system (Perves, 2015). Moreover, Islamic banks face new and unique risks resulting from their liability and asset structures which differ from the conventional banking system and which stem from the need to comply with Shariah laws (Ismail, Rahman, and Ahmad, 2013).

2.2.3. Capital adequacy

Bank capital is vital to the stability of the financial market because it safeguards each institution against failure and reduces systemic risk (Rochet, 2018). The IFSB recognizes the presence of displaced commercial risk (DCR) whereby the Islamic banks are under pressure to pay the investment account holders cash returns that align with the benchmark for the conventional deposit rate of return when the actual returns on the accounts may be lower (Baldwin et al., 2019). This diminishes the bank's capital in the case where the bank uses its capital to pay investment account holders. Baldwin et al. (2019) denote such a scenario in the 1980s when a bank (the International Islamic Bank for Investment and Development) allocated all its profit to investment account holders. The presence of displaced commercial risk thus threatens the capital adequacy of Islamic banks. Although DCR is unique to an Islamic bank, conventional banks also face market risks that threaten their working capital. Therefore, both banking systems require adequate capital. The Basel frameworks provide for three types of capital that must be maintained by a bank: (a) regulatory capital, (b) capital conservation buffer, and (c) countercyclical buffer.

2.2.3.1. Regulatory capital

The Basel framework lists three types of capital as eligible regulatory capital: common equity tier 1 (CET1), additional tier 1, and tier 2. CET1, according to the Basel framework, comprises (a) common shares issued by the bank, (b)share premium coming from the CEIT1 instruments, (c)retained earnings, (d) other comprehensive income and disclosed earnings accumulated, (e) common shares issued by consolidated subsidiaries, and (f) regulatory adjustments in the computation of CET1. Additional tier 1 comprises (a) instruments issued by a bank that meet tier 1 requirements but do not fall under CET1, (b) the stock surplus resulting from selling additional tier 1 instruments, and (c) instruments from consolidated subsidiaries held by third parties which meet tier 1 and not CET1 requirements. Additional tier 1 instruments must not have a maturity date unless they have an automatic rollover. Tier 1 capital is thus predominantly the banks' shares as well as its retained earnings. Tier 2 capital, according to the Basel Framework, comprises (a) bank-issued instruments that do not meet the criteria for tier 1, (b) share premium from tier 2 instruments, (c) the third party held instruments from consolidated subsidiaries that do not meet the criteria for tier 1, (d) loan loss provisions, and (e) regulatory adjustments in the computation of tier 2. (BCBS, 2021).

The Basel framework further indicates that tier 1 capital is the sum of CET1 and additional tier 1, and total regulatory capital is the summation of tier 1 and tier 2 capital. The capital requirements as a percentage of risk-weighted assets are shown in figure 1 below.

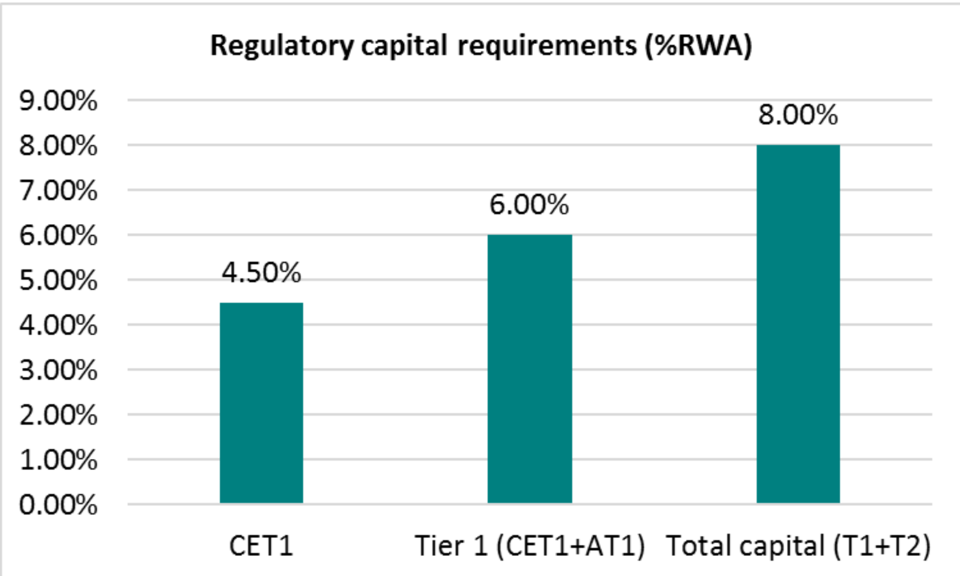

Figure 1. Regulatory capital requirements by the BCBS adapted from BCBS, 2021

2.2.3.2. Capital conservation buffer

The CCoB is one of the macro-prudential rules introduced by the BCBS in the Basel III framework as a means to mitigate the risks that stem out of pro-cyclical consequences of bank capital (Maatoug, Ayed and Ftiti, 2019). Banks are required to have buffers above the minimum regulatory requirements. The conservation buffer enables banks to build buffers in periods where there is no financial stress.

According to the Basel Framework, a CET1 conservation buffer is set at 2.5% of RWA for all banks (BCBS, 2021, p.151/1626). The Basel Framework further indicates that the buffer should be available for withdrawal but should not be used for competition with other banks. The IFSB acknowledges the importance of the capital conservation buffer and its use, keeps its meaning and recommends a value of 2.5% of RWA (IFSB-2015, p. 14). IFIs that fail to meet the conservation buffer submit a conservation plan. Further guidance on conservation buffer includes forbidding the inclusion of capital raised from Sukuk issuance.

2.2.3.3. Countercyclical buffer

The Basel III framework provides for the need for a CCyB for banks that are systemically important (BCBS, 2021, p.139-1626). The countercyclical buffer aims to account for the macroeconomic environment in which the banking sector operates by building up reserves during periods of excessive economic growth to cushion the banks against losses (during economic contractions). The determination of when to activate the countercyclical buffer is left to the supervisor, and some of the tools used include credit growth and credit-to-GDP. The value of the countercyclical buffer is set at a minimum of 0% and a maximum of 2.5% of RWA (BCBS, 2021, p.156-1626; India Data 2014, p.86). The Basel Framework further indicates that while buffer increase decisions following the announcement by the national authorities need to be implemented over 12 months, the reduction of countercyclical buffers should be immediate.

The IFSB recognizes CCyB and instructs national supervisors to consider pro-cyclicality in their stress testing and for Islamic Financial Institutions (IFIs) to consider the Basel III capital framework. Moreover, the IFSB considers the introduction of countercyclical buffers to reduce pro-cyclicality. The required level is left to the determination of the supervisory authority.

In Islamic banking, the computation of the capital adequacy ratio considers profit-sharing investment accounts, which are unique to the Islamic banking system and are a hybrid of equity and debt (Baldwin, Alhalboni, and Helmi, 2019). Baldwin, Alhalboni, and Helmi (2019) noted that regulators in Islamic banks had chosen the path of adopting the standards of the BIS as much as possible. In the computation of the capital adequacy ratio, the formula for Islamic banks is a modified version of the BIS formula. The modification involves an adjustment factor (alpha), which comes from subsidizing the returns of the account holder using the bank's equity. The IFSB estimates the alpha for each country based on the normally distributed return of Islamic banks' assets and thus does not include the alphas of the individual banks based on the risk profile of the asset (Baldwin et al., 2019).

2.2.4. Systemic risk

Systematic risk is the probability that the failure of one bank could have ripple effects leading to the failure of other banks (Karimalis and Nomikos, 2018). Following the financial crisis, most regulators have put pressure on the control of systemic risk through many policy reforms (Butzbach, 2016). First, regulators sought to reduce the too-big-to-fail problem of banks by encouraging de-diversification, size reduction, separation of investment banking and retail banking and risk exposure reduction through tightening liquidity and capital (Butzbach, 2016). The Basel framework recommends the imposition of higher loss absorbency with tier 1 capital for systemically important banks (BCBS, 2021, p. 160/1626). The aim of this is to tame banks from increasing their systemic importance.

The risk control measures by the IFSB concern controlling factors that may contribute towards systemic risk. For instance, protecting the Investment Account Holders (IAH) ensures the avoidance of Unrestricted Profit-Sharing Investment Account (UPSIA) withdrawals that may result in systematic risk. Another example is controlling the possibility of a bank run when Islamic investors withdraw their funds due to poor performance. Further, the FSB advocates for systemic protection through a public safety net.

2.2.5. Credit risk

The BCBS defined credit risk as the likelihood that a bank would lose partially or fully an outstanding loan because of credit events leading to a high probability of default (Isanzu, 2017). It is also the likelihood of a counterparty or a borrower failing to meet their obligations according to the agreed terms (Bahago et al., 2019; Basah et al., 2018; Isanzu, 2017; Qadiri and Alsughayer, 2021; Rafiq and Siddiqui, 2018; Saleh and Abu Afifa, 2020; Taiwo et al., 2017). The default usually emanates from the failure to settle an obligation, restructure, change of credit rating, moratorium/repudiation, and bankruptcy (Bahago et al., 2019; Isanzu, 2017; Qadiri and Alsughayer, 2021).

Credit risk is considered the largest exposure for most banking institutions (Dong and Oberson, 2021). It was addressed in Basel I through the introduction of CAR. In Basel II, banks were permitted to compute the RWA using two methods, the standardized approach and the advanced approach. The advanced or internal rating-based (IRB) approach permits banks to define one or three of the parameters for credit risk compute including the exposure at default (EAD), loss given default (LGD), and probability of default (PD) (Dong and Oberson, 2021). The determination of the banks that may adopt the IRB approach is subject to their operational nature, risk profile, and capability to meet the requirements for eligibility (Dong and Oberson, 2021).

Given that banks derive their income mainly from the interest charged to borrowers, advancing loans to customers is their crucial function (Bahago et al., 2019). Poor administration of credit leads to reduced profitability as well as distress and/or failure (Taiwo et al., 2017). This makes it critical for the bank to determine the risk for each loan and each borrower as a primary means of credit risk minimization and management (Konovalova, Kristovska, and Kudinska, 2016). Credit risk is carried out by the financier (bank) and involves the complete or partial loss of both the interest and principal. Credit risk is measured in previous studies through the percentage of NPLs (Misman et al., 2015). The loan becomes non-performing when the principal or interest remains due by 90 days or more (Misman et al., 2015).

2.2.5.1. Credit risk management in Islamic banking

In Islamic banking, credit risk could arise due to several events. First, the Islamic bank may be exposed to credit risk when a client fails to remit the proceeds of a Murabaha contract based on the pre-determined terms. Credit risk may also occur in a Musharakah contract when a customer fails to buy their agreed share based on predetermined terms and conditions (Farhan et al., 2020). Salam or parallel Salam if the contracted asset is not provided as pre-agreed upon, leading to the entire loss of an investment (Farhan et al., 2020). Further, failure to meet the commitments for Istina or parallel Istina contracts may expose the Islamic bank to credit risk (Farhan et al., 2020). Lastly, credit risk may occur if the lessee in an Ijarah contract fails to pay lease rentals according to the terms agreed (Farhan et al., 2020). Aside from these events, Dalhatu and Sharofiddin (2020) state that credit risk in Islamic banking may stem from a mismatch between the credit portfolio and the growth of assets.

According to Safiullah and Shamsuddin (2018), Islamic banks are exposed to higher credit risk in their profit and loss-sharing financing arrangement because of the borrowers' moral hazards where they could share losses with the bank. Additionally, restrictions on the use of instruments to mitigate credit risk, such as derivatives, may also increase their exposure to credit risk. However, the partnership contract between the borrower and the lender in an Islamic bank setting could decrease information asymmetry, facilitate a better understanding of the creditworthiness of the borrower and improve the problem of adverse selection (Safiullah and Shamsuddin, 2018). Credit risk management is thus important as it leads to maximizing the risk-adjusted return rate of a bank (Taiwo et al., 2017).

2.2.5.2. Credit risk management in the public sector/state-owned banks

Some researchers indicate that NPAs are a major problem in India's public sector banks (Bhatt, 2021; Hussain, Maheshwari, and Hamid, 2021; Pushkala et al., 2017). One of the main ways the public sector banks in India manage credit risk (high NPAs) is through initiating high levels of provisioning, which are reported in balance sheets (Pushkala et al., 2017). The NPAs, on the other hand, were never reported (Pushkala et al., 2017). Rahaman and Sur (2021) find several factors that influence NPAs in India, and among them are corruption and laws. As it pertains to credit risk management, Arora (2021) established that the credit risk management practices of Indian banks involved implementing know your customer (KYC), a strong mechanism for loan review and appraisal, being aware of the risk management mechanisms of other banks, controlling for wilful defaults, having a multi-tier process for credit approval, and risk-based appraisals.

2.2.6. Liquidity risk

Liquidity as a concept does not have a universally agreed definition because it emanates from different economic viewpoints (Marozva and Makina, 2020). In banking, it is defined as the capability to meet financial obligations on time (El-Massah, Bacheer, and Al Sayed, 2019; Khalid, Rashed, and Hossain, 2019; Tran, Nguyen, and Long, 2019; Yaacob et al., 2016). Liquidity risk, on the other hand, refers to the probability that a bank will fail to meet its obligations (Abdul-Rahman, Said, and Sulaiman, 2017; Dhiraj, Puneri, and Benraheem, 2019; El-Massah et al., 2019; Ghenimi, Chaibi, and Omri, 2020; Mennawi and Ahmed, 2020; Yaacob et al., 2016). Other authors use different terms in defining liquidity risk. For instance, Bahago, Jelilov, and Celik (2019) defined liquidity risk as the likelihood of customers exceeding the available bank calls on cash or that the bank's income through a bay window as well as what it can raise through the issuance of equity or debt is unable to cover the operating obligations leading to a halt in bank operations. Further, liquidity risk may emanate from the lack of a hedging instrument at an economical price or the inability of a bank to sell its assets at or above its market value (Abdo and Onour, 2020; Bahago et al., 2019; Chen et al., 2018).

Liquidity risk management refers to the strategies or procedures that banks put in place to enable them to balance the supply (asset) and demand (liability) of liquidity (El-Massah et al., 2019). A balance is necessary as excess liquidity is unfavourable to the bank as it reduces bank profitability due to the loss of opportunity (Abdo and Onour, 2020; Jedidia and Hamza, 2015; Mennawi and Ahmed, 2020). Some of the strategies involve monitoring the variations in the maturities of assets and liabilities and future funding needs while considering different scenarios, such as the ability of a bank to quickly liquidate their positions when faced with adversity (Abdo and Onour, 2020; Bahago et al., 2019; Mennawi and Ahmed, 2020).

2.2.6.1. Regulatory provisions

The Basel committee came up with standards that are aimed at enhancing the sound management of liquidity in banking institutions (Mennawi and Ahmed, 2020). This includes the LCR and the NSFR (Marozva and Makina, 2020; Yaacob, Rahman, and Karim, 2016). The LCR is a means to promote the resilience of banking institutions during short periods of stress, ensuring that they have HQLA lasting 30 calendar days (Yaacob et al., 2016). According to the Basel III standard, the bank's LCR should be 100%, which means that their stock of HQLA equals their total net cash outflows (BCBS, 2021). However, GN-6 (2015, p.1) indicates that the initial percentage required was 60%, and banks were to increase the value each year by 10% to reach 100% by 2019. Moreover, the HQLA is permissible for use during systemic and idiosyncratic stress events. The characteristics of HQLA include less risky assets, its valuation is easy and certain, its correlation with risky assets is low, and the asset is listed on a recognised and developed exchange. The NSFR is aimed at ensuring that banks keep stable their funding profiles as it relates to their off-balance sheet activities and their asset composition, which in the end, restricts their overdependence on wholesale short-term funding.

NSFR is only a complement of the LCR, having a horizon of one year and coves idiosyncratic stress (Yaacob et al., 2016). The components of the NSFR include the ASF, which refers to the liability and equity funding that can be relied on over a year under extended stress conditions and the RSF, which is based on the liquidity attributes as well as the residual maturities of different assets under the scenario of extended idiosyncratic stress. The ratio of ASF and RSF is 100%.

The purpose of the leverage ratio is twofold (a) limit the build-up of extreme leverage levels that would destabilize the process of deleveraging, which can destroy the wider financial system, and (b) strengthen the risk-based framework for capital adequacy with a backstop measure that is non-risk. The minimum leverage ratio in Basel III is 3% (Hidayat et al., 2018). The leverage ratio is measured using tier 1 capital, and the measure of exposure is a non-derivative and on-balance sheet (Jaara et al., 2017). According to Hidayat et al. (2018), the leverage ratio ought not to be a problem for Islamic banks since they rely on fixed assets.

2.2.6.2. Liquidity risk in Islamic banking

The IFSB acknowledges the liquidity challenges faced by Islamic banks. According to IFSB, using the liquidity standards requires infrastructure improvements such as Shariah-compliant deposit insurance, Systemic Lender of Last Resort (SLLOR) scheme, and a regular and sufficient supply of HQLAs. The IFSB recognizes the role of LCR in short-term stress scenarios. The definition of LCR and HQLAs is similar to in the case of BCBS, except for the replacement of non-compliant with compliant assets. The level 1 assets in Islamic banking comprise (a) banknotes and coins, (b) central banks reserves that can be drawn during times of stress, (c) Sukuk and Shariah-compliant securities guaranteed or issued by sovereigns, *Multilateral Development Banks* (MDBs), Public Sector Entities (PSEs), or the International Islamic Liquidity Management (IILM) Corporation. The definitions and requirements for levels 2A and 2B remain like the BCBS except for the inclusion of Sukkuk and allowable Shariah-compliant instruments.

The IFSB acknowledges the NSFR and includes five tools that are relevant for liquidity monitoring. These include (a) mismatch in contractual maturity, (b) funding concentration, (c) unencumbered assets, (d) market-associated tools for monitoring, and (d) LCR by their significant currency (GN-6, 2015, p.1). IFSB provides discretion to the supervisors on parameters such as run-off rates. They argue that these parameters need to be studied with the consideration of the business model, funding profile, and products offered by the IFIs and additionally consider the market and stress situation and consider smaller IFIs.

Liquidity risk bears the same importance in Islamic banks as in conventional banks (El-Massah et al., 2019). Of all the banking risks, it is regarded as the most influential as it could result in the collapse of the bank and cause instability in the entire banking system, for instance, the 2000 to 2001 banking crisis in Turkey and the collapse of South Africa's Islamic Bank Limited (Abdul Ganiyy, Zainol, and Ahmad, 2017; Harun et al., 2021). Basel III requires banks to maintain high quality and high levels of liquidity, and the standard liquidity ratio should be 2:1 (Abdo and Onour, 2020; Sarker and Bhowmik, 2021). However, Islamic banks are often forced to have higher levels of liquidity above prudential and legal requirements compared to conventional banks (Abdul Ganiyy et al., 2017; Dhiraj et al., 2019; Harun, Kamil, Haron and Ramly, 2021; Jedidia and Hamza, 2015). In essence, Liquidity remains the biggest challenge that Islamic banks face (Harun et al., 2021; Hidayat et al., 2018; Jedidia and Hamza, 2015).

Theoretically, the Islamic banking system should have no problem with keeping high quality and sufficient liquid assets because of the concept of profit and loss sharing, which reduces the overall bank risk, and a two-window model should make them insolvency proof (Amin, Ali, and Nor, 2018; Jaara et al., 2017; Waemustafa and Sukri, 2016). For instance, Mudaraba deposits and savings should enable them to finance debt-based assets, restricted investment accounts should help in financing equity investment and short-term and cash financing should cater for regular withdrawals (Mennawi and Ahmed, 2020). Moreover, contractual risks with the potential to generate liquidity challenges ought to be managed through parallel contracts, securitization and careful documentation, especially for salam, istina, and ijara, while looking for the opportunity to trade them in the secondary market whenever possible (Dhiraj et al., 2019). Sukkuk contracts can also be used as a liquidity management solution (Harun et al., 2021).

The biggest challenge lies in the translation of these concepts into real-life situations in the face of market imperfections and information asymmetry (Jaara et al., 2017; Jedidia and Hamza, 2015). One such imperfection is that many assets in Islamic banks are debt-based, and therefore, the restrictions on selling debt render them illiquid during distress (Yaacob et al., 2016). Moreover, even when Mudaraba exists in two tiers, the banks are still subjected to liquidity risk because the capital value of the demand deposit is guaranteed and is redeemable on demand and at par, and they rely on short-term deposits for funding long-term projects (Jedidia and Hamza, 2015; Waemustafa and Sukri, 2016).

Islamic banks have constrained sources of liquidity in general as they lack the flexibility that is eminent in conventional banking (Hidayat et al., 2018; Jaara et al., 2017; Zolkifli, Samsudin, and Yusof, 2019). This flexibility includes the money market instruments (interest-based) and the sale of debt instruments often used in the conventional banking system but which are prohibited for Islamic banks based on Sharia principles (El-Massah et al., 2019; Jaara et al., 2017; Yaacob et al., 2016). They also include the inability to engage in interbank transactions with conventional banks or turn to the central bank as the lender of last resort because the Central banks' lending instruments in many countries are not Sharia-compliant (Abdul Ganiyy, Ogunbado, and Ahmad, 2017; Dhiraj et al., 2019; Elouali and Oubdi, 2020; Harun et al., 2021; Mennawi and Ahmed, 2020; Yaacob et al., 2016). The shariah compliance issues include riba, tawarruq and ijarah inah (Jedidia and Hamza, 2015).

Solutions such as securitization are minimally used in Islamic banking, and given that they handle real assets and business cycles, liquidity risk lies in the dependence on the cooperation of business partners and a good business condition to maintain high liquidity (Islam, Farooq, and Ahmad, 2017; Yaacob et al., 2016). Where innovative instruments are used to handle liquidity risks, the instruments are not globally acceptable and thus are not adaptable, cannot be traded, and lack the flexibility witnessed for the instruments used in conventional banking systems (Dhiraj et al., 2019).

The IILM Corporation has in the past employed temporary solutions to tackle the liquidity challenge (Hidayat et al., 2018). Most of the liquidity management solutions used by Islamic banks include assets that generate lower profits, for instance, central bank deposits and cash, among others and are thus less effective than the instruments used in the conventional banking system (Hidayat et al., 2018). This leads to the need for Islamic banks to resort to using short-term financing techniques that could help them achieve the same profits as the conventional banking system. Such techniques introduce further risks (Harun et al., 2021). For instance, Perves (2015) stated that in Bangladesh, 60% to 70% of Islamic banks' investments are mark-up based (Tawarruq contract) as opposed to Murabahah. Further, Islamic banks many times operate in markets where Islamic interbank money markets are either underdeveloped or non-existent (Elouali and Oubdi, 2020; Ismail, Rahman, and Ahmad, 2013; Mabrouk and Farah, 2021). Further, the banks operate where there are no Islamic capital markets and especially Sharia-compliant secondary financial markets (Dhiraj et al., 2019; Elouali and Oubdi, 2020; Harun et al., 2021; Waemustafa and Sukri, 2016).

2.2.6.3. Liquidity risk in the public sector/state-owned banks

According to Pushkala et al. (2017), public sector banks in India are shielded by a liquidity cover (repos). However, other studies indicate that the high level of NPAs in the public sector banks in India lowered the liquidity levels of the banks, although an empirical examination of their relationship returned insignificant findings (Bandyopadhyay and Saxena, 2021; Bhatt, 2021).

2.2.7. The implementation of Basel III

The Basel Framework aims to provide standards to ensure the prudential regulation of banks. Further, implementation is in a consolidated manner. According to the Basel Framework, the scope of implementation of the Basel framework is unlimited and includes all active banks without discriminating against Islamic banks (BCBS, 2021, p.1).

2.2.7.1. Contextual provisions for Islamic banks

The Basel accord, especially Basel III, is criticized for its inability to address Islamic banking risks, which many times emanate from the uniqueness of the banking system (Mohd Amin and Abdul-Rahman, 2020). Moreover, many Islamic banks operate within the same regulatory environment as conventional banks (Mohd Amin and Abdul-Rahman, 2020). The IFSB has the role of providing prudential standards and prescribing ways of adapting the conventional requirements (BCBS standards) for Islamic banks. The guidelines provided by the IFSB permit the implementation of local adjustments by regulators (Spinassou and Wardhana, 2021).

Changes have occurred in the regulation of Islamic banking pre-2008 financial crisis and post-crisis period. Some of these changes correspond to the need to adjust BCBS provisions to the Islamic banking environment. In 2002, the Liquidity Management Centre (LMC) was created to aid the development of a Sharia-compliant secondary liquid market (Mennawi and Ahmed, 2020). Post-crisis, the IILM corporation launched a short-term Sukuk program to foster cross-border liquidity management (Mennawi and Ahmed, 2020). The IFSB-2 standard, which was published in 2005, was amended in March 2011 through the introduction of guidance on the determination of a new regulatory Capital Regulation.

The Basel III framework requires banks to maintain two minimum liquidity standards – the NSFR and the LCR (Alsharif et al., 2016; Amran and Ahmad, 2021; Ayed, Lamouchi, and Alawi, 2021; Galletta and Mazzù, 2019). The role of the LCR is to provide cash within 30 days of stress, while the NFSR is meant to enable the bank to address maturity mismatch in their balance sheets (Alsharif et al., 2016; Mennawi and Ahmed, 2020). The IFSB modified the NSFR and LCR to include Sharia-compliant assets through the publication of the IFSB-12 in March 2012.

IFSB developed 23 principles for liquidity management by Islamic banks which made the board of directors responsible for coming up with the policies, strategies, and framework for liquidity risk management as well as the degree of tolerance to liquidity risk (Mennawi and Ahmed, 2020; Syamlan and Jannah, 2019; Yaacob, Rahman, and Karim, 2016). Senior managers were to implement these policies and strategies while ensuring timely and effective liquidity management (Mennawi and Ahmed, 2020).

IFSB-15 was announced in December 2013. It featured the revised standard for capital adequacy for Islamic financial services in line with Basel III (Maatoug, Ayed, and Ftiti, 2019). The Basel committee requires banks to hold sufficient capital to absorb losses, including 8% of risk-weighted assets as the minimum capital with tier 1 exceeding 4% of risk-weighted assets as well as 3% of the total assets (Golubeva, Duljic, and Keminen, 2019; Misman and Bhatti, 2020; Onagun, 2019; Spinassou and Wardhana, 2018). The Tier 1 capital, according to the Basel committee, comprises reserves, paid-up capital, reserves and retained earnings. Tier

2, on the other hand, comprises subordinated debts and hybrid instruments, which contradict the Shariah law (Onagun, 2019).

The IFSB thus have modified capital requirements that are aligned with the Sharia. The capital components based on the IFSB are divided into Tier 1 and Tier 2, where Tier 1 is further subdivided into common equity (CET1) and Additional (AT1) (Onagun, 2019). AT1 includes instruments with a high level of loss absorbance (Sukuk Musharakah) and some reserves, while CT1 capital comprises common equity shares, retained earnings as well as some reserves (Onagun, 2019). Tier 1 capital enables the banks to absorb losses while they are still solvent, while tier 2 absorbs additional losses beyond tier 1 and includes instruments (Wakalah or Sukuk Mudarabah), premiums paid on the instruments and reserves or general provisions (Onagun, 2019). The minimum maturity of the tier 2 capital should be five years, and the profit distribution must not be associated with IIFS credit rating (Onagun, 2019).

In October 2014, the IFSB issued a guidance note (IFSB-GN-6) in which the attributes of HQLAs were described as assets that are active, less volatile and less risky and advocated for the implementation of Basel III's NFSR, LCR and implementation schedule (Hidayat et al., 2018; Mennawi and Ahmed, 2020). These were published in April 2015 (Ayed, Lamouchi, and Alawi, 2021).

Most of the bank risk management strategies and tools do not apply to Islamic banks. Therefore, in some jurisdictions where Shariah law is not the fundamental law of the country, central banks often create Shariah-compliant risk management facilities for Islamic banks (Dhiraj et al., 2019). Further, many countries have begun to create Sharia-compliant instruments for liquidity management, including interbank investment accounts, commercial papers, certificates of deposit, commodity murahaba, money market and Sukuk (Mennawi and Ahmed, 2020).

Aside from developing Sharia-compliant instruments, two-thirds of national regulators often permit Islamic banks to customize the capital requirements of conventional banks before applying them to the Islamic banking system (Spinassou and Wardhana, 2021).

2.2.7.1.1. Pakistani case

To help Islamic banks in Pakistan to minimize risk, the central bank in Pakistan (The State bank of Pakistan) provided several guidelines. First, the central bank requires Islamic banks to come up with a financing strategy to identify maximum exposures to credit risk (Farhan, Alam, Sattar, and Khan, 2020). The bank's board of directors is deemed responsible for regulating asset allocation, risk appetite, as well as risk divergence and coming up with a catalogue that describes all permitted and relevant financing activities of the bank. The board is also responsible for developing Sharia-compliant strategies for how banks handle inherited credit risks. Further, expert review is required for the entire life of a project, and Islamic banks are required to come up with measurement and reporting strategies for credit risks emanating from different financial contracts, including counterparty risks in Salam and Istina.

The central bank permits the development of Shariah-compliant procedures for each contract, including considering all possible risks in pricing decisions and determining the return rate of their contracts. The banks are required to have an administrative mechanism for handling defaulters, and measures for recovering loans may include (a) proactively negotiating with the customer, (b) using a debt collection system, (c) enforcing collaterals or guarantees, (d) permitting debt restructuring or rescheduling, (e) imposing penalties and fines and (f) giving customers enough time to make payment (Farhan et al., 2020). The central bank further advised Islamic banks to come up with strategies and policies for fulfilling their commitments in Parallel Istina and parallel Salam contracts as well as on leased products and provide Takaful coverage against products that were deemed essential (Farhan et al., 2020).

Credit risk management is governed by some basic guidelines beyond which the bank is permitted to come up with innovative ways to control risk (Bülbül, Hakenes, & Lambert, 2019). The challenge of leaving credit risk management to the board without active banking supervision by the regulator (inadequate supervision) is the potential for insolvency issues, as experienced in Ghana (Boateng, 2019). We, however, did not find evidence of Islamic banks in distress in Pakistan, although a recent study revealed that while local banks were in good health, foreign banks in Pakistan were at risk of bankruptcy (Ullah et al., 2021). Ulla et al. (2021), however, classified banks into public, private, and special banks and did not mention the banks in their sample, whether they were Islamic or not.

2.2.7.1.2. Indonesian case

Indonesia enacted laws that necessitate the supervisory board in sharia financial institutions and sharia companies (Ningsih, 2020). The role of the supervisory board is to ensure the banks operate as per the Sharia laws by providing counsel to the board of directors. They also provide mediation between the national sharia board and bank management as it pertains to fatwas. Lastly, the supervisory board act as a representative of the national sharia board in implementing DSN fatwas (Ningsih, 2020). Compared to the case of Pakistan, Indonesia seems to have better supervision because of the presence of a national board other than the bank's board of directors. Studies on the role of the Sharia supervisory board only focus on corporate governance characteristics, which does not align with this study.

2.2.7.1.3. Bangladesh case

The country has provisions in its laws for Islamic banking, but there are no laws that specifically address Islamic banking (Perves, 2015). In 1984, the country's first provision for Islamic banks was made in the income tax ordinance, where profits paid on Mudaraba were considered as an expenditure. In the 1990s, the country established an Islamic economic division to handle varied matters about Islamic banking. In 2004, the central bank (Bangladesh Bank) established its first Shariah-compliant investment bond, and in 2007, the central bank issued the Mudaraba Perpetual Bond (Perves, 2015).

In 2009, the central bank instructed Islamic banks to identify risks associated with investment and financing contracts to ensure capital adequacy. This instruction was based on the IFSB-2. Further, in 2009, the central bank issued guidelines for Islamic banks as a supplement to the existing bank laws, regulations, and rules. Perves (2015) states that these guidelines so far do not provide a comprehensive framework on how to handle priority cases in situations where the International Financial Reporting Standards (IFRS) and The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) conflict leading to the possibility of having incomparable financial statements.

Aside from the efforts, the central bank also introduced the Islamic Interbank Fund Market (IIFM) to improve Islamic banks' instruments for managing liquidity. Further, the parliament amended the Banking Companies Act of 1991 to terminate Islamic banking services offered through conventional banks to prevent the misappropriation of funds and ensure full compliance with Sharia principles (Perves, 2015). Additionally, specific guidelines for risk management include:

- The central bank permits Islamic banks to maintain a statutory liquidity rate of 10% instead of 20% of their total deposit liabilities in the conventional banks to ensure increased availability of liquidity for investment to ensure their profitability (Perves, 2015)
- The central bank permits Islamic banks to come up with their mark-ups and profit-sharing ratios based on their business environment to provide more independence in following Shariah law (Perves, 2015)

Bangladesh has a more advanced regulatory system compared to Pakistan and Indonesia in that aside from supervision; the central bank has a huge role in risk management in Islamic banks. These provisions touch on capital adequacy and liquidity and may correlate with other bank-specific risks.

2.2.7.1.4. The UAE case

The central bank of UAE has certain guidelines that apply to both Islamic and conventional banks within their jurisdiction. Rather than the 8% recommended by the Basel Committee, the central banks require banks to have a minimum CAR of 12% and that the tier capital should be 67% of tier 1 (Onagun, 2019). Further, banks in UAE require the approval of central banks to include tier 3 capital in their capital base (Onagun, 2019). Further, UAE banks are permitted to compute risk charges using internal rating and standardized approaches (Onagun, 2019). This case presents a move from the basics (sharia supervisory boards and a higher supervisory board) and active supervision to country-specific regulations that set the capital adequacy ratio above the minimum requirements in the Basel accord. It is not clear, however, whether these increased measures for Islamic banks have resulted in increased stability of these banks.

2.2.7.1.5. Malaysian case

Malaysian has an Islamic Interbank Money Market (IIMM) established in 1994 to help distressed Islamic banks through the provision of short-term lending effectively and efficiently (Waemustafa and Sukri, 2016). The author, however, argues that the secondary market was not tested during the 1998 crisis when banks were in distress. Another important concept in Malaysia is that the central bank introduced Mudarabah-based Sukuk (Islamic bond) to provide lending as a last resort (Waemustafa and Sukri, 2016). Malaysia, just like Bangladesh, has focused more on having institutions that mirror the conventional banking system to provide liquidity during crises.

2.2.7.1.6. The effectiveness of national regulations on risk management

The additional regulations of provisions for the Islamic banks are meant to enhance supervision and, in turn, help manage bank risk with the aim of ensuring the stability of the banking system. The findings from the study of Bahago et al. (2019) revealed that banking supervision influences Islamic banks' credit and liquidity risks. In all the countries examined, the degree of supervision is incremental from the establishment of supervisory bodies (shariah boards at the bank level and a national or higher board), institutions to help with risk management (such as Islamic insurance companies, Intermarket liquidity, and lender of last resort) and increased capital and liquidity regulations. Even with these, conventional banks still seem to have better structures, regulations, and institutions to help with supervision and risk management compared with Islamic banks. The absence of a parallel Shariah-compliant system that mirrors the degree of supervision and regulation of conventional banking systems in many countries could amplify credit and liquidity risks.

Holding on to this inferiority narrative, it thus seems that an examination of the risks of the Islamic and conventional banks should reveal worse risk outcomes for Islamic banks. The study of El-Massah et al. (2019) compared liquidity risk in Islamic and conventional banks in the MENA region. The authors investigated the determinants of liquidity risk in a sample of 257 banks comprising 167 conventional banks and 90 Islamic banks for the period encompassing 2009-2016. The authors established that the type of bank (Islamic or conventional) did not influence the determinant of liquidity risk. The authors concluded that Islamic and conventional banks similarly mobilize funds. Furthermore, they concluded that banks operating under similar micro-and macro-economic conditions are influenced by similar international and domestic liquidity regulations.

This comparison may have been conducted without considering the different liquidity funding processes between Islamic and conventional banks and their different approach to liquidity risk. Therefore, it cannot be authoritatively concluded that all Islamic banks have a low liquidity risk despite less regulation and the absence of liquidity support institutions in some countries. Moreover, while the findings of El-Massah et al. (2019) highlight an important aspect that Islamic banks are not inferior to their conventional counterparts, the study fails to acknowledge certain concepts. First, the regulatory challenges facing Islamic banks in certain countries are not acknowledged, and the authors seem to support the notion that all the countries examined had homogenous regulations. It raises the concern of whether the findings would differ if some countries had better risk management provisions for Islamic banks. Thus, though not captured, the regulatory context (the presence of additional national regulations for the Islamic banking sector other than those issued by the IFSB) needs to be considered as it pertains to its role in advantaging or disadvantaging Islamic banks compared to conventional banks.

A comparable study was conducted by Ghenimi, Chaibi, and Omri (2020). The authors analysed the differences and similarities of the determinants of liquidity in Islamic and conventional banks. Their sample comprised 27 Islamic banks and 49 conventional banks in the MENA region, and data were collected between 2005 and 2015. Their findings indicate that the liquidity risk of both banking systems is influenced by a set of variables, and the difference comes from the influence of macroeconomic variables. While the liquidity risk of conventional banks is influenced by macroeconomic factors, Islamic banks' liquidity risks are not influenced by macroeconomic factors. This, in a way, could suggest that liquidity risk management in the Islamic banking system is better as it is more resilient to macroeconomic factors.

The study of Ghenimi et al. (2020) raises more questions than answers. First, does this imply that Islamic banks are immune to economic crises? In that case, what is the causative factor? Can these studies be generalised to all Islamic banks, or what contextual differences do the banks in the MENA region have compared to Islamic banks in other emerging countries? We argue that these findings are not reflective of the real economy. The reason is that Islamic banks, as partners with their customers, also depend on the economy to generate more output, and factors like inflation erode the working capital of both conventional and Islamic businesses. Moreover, Islamic banks are tied to real estate contracts which, in a situation like the GFC, would still be impacted.

In another study that compared Islamic banks and their conventional counterparts, Salim, Mahmoud, and Atiatallah (2015) compared the capital adequacy of conventional banks (using the Basel II) and their Islamic bank counterparts (using IFSB) in the Middle East. The authors included three conventional banks and three Islamic banks in their sample. The findings of the study reveal that Islamic banks are more solvent, have higher liquidity and are more capitalized compared to conventional banks using Basel II, but conventional banks are more efficient and more profitable. The findings of Salim et al. (2015) contradict those of El-Massah et al. (2019) while reinforcing those of Ghenimi et al. (2020) as better solvency, capital, and liquidity outcomes should translate to lower risk profiles compared to their conventional counterparts. However, the authors' use of Basel II instead of III may have influenced the findings as Basel III helps in addressing the shortcomings of Basel I and Basel II (Golubeva, Duljic, and Keminen, 2019). When authors compare Islamic banks with conventional banks, they do not consider the structure of Islamic banks' businesses and the unique set of risks associated with Islamic banking. In that scenario, these methodologies, without being translated to capture contextual differences, may make Islamic banks appear to have a better performance compared to conventional banks, and this may be the case in the study of Salim et al. (2015).

The finding on better capital outcomes for Islamic banks aligns with the results of Bitar et al. (2018). The authors examined the influence of different types of bank capital on the efficiency and profitability of Islamic and conventional banks. According to their findings, IFSB capital guidelines have higher effectiveness in enhancing the performance of Islamic banks compared to BCBS guidelines. These findings suggest that IFSB guidelines are superior compared to the BCBS guidelines. No study has, however, examined IFSB and BCBS to establish additional or different shariah-compliant regulations that could spur better risk performance in Islamic banks. Without such as study, the findings of Bitar et al. (2018) are only speculative and may only be the result of methodological bias that does not take into account the uniqueness of Islamic banking when comparing the risk profiles of Islamic and conventional banks.

In addressing the superiority of IFSB, some authors (such as Rasli, Kassim, and Bhuiyan, 2020) share the context argument. In their conceptual model, the authors assumed that the Islamic banks operating in Malaysia have more effective Shariah governance, which would result in lower risk-taking. This lower risk-taking is established in the study of Waemustafa and Sukri (2016), who revealed that Islamic banks had higher liquidity compared to their conventional counterparts, which could translate to having lower liquidity risk. However, the findings do not indicate whether the higher levels of liquidity also translated to lower profits than conventional banks due to missed investment opportunities.

The concept of Shariah governance may be based on the ability to motivate banks to pursue lower-risk businesses, which essentially highlights the difference between Islamic and conventional banking systems. In conventional banking systems, banks take calculated risks to maximum risk-return profiles and are, in return, supported by different institutions to manage credit and liquidity risks alongside their capital and liquidity provision requirements. On the other hand, the Islamic banks, by missing investments, return lower than their conventional counterparts, which is a liquidity risk when deposit-making clients move their money to the conventional system where it can earn better returns or when all profits are paid out to investors, resulting in acute liquidity shortages.

A more precise study was conducted by Ningsih (2020). The authors measured the participation ratio, efficiency, and effectiveness of the sharia supervisory board to Indonesian Islamic banks. Although this study does not examine the national regulations to show their contribution to the performance of the boards, the author does present some useful findings. For instance, the author states that the supervisory board is not valuable when it comes to Islamic banks' lending activities and is less efficient. The context of supervision cannot be ignored, as the supervisory power is provided by the central bank, which also enables the supervision process through the provision of necessary tools. This finding agrees with our arguments.

Authors have examined the direct influence of national regulation on the risk profile of Islamic versus conventional banks. Although the study by Mohd Amin and Abdul-Rahman, (2020) was not contextual but covered a wide range of countries in the OIC countries between 2000 and 2014, the findings could help reveal the role of banking regulations. The findings indicate that the restrictions placed on banking activities and their capital requirements could significantly influence liquidity risk, but the impact of regulatory capital is higher in conventional banks as opposed to Islamic banks. This finding thus highlights that additional regulations beyond the bare minimum instituted by the Basel accord could impact risks in the banking system.

Based on the findings of these reviews and the cases examined, several gaps have been established which require proper investigation. First, no study has examined the structural differences between the risk profiles of Islamic and conventional banks. Second, no study has critically examined the differences in IFSB and BCBS regulations before concluding which is superior. Third, no study has examined additional risk management techniques taken by Islamic banks to mitigate the unique risks that arise from their low returns. Chapter two bridges these gaps through a qualitative comparison of country-specific regulations and risk management techniques undertaken by Islamic, conventional, and Hybrid banks in emerging economies.

2.2.7.2. Contextual provisions for public sector banks

We did not find studies that directly indicated whether regulators are more biased towards state-owned banks. However, the few studies established showed a trend of decreased efficiency of state-owned banks due to political influence and the pressure to fulfil government agendas. Thus, even though a similar regulatory environment might apply to both public and private banks, the influence through requirements such as to loan state-owned enterprises might make it difficult for the banks to maintain their stringent internal risk management. Further, the government might provide bank managers with risk-taking incentives such as capital injection. A study conducted by Zheng et al. (2017) examined the relationship between the capital regulation of banks and their risk profile, considering their ownership structure. The findings show that banks that experience higher capital regulation have better stability when it mitigates credit risk. The findings of this study peg stability on the ability to mitigate credit risk, which might be out of alignment with government welfare programs such as forgiving debt.

Another study sought to establish the existence of a moral hazard in the regulation of state-owned banks (Zhang et al., 2016). The authors analysed 16 state-owned banks in China together with 11 rural banks and tested for the existence of moral hazard in their lending decisions. The motivation for the study emanated from capital injection by China into the banking system and scrutiny over non-performing loans. The findings showed that an increased NPL ratio increased riskier lending leading to increased deterioration of the quality of loans and the instability of the financial system. In this case, lending discipline is reduced through less severe consequences as the government seldom withdraws operating licenses for state-owned banks. This prevents the need to explore disciplinary mechanisms put in place to regulate credit and liquidity risks in public banks and how these compare with private and Islamic banks. Studies on public banks only speculate the presence of a weaker regulation of public banks without solid evidence. This study fills this gap by examining public bank-specific regulations and risk management structures that could influence credit, liquidity, and systemic risks.

2.3. Theoretical Framework

The theoretical framework is based on the perceived relationships between the banking systems and the international regulatory bodies. We conceptualize a hierarchical implementation of the Basel III framework. At the top of the hierarchy are the international regulators. For our research, we consider BCBS to be at the top of the hierarchy, given that they independently come up with requirements for banks and their regulators. Second in the hierarchy is the IFSB. Although it is also an international standard-setting body, there is sufficient evidence that it Islamizes the Basel rules – examines their applicability in the Islamic banking system and suggests Shariah-compliant methods and instruments meet the BCBS standards.

The third in the hierarchy are the national regulators or supervisors. These interpret and issue regulations for the banks operating within their jurisdiction. The regulations might be in strict compliance with Basel III, or it might be a modified version that takes the local context into account. The study predicts similar laws for all banks with provisional clauses that align with the government's economic agenda for state banks and provisions to ease compliance by Islamic banks. In turn, these have an impact on banks' capital adequacy, systemic, credit, and liquidity risks. The conceptual diagram is shown in figure 2 below.

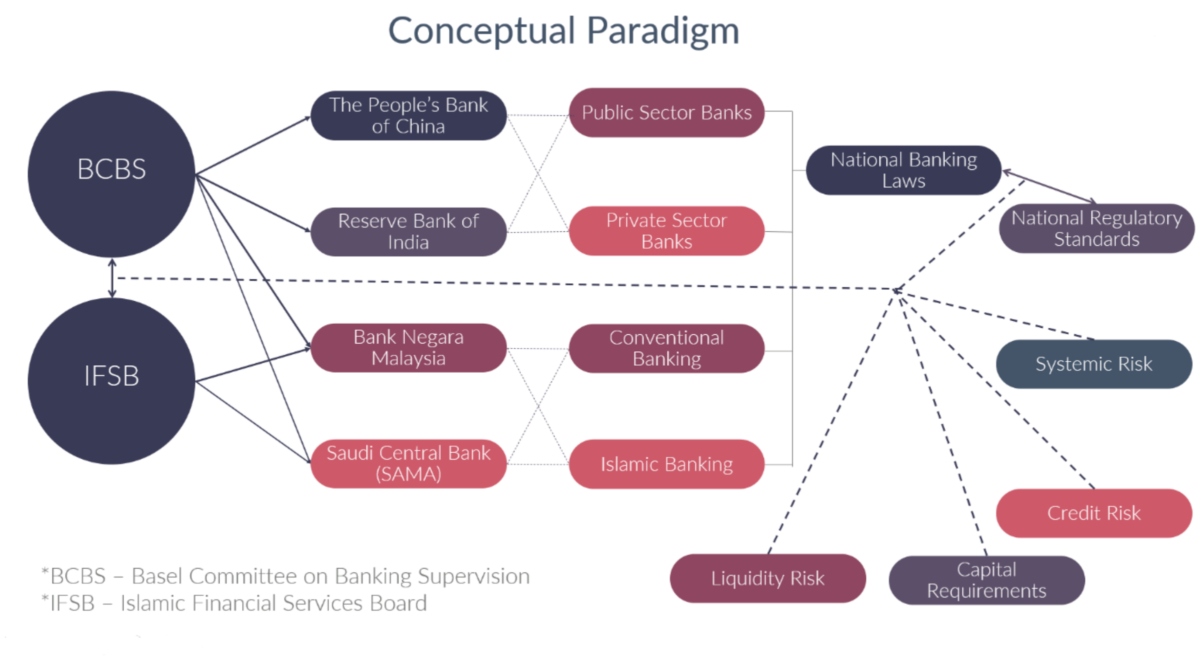

Figure 2. The interrelationship between the regulatory bodies and the banking systems (Source: Authors Conceptualisation)

Based on the figure above, we conceptualize that the BCBS and the IFSB though independent, have some form of interaction (through similar regulations) and that the BCBS regulations, especially Basel III, influence all banks, while the IFSB only influences aspects of conventional banking (Islamic banking windows) and Islamic banks. Further, the interaction of BCBS and IFSB influences the regulation and management of capital requirements, liquidity, credit, and systemic risk.

This model contributes to filling the research gaps by exploring various regulatory systems used to manage capital and liquidity risk in emerging markets from the perspective of single regulatory systems and dual regulatory systems, which include Islamic banking. The findings will aid a fair comparison of the banking systems (Islamic versus conventional, public versus private) based on risk profiles, mitigation, degree of compliance with Basel III, and additional regulations to mitigate emerging risks. This chapter further examines the role played by standard capital and liquidity regulations in mitigating bank risks and country-specific regulations in place to counter additional risks.

2.4. Research Methodology

The overall aim of this study is to investigate whether the implementation of Basel III requirements by banks in emerging markets is sufficient to address bank-specific risks and systemic risks among banks in emerging markets. Chapter two seeks to fulfil a part of this aim by (a) investigating the differences between capital and liquidity regulations framework set by Basel III, IFSB, and national regulators under single and dual supervisory regimes within emerging markets; (b) investigating national regulators' management of dual supervisory regimes, focusing on capital adequacy, systemic risk, credit risk, and liquidity risk; (c) investigating the additional regulatory provisions besides the minimum provisions outlined in Basel III; and (d) analysing the differences in regulations applied to public and private sector banks within emerging market economies. To achieve this, we chose qualitative research, particularly using document analysis. This section describes document review as a research methodology – its definition, data collection and analysis, and validity and reliability. We also justify the selection of the method and the accompanying analysis methods.

2.4.1. Document analysis method

Documents refer to virtual or physical artefacts designed to function within a certain context (Dalglish et al., 2020). Documents are also described as social products which present the reality that reflects broader norms and values as opposed to only reflecting facts adequately and independently (Wood, Sebar, and Vecchio, 2020). In this study, these documents refer to policy and regulatory reports, including banking laws and reports from the relevant regulatory or supervisory body. Documents can also be public or private (Kayesa and Shung-King, 2021). The documents analysed in this study are accessible to the public as they are produced within the context of activities conducted in the public sector. Dalglish et al. (2020) indicated the possibility of using documents to aid in answering the research questions.

According to Dalglish, Khalid, and McMahon (2020) document analysis is among the methods that are commonly employed in policy research. Document analysis can be defined as a systematic procedure employed in the review and evaluation of documents for the provision of context, generation of questions, and supplementing other data, corroborating other sources, and tracking changes over time (Dalglish et al., 2020).

Document analysis is efficient, cost-effective, straightforward, unobtrusive, and manageable (Cardno, 2018; Wood et al., 2020). The cost-effectiveness comes about because of the availability of documents. Moreover, this data collection method does not require ethical approval for publicly available documents, which saves time (Cardno, 2018). Some of the challenges with the method include the accessibility of documents, their authenticity, and the sufficiency of the details (Cardno, 2018). The operationalisation of the method is a systematic procedure that involves making the materials ready (document collection), data extraction, data analysis, and distillation of findings (Dalglish et al., 2020; Kayesa and Shung-King, 2021).

2.4.1.1. Document collection

The data collection involved first searching for relevant regulatory bodies or bank supervisors and then using the search function to get the webpage link to the required documents. We observed that these regulators/supervisors were not necessarily central banks. For India, Saudi Arabia, and Malaysia, the regulator was the central bank. However, for China, the regulatory body was a separate entity – China Banking and Insurance Regulatory Commission (CBIRC). We searched for banking laws, supervisory reports, and policy documents published between 2010 and 2021. The documents established were in English and thus did not require any translation. Further, they were available for downloading and thus did not require any special permissions. The downloading process also involved renaming documents to reflect the country and year (for annual reports). Table 1 below shows the number examined by country. A full list containing document names is provided in *Appendix A*.

Regulatory Institution	No. of documents extracted
BCBS (International Regulatory Framework)	1
IIFB (Regulatory Framework for Islamic Banks)	13
The People's Bank of China (China)	14
Reserve Bank of India (India)	12
Bank Negara Malaysia (Malaysia)	50
Saudi Central Bank (Saudi Arabia)	16
Total	**92**

Table 1: No. of Documents analysed by each regulatory authority.

2.4.1.2. Data extraction, analysis, and distillation of findings

We imported the documents into qualitative analysis software (NVIVO). The analysis of the documents collected was conducted in iteration. This involved (a) reading, (b) first-cycle coding, (c) second-cycle coding and theming, (d) establishing the relationship between themes and concepts and (e) reporting.

2.4.1.2.1 Reading

Reading through the documents is the first and one of the most important steps in qualitative analysis. Dalglish et al. (2020) insist that researchers ought to read documents from beginning to end, which includes the annexes, explaining that the process of reading may be tedious but has the potential to provide the needed nuggets. The purpose of reading the entire document is to gain an overall perspective or meaning associated with the research question (Dalglish et al., 2020; Kayesa and Shung-King, 2021). we read through the documents once. This reading led to noting down important points and keywords, which were pursued further in the next stage of analysis (thematic content analysis).

2.4.1.2.2. First cycle coding

In the first cycle coding stage, we used the key points and keywords noted in the reading phase to search the documents and code within context. The challenge of conducting the second reading of all documents is that some documents were very long (more than 500 pages), and though the context were all useful, not all were necessary for answering the research questions. Thus, to ease information processing through the first cycle of coding, we used the search function to highlight important parts of the documents. The search was set at exact as most of the keywords were technical phases whose synonyms or generalisations would not be meaningful. The results of the search were each examined within a broader context to extract meaning and code within a broad context. These codes were categorised broadly into general nodes. For instance, the word collateral or security was categorised broadly under the node credit risk.

2.4.1.2.3. Second cycle coding and theming

During the second coding, we examined each node, read through each of the codes and reclassified them under a different node, or created a child node under its current node. This process helped in refining the codes to only what is relevant within the node. Further, the nodes were given more descriptive names (themes), and the child nodes under them were considered subthemes. The reclassification and sub-grouping process also helped in gaining more insights into the data. Using the example of collateral/security, we sub-grouped it as credit protection (3 hierarchy, child node) under credit risk mitigation (2 hierarchy, child node), which was within credit risk management (1 hierarchy, node). During our study, we took caution to ensure that the nodes and child nodes are not too many and that the data are comparable between countries and between banking systems.

2.4.1.2.4. Establishing relationships between data concepts

Establishing relationships occurred during the analysis phase. This involved noting meanings and relationships between the data. The purpose of this phase was to establish the interconnectedness between the concepts beyond the classification of nodes and child nodes. The main method used to note possible relationships was through examining co-current codes and tree maps where they could be generated.

2.4.1.2.5. Reporting

In this study, the findings are reported in a narrative format in the order of the themes and subthemes. Where comprehensive statistics were available, we entered the data into Excel and presented the data using visual graphs to improve the conciseness of the report. We further presented the relationships established in diagrams to demonstrate the findings further.

2.4.2. Validity and reliability

Just like other qualitative research methods, document analysis presents the need for ensuring reliability, authenticity, validity, representativeness, and motivated authorship (Dalglish et al., 2020; Roberts, Dowell, and Nie, 2019). These were mitigated by enhancing rigour through triangulation between and across the documents and ensuring an adequate sample size (Dalglish et al., 2020; Hadi and José Closs, 2016). We examined more than a single document for each regulatory body. For India, these were annual reports from the year 2010 to 2021 (14), Saudi Arabia (16 documents), Malaysia (50), and China (14). These provided a point of data intersection and confirmation. Further, information especially referring to the regulatory provisions of the Basel Framework of the IFSB was triangulated using 13 documents from the IFSB and 1 document from the BCBS (the Basel Framework).

We achieved validity through the data collection, ensuring that each of the documents was relevant. First, the authorship of the documents was authoritative entities, which ensures that the reports reflect the true picture of the banking system. Secondly, the source of the documents was directly from the regulators' website, ensuring the content of the documents was unaltered and contained information as intended. Third, the documents were analysed unaltered, as they were in English and thus did not require translation.

2.5. Discussion on Findings

In this section, we report the findings from the content analysis conducted in which banking reports, laws, and regulations, as well as IFSB and BCBS regulations, were examined and compared with existing literature. This analysis seeks to answer the two sub-questions:

1. How do standardised capital and liquidity regulations mitigate risks faced by banks?
2. What country-specific regulatory frameworks are in place to cater for additional risks that banks may face while operating within emerging markets?

We thus focus on examining the implementation of the Basel accord and IFSB regulations and guidance while examining country-specific deviations and additional requirements to suffice their contextual issues. We also compare regulations and guidance between countries. The findings are presented based on the themes and sub-themes established during the analysis.

2.5.1. The focus of regulatory efforts

We established that the regulators in different countries had a certain focus on their regulatory efforts, which determined the course of the regulations. The efforts included risk-based supervision and stability.

2.5.1.1. Banking stability

Banking stability was recognized as the role of the supervisor (or regulator) by the BCBS and in the reports for India and Saudi Arabia. This is in line with the assertion of Ferguson (2002) that financial stability is indeed the fundamental aim of the central bank (the regulator). This fundamental role may not differ even though not acknowledged in the reports from Malaysia and India. This concept only changes when the IFSB is considered, as the findings reveal that while the BCBS considers stability as the role of the regulator, the IFSB considers stability as managed by national and supranational bodies. We established two patterns: banks that focused on achieving stability from a systems perspective and those that focused on achieving stability through regulations targeted for implementation by individual banks.

2.5.1.1.1. Achieving systemic versus individual bank stability

We found information on systemic stability in coded documents from India. The phrase systemic stability was mentioned 23 times in the code report. This could imply that the country has challenges with stability or that its achievement is the major focus of regulatory efforts. Measures put in place to achieve systemic stability included: (a) Focusing on the entire banking system rather than addressing individual banks, (b) Collaborative supervision of international banks of Indian origin through supervisory alliances and supervisory colleges, and (c) Capacity building for financial institutions.

Of the three measures, supervisory colleges form part of the recommendations by the BCBS.

> "*In line with the BCBS principles on cross border consolidated supervision, the Reserve Bank [of India] is instituting supervisory colleges for Indian banks with considerable overseas presence*." (RBI, 2015, p.94)

Both the BCBS and the IFSB acknowledge the need for supervisory colleges. It is evident that the IFSB adopted the supervisory college from BCBS. The scope of adoption is stated as follows,

> "*Broadly, the scope of the engagement and an appropriate structure of the supervisory college would be guided through BCBS's Good Practice Principles on Supervisory Colleges; however, in particular, issues relating to the following should be included in the scope of the supervisory college: (a) the regulatory and legal framework for IIFS; (b) divergence of Sharī`ah compliance practices and integration of SSBs; (c) key disclosures on IIFS' operations as indicated under IFSB-4 and confidentiality; and (d) cross-border insolvency of IIFS as part of a group operating in more than one jurisdiction*." IFSB, 2016, p.31

The main role of the supervisory college is to gain an enhanced understanding of the risk profiles of banking groups while strengthening the supervision of individual branches by means of cooperation and exchange of information between supervisors. The literature examined did not provide evidence of supervisory colleges in China, Malaysia, or Saudi Arabia. It seems, therefore, that only India has instituted a supervisory college for monitoring cross boarder banks. We further did not find any empirical studies that linked cross-border banking supervision with stability.

The efforts by India towards building stability align with the recommendations of the Basel framework. First, the pooling or aggregation of data for decision-making align with the requirement for using aggregate or sectoral data for decision-making by regulators as a step towards ensuring financial stability. Second, supervisory alliances for information sharing align with the recommendations for supervisors to access stability assessments from other regulators. Further, the annual reporting of stress tests conducted and factors that could affect financial stability is in line with Basel recommendations for macroprudential surveillance.

Contrary to examining financial institutions as an interconnected system, countries such as Malaysia focused on examining the stability of individual banks that make up the system. This was evidenced by the regulations targeting banks and their internal supervision and risk control. Further, the regulator relied on independent auditors and mainly used licensing/declining to license deviant banks as a control mechanism. Thus, regulatory efforts focus on the responsibility of the board of directors to come up with an acceptable risk strategy, implemented and monitored by senior management and externally monitored by external auditors. As opposed to the case of India, where the regulator conducted capacity building collectively, Malaysia instructed its financial institutions to ensure they have experts in risk management.

2.5.1.1.2. Factors that impede the stability of the conventional banking system

Factors influencing the stability of the banking system were mainly derived from the BCBS. The BCBS identifies shadow banking as having adverse impacts on the stability of the banking system. Indeed, research indicates that shadow banking collapses during economic downtowns, leading to systemic risk that damages the financial stability of a country (Pan and

Fan, 2020). Of all the countries, only India addressed the issue of shadow banking, although they indicated that shadow banking is not in India.

> "*The shadow banking sector, as it is understood globally, does not exist in India.*" (RBI, 2011, p97)

We established from the literature that shadow banking is a problem in China (Acharya, Qian, Su, and Yang, 2021; Allen and Gu, 2021; Shah, Jianjun, and Qiang, 2020) and Malaysia (Nijs and Nijs, 2020). The BCBS also identifies weaknesses in a country's banking system as having the potential to harm domestic and international financial stability. Another factor identified in the Basel framework as impacting financial stability included macroeconomic factors such as high government expenditure or borrowing and liquidity shortages or excess could negatively influence the stability of the financial system.

The BCBS thus recommends the implementation of its core systems to promote financial stability. While indicating the importance of the core principles in the Basel framework, the BCBS shows the need for supervisors to come up with additional and tailored ways (BCBS, 2021, p. 1530/1626). Thus, it is expected that supervisors will modify the BCBS recommendations and their implementation in line with the stability needs of their countries. The extent of implementation and modification, compared with the implementation and/or modification of IFSB guidelines, are presented in the succeeding sections.

Further, BCBS recommended proactive addressing of the serious threats to banking stability. Being proactive would involve early identification of threats and addressing them to avert instability, a concept that reflects risk-based supervision discussed in the next sub-section. Further, the process of being proactively involved in conducting stress tests and macroprudential surveillance on the banking system which were identified as part of the measures currently being undertaken by India regularly.

2.5.1.1.3. Factors that impede the stability of Islamic banks

As in the case of conventional banks, the IFSB recognized stability barriers for the Islamic banking system. One of these factors includes the absence of a Shariah-compliant lender of last resort (SLOLR). The IFSB further indicates that the stability of the Islamic banking system is threatened by the lack of support infrastructure and systems. Further, another infrastructure mentioned as contributing towards the stability of Islamic financial institutions is an Islamic deposit insurance system, which the report indicates has been difficult to implement. The two major issues raised -SLOLR and support infrastructure systems -point to challenges with liquidity support systems. This is discussed in succeeding sections.

Stability strategies currently in place include the issuance of guiding principles and prudential standards for the global Islamic financial sector. These principles include the prioritization of financial stability over business efficiency. The IFSB's guidance shows a preference for a lower risk appetite and a preference for stability. Further, the guidance gives the responsibility of ensuring compliance to the supervisor (regulator) and not to the directors of the banking establishment. This implies the assumption of a systemic stability system in countries that license Islamic banks.

2.5.1.2. Risk-based supervision

According to the findings, the risk-based supervisory approach was recommended for adoption in India in 2013.

> "*In line with the BFS directives, 28 banks have been assessed under the RBS framework (SPARC – Supervisory Program for Assessment of Risk and Capital) beginning 2013-14. These banks account for approximately 60 per cent of the banking sector's assets and liabilities and cover a cross-section of banks (on an ownership basis).*" (RBI, 2014, p88)

Before this period, the supervisor employed the capital adequacy, asset quality, management capabilities, earnings sufficiency, liquidity position, and sensitivity to market risk (CAMELS) approach. The risk-based approach, on the other hand, utilizes the supervisory program for the assessment of risk and capital (SPARC) approach. Thus, the supervisor initiated the phased migration of banks to the risk-based approach in 2012 and successfully migrated all banks to the RBS framework in the financial year 2017-2018. The use of risk-based supervision in India is supported by literature, as Pushkala et al. (2017) explained that the approach shields the banking system from global shocks.

In Malaysia, risk-based supervision is recognised and implemented at the bank level through stress testing and acting towards improving risk management and capital if undesired results are established (Stress Testing Policy Document, 2017, p.15). Thus, the responsibility of implementing and monitoring risk-based supervision is passed down to the banking institution. Further, the role of the central bank in Malaysia is to review the conduct of banks in the identification, control, and handling of business risks (D'Cruz and Adnan Sundra & Low, 2021, p.4/37).

2.5.2. Basel III implementation in banking institutions

2.5.2.1. Implementation schedule

We examined if implementation schedules, especially for Basel III, are outlined in the Basel Framework. The findings indicate that instruments that do not meet Basel III requirements are being phased out in the period encompassing 1 January 2013 to 1 January 2022, which implies that the set deadline for Basel III framework implementation is 2022. The document, however, indicates that there is a revised date announced in March 2020 with the revised date provided in India's 2020 annual report on Regulation, Supervision, and Financial Stability as moved to January 2023 because of the COVID-19 pandemic (p. 133). Deferring the implementation was further reported to be endorsed by Governors and Heads of Supervisory agencies (GHOS) (Regulation, Supervision, and Financial Stability, 2021, p.137).

For India, the implementation of Basel II and III has been based on a phase-by-phase basis. The schedules extracted from its annual reports is shown in table 2 below.

Aspect implemented	**Implementation phase**	**End Dates**
Basel II Regulatory capital	Stage 1	31 March 2008
	Stage 2	31 March 2009
Basel I minimum capital requirements	Parallel run with Basel II	31 March 2013
Basel III leverage ratio	Test parallel run	1 January 2017
Basel conservation buffer	Contracted deadline	1 January 2019
Basel III capital regulations	Extended end date	31 March 2019

Table 2: Phased implementation of the Basel framework in India

The information on the implementation of the Basel Framework in Saudi Arabia focused more on the date when the regulator (SAMA) issued instructions to begin implementation. This includes Basel I capital adequacy in 1992, Basel II in 2008, and Basel III risk-based capital in December 2012. Further, SAMA indicated that the starting date for implementation of phase I of Basel III was in January 2013, based on the timelines issued by BCBS. Following the same timelines, LCR was introduced in 2015 and NSFR in 2016, which the report indicates was two years ahead of the Basel III deadlines. The report further indicates that banks in Saudi Arabia attained compliance with the Basel III requirements (leverage, capital, and liquidity standards) by June 30th, 2018. Based on the available information, Saudi Arabia has met the full requirements of Basel III, while India is still struggling to meet the standards.

Information about Malaysia and China's state of Basel III implementation was not very explicit. However, the literature indicates that the banking regulator in China has relentlessly pursued the implementation of Basel III requirements (Xi, 2016).

The challenges facing the implementation of Basel III standards were largely contextual, although the COVID-19 pandemic has also been a factor recognised by regulators across different countries. Acknowledged challenges included the banking structure. India's banking system acknowledges the presence of different types of banks -SCBs, rural banks, urban banks, and cooperative banks. Some of these banks are struggling to meet minimum regulatory requirements but play a large role in the economy and thus cannot be shut down. Though not explicit in the findings, the struggle could be due to the macro-economic situation in India during the periods examined, as Upadhyay (2021) noted that the years 2019 and 2020 were the most difficult for India's banking system. This makes the regulator, in consideration of these banks, come up with a flexible implementation schedule for the Basel III requirements.

Some researchers have argued that the full implementation of Basel III could have some downsides. For instance, Golubeva et al. (2019) argued that considering the definition of eligibility for liquid assets implies that the liquidity of the banking system would depend heavily on government securities and other public sector liabilities such as central bank deposits. Deterioration of the liquidity might occur because of inelastic demand, and possible default by the government might, in turn, make securities ineligible as liquid assets. Further, compliance would also result in reduced lending margins and negatively influence the performance of banks (Golubeva et al., 2019).

2.5.2.2. Comparison of Basel III and IFSB requirements

We observed several references to the Basel frameworks in the IFSB guidelines and standards, which is indicative of the attempt to interpret the standards to the Islamic banking settings in terms of their applicability. This was captured in one of the guidelines, *"Further, the Standard also provides guidance on the application of new features introduced by the BCBS in its Basel III documents, with necessary adaptations for IIFS – namely, the capital conservation buffer, the countercyclical buffer and the leverage (or common equity to total exposures) ratio*." (IFSB-15, 2013, p.4)

The statement above clearly shows that IFSB guidelines are largely adapted from the Basel Framework to fit the Islamic banking context. This implies that the IFSB frameworks may be largely an attempt to create an Islamic replica of the BCBS standards by directly implementing what is directly applicable while modifying what cannot be directly implemented. This perspective of the IFSB is further reinforced by the IFSB-22, which indicates that the equity investments through ICIS computed through the look-through approach are based on the Basel framework beginning of January 2017 (BCBS, 2021, p.15). Other references were made to Basel II and Basel III in IFSB issues. The scope applicability of the IFSB guidelines and standards is, however, limited to Islamic financial institutions. The relationship between the two frameworks is illustrated in figure 3 below.

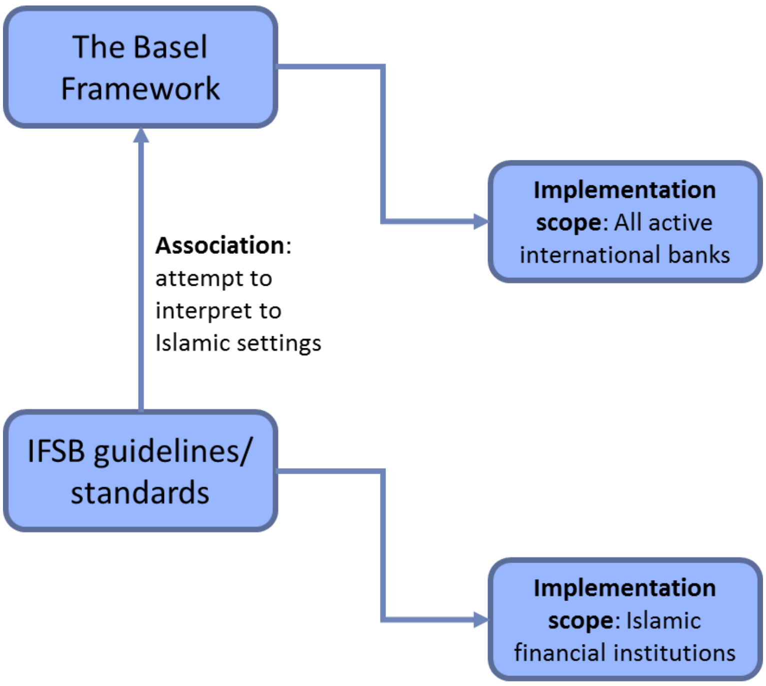

Figure 3: The relationship between Basel Framework and IFSB guidelines and standards (Source: NVivo Output by Author)

The findings of this study are in line with previous studies. For example, Ling, Haron, and Hasan (2022) compared the Basel III framework with IFSB guidelines using mixed methods analysis that included document analysis. Their findings reveal that IFSB guidelines are adapted from the BCBS wit modifications aimed at meeting the asset-liability structure and uniqueness of Islamic banks.

2.5.3. Capital Adequacy

2.5.3.1. Regulatory capital

2.5.3.1.1. Deviations in the regulatory capital between BCBS and ISFB

The tiers of regulatory capital are similar for both IFSB and BCBS standards. CET1 holds the same meaning, while AT1 has the modification of including Shariah-compliant instruments and some reserves. The same case is for tier 2 capital, where the instruments are regarded as those that are Shariah-compliant. Further, regulatory capital from subsidiaries will be acceptable only if the subsidiary is an Islamic financial institution. The eligible capital requirements for Islamic financial institutions are similar to the Basel III requirements. Deviations thus seem to be only in definitions where instruments are Shariah-compliant and the consolidated subsidiaries are Islamic financial institutions.

2.5.3.1.2. Regulatory capital in different countries

China had similar definitions for regulatory capital, but during our study, we did not find the exact percentage RWA for CET1, AT1, T2 and total capital. Although we found deviations in regulatory requirements for banks only in India, as shown in figure 4, while other countries maintained the BCBS standards. This included countries with Islamic banks. This is expected as the IFSB has similar requirements by per cent RWA. The exact percentage RWA for China was not available in the documents reviewed, although the reports from China acknowledge similar definitions as in the BCBS.

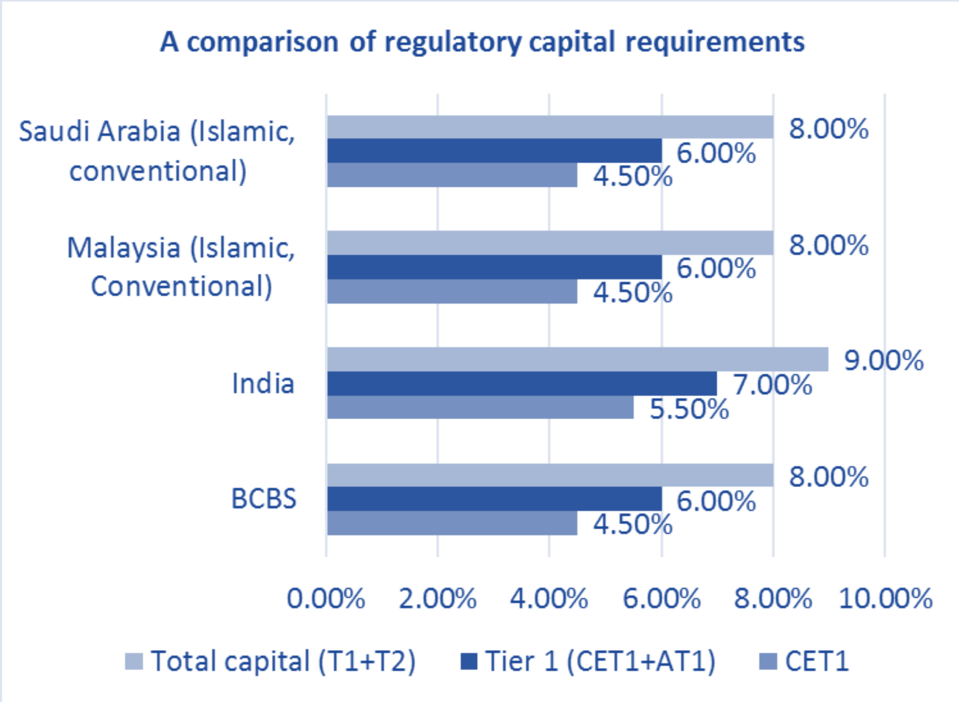

Figure 4: Comparing regulatory capital requirements between countries (Source: NVivo Output by Author)

Based on these findings, India's higher regulatory capital requirements imply a means to adapt the Basel III requirements to its context. Although India had higher regulatory capital requirements, the reports reviewed indicate that the overall performance may be lower; as the country projected, it would take time to increase the average regulatory capital, but it would settle above the regulatory guidelines. An examination of existing literature revealed that China's regulatory capital requirements are higher than Basel III requirements, although small and medium-sized banks are under funding pressure (Ba, 2022; Zhang and Wang, 2023). On the contrary, although Saudi Arabia maintains a regulatory standard similar to the BCBS, Saudi banks (conventional and Islamic) reported higher capital adequacy ratios. Particularly in 2018, Islamic banks had a CAR of 20.3%, and the average CAR for all banks was 20.8% RWA.

2.5.3.2. Capital conservation buffer

From a country perspective, China acknowledges the use of conservation buffers, but the information is not sufficient as it pertains to how much. India requires a conservation buffer of 2.5% of RWA. According to the 2019 report, the implementation of the conservation buffer was based on a phase-by-phase basis, with a 0.625% increment per year to achieve 2.5% of RWA by March 2019. However, because of economic difficulties (stress) faced by the Indian banks, the end date was revised to March 2020, it was further extended to September 2020 and then due to COVID-19-related stress, it was deferred again till October 2021 (India data 2019, p. 113; India Data 2020, p. 133; India Data 2021, p. 142). Malaysia required Islamic banks to maintain a capital conservation buffer of 2.5% (Capital Adequacy Framework for IB (capital components), p. 6), the same as conventional banks. Saudi Arabia had fulfilled all the Basel III requirements, including a capital conservation buffer (minimum 2.5% of RWA).

2.5.3.3. Countercyclical buffer

Countries such as Saudi, China, India, and Malaysia recognized countercyclical buffers. Saudi Arabia recognizes countercyclical downturns of a single industry or the wider economy and, thus, instituted the National Development Fund to provide countercyclical support. Malaysia requires both Islamic and conventional banks to have countercyclical buffers as a percentage of their RWA. For India, the framework for implementing a countercyclical buffer was put in place in 2015, which defined its constituents, indicators that lead to its activation and how it is calibrated. The implementation was expected to take place over four quarters. In 2020 and 2021, the supervisor did not find a necessity for activating a countercyclical buffer after empirically testing its indicators.

Even though some information was missing from the documents analysed, we established findings that show that the capital adequacy requirements of China and India, in general, are higher than Basel III. For instance, the minimum capital adequacy ratio under Basel III is 10.5%, while that of China is 15%.

> *"… according to the Guidelines on Supervisory Ratings of Commercial Banks, the weighting of the key risk components is as follows: capital adequacy (15 per cent), …. According to the risk characteristics and regulatory priorities of various types of banking institutions, the regulatory authorities of the CBRC may adjust the weight of each rating element by five percentage points." (IMF, 2017b, p69)*

Further, India's RBI Prudential Norms on Capital adequacy indicate that "*Banks are required to maintain a minimum Capital to Risk-Weighted Assets Ratio (CRAR) of 9 per cent on an ongoing basis*" (RBI, 2022, p4)

This represents a modification to align with contextual factors. We also established that without additional regulations, banks in countries like Saudi Arabia have surpassed minimum regulatory requirements. The study of Edge and Liangb (2022) sought to examine the relationship between financial stability committees and countercyclical buffers under Basel III. The findings show that countries with stronger financial stability boards are more likely to increase their countercyclical buffers. Although the authors do not indicate the possibility of a reverse relationship, the presence of higher buffers could be predictive of stronger FSBs in India and China

2.5.4. Systemic risk

2.5.4.1. Assessment of domestic systemically important banks

In Malaysia, the supervisor recognizes the need for risk identification and management for DSIBs and differentiates them by three criteria – size, substitutability, and the interconnectedness of the bank. The determination of systemic importance follows an indicator-based approach (IBA) whereby the level of systemic risk is determined by financial distress or bank failure. This is based on an assessment of (a) the indicators related to the distressed or failed financial institution, such as critical functions, material exposures, and contributing factors to the systemic impact, (b) the alignment of policy objectives to the regulatory framework, and (c) supervisory overlay. This leads to the clustering of the banks by buckets. The list of DSIBs is reviewed on an annual basis, and changes to the list are noted. In India, the identification of DSIBs is based on the IBA used for identifying GSIBs. This includes their size, complexity, interconnectedness, and lack of substitutability. Based on their IBA score, banks in India and classified into four buckets.

One of the regulatory mechanisms for reducing systemic risks is to put stringent measures on systemically important banks (Butzbach, 2016). Thus, the identification of these banks is a step towards limiting their growth as a systemic risk management process. The Basel Framework outlines an IBA for evaluating the systemic importance of GSIBs. The advantage of the approach is its ability to measure indicators that hold systematic importance. The measurement of this importance, according to the framework, ought to be based on LGD and not the probability of the bank's failure. The indicators are similar to what is applied in Malaysia and India, and although the documents analysed show an acknowledgement of

GSIBs in China, the technique of determination is not provided and thus assumed to be based on the Basel framework. Moreover, given the full implementation of Basel III in Saudi Arabia, we assume a similar methodology is adopted.

2.5.4.2. Systemic risk control measures

We only found comprehensive information on systemic risk control measures in Malaysia and India. In China, the regulator limits GSIB to GSIB exposure to 15% of net tier 1, and Saudi Arabia recognized the need to control for systemic risk. Measures undertaken by others are detailed.

2.5.4.2.1. Systemic control measures in Malaysia

According to the Malaysian Financial services Act 2013, the systemic risk stems from two scenarios: that the failure of a bank influences another bank or that the liquidity problems in a bank affect the entire financial system. In Malaysia, the methods of controlling for systemic risk were based on (a) higher capital buffers required from DSIBs and (b) risk identification and control through policy formulation following IBA classification. On higher capital requirements, DSIBs are expected to hold capital to meet the requirements of higher loss absorbency (HLA), including higher than the minimum CET1, tier 1, and tier 2 capital ratios and capital buffers. The HLA requirements as a percentage of RWA are 0.5% for bucket 1, 1% for bucket 2, and 2% for bucket 3. The national authority further indicates that the countercyclical buffer is a step towards handling systemic risk by preventing its build-up during excessive growth. Moreover, IBA classification facilitates policy measures that correspond to the level of systemic risk that they pose to the country's financial system.

2.5.4.2.2. Systemic control measures in India

According to the regulator, the regulatory and policy objectives in India are all inclined towards maintaining systemic stability (RBI, 2011, p.96). The policy tools include the specification or revision of norms of exposure, differentiating risk weights for sectors that are sensitive (such as the real estate sector), specifying loan ratios, and standard assets provisioning. Systemic risk in India is thus controlled in various ways. First, systemic risk is controlled through restricted access to non-collateralised lending and borrowing in money markets. Second, the reserve bank also limited inter-bank liabilities as a means of controlling contagion risks from banks' interconnectedness. Third, the regulator created a financial stability unit (FSU) which carries out macro-prudential surveillance by conducting systemic stress tests and prepares financial stability reports bi-annually (RBI, 2010, p.105). Moreover, the regulator prohibited investment in zero-coupon bonds unless they have a sinking fund provided by the issuer, as a large-scale investment could pose systemic problems (RBI, 2011, p. 105). Further, the regulator limited interbank exposures to 25% or T1 capital for GSIBs. In 2013, the reserve bank came up with a policy that required DSIBs to have higher capital to be subjected to more stringent regulations. The additional CET requirements include 0.2% (bucket 1), 0.4% (bucket 2), 0.6% (bucket 3), and 0.8% (bucket 4).

2.5.5. Liquidity risk

The liquidity risk measures established from the findings are classified in Figure 5 below:

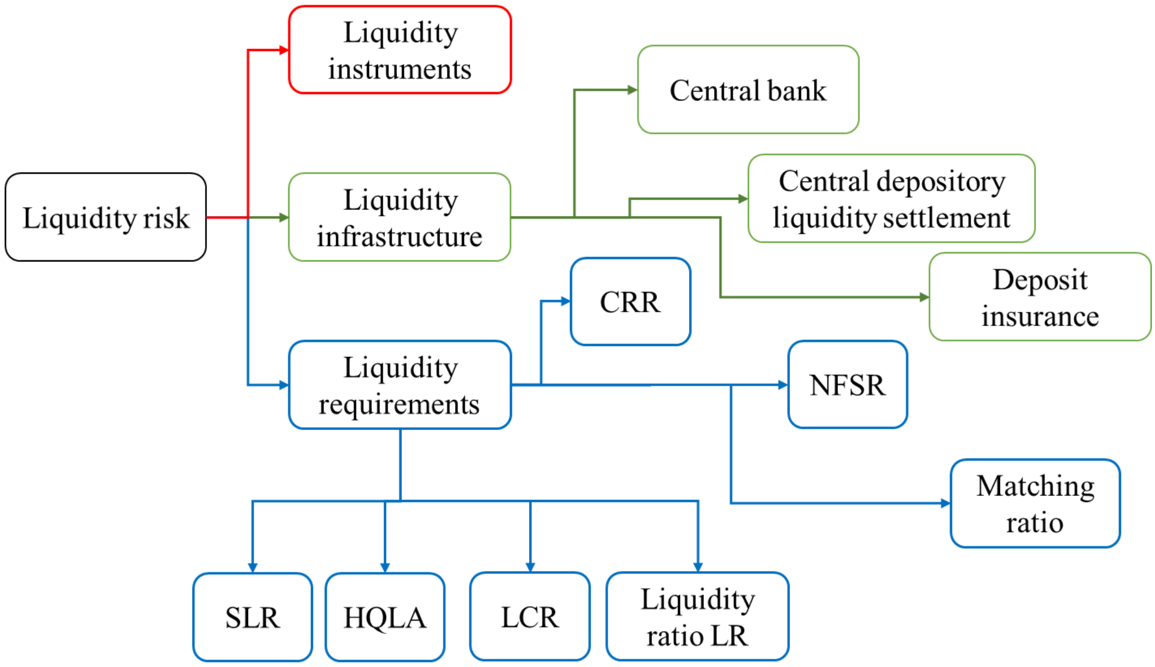

Figure 5. Liquidity risk measures (Source: NVivo Output by Author)

2.5.5.1. Liquidity Risk Management in Saudi Arabia

SAMA indicates that it considers strong liquidity adequacy as the foundation of a banking system and, thus, that liquidity ratio guidance has been provided for banks in Saudi Arabia since 1966. Moreover, Saudi banks complied with Basel III requirements for liquidity by 2018 June 30th. The regulator controls liquidity risk in the banking sector through certain policies. For instance, banks in Saudi Arabia are required to maintain liquidity reserves of a minimum of 15% on their deposit liabilities. Moreover, the LCR and NSFR were fully compliant with Basel III as of June 2018. By 2018, the NFSR was far above the regulatory requirements, with banks having an average NSFR of 127% in 2018, up from 122% in 2017. Some of the tools used in Saudi Arabia for liquidity management in Islamic banks include Sukkuk because of its ability to provide fixed returns.

2.5.5.2. Liquidity Risk Management in China

The indicators for liquidity used in China include the LCR, HQLA adequacy ratio, NSFR, liquidity ratio and liquidity matching ratio. The regulator divides commercial banks into two: those whose assets are less than RMB200 billion (required to fulfil the minimum regulatory requirement for HQLA adequacy ratio as well as the liquidity matching ratio) and those whose assets are more than RMB 200 billion (required to fulfil the minimum regulatory requirements for LR, LCR, NSFR and liquidity matching ratios). The minimum regulatory requirements are shown in figure 6 below:

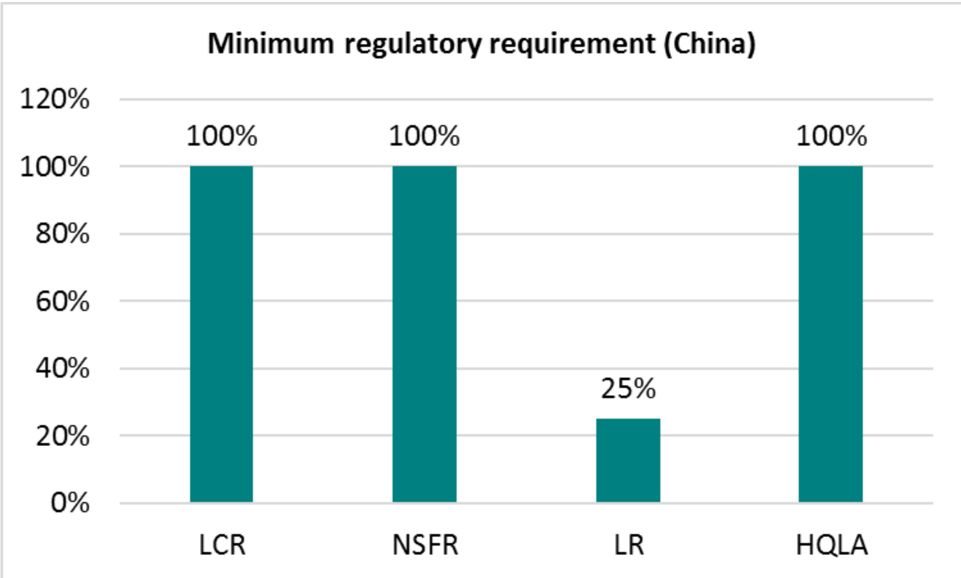

Figure 6. The minimum regulatory requirement for liquidity in China (Source: NVivo Output by Author)

The role of monitoring and regularly analysing the liquidity risk of commercial banks is carried out by the regulator. Banks that do not meet the minimum requirements take corrective measures within a time limit prescribed by the regulator. However, in scenarios of stress, the regulator shall consider the macroeconomic situation and evaluate the factors influencing each bank's liquidity profile and take the appropriate measures. The rules for leverage ratio were adopted in China in 2012 and corresponded to the requirements of Basel III.

2.5.5.3. Liquidity Risk Management in India

In India, the final guidelines on LCR were issued in 2014 for introduction in early 2015, with the minimum requirement set at 60% to reach 100% by early 2019. Banks in India are required to hold government securities under the following conditions: (a) they have achieved the minimum SLR, (b) the security held is within the range permissible by the Reserve Bank under Marginal Standing Facility (MSF) and Facility to Available Liquidity for Liquidity Coverage Ratio (FALLCR) (2% of their Net Demand and Time Liabilities (NDTL) and below 11% of NDTL). Thus, Level 1 HQLA is government securities. Further, the regulator set to implement NSFR in 2018 with a minimum requirement of 100%. However, the implementation was deferred to October 2020. The leverage ratio was implemented in India in January 2017 using an indicative value of 4.5%. However, in 2018, the regulator advised DSIBs to have a minimum liquidity requirement of 4% and other banks to have a minimum liquidity requirement of 3.5%.

2.5.5.4. Liquidity Risk Management in Malaysia

Malaysia required banks to have HQLAs to maintain the minimum required LCR levels. The LCR levels were initially 60% in June 2015 and are expected to reach 100% by January 2019. Further, the supervisor recognized the following as HQLAs, which are in alignment with Basel III: liquidity facilities from the central bank, foreign currency purposed for covering liquidity needs of the domestic environment, and use of level 2 assets with increased haircuts. In Malaysia, level 1 HQLAs comprised cash, placements (including overnight deposits, term deposits, Wadiah, commodity Murabaha, surplus cash in certain accounts -RENTAS and eSPICK, SLRR balances), other central bank placements, debt securities and marketable securities. While level 1 HQLAs are unlimited, levels 2A and 2B should not exceed 40% of total HQLAs, and level 2B should not exceed 15% of HQLAs. The HQLAs are immediately usable as contingent liquidity and thus should be convertible to cash within 30 days of stress and must only be withdrawn during stress; thus, in ordinary conditions, banks are required to maintain non-SLRR HQLA.

The NSFR was implemented in Malaysia in June 2015. The requirement is for banks to keep a minimum of 100%. The regulator allows banks to have a higher NSFR than the minimum set by Basel III if they deem their liquidity risk to be higher, and such banks must always maintain their high amount.

2.5.6. Credit risk management

We searched the documents to identify the credit risk management techniques employed in the four countries. This is shown in figure 7 below.

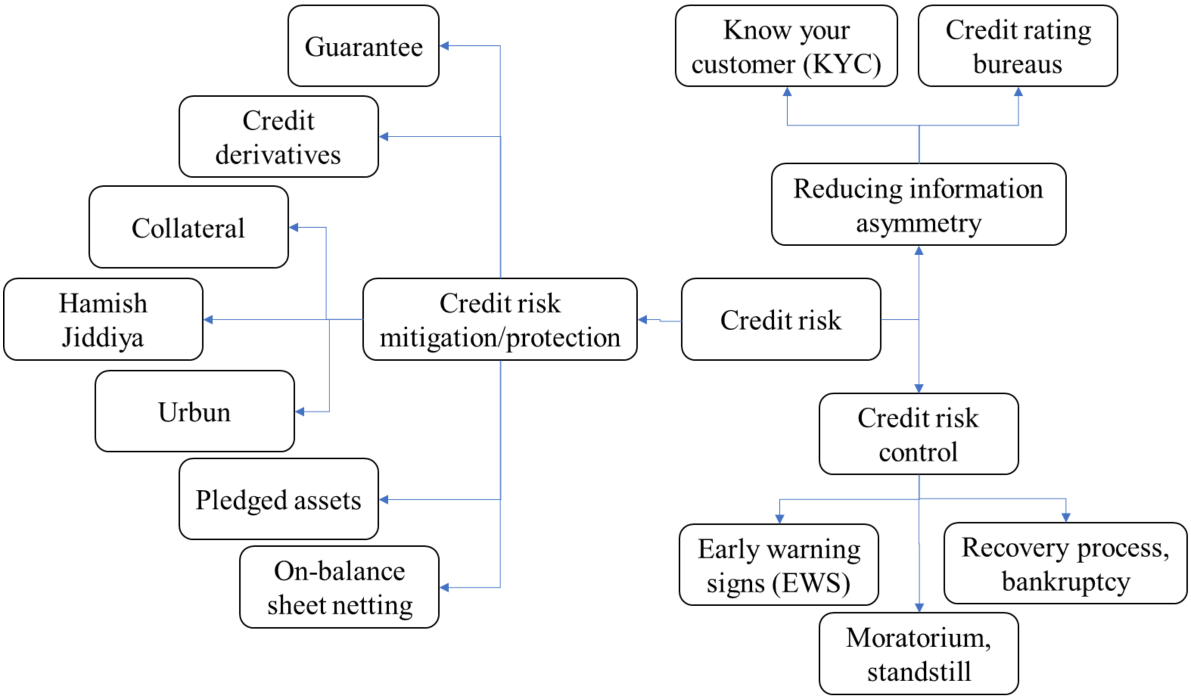

Figure 7. The credit risk mitigation techniques identified from the documents (Source: NVivo Output by Author)

2.5.6.1. Credit Risk Management in Saudi Arabia

Credit risk management in Saudi Arabia is profound, with defined stages of examining the borrower, their ability to pay and their commitment to paying loans extended. In Saudi Arabia, credit risk is measured through NPL and coverage ratios. Credit risk management is conducted in various ways, including specific laws that regulate banks' exposure to credit risk, methods of reducing information asymmetry between the lender and the borrower, and management of potential default.

2.5.6.1.1. Laws associated with the issuance of credit facilities

Saudi has come up with laws to control credit risk. For instance, The Saudi Banking Control Law 2014, article 8 prohibits banks from issuing loans above 25% of their reserves and invested or paid-up capital (p.6). Further, banks are prohibited from using their shares as security for any financial liability, guarantee, or loan or granting loans to their employees for amounts exceeding their four monthly salaries (p.7). Saudi laws also require the incorporation of credit risk management into the bank's regular processes of credit management (Saudi rule 2, 2020, p. 15).

2.5.6.1.2. Reducing asymmetry of information

Another credit risk management technique is the reduction of information asymmetry by collecting borrower information across banks and rating the borrower through a credit bureau. Saudi Arabia has a fully functional credit bureau owned by banks and licensed by SAMA. Information asymmetry is also reduced through due diligence, as SAMA requires the lender to establish the creditworthiness of the borrower, the soundness of the collateral provided, and that the prospect of the business-funded is reasonably successful.

2.5.6.1.3. Handling cases of potential default

SAMA has instituted a time-based technique for handling potential defaults. The timeline and actions are presented in figure 8 below:

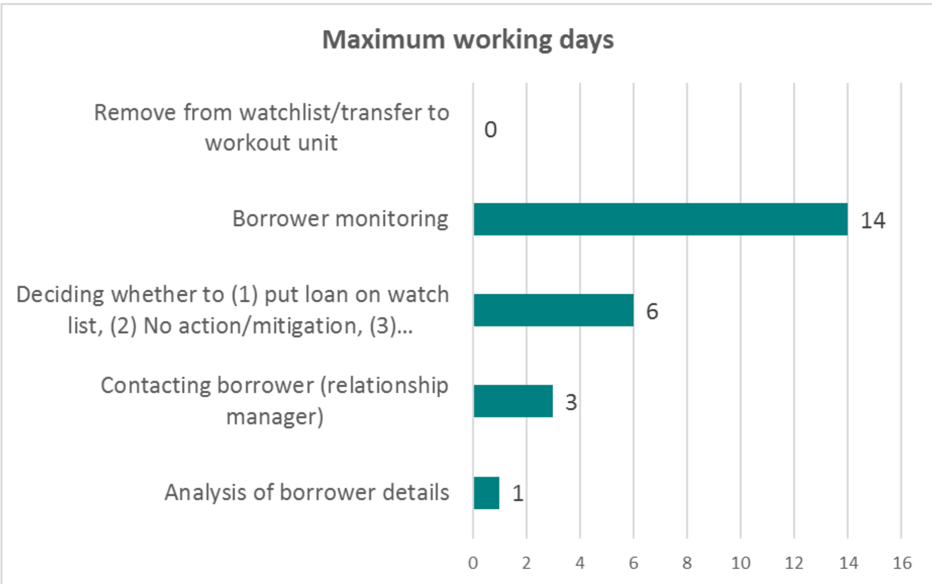

Figure 8. A time-based trigger for handling potential default (Source: NVivo Output by Author)

The last action (removal from the watch list/transfer to the working unit) is not given a timeline as it is left to the bank to determine based on its internal credit policy. The regulator argues that when loans are permitted to stay within the originating unit for a long, it results in the generation of NPLs, and thus, the working unit is the last option for banks. The regulator thus advises that this decision should be dependent on factors such as the unsustainability of the loan, severe depletion of the firm's equity, and previous unsuccessful restructuring and therefore warranting drastic measures to speed recovery. The loan recovery process stipulated by the regulator includes the recognition of NPLs through Early Warning Systems (EWS), restructuring, provisioning, the valuation of the creditor's collateral, legal process/recovery/foreclosure, managing foreclosed assets, monitoring and reporting of NPL and work out effectiveness. The legal process stated above is about the bankruptcy law that came into effect in August 2019. This process is aided by an EWS unit, which operates outside of the originating unit but is incorporated into the bank's credit risk management department.

2.5.6.1.4. Standstill agreement

Saudi laws permit loan restructuring. However, this restructuring needs to be compared to other options, such as bankruptcy or enforcement, in terms of the value it could create. The Saudi laws indicate that where a borrower owes several creditors or where a creditor has had a long-term relationship with the borrower, the formalisation of a standstill agreement is required. This involves a period where no lender is permitted to enforce rights against the creditor to give breathing space for the creditor to come up with a survival strategy. During this period, the lenders joined to come up with a unified approach. The approaches may include extending additional credit for working capital or postponement of the interests due.

2.5.6.1.5. Credit protection

Aside from the credit risk mitigation techniques mentioned, Sukuk is also used as a debt instrument in Saudi Arabia because of its ability to provide stable earnings. Rather than debt, the literature indicates the suitability of Sukkuk as a tool for liquidity management for the same reason – earnings stability (Harun et al., 2021).

2.5.6.2. Credit Risk Management in China

2.5.6.2.1. Credit risk

The issuance of credit by commercial banks, according to the regulator, should be reflective of the commercial bank’s credit level and their risk appetitive (characteristic), and they must have sound processes for credit risk determination in receivables. Even though collateral is stressed, the regulator recognizes that there are unsecured, uncommitted loans granted to individuals on a revolving basis. Further, the banks are obliged to recognize the credit risk inherent in their loan portfolios and the creditworthiness of the borrower (collateral holder). Taking this recognition into account, the regulator requires commercial banks to cancel facilities granted to a borrower, such as cancellable corporate overdrafts, when their credit quality deteriorates. Further, the banks use LGD in evaluating a facility and PD when evaluating highly leveraged borrowers or those whose assets are held for trading. China also requires a 2%-4% risk weight on the collateral. Further, the law requires no correlation between the collateral value and the counterparty's credit quality.

2.5.6.2.2. Counterparty credit risk

One of the methods of controlling credit risk is through hedging utilizing derivatives. This introduces counterparty credit risk. The regulator defines counterparty credit risk (CCR) as the probability of defaulting before settling the final cash flows due to a transaction. This is differentiated from credit risks due to loan default, as the risk is not unilateral. Although the credit risk mitigation methods lead to the transfer or reduction of credit risk, they lead to an increase in residual risks leading to the need to control the residual risks. Commercial banks are expected to comply with (1) ensure compliance of collateral and guarantee management with the regulator's requirements; (2) the degree of cover must be explicitly specified; (3) CRM impacts are not double counted. Further, to mitigate credit risk, the bank must ensure that they possess the right to quickly take legal possession or liquidate the counterparty's collateral in case of insolvency, default, or bankruptcy. Further, the collateral must be valued every six months, pledged over the life of the exposure, segregated from the assets of the custodian, and its value has no relationship with the counterparty's credit quality.

2.5.6.3. Credit Risk Management in India

The determination of credit risk is conducted through stress testing and monitors credit growth in different sectors. Further, the country implemented the standard approach for credit risk in 2013. Additionally, under the internal rating-based approach, banks were permitted to adopt either Advanced or foundation internal rating-based approaches.

2.5.6.3.1. Credit risk mitigation facilities

CDS was formulated in 2010 as the derivative market. India also has deposit insurance and credit guarantee corporations.

2.5.6.3.2. Provisions

The regulator also requires provisions to guard against asset deterioration. For instance, the provisions for standard commercial real estate assets were increased from 0.4% to 1%. Further, in the spirit of building up provisions (dynamic or ex-post specific provisions) during periods when banks have good earnings, banks in India were advised to attain a minimum of 70% for their provision coverage ratio. The regulator argues that during credit booms, banks have the tendency to lower their credit standards leading to asset quality deterioration. India also required a 2% provision for the first two years following the restructuring of standard advances from NPAs. For accounts upgraded from NPA to a moratorium, the 90-day norm for NPAs does not apply.

2.5.6.3.3. Reducing information asymmetry

Credit Rating Agencies (CRAs) keep borrowers' credit information and avail them to lenders for access to customers' credit history. The Indian regulator argued that increased information sharing between lenders reduces the rate of default and average rate of interest, increases lending and deepens the credit markets. However, in 2011, the regulator worked towards ensuring the banks to do excessively relied on CRAs. Aside from the CRAs, the central bank also instituted a Central Repository of Information on Large accounts (CRILC) to perform the functions of collecting, storing, and disseminating credit data. CRILC captures both funded and non-funded exposures and aims to help banks to recognize problems with asset quality early enough and to make informed decisions on credit (India data 2014, p.82). Since CRILC handles only large borrowers, banks were advised to furnish information on lenders for the fund and non-fund-based exposure exceeding 50 million rupees. Another method of reducing information asymmetry is to know your customer (KYC) norms that were stressed by the regulator. KYC has also been reported in the literature as a bank-level credit risk management technique (Arora, 2021).

2.5.6.3.4. Banking regulations and policies

In 2012, India revised the exposure of Urban Co-operative *Banks* (UCBs) to commercial real estate and housing and real estate from 15% of their deposits to 10% of their assets. Further, a policy framework was instituted in January 2014, which aims to enable banks to detect problematic accounts early, restructure viable accounts promptly, and recover or sell unviable accounts promptly. In 2015, the regulator formulated large exposure limits in line with the BCBS framework. The regulator also instituted a peer-to-peer platform for unsecured crowdfunding, which evaluates the lender's creditworthiness and also collects loan payments. Additionally, the bankruptcy law was passed in 2016 to strengthen the framework for resolving corporates.

2.5.6.3.5. Early Warning Systems (EWS) and corrective mechanisms

According to the regulator, it stepped efforts towards the identification of risky credits, tracking and monitoring disbursals and appropriately pre-empting delinquency and ensuring that the retrieval processes, where applicable, are fast and cost-effective. There has been effected by creating mechanisms to issue EWS. In 2015, strategic debt restructuring was introduced in India 2015, where secured creditors joined up to form a joint lenders forum. This is to convert the loans due to them from an entity into shares and, thus, collectively become the major shareholders and divest the holdings earliest.

2.5.6.4. Credit Risk Management in Malaysia

Credit protection in Malaysia under the standardised approach is conducted under credit derivatives, guarantees, and financial collaterals. The IRB approach, on the other hand, uses the value at risk (VaR) method to measure credit risk. The IRB approach utilises the principles of LGD, PD, and EAD. The identified risk can be mitigated through wide-ranging techniques set by the supervisor. Some of the infrastructure in place to provide credit protection include the Credit Guarantee Corporation and Cagamas Berhad. For moratorium, this is limited to the situation when a counterparty is facing natural disasters, and this consideration is done internally at the bank level. An independent party is required to review and monitor the internal processes for granting a moratorium. This should be no more than six months following the application by the obligor.

The credit risk management techniques in the conventional system do not differ much from the techniques used by India and Saudi Arabia. First, the banks are required to immediately and unconditionally cancel revocable and cancellable commitments such as overdrafts because of the deterioration of creditworthiness. Second, the banks use LGD, EAD and PD to estimate the credit risk. The supervisor requires banks in Malaysia to perform stress tests to determine the impact of credit risk on the bank's IRB regulatory capital. Further, for purposes of reducing information asymmetry, banks in Malaysia may establish a credit bureau for the collection of credit information and any other information deemed fit, and banks are permitted to disclose this information to other financial institutions. Credit risk mitigation (CRM) techniques include (1) collateral, (2) credit derivatives and guarantees, and (3) on-balance sheet netting. Further, the contract in place for credit protection is irrevocable unless, on the occasion where the lender does not fulfil their part of providing credit.

2.5.6.4.1. Credit risk exposure in Islamic banking

The seven Islamic financial contracts exposed to credit risk are listed as follows:

- Murabaha and MPO with a non-binding AP: exposure to credit risk emanates outstanding balance following the purchase
- MPO with a binding AP: the exposure is equal to the cost of asset acquisition
- Salam and Salam with parallel Salam: exposure is equal to the amount paid by the bank
- Ijarah with binding AL: exposure is equal to the cost of acquiring the asset after signing an AL, and the exposure comes from the outstanding lease amount after signing an LC
- Ijara with no AL: the exposure is based on the balance lease amount
- Musharakah with a sub-contract: the bank is exposed to credit risk
- Mudarabah and Sukuk: no credit risk exposure

Even though co-ownership in Islamic banking signals an equity risk (for instance, in the Masyarakat mutanaqisah), when a wa'ad is applied to permit the transfer of the asset to the obligor, this leads to the creation of credit risk. Islamic banks are allowed to employ risk weighting under the regulatory retain, provided that the risk profile is the same as the ijarah or Murabaha contracts. They are permitted to hold non-financial collateral such as residential and commercial real estate, physical collateral and financial receivables. Moreover, Islamic banks are subjected to similar credit risk mitigation mechanisms as conventional banks, except that mitigation techniques are sharia compliant. For instance, credit insurance is replaced with credit trade takaful. Additional credit risk mitigation mechanisms available for Islamic banks include (a) Hamish jiddiyah, a security deposit before a contract or sale is executed and (b) urbun, which is earnest money to assure contract performance.

2.5.7. Compliance of risk management with BCBS versus IFSB

The risk definition and mitigation methods above complied with BCBS. About the IFSB, the provisions were somewhat similar to the BCBS requirements, except for the replacement of the non-compliant instrument with equivalent Shariah-compliant instruments. For instance, IFSB Islamic banks are permitted to use the services of credit rating agencies recognised by External Credit Assessment Institutions (ECAI) for the assessment of the creditworthiness of, for instance, Takaful and retakaful. Moreover, IFSB provides for Shariah-compliant instruments such as Tahawwut (Shariah-compliant hedging).

This aligns with the statement by Ganiyy et al. (2017) that the Islamic banking system could be considered an Islamised conventional system. They further explain that in many cases, the banking regulator uses the same rules for both Islamic and conventional banks, which was practised especially in Saudi Arabia, where there was almost no distinction between the regulations for Islamic and conventional banks. The provisions of the IFSB, which largely mirror the BCBS, and especially Basel III, could also be a contributing factor to the almost similar (Islamised) regulatory treatment. Thus, in terms of compliance with Basel III, it was more about which tools an Islamic bank can use to achieve regulatory requirements as opposed to adapting to a differing regulatory standard that adapts to the uniqueness of Islamic banking.

2.5.7.1. Credit risk

Changes to the BCBS were mainly a response to the contextual nature of the regulatory environment. For instance, banks used some aspects of Basel II requirements in Malaysia and China before the full adoption of Basel III, such as the IRB approach. While Malaysia required banks to choose between PD, LGD, and EAD, China specified when LGD or PD could be used. India banks had the choice between the foundation IRB and the advanced IRB approaches.

Moreover, another innovation was in credit risk mitigation. For instance, before India enacted a bankruptcy law, the regulator had three different frameworks for managing bankruptcy events. Moreover, in India, credit rating agencies were classified into two: credit rating companies licensed by the regulator and a government-owned rating agency for large credits. Changes were also realised in terminology. For instance, in Saudi Arabia, a version of Moratorium was referred to as a standstill agreement.

Although credit risk mitigation techniques were largely similar to those used in conventional banking, such as the use of derivatives, guarantees and collateral for credit protection, we noticed some innovations to help Islamic banks achieve compliance. The need for modification of credit risk mitigation mechanisms is supported in the literature. Jarbou and Niyama (2020), for instance, explained that the Shariah law does not permit banks to apply fines or penalties against customers in default. This makes it difficult for Islamic banks to apply credit discipline to their customers. Some of the innovative credit protection used included the application of waad. In Malaysia specifically, Musharakah Mutanaqisah could be undertaken with or without waad, which is binding and can be executed instead of the default. Secondly, credit insurance in Malaysia was conducted through the credit trade Takaful or Re-Takaful. Further, in Malaysia, Islamic banks were permitted to hold non-financial collateral. For Saudi Arabia, Sukkuk was viewed as a good means of credit protection.

2.5.7.2. Liquidity risk

In the analysis conducted, we established that Saudi is one unique country as it has fully implemented the Basel III requirements and surpassed most of the metrics, including requirements for liquidity, as other countries struggled to meet the minimum requirements and opted for phased implementations. The report by Islamic Development Bank indicates,

> "*Saudi banks already meet the Basel III capital, liquidity and leverage standards that international banks are expected to meet by 2019*." (IsDB, 2020, p19)

This could be due to the country's excess liquidity status. As observed in the literature, excess liquidity has two possible concerns: that funds are not being invested and thus, banks have lower profitability than their peers, and second, that in pursuit of higher earnings (where such incentives exist), bank managers take excessive risks during booms, triggering a financial crisis (Harun et al., 2021; Sajjad Hussain, Muhaizam Bin Musa, and Omran, 2018). Additionally, high liquidity as an aftermath of Basel III implementation has been linked with high levels of gross non-performing loans, which is indicative of higher credit risks (Rizvi, Kashiramka, and Singh, 2018). Thus, in a situation such as in Saudi Arabia, it becomes important for the regulator to permit reasonable investments to allow for profitability while taming risk engagement.

So far, Saudi Arabia has responded to this need by establishing a highly controlled credit risk management environment where banks have limitations as it pertains to their lending decisions and loan recovery options. These have so far enabled the country to maintain very low NPAs compared to other countries. The country has also set up a national fund that should help with handling possible liquidity crises. Thus, given that the 2008 financial crisis was not curtailed with liquidity support, the multiple initiatives to control credit risk should help maintain the stability of the Saudi banking system (El-Massah et al., 2019).

Moreover, full compliance only helps to ensure stability but without a sure guarantee. This means that regulators must take appropriate contextual-based actions following the close observance of the economy and the banking system. We observed that India, which had set higher than the minimum standards, struggled to reach the minimum regulatory standards. However, the regulator conducted pilot studies with the regulations to examine their suitability before system-wide application. This enabled the regulator to determine the after-effects of compliance to determine whether additional time or policies were needed to ensure compliance and to maintain the stability of the banking system. This was followed by bi-annual stability monitoring.

2.5.8. Differential treatment of state-owned commercial banks

We did not find preferential treatment as it pertains to whether banks were state-owned or privately owned. In China, the regulations are impartially applied to all the banks, as evidenced in the statement on the rules on liquidity. However, notes by financial asset managers for acquiring state-owned banks were considered as collateral.

In India, we established an open acknowledgement of the lower performance of public sector banks, including an acknowledgement of rampant fraud (92.9% of all cases in 2017-18), and an acknowledgement that they were largely stressed.

> "*During 2017-18, PSBs accounted for 92.9 per cent of the amount involved in frauds of more than `0.1 million, as reported to the Reserve Bank, while the private sector banks accounted for 6 per cent*." (RBI, 2018, p128)

This is in line with literature that indicates that public sector (state-owned) banks are inefficient. The regulator reacted to this through the consolidation of the public sector bank. Consolidation is a different strategy that increases the size of the banks (the opposite of restraining the asset growth of privately owned banks).

2.6. Conclusion

In this chapter, we sought to answer two sub-questions: (a) how do standardised capital and liquidity regulations mitigate risks faced by banks? (b) what country-specific regulatory frameworks are in place to cater for additional risks that banks may face while operating within emerging markets? We used document analysis in which regulatory documents, national laws, and annual reports from the regulatory authorities were analysed. The findings reveal that countries are at different stages of implementing Basel III: while some have fully implemented it, some are still in the implementation stage. The findings also reveal countries that have set higher than Basel III required capital adequacy and liquidity ratios recognise the unique challenges they face and the inability of the standard regulation to mitigate additional risks within their banking system. However, the reports and documents analysed do not provide evidence that the additional regulations helped reduce the build-up of systemic risk or increased the stability of the banking system. This is the same between conventional and Islamic banks.

Regarding the second sub-question, we found that regulators in the different countries did not engineer any novel rules beyond the Basel III Framework, only requiring banks to have higher than standard ratios. Even for Islamic banks, we determined that BCBS frameworks were only adapted to Islamic contexts. Since nothing new was engineered, it presents a need to establish statistical proof of whether credit risk and liquidity risk influence stability and systemic risk and the influence of lower liquidity risk on credit risk. These gaps are further addressed in the empirical studies in chapters three and four.

Chapter 3 - Basel III: Implications of Capital and Liquidity Regulations on Financial Stability During Economic Depression

In this chapter, we attempt to answer our research question by investigating the effect of Basel III's new capital and liquidity requirements on systemic risk in the financial system within emerging markets. We do this by exploring the relationship between the capital and liquidity regulations, evaluating NSFR for banks and their probability of default risk, and analysing the marginal contribution of banks towards systemic risk. Section 3.1 aims to provide some background context into emerging markets as part of the introduction. Section 3.2 provides a theoretical framework by discussing key theories relevant to our research question. Section 3.3 of this chapter explores the existing literature and discusses different approaches used to study capital and liquidity regulation in relation to systemic risk and the assessment of results from existing literature. Section 3.4 investigates both standards (original and revised) of calculating NSFR under Basel III using historical data. Additionally, this section also lays out our use of the default risk model after reviewing the existing literature and presents empirical findings. This section further extends to investigate the systemic risk models used in the literature and our methodology to measure systemic risk along with its findings. Section 3.5 provides a discussion and concluding remarks based on the results from the preceding section.

3.1. Introduction:

The rationale for studying emerging market economies and policymaking processes is that they have a distinct set of features that distinguish them from both developed and frontier markets. The first crucial attribute of emerging markets pertinent to this study is their increased degree of volatility, which has been backed by both researchers and data. The essential question in judging emerging market volatility is whether it is the outcome of uncontrolled causes or the effect of the policy framework within which countries operate. The difference between these two causes of volatility is not easy because natural disaster shocks can be minimised if preventative and disaster management mechanisms are in place. Kaminsky et al. (2004) differentiate the policy framework in the case of developed economies, where policy frameworks function as a stabilising force within the economy, unlike emerging market economies where policy frameworks tend to be more procyclical in nature, encouraging economic booms and exacerbating recessions. Such arbitrariness in policymaking diminishes investor confidence and reduces long-term investments into productive assets. These uncertain policies are also thought to be a significant drag on GDP within emerging markets (Fatas and Mihov, 2003).

The second significant attribute in the transitory element in emerging markets. Emerging markets are increasingly transitioning to various fonts. These fonts cover essential demographic characteristics such as fertility rates, life expectancy, literacy rates, and the important artefacts pertinent to this study, the shift within economic and political institutions. These shifts are primarily characterised by repeated regime swaps resulting in dramatic reversals in fiscal, monetary and trade policies. These reversals are a predominant source of volatility in these markets and lead to shocks in economic growth (Aguiar et al., 2007). Finally, and perhaps most important transition to increasing interaction with international capital markets is frequently drawn out and, at times, disruptive. Ranciere et al. (2006) argue that pressing countries to push transitions may occasionally embrace measures that boost the rate of progress within the economy primarily by soothing borrowing constraints, leading to higher investments and higher economic growth while at the same also increasing the chances of crises due to stimulating risk-taking behaviour, leading to financial fragility and amplified probability of a financial crisis. Which often have dire recessionary consequences for emerging market economies.

This mixture of high volatility and transitional characteristics present within emerging markets poses a real dispute in policymaking. In established parlance, the challenge is to strike the right balance between commitment and flexibility or between rules and discretion. To demonstrate good faith in policy initiatives, perseverance is desirable; thus, methods that ensure such pledges will be valued by investors and will assist in economic success. As such, a continuous promise displays a resolution to remain on course despite the numerous continuing transformations. That promise is a pledge that, notwithstanding the country's volatility, policymakers will not behave in a way that aggravates or magnifies the volatility; rather, volatility will be mitigated to the greatest extent possible through policy actions. Likewise, Nguyen et al. (2022) add that uncertainty in policymaking and illiquid domestic markets are the major drivers of corporate default risk within emerging markets. As firms engage in risk-taking behaviour, they reduce their cash holding, resulting in an increased cost of financing and deteriorating financial performance (Ahsan and Qureshi, 2020; Tran, 2021).

Regulatory developments in the financial services industry within emerging markets are slow and diverse but are moving towards a similar trend as prescribed by the international regulatory regime. For instance, the People's Bank of China introduced Deposit Insurance Scheme in 2015 to protect depositors' confidence in the banking and Financial system (Gang, 2018). Likewise, the Chinese Government in 2017 also enacted Financial Stability and Development Committee assigning it regulatory powers under the state council to oversee the systemic risk within the Chinese economy as well as liaise with international regulatory bodies in relation to international market developments (Gang, 2018). On the other hand, China's Banking and Insurance Regulatory Commission (CBIRC) introduced a new liquidity risk measurement framework in 2018 which includes liquidity risk measures such as Net Stable Funding (NSFR) and Liquidity Coverage Ratio (LCR) as prescribed in Basel III along with LMR and HQLAAR with both measures aimed at meeting additional short-term liquidity demands under stressed conditions and helping banks' strategically place HQLA to meet their long term demands based on their maturity structure (CBIRC, 2018). The latter two measures will come into effect in 2020. Similarly, in addition to Basel III's liquidity requirements, Indian banks are also required to meet two additional liquidity measures under Sections 24, 42, and 56 of the Banking Regulations (Amended) Act 2017 (RBI, 2019). Indian Banks' are required to hold a Cash Reserve Requirement (CRR) of 4% of their Net Demand and Time Liabilities (NDTL) along with a Statuary Liquidity Requirement (SLR) of 18% of NDTL by 2020 (RBI, 2019).

The main objective of capital regulations is to limit banks' probability to default by increasing banks' loss-absorbing capacity. In contrast, the introduction of liquidity regulation is intended to mitigate the maturity mismatch between assets and liabilities as a preventive measure to funding risk and market liquidity risk. However, in theoretical terms, more liquid and enhanced capital should enable banks to absorb losses. In practice, the requirements proposed by Basel III would prompt changes in risk management in terms of evaluating risk and decrease bank profitability and ultimately encourage banks to pursue more risky investments in an effort of profit maximization. Although there is substantial literature on the effectiveness of capital regulation and its role in predicting banks' probability of default, research on the impact of new liquidity standards introduced by Basel III on banks remains scarce (Chiaramonte and Casu, 2017). Likewise, there is a difference between evaluating capital and liquidity requirements. For instance, capital requirements are calculated based on the total Risk

Weighted Assets (RWA) that a bank may hold and is a measure of solvency risk, but it does not address asset liquidity risk. In contrast, liquidity requirements are a function of the funding mix of the bank that does not depend on other banking fundamentals such as capital adequacy and asset risk (Pierret, 2015). Liquidity requirements are computed based on a specific mix of HQLA rather than RWA and address funding and market liquidity risks (Chiaramonte and Casu, 2017). Equally, there is a consensus amongst academics and policy analysts on how to calculate capital requirements and the need for capital regulations, but there is limited consensus beyond the identification the liquidity is hard to measure (Allen, 2014; Diamond and Kashyap, 2016; Chiaramonte and Casu, 2017; Bai et al., 2018). Furthermore, empirical evidence on how the combination of capital requirement and liquidity measures impacts the bank's stability and the financial stability of the system is limited (Chiaramonte and Casu, 2017; Bai et al., 2018).

3.2. Theoretical Framework

This section investigates traditional theories on Bank Capital and liquidity in relation to systemic risk relevant to our fundamental research question discussed earlier in this study.

3.2.1 Theory of Bank Capital

Diamond and Rajan's (2000) theory of bank capital explains why banks need capital requirements by arguing that banks' capital structure and operations differ from those of other industrial businesses. The theory first explains the core functions of a bank by describing borrowers as entrepreneurs seeking funding for specific projects. Hence, every borrower has specific skills to maximise their cash flows from their project better than any other, given that they are well aware of their abilities. However, a borrower can not commit his human capital to the project, with the exception of when the payment comes due. A bank looking to extract repayment can only do so by threatening to liquidate the loan by taking the loan away and selling it to the next best user, in this case, other investors. At the same time, borrowers can threaten to withhold payments in future, triggering a loss for the bank. This would lead the bank to only extract a fraction of the total loan amount. Thus, loans are illiquid in nature as they cannot be refinanced to the full extent of the loan repayments due.

Because human capital cannot be easily committed to these assets, they are illiquid. A tool that may link human capital to a bank's assets would result in the production of liquidity. As a result, a bank that finances its lending activities through demand deposits is a type of instrument that can link human capital to a bank's assets. Demand deposits are deposits with fixed claims in the sequential service order, in which the depositor receives their money until the bank runs out of money or assets to sell. The dilemma for the bank in this fragile capital structure is that it cannot threaten to hold up depositors since this would result in collective action by all of its depositors anytime they believe their claim is in jeopardy. Any attempt by a bank to bargain with depositors or threaten to stop this service will result in a bank run. This effectively disintermediates the bank by crushing its profits to zero. As a result, the bank will honour all collections made by depositors. In a stable economic environment, banks maximise the amount of credit they can give by rigidly screening borrowers and employing a weak all-deposit capital structure.

Although uncertainty can be assessed but not verified, hence such a metric cannot be used exclusively to limit the amount of credit available to borrowers. Similarly, any decrease in real asset value could lead to a run on the bank due to panic among depositors. As a result, a bank must trade-off between the cost of bank runs against the cost of expanding credit and liquidity creation. As a result, it is preferable for banks to partially finance themselves with softer claims that may be renegotiated during uncertainty. These softer claims are known as capital, and they are long-term claims with no first-come, first-served right to banks' cashflows, unlike depositors. This capital can be obtained in the form of equity, in which investors always have the right to replace bankers. Given the fact that equity is a loan that is long-term in nature, the right to claim long-term debt emerges only in the case of a bank's default; thus, capital holders, unlike depositors, are not subject to the collective action problem. A capital requirement fulfils three essential roles. It boasts a bank's ability to absorb loan losses, acts as a buffer against asset price shocks, and allows the bank to modify the amount that can be collected from borrowers. The theory also claims that such higher capital requirements come at the cost of direct reduction in banks' liquidity and transaction services and higher agency costs resulting in lower credit and liquidity creation by banks.

Nevertheless, earlier works by Holmstrom and Tirole (1997) dispute the costs associated with imposing a higher capital requirement on banks, as mentioned in Diamond and Rajan's (2000) work, highlighting that the higher capital requirement, in fact, incentivises banks to make efficient asset portfolio choices and reinforces these incentives to monitor borrowers through monitoring channels. From a similar standpoint, the higher capital requirement also improves lending, liquidity creation and higher market share for banks (Mehran and Thakor, 2011). A theoretical model developed by Allen et al. (2011) adds that increased capital requirement does not have to be financed solely by equity holders and depositors. Banks can charge higher rates to borrowers to make up for the capital required, as this incentivises banks to monitor for borrowers that can pay off their loans. The only cost associated with such a measure would negatively affect the borrowers, particularly lower investment returns due to higher bank charges. Evidence Berger and Bowman (2013) and Thakor (2014) suggest that banks with higher capital levels have a significantly higher probability of sustaining a financial crisis, gaining a competitive edge in deposit and loan markets, and higher liquidity creation among large banks. However, evidence of higher liquidity creation is based on the sample of large banks from the US. In terms of financial stability, Thakor (2014) further adds that higher capital requirements improve not only the stability of the banks but also the wider financial system as an effective remedy for reducing contagion risk.

3.2.2. Theory of Bank Liquidity Requirements

The seminal work on liquidity risk by Diamond and Dybvig (1983) highlights that banks face liquidity risk during the financial intermediation of turning liquid liabilities into illiquid assets. They also add that deregulation increases competition among banks' and is a good sign of a free market economy, but they also state that during dire market conditions banks' face liquidity risk due to bank runs. They propose that banks' can mitigate liquidity risk by introducing a Deposit Insurance Scheme, due to which depositors would have no incentives to rush to move their deposits. However, Diamond and Dybvig's (1983) deposit insurance scheme proposition is not effective reasoning as evident during GFC, although banks' had deposit insurance schemes in place that did not stop bank runs. Furthermore, Diamond and Dybvig (1983) also mention that the deregulation of banks' encourages competition; however, the underlying issue of financial deregulation is that it creates a moral hazard problem when banks may invest in risky assets building systemic risk and thereafter creating a "too big to fail" effect within the financial system as mentioned by Repullo (2005).

Additionally, Diamond and Dybvig (1983) address only liquidity risk arising from depositors on the liabilities side of the balance but do not take into account banks' other obligations, such as investors' flight to quality and banks' short- and long-term liabilities. More importantly, they do not address the need for capital buffers to idiosyncratic liquidity risk arising from changing macroeconomic conditions. Diamond and Rajan (2005) agree that banks' face contagion risk, and this can affect the pool of liquidity when banks collapse. However, their work does not address the role of capital regulations and macroprudential policy in mitigating liquidity risk. Malherbe (2014) argues in light of new Basel III liquidity requirements that imposing limits on liquidity would lead banks' to hoard liquidity and would lead to lemon problems as they argue the more HQLAs banks' hoard, the less likely they are to trade in interbank markets to raise new cash limiting other banks' to borrow from interbank markets. Allen and Gu (2018) add in the context of financial stability that banks face multiple risks, such as panics, crises due to a decline in asset prices, contagion risks, foreign exchange risks, and Behavioural effects which cannot be prevented without the need of macroprudential regulations. Allen and Gu (2018) further argue that Diamond and Dybvig (1983) do not highlight the cost of implementing insurance schemes. Moreover, what could be the result if bank runs are reduced by insurance schemes in a world where the crisis would have been caused due to fundamentals? They dismiss the work of Diamond and Dybvig (1983), highlighting that the model is very simple and excludes other systemic risks referring to the financial crisis in Ireland.

Calomiris et al. (2015) developed a theory on bank liquidity requirements by extending the previous work conducted by Diamond and Dybvig (1983) by looking at both the asset and liabilities sides of a bank in light of new Basel III requirements. Their theoretical model highlights that the value of liquidity held at central banks is observable at all times, unlike the value of capital, which is dependent on the value of risky assets. Given that High-Quality Liquidity Assets (HQLA) are risk-free assets hence when banks hold such assets, they are committing to removing a portion of default risk from their portfolios. Because Liquidity is observable in value and risk-free, this can be used to pay senior bank claim-holders, in this case, a depositor, in the event of bank liquidation. They further highlight that the high cost associated with raising equity pre and post-crisis makes it challenging for banks to effectively respond to bank runs despite the deposit protection schemes in place. The incentive for banks to implement liquidity requirements is that even though it is difficult for banks to raise equity to shore up their capital in times of crisis. Banks can recourse to making use of liquidity buffers to avoid fire sales to incur losses in order to address collective action problems by depositors in times of crisis.

Nonetheless, empirical evidence by Hong et al. (2014) concludes that there is a negative relationship between NSFR and banks' probability of failing. Furthermore, they find that effect of LCR is insignificant in relation to preventing bank failure. The effect of LCR can be argued on the basis that LCR only covers 30 calendar days and does not address the maturity over the longer-term horizon. In contrast, Chiaramonte and Casu (2017) provide empirical evidence that the final version of NSFR (October 2014) has a higher predictive power compared to the earlier standards of NSFR (December 2010). They also find that NSFR has a positive effect on improving bank stability and supporting regulatory efforts to curb systemic risk. Hugonnier and Morellec (2017) reach a different conclusion stating that although the introduction of liquidity requirements decreases the magnitude of losses in default, it increases the likelihood of bank defaults. However, their work is focused from a Micro-prudential perspective rather than a macro-prudential perspective. Their work primarily relies on liquidity and leverage requirements but does not take the capital requirement of banks, and most importantly, their results are based on unregulated financial institutions.

Our study stems from several contributions to the literature. Primarily, studies conducted by Chiaramonte and Casu (2017), Hong et al. (2014), and King (2013) examine the effect of NSFR and LCR in predicting bank failures but fail to address the effect on mitigating systemic risk within the financial system taking all instruments of capital requirements into consideration. Our study is the first, to the best of our knowledge, which examines the effect of NSFR in a systemic liquidity risk context considering capital requirements such as Tier 1 to total assets ratio, Capital Adequacy Ratio (CAR) and using liquidity risk measures introduced post-financial crisis. Secondly, this is the first study to our knowledge that explores the effect of NSFR within the geographical sample of nine major EMEs as per the MSCI EM index based on Nominal GDP. Furthermore, the study also examines the effect of new capital and liquidity requirements on EMEs financial institutions in the context of systemic risk.

3.3. Literature Review:

The aim of this section is to review existing literature regarding capital and liquidity regulations from various standpoints. Additionally, In this section, we review three important themes. Firstly, the relationship between capital and liquidity regulations under the new liquidity standards, namely NSFR and its role in mitigating systemic risk from banks' perspective. Secondly, what role do central banks' play in alleviating the systemic risk via Macroprudential policies and LOLR functions? Thirdly, the role of liquidity within interbank markets and the contagion risk arising from short-term lending and borrowing activities within interbank markets. The study briefly highlights the issues of systemic risk, liquidity risk and capital regulations before going into a more in-depth discussion on the three themes explained above.

Capital requirements have been a long regulatory tool for assessing the safety and soundness of banks (Chiaramonte and Casu, 2017). Similarly, the interactions between capital and liquidity regulations are appropriate in the macroprudential context (BCBS, 2015; BCBS, 2016). But regulators prior to GFC relied heavily on capital regulations to maintain the safety and soundness of the financial system. The focus on capital requirements was based on the view that capital and liquidity are substitutes (ECB, 2018). However, the GFC has proved that capital and liquidity regulations are complementary and that capital requirements alone are insufficient to ensure the safety and soundness of financial institutions and minimize systemic liquidity risk.

Multiple studies on the financial crisis have highlighted the importance of liquidity risk. For instance, Diamond and Dybvig (2007) discuss the role of banks in liquidity creation. Banks grant loans which are illiquid and cannot be sold immediately at a higher price margin. While at the same time, banks supply on-demand deposits, which allows depositors to make withdrawals at any time. This causes liquidity mismatch when bank liabilities are more liquid than their assets during times when numerous demand deposits are withdrawn all at once (Diamond and Dybvig, 2007). Diamond and Rajan (2005) explain the reasons that Banks' assets are illiquid because they cannot be put as collateral or sold for the full value of the loan granted because human capital is not able to generate full value committed to the asset hence there is a contagion risk that affects the bank's assets if sold prior to maturity. Helbik (2017) adds that failures do not only occur because of bank runs and interconnectedness between financial institutions but also due to the fact that a bank failure from one bank can wipe out a large pool of liquidity from the market, causing systemic liquidity shortages during periods of stress.

3.3.1. The relationship between capital and liquidity requirements under Basel III

By definition, liquidity is a measure of cash, as well as any other assets that banks have and can use them to quickly meet short-term financial obligations and bills Saleh and Abu Afifa (2020), while capital is defined as a measure of resources that a bank has to absorb losses. In this section, the debate or argument is based on the premise that since capital is a loss-absorbing buffer, banks that have high capital ratios are expected to be less vulnerable to runs from short-term wholesale funding, as well as from deposits. Studies such as Dahir et al. (2019) support this premise by stating that these lower run risk enables or allows banks that are highly capitalized to take on greater liquidity risk.

Thakor (2018) claims that recent regulatory reforms with the twin objective of curtailing systemic risk and promoting economic growth do not serve as a valuable economic resolution in countering the root cause of the GFC. They add that the root cause of the GFC was insolvency risk rather than liquidity risk. Although recent regulatory reforms address the need to strengthen capital requirements, Basel III's liquidity requirement serves no benefit and should be abolished or relaxed. Similarly, Smith et al. (2019) justify the role of both capital and liquidity based on using confidential data of UK Banks from the Bank of England's database between 1989 to 2013 on a quarterly basis using variables such as actual regulatory capital, changes to individual capital guidance, RWA density, ROA, NPLs, liquid assets, derivatives to total assets ratio, wholesale debt to total assets and off-balance sheet commitments to total assets using fixed effect model. Their findings indicate that when banks have low capital, this implies that banks are highly leveraged, resulting in amplified insolvency risk; in such instances, the probability of failure is higher due to liquidity problems. In contrast, when capital requirements are raised, although the probability of failure and insolvency risk declines, banks shift excess liquidity into high-return illiquid assets as capital requirements are increased. Banks' view excess liquidity as an opportunity to grow their balance sheet and generate economic value for their stakeholders. However, shifting from liquid to illiquid assets does not protect banks from bank runs which arise when market conditions are uncertain or when banks are exposed to higher insolvency risk.

DeYoung et al. (2018) support the work of Smith et al. (2018) by claiming that if a decrease in equity capital causes uncertainty among uninsured bank creditors, in such a scenario, banks might treat capital and liquidity as substitutes. In the scenario of a potential bank run, banks may increase the liquidity of their assets by transferring illiquid loans to liquid securities or by increasing the maturity of their liabilities. Conversely, if the negative equity capital shock decreases the value of the bank, it makes the bank less risk-averse. It will lead to banks' treating capital and liquidity as compliments. In the latter scenario, a bank may increase its credit risk, interest rate risk and liquidity risk by shifting from high-rated stable liquid securities towards risky and illiquid loans or alternatively by decreasing the duration of its liability by shifting from stable long-term deposits to less stable short term brokered deposits and commercial paper issuance. A study by Carletti et al. (2019) also contributes to this. The researchers inspected the link between solvency and liquidity in relation to systemic risk. They explained that a bank with a larger share of short-term funding and illiquid assets is exposed to a rollover risk as compared to banks with high equity and more HQL assets. Additionally, raising equity while keeping the bank's asset side stationary has a similar effect on a bank's stability as increasing the stock of HQLAs while keeping the liabilities side of the balance sheet stationery.

DeYoung et al. (2018) argued otherwise. The researchers claimed that this does not apply to community banks in the U.S. as smaller banks pose little threat towards systemic risk. Furthermore, even after considering negative capital shocks, smaller banks tend to hold much higher liquidity as compared to their larger counterparts, given that they do not have access to multiple sources of funding. Hence their findings support the idea of excluding smaller banks from Basel III liquidity requirements because imposing NSFR and LCR requirements is likely to be redundant in practice and expensive. On the contrary, their study also finds no evidence of any linkage between capital shocks and liquidity management among larger banks advocating for two separate sets of capital and liquidity requirements alike to Basel III efforts to mitigate liquidity risk. However, their work is based on US banks only with assets of less than $ 1 Billion which essentially does not cover G-SIBs. The methodology used in their study to generate exogenous shocks to capital ratios does not take into account macroeconomic variables as these shocks are purely accounting-driven using balance sheet variables. The study also lacks evidence of the wider implications of these new regulations, for example, credit supply, interest rates on loans and changes to the balance sheet of banks.

Distinguin et al. (2013) also examined regulatory capital and liquidity measures proposed in Basel III for both US and European banks using NSFR. Their study found that the capital ratio of large banks tends to decrease as large banks become more illiquid and treat capital and liquidity as compliments. Whereas in the case of small banks, an increased relationship is found between capital ratios and illiquidity because small banks treat capital and liquidity as substitutes. However, their study relied only on the original version of NSFR weighting and revised NSFR weighting has not been studied in their research. On the other hand, Birn el al. (2017) investigated banks' response to Basel III's joint regulatory constraints using confidential data. They take risk-based capital, leverage capital, NSFR and LCR as their joint regulatory constraints and conclude that banks cannot manage their liquidity positions under joint constraints by increasing stable deposit funding, but banks can effectively manage their liquidity positions by increasing their liquid asset investments.

King (2013) offered insightful information on accommodating NSFR requirements by using data on banks based in both developed and emerging markets. They use banks' balance sheets and income statements by taking the weighted average of each country's banks' total assets to compare across other countries. Their macroeconomic variables include deposit, lending, policy rates, 1-month interbank offered rate and risk-free rates. Firstly, they calculate NSFR and the portion cost of wholesale funding with a maturity of one year or less. Secondly, they calculate the interest expense that a bank will incur on its retail deposits & wholesale funding, including interbank borrowing with a maturity of 1 year or less and on long-term debt. On the asset side, they calculate other income generated via investments and securities as compared to the risk-free rate offered on sovereign bonds.

The findings indicated that banks could meet NSFR by either increasing ASF, increasing the stakes of stable deposits against less stable deposits, extending maturities of wholesale debt beyond a one-year timeframe, or increasing the proportion of tier 1 capital. Alternatively, banks can reduce the RSF by shrinking the balance sheet loan portfolios, shifting the compositions of investments by selling a low-rated investment for cash holding or replacing it with high-rated investments by changing the composition of loans from retail to corporate loans and mortgages to reduce the maturity to less than a year. Despite these findings exhibiting a certain motivation, they fail to consider an instance where a bank is likely to face numerous defaults on its loan portfolio, where loan maturity is beyond a year, or alternatively, experience bank runs. The findings of Gobat et al. (2014) coincide with the above, that loan exposures beyond one year are not accounted for in the NSFR requirement. They also address additional shortcomings of the NSFR requirement stating that NSFR restricts banks' traditional role as liquidity providers and maturity transformers and may lead to liquidity shortages over the long term with real consequences towards the financial stability of the banking sector. It may also make deposits less stable while banks compete for funding sources.

Classical banking theories by Bryant (1980) and Diamond & Dybvig (1983) have acknowledged that assets and liabilities of financial institutions are jointly related in producing financial services and the creation of both default and liquidity risk. Calomiris et al. (2012) provide a theoretical explanation of liquidity requirements under Basel III by extending classical theories on liquidity risk. They demonstrate this by relaxing the assumption made in Black Scholes-Merton Framework; the effect of liquidity assets and illiquid assets is not the same on banks' default risk. As per Diamond and Dybvig (1983), early liquidation of assets is costly and increases liquidity risk, which motivates banks to hold higher accounts of liquid assets. Early liquidation sends investors and depositors signals that a bank may be holding a risky portfolio and is illiquid, resulting in large outflows. Hence, banks holding liquid assets can isolate them from misinformed early withdrawals as well as mitigate default risk should they not meet their obligations. They further add that capital alone cannot mitigate risks faced in the banking industry. For instance, during the peak of the GFC in 2008, Citibank was bailed out by the U.S. government even after its capital to risk-weighted assets exceeded 11% during the crisis period.

A study by Covas & Driscoll (2014) refutes the above, claiming that forcing financial institutions to hold HQLAs, might lead to a decrease in the number of assets that banks hold. This will, however, raise the interest rate on bank loans. They argue that new liquidity regulations interact with the existing regulations on capital requirements. They develop a nonlinear dynamic general equilibrium model to study the macroeconomic impact of new liquidity requirements in relation to existing capital adequacy requirements. Their findings conclude that liquidity requirement in a baseline scenario would see a 3 per cent decrease in the number of loans granted, whereas banks holding more HQLAs over 6 per cent results in an aggregate output decline by 0.3 per cent and consumption drop by 0.1 per cent, preventing banks from profit maximization. Similarly, an increase in capital requirement from 6 per cent to 12 per cent would lead to the stock of loan portfolios declining by 1 per cent; at the same time, increasing the HQLAs by 9 per cent during the transition will have a higher effect on loan rates being increased by 15 basis points and stock of loans declining by 4 per cent. The study, however, fails to consider the dynamic nature of risk ratings among consumers and corporates, which is fundamental in evaluating the creditworthiness of borrowers. Additionally, the risk rating applied in the study relies on Basel I risk weights rather than sovereign credit ratings of government securities such as AAA or AA-. This makes it difficult to capture banks' cross-border exposures in other governmental securities aside from the U.S. T-bills. Moreover, this study does not reflect the exposures of banks' lending to other banks and the underlying systemic risk that arises from interbank lending activities.

Conversely, Dietrich et al. (2014) examine 921 banks in Western Europe with data samples ranging from 1996 to 2010 to calculate NSFR and Basel III implications on financial institutions. They calculate ASF and RSF to compute values for NSFR and then conduct GMM regression using banks specific variables. They also include two macroeconomic variables, GDP growth and a 10-year yield curve calculated by Organisation for Economic Co-operation and Development (OECD) with a dummy variable to reflect the GFC period. The empirical evidence indicates that the introduction of NSFR is likely to have a slight impact on bank performance based on bank-specific variables. However, Dietrich et al. (2014) do not address the link between capital and liquidity in terms of crisis. Chiaramonte and Casu (2017) believe that despite the cost associated with the implementation of Basel III, the primary aim of a new set of financial regulations is to make banks' stable to absorb shock and mitigate the spill-over effect into the economy. Both capital and liquidity holdings are equally important in promoting the safety and soundness of the financial system; however, according to Van den Heuvel (2018) and Chiaramonte and Casu (2017), little is known about the newly introduced liquidity standards and their interaction with a broader set of capital requirements. Carletti et al. (2019) further add that the introduction of liquidity requirements, specifically LCR and NSFR, complements capital requirements which have led to discussions about the interactions of these regulatory tools and their potential benefits and shortcomings towards promoting financial stability.

Carletti et al. (2019) explain that during the crisis, banks experience large outflows of funds, a process well explained in the academic literature of liquidity risk both from the view of depositors and investors such as Diamond and Dybvig (1983), Diamond and Dybvig (2007) and Dimond and Rajan (2005). The key difference between the role of capital and liquidity is that capital appears alongside liabilities as a source of funding. However, capital can absorb losses, but that does not mean that the capital is stored for a crisis period. Whilst liquid assets, for instance, cash, central bank reserves and governmental securities, appear on the other side of the balance sheet to be used as funding together with a liquidity buffer of HQLAs to alleviate the risk of a liquidity crisis (Frang et al., 2013). The term source of funding, as explained by the researchers, is the capital raised by banks through various activities such as investors and customer deposits, which would appear as liabilities on banks' balance sheets, whereas the term source of funding refers to covering losses arising from loan portfolios which is an asset on the balance sheet but if the borrower defaults these losses are covered by liquidity buffers explained above.

To put this into theory, the value of liquid assets, unlike capital requirements, is always observable. In contrast, the value of capital which co-depends on the value of risky assets. HQLAs are mainly risk-free assets, so when banks hold HQLAs, they are committing to reducing default risk partially as well as limiting liquidity risk (Calomiris et al., 2012). Hong et al. (2014) elaborate on the key difference between LCR and NSFR and categorise liquidity funding risk in two separate categories: asset liquidity and funding stability and link this with new liquidity requirements. They indicate that asset liquidity comprises of net liquid asset ratio, current ratio and government securities ratio, whereas funding stability comprises of brokered deposit ratio, core deposit ratio and non-core funding ratio. Based on the above categorises, LCR measures asset liquidity risk, whilst NSFR measures funding stability risk.

Vazquez and Federico (2015) and Chiaramonte and Casu (2017) both use data from American and European banks' and further add that smaller banks are more likely to collapse due to liquidity shortfalls, whereas large banks are more vulnerable to solvency issues due to inadequate capital buffers. Moreover, a single regulatory model of capital requirement cannot be used to promote financial stability as well as facilitate economic growth, as suggested by

Thakor (2018). Even if banks were to hold liquid assets as part of higher capital requirements, it does not necessarily solve the issue of asset bubbles. Bank liquidity increases during uncertain market conditions or when banks are exposed to increased macroeconomic risk as investors adjust from direct investments in the market to saving deposits (Acharya and Naqvi, 2012). Investors' flight to safety behaviour leaves banks with excess liquidity from their liability side of the balance sheet due to higher saving deposits. This results in banks relaxing their lending standards, fuelling asset price bubbles and credit booms or alternatively sowing the seeds for the next crisis.

3.3.2. The role of Central Banks in liquidity provisions

The central argument in this section is premised on the claim that the LOLR policy by Central Banks significantly inflates systemic risk within the financial system. Studies such as Bagehot (1873) recommend that central banks should lend freely at high-interest rates during the pre-crisis periods, but they should do this only to banks that are solvent and illiquid, with good collateral, assets should be valued between during and pre-crisis prices, and that banks without collateral should be allowed to fail.

Literature on the role of central banks dates to the seminal work by Henry Thornton (1760 – 1815) and Walter Bagehot (1826 – 1877) on BoE's role as the LOLR. It has been known that central banks' play an important role in maintaining financial stability and preventing and managing the financial crisis (Allen, 2014). In an influential book written by Bagehot, "*Lombard Street*", Bagehot (1873) highlights important principals under which central banks' should lend to financial institutions during a crisis period: i) central banks' should lend freely at a high-interest rate during the pre-crisis period but only to solvent but illiquid banks' with good collateral ii) these assets should be valued between crisis and pre-crisis prices iii) Financial institutions without collateral should be allowed to fail. Rochet and Vives (2004) examine Bagehot's principal of central banks' lending to banks' which are illiquid but solvent in the context of the 21st-century of modern banking. They construct an equilibrium model to understand the rationale between investors and bank runs, and their findings conclude that the systemic risk can be avoided by adequate solvency and liquidity requirements, although the cost associated with this is large in terms of foregone returns that financial institutions would have generated. In other words, this interpretation shows that prudential regulations should be complemented by the LOLR policy.

Freixas et al. (2011) studied the role of central banks' as LOLR and the role of quantitative easing using aggerate liquidity risk in the context of GFC. Their research is similar to Allen et al. (2009) as they include idiosyncratic liquidity shocks to banks. They develop various models, including Federal reserve rates and Taylor rule to capture the effects on three banks' during the financial crisis, namely BNP Paribas, Bear Sterns and Lehman Brothers. Taylor Rule is a measure of the output gap and inflation rate (CPI), as this is the primary benchmark for setting interest rate policy. They use single and multiple effects of liquidity shocks on banks' and analyse central banks' role in setting interest rates. The interbank interest rate plays two important roles; firstly, from an ex-ante perspective, the expected rate of return from holding additional liquidity impacts banks' decision-making for holding short-term liquid assets against long-term illiquid assets, and secondly, ex-post rate controls the conditions at which banks can borrow liquid assets in response to distribution liquidity shocks (Freixas et al., 2011). Despite the role of interbank interest rates, they criticise that the primary role of financial institutions in an incomplete market is to share the risk and liquidity. However, banks' themselves face significant ambiguity regarding their own idiosyncratic liquidity needs during financial instability and hence will have larger borrowing needs than usual. They conclude that banks can achieve optimal allocation provided that the risk is shared among consumers and the insurance industry, but interbank interest rates should be kept low in conditions of financial instability.

Similarly, Drechsler et al. (2016) explore the role of LOLR in the context of the recent European debt crisis. They provide insights into the costs and benefits of central banks' interventions as LOLR considering classical theories by Thornton (1802), Bagehot (1873), and Diamond and Dybvig (1983). Their findings do not support the classical LOLR theory reasoning that despite LOLR stopping bank runs and allowing financial institutions to continue financing existing assets while limiting the fire sale phenomenon by banks, the LOLR theory does not address banks with weak capital. In support of the above, Bagehot (1873) states that banks with no collateral should be allowed to fail but fails to address the weak collateral. However, the ECB acted as the LOLR during the European debt crisis by providing loans to financial institutions through repo agreements. The criteria for the amount of funding is given based on the marked-to-market value of the collateral used minus the haircut. Banks with risky collateral are penalised with higher haircuts; however, the collateral needs to meet the criteria of ECB-eligible collateral. After September 2008, ECB began to offer subsidised haircuts that were below the private market haircuts value; for instance, in 2010, a Portuguese bond had a haircut of 4 per cent, and a German bond had a haircut of 3 per cent, whereas the same collateral had a haircut of 10 per cent and 2 per cent at London Clearing House exchange (Eberl et al., 2014; Drechsler et al., 2016). However, Drechsler et al. (2016) claimed that banks with weak capital structures borrowed more from LOLR and pledged riskier collateral as compared to highly capitalized banks. They also highlighted that banks with weak capital borrowed to buy part of risky sovereign debt and pledged a third of European sovereign debt as collateral. Hence, they argue that their findings point towards an alternative path of LOLR theories as weak banks have the incentive to take on more risk and borrow more from LOLR because they are close to being at default (Drechsler et al., 2016). In support, Acharya et al. (2017) argue that during the financial crisis, the Federal Reserve acted as a LOLR using two facilities – the Term Securities Lending Facility (TSLF) and Primary Dealer Credit Facility (PDCF) to address funding pressures during the recent financial crisis. They observe that TSLF allowed banks to exchange less liquid collateral for highly liquid Treasury collateral based on the fee set via auctions. Their findings also suggest that the demand for liquidity by banks as compared to the participants in the facilities, the bid rate and the amount borrowed was far higher on TSLF for banks with weak capital. Despite these, Bernanke (2013) strongly defends these arguments by stating that it was the Federal Reserve's LOLR facilities that prevented the credit crunch. However, Central banks lacked a full understanding of liquidity risk implications that resulted from banks' complex financial instruments such as derivatives, securitizations, and SPVs and their overwhelming dependence on short-term wholesale funding (Gobat et al., 2014).

Looking into EMEs, the role of Central Banks' LOLR function slightly differs as compared to developed economies. Rochet and Vives (2004) mentioned that financial crisis, along with currency crises, is common in EMEs in Asia, Latin America and Turkey. Since financial globalization, financial markets have been linked to the increased flow of capital in cross-border banking activities with a surge in foreign currency short-term debt, and Vives (2006) claimed that a crisis in EMEs has been blamed due to foreign currency (FX) exposures. Chuliá et al. (2018) argued that volatility spillover in the FX market creates its own risk for any given country, either facing depreciation or appreciation pressures. In a scenario of currency appreciation, central banks may lean against the wind to the degree that they are willing to do so. In contrast, the response of the central bank is much more restricted in a scenario of currency depreciation and, in the worst case leading to reducing the limit of FX reserves.

The study conducted by Chuliá et al. (2018) analysed currency downside risk in light of liquidity and financial stability risks taking 20 different currencies both from developed markets and emerging markets, a study similar to Diebold and Yilmaz (2015). Chuliá et al. (2018) discovered that currency appreciation and depreciation are tied to sovereign debt issues. Moreover, their findings suggest that the more liquid a set of currencies are, the more affect these liquid currencies have on other non-liquid currencies during periods of shock. They add that for emerging marketing, depreciation pressures are a real cause of concern for central bankers, which can lead to the destabilisation of their balance of payments. On the other hand, for mature economies, with more liquid currencies, appreciation or depreciation is more related to portfolio diversification with little consequences for the real economy. Hence, they argue that emerging market currencies are net transmitters of volatility, whereas developed market currencies are net receivers of volatility.

Tucker (2014) points out the issue of how central banks manage the crisis if the liquidity crisis is not in a local currency. The U.S. is bound to be the final lender of last resort of the dollar to the world as long as the key reserve currency is U.S. dollars (Lawrence, 2012). Even if the shortage is in Euro or Yen, the issuing central bank does not take exposures of the beneficiaries of LOLR functions (Tucker, 2014). The domestic central bank may decide to extend the LOLR operation to a bank but takes collateral to mitigate the risk. The central bank may then borrow money from the issuing central bank, holding its own currency as collateral.

The issuing central bank holds its foreign currency as collateral against the deposit of the domestic central bank. The bigger issue for issuing central banks' is credit exposure to the counterparty central bank and how valuable its currency is (Tucker, 2014). The author also argues that due to the recent GFC, issuing central banks are cautious about the moral hazard issue and are often left with a difficult choice between lending to the counterparty country to maintain financial stability or allowing a crisis to erupt that could be driven home. The latter choice becomes more difficult for larger EMEs. Dobler et al. (2016) dismissed the idea that the commercial banks' management ought to manage FX risks with relatively high dollarization in the EMEs, as this was evident in the GFC, where some banking sectors held a large FX exposure and were constrained due to global FX liquidity required.

3.3.3. Liquidity Provisions and Systemic Liquidity Risk

The main argument in this section revolves around the idea that when liquidity risks or problems are systemic, they are likely to have adverse effects on the stability of the entire financial system, as well as the economy. This is a situation that is characterized by banks taking excessive liquidity risk, which is often through relying too much on short-term wholesale funding.

In the era of modern banking, the concept of interbank markets has significantly played a role in financing banks' assets. The role of these markets is to ensure adequate liquidity is transferred from banks with surplus liquidity to banks in need of liquidity. According to Allen (2014), these markets are key to central banks' monetary policy and are crucial in sustaining the stability of the overall financial system. The financial regulations of central banks had a primary focus on ensuring that banks' have enough funds to protect themselves from the risks arising from their loan portfolios, such as credit risk or risks from the liabilities side. Ladley (2013) argues that GFC demonstrated serious shortcomings attached to this approach. Ladley (2013) further adds that problems with few banks easily spread throughout the financial system, where many financial institutions were adequately capitalized according to the regulatory capital requirements. The author critiques that the concept of interbank lending is to provide stability, but instead, it is also a mechanism by which contagion risks of one bank could spread between other financial institutions.

The study conducted by Allen and Gale (2004) shows the interactions between financial institutions and markets can lead to financial fragility. It, however, remains the role of the central banks to ensure that markets have adequate liquidity. Allen and Gale (2004) also add that financial institutions should have an incentive to provide liquidity in the market based on the volatility in the market, the type of asset they invest in and the risk of default. Additionally, if the interaction between the financial institution and markets is incomplete, there appear to be explanations for the systemic-wide crisis. Allen and Gale (2004) developed a model to explain the contagion risk that interbank markets pose. They argue that Diamond and Dybvig's (1983) theories do not address the underlying risk that arises from multiple financial institutions during a bank run. A study conducted by Berger & Bouwman (2009) investigates ways of calculating the liquidity within the US banking system by all US banks using data from 1993 -2003. They develop a model in three steps; firstly, they consider all of the banks‘ assets, liabilities, equity and off-balance sheet exposures into three different liquid classes; liquid, semi-liquid and illiquid. Secondly, they assign weights to calculate three categories of liquidity. In their third step, they construct liquidity measures based on loan maturity and on and off-balance sheet assets and liabilities. Their findings show that U.S. banks’ liquidity creation exceeded $2.8 trillion in 2013. However, their findings do not show any empirical evidence of addressing the contagion risk within interbank markets and its interlinkage between financial institutions from a systemic liquidity risk perspective.

Acharya et al. (2012) addressed liquidity issues within the U.S. interbank market. They construct a model based on three assumptions. Firstly, they assume that some assets are bank-specific and are worth more than trading in interbank markets. Secondly, they assume that there are frictions in the interbank lending markets which act as the moral hazard in the interbank market, such are the contagion risk arising from the borrowing financial institution. They argue that the borrowing bank would need to have a claim large enough for other financial institutions to monitor its assets. Thirdly, they assume that liquidity is concentrated within a few banks’ giving them market power. However, Goodfriend and King (1988) believe otherwise, as they argued that in an efficient interbank market, central banks should not lend to individual banks but instead provide liquidity via OMOs, as this would reduce liquidity concentration problems. Freixas and Jorge (2007) argue that the interbank market would fail to allocate liquidity adequately due to frictions such as asymmetric information of banks’ assets.

Jobst (2014) constructs a Systemic Risk-adjusted Liquidity (SRL) model taking into account the new Basel III liquidity requirements, such as the NSFR, using data on the US Banking sector. First, they calculate the market implied value for both RSF and ASF to capture market interactions using option prices. Secondly, they adjust market risk using RSF as a strike price modelled based on daily options prices. This allows for expected loss from liquidity risk to be evaluated. Thirdly, they determine the expected joint losses from liquidity risk within the financial system. However, their study does not show any evidence of considering other elements of Basel III, such as CCyB and Capital Conservation Buffer (CCoB), as these instruments are equally important in capturing the systemic liquidity risk as both buffers carry HQLAs. Adrian and Boyarchenko (2013) highlight that both liquidity and capital requirements impact the risk-taking nature of banks. They analyse the systemic risk in the US banking sector using BHCs data. They include variables such as LCR and NSFR measures, Haircuts on weak collateral and then use the Dynamic Stochastic General Equilibrium (DSGE) model. Their findings suggest that prudential capital and liquidity requirements affect the systemic risk and return trade-off.

3.3.4. Research Hypotheses

After reviewing both theoretical and empirical literature, we develop the following hypothesis:

H_{1a}: New Capital and Liquidity Regulations, such as the Net stable funding ratio (NSFR), significantly and positively affect bank stability.

H_{1b}: NSFR complaint banks reduce their individual contributions towards systemic risk.

In this study, capital and liquidity regulations will be operationalized by Net stable funding ratio (NSFR), while bank stability by Z score and contributions towards systemic risk by CoVaR

3.4. Research Methodology

3.4.1. Data Requirements

The data sample for this study includes 550 observations from 55 banks listed on the MSCI Emerging Market Financials Index covering nine emerging market economies from Bankscope, spanning ten years of data from 2009 to 2019. The data contains banks' balance sheet information covering both asset liability as well as off-balance sheet items on consolidated bases reported in USD. The 10-year time span will enable us to consider the transition phase post-GFC, particularly the changes to capital and liquidity regulations. Additionally, this will also evaluate banks in emerging markets that meet NSFR liquidity measures and banks that do not meet the NSFR threshold and their contribution towards systemic risk.

In order to avoid sample selection bias, we followed the recommendation by Saleh and Abu Afifa (2020) on minimizing selection bias, where the authors emphasized the importance of correctly restating and revisiting the main goal of the research, then define the inclusion criteria from the target population, and then use random sampling to select the units to include in the study. Using random sampling ensures that every sampling unit has an equal chance of being included in the final sample. After taking into account the inclusion criteria, the emerging economies and banks therein were selected using random sampling.

3.4.2. NSFR Calculation

NSFR is calculated using the Basel III NSFR framework (BCBS, 2014) as done in studies conducted on European and American Markets (see Chiaramonte and Casu, 2017; DeYoung and Jang, 2016). The BCBS defines NSFR as the ratio of Banks ASF to its RSF (BCBS, 2014). This can be calculated as

$$NSFR = \frac{ASF}{RSF} \qquad (3.1)$$

ASF represents the weighted average of a bank's liabilities and capital with higher weights assigned to stable sources of funding such as equity, subordinated debt, core and savings deposits and lower weights assigned to less stable sources of funding such as other deposits and short-term borrowing. ASF can be calculated as

$$ASF = Equity + Total\ LT\ Funding + (Customer\ Saving\ Deposits) * 0.95 + (Customer\ Current\ Deposits) * 0.90 + (Other\ deposits\ and\ ST\ Borrowing) * 0.5 \quad (3.2)$$

Likewise, RSF is a weighted average of the bank's assets and OBS items with higher weights assigned to long-term, illiquid and volatile assets such as trading securities, assets pledges as collateral, investments in subsidiaries, corporate loans and loans to SMEs and consumers. This can be represented mathematically as

$$\begin{aligned} RSF = {} & Other\ Assets + At.Investments\ in\ associates + Reserves\ for\ impaired\ Loans \\ & + (Governoment\ Securities + OBS\ items) * 0.05 \\ & + (Other\ Securities + Loans\ and\ Advances\ to\ Banks) * 0.5 \\ & + (Mortgage\ Loans) * 0.65 + (Retail\ and\ Corporate\ Loans) \\ & * 0.85 \quad (3.3) \end{aligned}$$

The full criteria of weights for each RSF and ASF instrument are shown in *Appendix B*. In the following step of this study, we measure the default risk of the banks which meet and breach the NSFR threshold to examine which categories of banks exhibit lower and higher default risk.

3.4.3. Default Risk Models

Research Scholars from the fields of finance and accounting have extensively studied bankruptcy prediction models since the works of Altman (1968) and Ohlson (1980) on Z-score and O-score. However, there has been a revitalised interest in default risk prediction models, particularly post-financial crisis capital and liquidity reforms under Basel III. For example, Lallour and Mio (2016) analyse NSFR's predicting power for bank failures and solvency issues against traditional accounting default risk measures. They use the multivariate logit model to examine the predictive power using variables such as capital adequacy ratio, leverage ratio, core funding ratio, loan-to-deposit ratio, an asset-to-deposit ratio, NSFR and liquid asset ratio with macroeconomic variables such as gross government debt-to-GDP ratio and current account deficit of the home country of the bank. Their findings suggest that the NSFR, core funding ratio and deposit-to-asset ratio were statically significant predictors of financial distress in firms. Nonetheless, their model relies purely on balance sheet information and does not incorporate market information. Hillegeist et al. (2004) add that accounting data is by nature historical and is prepared on a going concern principal hence using that data to predict the future, especially one that violates the "going concern" principal itself, is fundamentally flawed. Accounting-based measures relay on financial statements, which are effectively designed to measure the past performance of the bank and are not a good indicator of future performance.

Nevertheless, the Z-score model was established more than 50 years ago using multivariate discriminant analysis, and numerous market-based default risk prediction models exist. However, the Z-source model continues to be used globally as a primary or secondary tool for bankruptcy prediction and analysis both in research and practice (Altman et al., 2017). The use of the Z-score measure is beneficial for businesses that do not have market data or are not listed in their respective stock markets (Altman et al., 2017). Additionally, from a regulator's perspective, the current Basel requirement needs banks to validate their distress prediction models and record their results. Henceforth accounting-based models play a crucial role in an international context. Accounting-based models also compliment recent accounting regulations on IFRS 9, where default is recognized at initial recognition as compared to once a default materializes. However, Agarwal and Taffler (2008) acknowledge that accounting numbers are subject to reporting standards (such as cost accounting) which may hinder the true representation of the economic value of cost.

Market-Based models such as Black and Scholes (1973) and Merton (1974) using contingent claims approach overcomes most of the criticisms faced by accounting-based models such as sound theoretical model, stock price reflects the information contained in accounting statements, market variables are not influenced by accounting policies, and market prices reflect future performance of the company. However, market-based models have assumptions which are unpractical in real-world financial markets, as these models assume the stock returns would be normal, do not differentiate between types of debt issued by the company and only assumes that the firm only has one zero coupon loan. More importantly, it assumes that markets are perfectly liquid and market trading is continuing; however, during the GFC, this was not the case. Market-based models fail to address some of the basic empirical questions regarding the correlation between corporate failures and deteriorating investment opportunities (Campbell et al., 2008). Nevertheless, the default risk prediction power between market-based models and accounting-based models is statistically not significant (Agarwal and Taffler, 2008). Their study compares both the Black Scholes Merton options-based model and Z-score using variables such as 1-month risk-free rates, the market value of equity, daily stock price information, return on assets, and return on risk-weighted assets using the ROC curve. They conclude that neither the market-based model nor accounting-based models are statistically significant is failure prediction, although both models carry unique data for firm failure. However, market-based models are theoretically well-founded, but empirically, their lack of superior performance is not to be taken by surprise. Empirical superiority of the market-based model is hindered due to the restrictive assumptions of the model itself (Hillegeist et al. 2004). Despite criticism of traditional accounting-based models and theoretically appealing framework for market-based models, practically accounting-based models are robust and not dominated by market-based models such as Black Scholes Distance to default model and KMV model (Agarwal and Taffler, 2008).

3.4.4. Default risk Measurement

In this study, we employ the Z-score model to measure default risk for two main reasons. Firstly, the measurement of Basel III's NSFR requirement is measured based on financial statements rather than market information hence using the Z-score model naturality compliments components of NSFR measurements, mainly ASF and RSF. Secondly, despite the drawbacks of the Z-score model as well as market-based models, neither of them is statistically superior to one other in predicting default risk (Agarwal and Taffler, 2008). The Z-Score model has been the dominant model since its existence more than 45 years ago; it is still used as a main supporting tool for default prediction or financial distress analysis both in research and practice (Altman et al., 2017). This study uses a similar approach used by Giordana and Schumacher (2017), but the scope of research here is to measure the impact of Basel III liquidity standards on emerging markets. Furthermore, the set of variables used is slightly different to the one applied in their paper. This essentially will cover a diverse nature of risks that emerging markets are exposed to as compared to developed markets.

The data input for Z-Score can be derived from the balance sheet information of the banks and is calculated as follows:

$$Z - Score = \frac{{E_{it}}/{A_{it}} + ROA_{it}}{\sigma(ROA_{it})} \quad (3.4)$$

Where E_{it} is the Tier 1 Capital of a Bank i at the time t, A_{it} are the total assets of the bank i at the time t. Hence ${E_{it}}/{A_{it}}$ is derived into Capital to Assets Ratio (CAR), likewise ROA_{it} is the return on assets calculated as profits after tax divided by the total assets on a yearly basis. σ is the standard deviation of ROA_{it} as a measure of default risk as the square of its inverse is the probability of losses that would exceed equity in a normally distributed return. Hence equation 3.4 can be rewritten as

$$Z - Score = \frac{CAR_{it} + ROA_{it}}{\sigma(ROA_{it})} \quad (3.5)$$

The Z-Score indicator relies on a few assumptions in this study. Firstly, the data reported in the financial statements are accurate and transparent and decisively linked to the respecting bank's fundamental performance. Due diligence on the accuracy of the data reported has been cross-examined from other data-providing vendors to avoid any error in reporting from data-providing vendors. Secondly, the banks selected in the sample are listed in the MSCI index and are assumed to be domestically systemic important banks in the listed country.
The relationship between CAR and ROA has been studied both in developing and developed economies. One may conclude that financial institutions with higher leverage would be penalized since these institutions have a small portion of the equity that could be used to absorb losses given the case of emerging markets; likewise, a higher ROA leads to lower default risk and standard deviation of ROA decreases the Z-score since it increases the probability that equity may fall short to cover the losses that may originate (Giordana and Schumacher, 2017). Equally, if a bank was to improve its ROA by increasing leverage, it is also possible that an increment in leverage can bring that bank closer to default. This is because high leverage is associated with higher ROA under the condition that a bank is able to generate enough profits to service its debt. On the other hand, if such a bank fails to generate enough profits, it will have a lower ROA.

Feng et al. (2020) studied the relationship between capital adequacy and growth in lending in emerging market dynamics. They argue that capital adequacy and ROA are heterogeneously related to each other and are primarily dependent on bank-specific characteristics and economic conditions. Their results indicate higher capital requirements and ROA are negatively associated with each other during staggering economic growth. Their study employs an OLS estimation model using variables such as CAR, change in CAR, ROA, RWA and Liquid assets. In general regression model for panel data can be written as follows:

$$\log\left(\mathrm{ZScore}_{\mathrm{i,t}}\right) = \beta_0 + \beta_1 \mathrm{X}_{\mathrm{it}}^{1} + \beta_2 \mathrm{X}_{\mathrm{it}}^{2} + \cdots + \beta_{\mathrm{k}} \mathrm{X}_{\mathrm{it}}^{\mathrm{k}} + \mathrm{u}_{\mathrm{it}}$$

where i denotes cross sections and t denotes time-periods with $i = 1,2,\cdots,n$, and $t = 1,2,\cdots T$. $log\ (ZScore_{i,t})$ is the dependent variable, Xs are independent variables. βs represents relevant intercept and slope coefficients, and u_{it} is the error term.

The three most common estimation techniques used to estimate the model are pooled regression, random effects, and fixed effects models. The simplest way of estimating the model is ignoring the space and time dimensions of the panel data and simply estimating the model by pooling the panel data. A pooled regression model corresponds to running ordinary least squares (OLS) on the observations pooled across i and t.

In practice, the assumptions underlying ordinary least squares estimation of the pooled model are unlikely to be met. First, if there is individual heterogeneity, then omitting unit-specific factors that might affect the dependent variable contributes to the inconsistency of the least squares estimator. Furthermore, the assumptions of homoskedasticity and uncorrelated errors for the same individual are unrealistic, and autocorrelation and heteroscedasticity are two common specification issues that arise in panel data models. Finally, the OLS method ignores the time series aspect of panel data, and there will be potential bias caused by this inconsistency.

When individual heterogeneity is assumed to be important, unobserved effects models, estimated with fixed and random effects approach, become crucial. The general specification of these type of models can be presented as follows:

$$log\ (ZScore_{i,t}) = \beta_0 + \beta_1 X_{it}^1 + \beta_2 X_{it}^2 + \cdots + \beta_k X_{it}^k + c_{it} + u_{it}$$

where $\mathrm{c_i}$ is an unobserved effect (unobserved component, latent variable, or unobserved heterogeneity) and $\mathrm{u_{it}}$ is the idiosyncratic errors or idiosyncratic disturbances.

The unobserved component is called a “random effect” when it is treated as a random variable, and it is assumed that the individual specific effects are uncorrelated with the independent variables. For the estimation procedure, the random effects approach puts $\mathrm{c_i}$ into the error term and then accounts for the implied serial correlation in the composite error, using a generalized least squares analysis. By contrast, unobserved effects are called a “fixed effect” when it is treated as a parameter to be estimated for each cross-section observation i, and the fixed effect assumption is that the individual specific effects are correlated with the independent variables. If some of the regressors are endogenous, but the endogeneity can be modelled as a dependence between the regressors and an unobserved component that is fixed over time, we can apply a fixed effects estimator, which may result in consistent estimation. The main drawback of fixed effects estimators is the inability to estimate the impacts of time-invariant explanatory variables.

To choose between fixed effects and random effects, generally, a formal test developed by Hausman (1978) is run during our empirical analysis, as shown in table 8. To understand the essence of the test, first note that the random effect estimator is at least as efficient as the fixed effect estimator and identifies all the parameters, unlike the fixed effect estimator omits the estimation of time-invariant variables. However, the fixed effect model is more robust as it does not require mean independence between the individual-specific effects and the observed regressors. The Hausman test is implemented under the null hypothesis that the fixed effects and random effects estimators do not result in systematically different outcomes. Therefore, the random effect estimator is consistent and efficient under the null hypothesis but inconsistent under the alternative hypothesis. In comparison, the fixed effect estimator is consistent under both hypotheses but less efficient than the random effect under the null hypothesis. If the null hypothesis is rejected, the conclusion is that random effect is not appropriate, so a fixed effects model should be used.

In table 7, as a robustness check, we also hypothesize the possibility of lag impacts for the dependent variable, assuming the existence of dynamic panel data effects. This modifies the main regression specification as follows:

$$log\ (ZScore_{i,t}) = \beta_0 + \rho log\ (ZScore_{i,t-1}) + \beta_1 X_{it}^1 + \beta_2 X_{it}^2 + \cdots + \beta_k X_{it}^k + c_{it} + u_{it}$$

By construction, the unobserved panel-level individual effects are correlated with the lagged dependent variables, which makes the standard estimators discussed above inconsistent. Both fixed and random effect models are estimated with the underlying assumption of strict exogeneity, meaning that the controlled regressors are not correlated with the error terms. The strict exogeneity assumption is often violated in economic problems, especially when there is a dynamic adjustment process that creates inertia. Therefore, in the specification with the lagged dependent variable, strict exogeneity assumption is violated and should be relaxed with the assumption that the regressors are weakly exogenous or sequentially exogenous or predetermined. This assumption is more natural than the strict exogeneity assumption and does not require the future values of the regressors to be uncorrelated with the error terms. In this last specification, when the lag of the dependent variable is one of the explanatory factors, pooled OLS is obviously inconsistent, as the disturbance in pooled regression is surely correlated with the lag of the dependent variable. Similarly, the fixed effects and random effects are also inconsistent.

A simple approach for consistent estimation of a dynamic panel data model was first proposed by Anderson and Hsiao (1982), who suggested an instrumental variable estimator with a generalized method of moments (GMM) approach, where after the first differencing of the model specification, a natural candidate as an instrumental variable for the lag term of the change in the dependent variable is taken the second lag term of the dependent variable. This is a proper instrument since it is correlated with the endogenous right-hand side variable, a change in the lag of the dependent variable but not correlated with the error term of the regression. A more efficient and consistent estimation approach for dynamic panel data models was proposed by Arellano and Bond (1991), who further developed the idea proposed by Anderson and Hsiao (1982), by noting that, in general, there are many more instruments available, and identify that not only all lagged values of the dependent variable but also all values of the regressors are available as instruments. Therefore, this estimator is more efficient, as it uses all the information, combining all the restrictions together in a GMM estimator.

Nevertheless, we chose fixed effects as our baseline specification, as the lag term in Arellano & Bond model is not significant. The Hausman test shown in table 8 suggests that FE is preferred over RE, and F-test for individual heterogeneity suggests that POLS is not preferred.

Hence, the model specification for this study is implemented under three different specifications. In the baseline specification, we regress the log value of Z-Score on NSFR only, as shown in equation 3.6, similar to the work conducted by Giordana and Schumacher (2017) and Ali et al. (2022). Then the model is extended with the period dummy and its interaction with NSFR, as shown in equation 3.7. Finally, a full model with control variables is examined, as shown in equation 3.8. In all the cases, we employed fixed effects estimator to control for bank-specific individual heterogeneity, as well as country-specific fixed effects are considered. As a robustness check, alternatively, as shown in Table 7, we also present the full model estimated with pooled OLS (POLS), Random Effects (RE) and Arellano-Bond linear dynamic panel-data (AB) estimators.

$$\log\left(ZScore_{i,t}\right) = \alpha_i + \beta_1 NSFR_{i,t} + \gamma \cdot Country_i + \varepsilon_{i,t} \quad (3.6)$$

$$\log\left(ZScore_{i,t}\right) = \alpha_i + \beta_1 NSFR_{i,t} + \beta_2 Period_t + \beta_3 NSFR_{i,t} * Period_t + \gamma \cdot Country_i + \varepsilon_{i,t} \quad (3.7)$$

$$\log\left(ZScore_{i,t}\right) = \alpha_i + \beta_1 NSFR_{i,t} + \beta_2 Period_t + \beta_3 NSFR_{i,t} * Period_t + \beta_x Bank\ Specific_{i,t} + \gamma \cdot Country_i + \varepsilon_{i,t} \quad (3.8)$$

$$log\ \left(ZScore_{i,t}\right) = \alpha_i + \beta_1 NSFR_{i,t} + \beta_2 Period_t + \beta_3\ NSFR_{i,t} * Period_t + \beta_4 \left(\frac{ROA}{\sigma_{ROA}}\right)_{i,t} + \beta_5 \left(\frac{CAR}{\sigma_{ROA}}\right)_{i,t} + \beta_6 \left(\frac{LLP}{Gross\ Loans}\right)_{i,t} + \beta_7 \left(\frac{LT\ debt}{TA}\right)_{i,t} + +\beta_8 \log(Total\ Assets)_{i,t} + \beta_9 EFF_{i,t} + \gamma\ Country_i + \varepsilon_{i,t} \quad (3.8a)$$

Where $\log\left(ZScore_{i,t}\right)$ is the log value of Z-Score, $NSFR_{i,t}$ is NSFR calculated as per equation 3.1. We introduce a period dummy $Period_t$ which takes the value of 1 for $Year \geq 2018$ and 0 otherwise. The rationale behind using a period dummy is to observe the effect of NSFR before and after NSFR became a mandatory requirement for banks to uphold. $NSFR_{i,t} * Period_t$ is the interaction term highlighting the effect of NSFR post-2018 on banks' default risk. $Bank\ Specific_{i,t}$ is the vector of control variables that includes normalized Return on Asset (ROA) $\left(\frac{ROA}{\sigma_{ROA}}\right)_{i,t}$ and normalized Capital adequacy ratio (CAR) $\left(\frac{CAR}{\sigma_{ROA}}\right)_{i,t}$, $\left(\frac{LLP}{Gross\ Loans}\right)_{i,t}$ is Loan Loss Provision (LLP) against Gross Loans as a measure of banks' credit risk. $\left(\frac{LT\ debt}{TA}\right)_{i,t-1}$ is the banks long-term debt against the total assets ratio and represents the banks debt structure. $\log(Total\ Assets)_{i,t}$ denotes to the size of the banks' balance sheet, $EFF_{i,t-1}$is an Efficiency ratio calculated as a non-interest expense by net income; this variable measures if a bank has effective resource allocation systems in place. $Country_i$ is country fixed effects. , $\varepsilon_{i,t}$ is the standard error term, and α_i, β_n, and γ_t are the estimated individual specific constant terms and slope parameters.

Banks' assets have always been considered illiquid and one of the main sources of fragility within the banking sector (Wagner, 2007). Therefore, national regulators levy all banks to place liquid assets to defend against liquidity shocks. Liquid assets held by financial institutions are considered a net defensive position against liquidity shocks that a bank may face (Davis, 2008). Hence, a bank with a higher liquid asset has the capability to fund liquidity scarcity in times of distress or while facing liquidity shocks (Gatev and Strahan, 2006). An increase in liquidity in normal economic conditions has no effect on the stability of the bank. However, the initial impact on the banks allows banks to transfer risks out of their balance sheet at the same time, and this also triggers banks to engage in risk-taking activities to it optimize returns which ultimately offsets the initial impact of stability that a bank had. Similarly, in times of economic distress, though, an increase in liquid assets makes banks less vulnerable to bank runs due to reduced losses. However, banks' offset this through increased risk-taking to sustain both the asset and liquidity side of the balance sheet during economic stress while also considering profit maximization targets to maintain investor confidence. This effectively offsets the initial impact on bank's stability.

3.4.5. Z-Source Empirical Results

Figures 9 illustrate the average log values of Z-Score by year and country, as well as the developments for the examined period. We observed that, on average, the highest value of Z-Score is observed for Indonesian banks and the lowest value for Hungarian banks. These findings are consistent with the findings of Achsani and Kassim (2021), who argued that Islamic banking in Indonesia showed more stability when compared to conventional banking, especially in facing macro and microeconomic shocks. For the examined period, the average Z-score is mainly decreasing till 2013-2015, after which a sharp increase was observed for almost all the examined countries. An important turning point is also 2018, after which the slope of the Z-Score development line changed for most of the examined countries. The obvious turning point in 2018 is also seen in the development of NSFR, figure 10

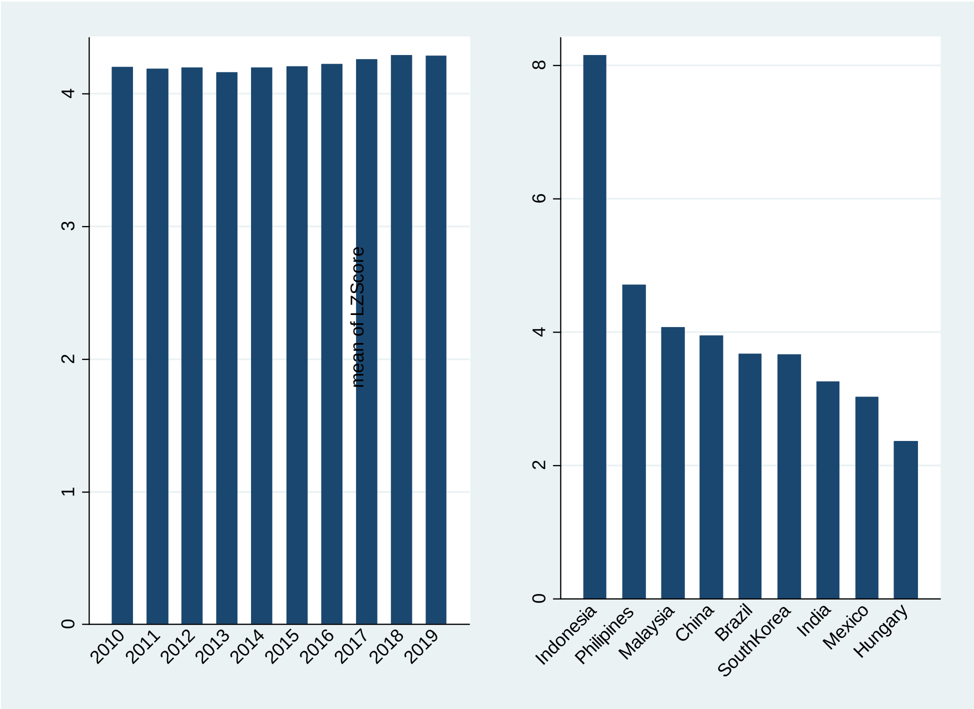

Figure 9: Mean of Log Z-score based on year and country (Source: authors analysis)

The main descriptive statistics for Z-Score and the considered explanatory factors by period are summarized in Table 3. The pair-wise correlation matrix is given in Table 5. On average log of Z-Score value for the examined sample of banks is about 4.22 units, with 1.04 as the lowest value (Indian AXSBIN bank, 2013) and 9.25 as the highest value (Indonesian BBCAJK bank, 2019). These findings are consistent with the findings of Sharma, Talanand Jain (2020) and Achsani and Kassim (2021), who studied the Indian and Indonesian banks, respectively. Sharma, Talanand Jain (2020) concluded that asset quality is one of the biggest risks in Indian banks. The authors further indicated that the lower z score is a result of the rise of bad loans in Indian banks. Achsani and Kassim (2021) attribute the high z score of Indonesian banks to the stability of Islamic banking in the country. The average value of the log Z-Score increased for the post-2018 period from 4.20 to 4.29. In contrast, the average value of NSFR slightly decreased after 2018, from 1.13 to 1.10.

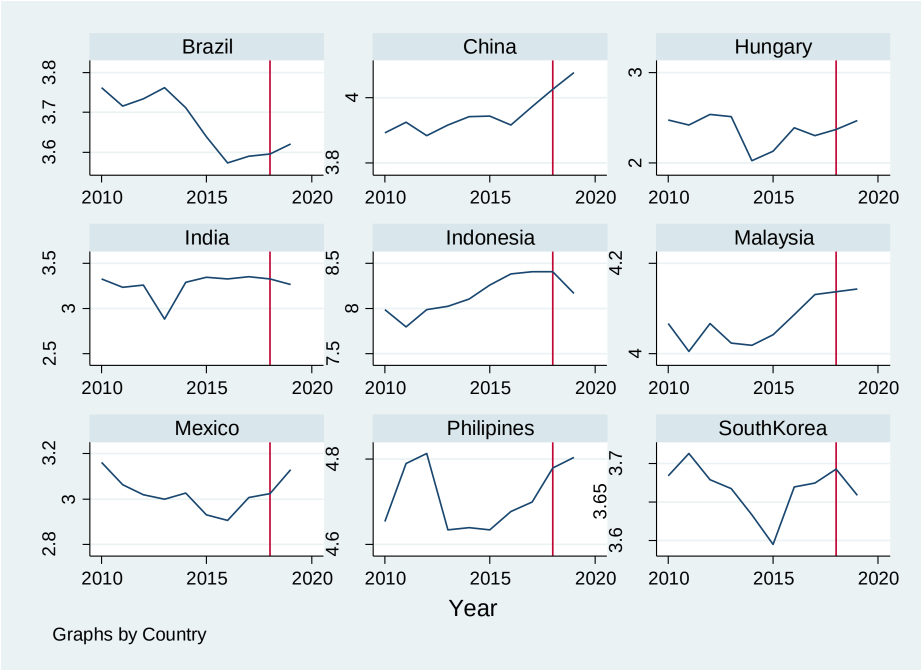

Figure 10: Mean Z-Score of Countries pre and post-2018 (Source: authors analysis)

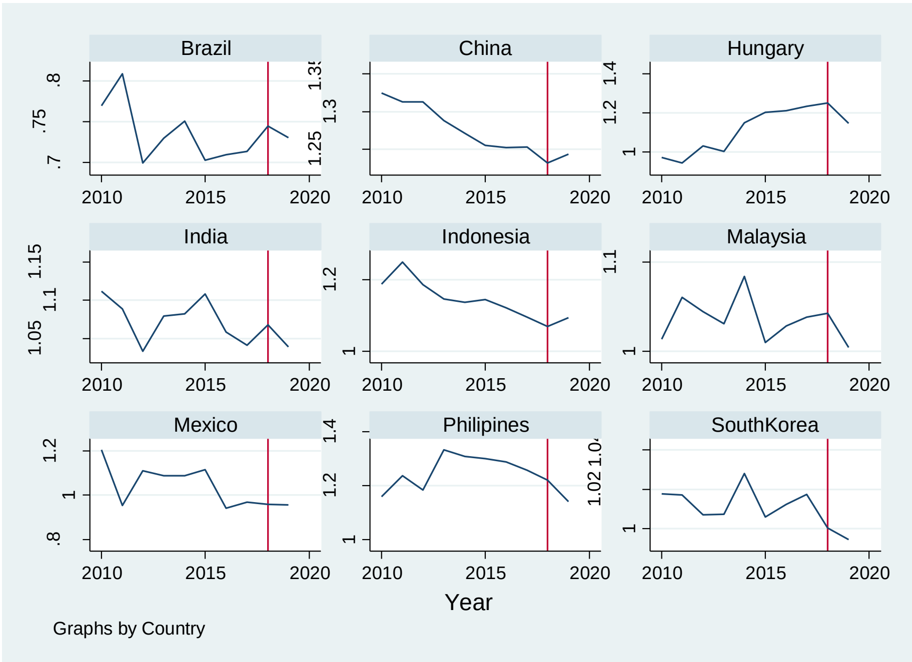

Figure 11: Mean of NSFR by Countries pre and post-2018 (Source: authors analysis)

Variable	Mean	Median	Min	Max	Sd	N
			Pre-2018			
Log(Z Score)	4.20	3.92	1.04	9.12	1.48	440
NSFR	1.13	1.16	0.53	1.67	0.20	440
ROA/sigma ROA	6.66	6.18	-0.92	23.87	4.01	440

CAR/sigma CAR	9.04	7.30	0.00	26.29	5.39	440
LLP/Gross loans	0.03	0.02	0.00	0.17	0.02	440
LT debt/TA	0.06	0.03	0.00	0.37	0.07	440
Log(Total Assets)	11.79	11.63	8.25	15.20	1.41	440
EFF	0.37	0.41	0.00	0.78	0.21	440
	Post-2018					
Log(Z Score)	4.29	4.01	2.37	9.25	1.54	110
NSFR	1.10	1.13	0.64	1.62	0.18	110
ROA/sigma ROA	6.00	5.50	-0.33	21.20	4.00	110
CAR/sigma CAR	9.70	8.38	2.38	25.16	4.98	110
LLP/Gross loans	0.03	0.03	0.01	0.08	0.02	110
LT debt/TA	0.07	0.04	0.00	0.39	0.07	110
Log(Total Assets)	12.18	12.12	9.48	15.28	1.37	110
EFF	0.36	0.36	0.00	0.80	0.22	110
	Total					
Log(Z Score)	4.22	3.92	1.04	9.25	1.49	550
NSFR	1.13	1.15	0.53	1.67	0.20	550
ROA/sigma ROA	6.53	5.97	-0.92	23.87	4.01	550
CAR/sigma CAR	9.17	7.58	0.00	26.29	5.31	550
LLP/Gross loans	0.03	0.03	0.00	0.17	0.02	550
LT debt/TA	0.06	0.04	0.00	0.39	0.07	550
Log(Total Assets)	11.87	11.75	8.25	15.28	1.41	550
EFF	0.37	0.40	0.00	0.80	0.21	550

Table 3: Summary Statistics

	Pre2018	*Post2018*	*pval*
LZScore	*4.2*	*4.29*	*0.60*
NSFR	*1.13*	*1.1*	*0.08*
ROA	*6.66*	*6*	*0.12*
CAR	*9.04*	*9.7*	*0.24*
LLPtoGrossLoansRatio	*.03*	*.03*	*0.70*
LTDebtTotalAsset	*.06*	*.07*	*0.19*
L_TotalAssets	*11.79*	*12.18*	*0.01*
EfficienyRatio	*.37*	*.36*	*0.56*

Table 4: *Mean difference between the two periods*

As can be seen in Table 4, we only reject (with 95 % confidence) the null hypothesis (under the null hypothesis, the average value of the examined variables is equal across the two periods) only for L_TotalAssets, meaning that the average values of the other variables are statistically not different across the two periods.

		1	2	3	4	5	6	7	8
		Pre-2018							
Log(Z Score)	1	1							
NSFR	2	0.0999*	1						
ROA/sigma ROA	3	0.4159*	0.1709*	1					
CAR/sigma CAR	4	-0.3191*	-0.4278*	-0.2745*	1				
LLP/Gross loans	5	-0.0497	-0.1684*	-0.1255*	-0.0339	1			
LT debt/TA	6	-0.3517*	-0.5058*	-0.3100*	0.5052*	0.0334	1		
Log(Total Assets)	7	-0.2207*	0.0953*	0.1229*	0.2060*	0.0412	0.1230*	1	
EFF	8	-0.6095*	-0.1427*	-0.2389*	0.3431*	-0.1106*	0.3811*	0.2486*	1
		Post-2018							
Log(Z Score)	1	1							
NSFR	2	0.0331	1						
ROA/sigma ROA	3	0.4525*	0.13	1					
CAR/sigma CAR	4	-0.3421*	-0.3184*	-0.2281*	1				
LLP/Gross loans	5	-0.0491	-0.125	-0.0487	0.0381	1			
LT debt/TA	6	-0.4058*	-0.3128*	-0.2598*	0.3504*	0.0851	1		
Log(Total Assets)	7	-0.2467*	0.2130*	0.0807	0.2198*	0.2080*	0.1137	1	
EFF	8	-0.5836*	-0.2025*	-0.2586*	0.4199*	-0.2426*	0.4646*	0.1788	1
		Total							
Log(Z Score)	1	1							
NSFR	2	0.0851*	1						
ROA/sigma ROA	3	0.4208*	0.1674*	1					
CAR/sigma CAR	4	-0.3216*	-0.4108*	-0.2681*	1				
LLP/Gross loans	5	-0.049	-0.1621*	-0.1130*	-0.0215	1			
LT debt/TA	6	-0.3609*	-0.4716*	-0.3026*	0.4773*	0.043	1		
Log(Total Assets)	7	-0.2220*	0.1074*	0.1064*	0.2124*	0.0703	0.1263*	1	
EFF	8	-0.6042*	-0.1516*	-0.2406*	0.3557*	-0.1336*	0.3962*	0.2302*	1

Table 5: Correlation Matrix

	(1)	(2)	(3)
VARIABLES	FE	FE	FE
NSFR	-0.409**	-0.358**	-0.113*
	(0.167)	(0.164)	(0.0630)
Period		-0.188**	0.0967*
		(0.0867)	(0.0570)
Period*NSFR		0.234***	-0.0833
		(0.0783)	(0.0542)
ROA/sigma ROA			0.0237***
			(0.00744)
CAR/sigma CAR			0.133***
			(0.0127)
LLP/Gross loans			0.249
			(0.886)
LT debt/TA			-0.204
			(0.175)
Log(Total Assets)			0.00623
			(0.0207)
EFF			-0.0619
			(0.127)
Constant	4.682***	4.611***	2.928***
	(0.188)	(0.185)	(0.286)
Observations	550	550	550
R-squared	0.037	0.081	0.682
Number of ID	55	55	55
The dependent variable in all the models is log of Z-Score. All the models are estimated through fixed effect (FE) estimator. Robust standard errors in parentheses.			
***** p<0.01, ** p<0.05, * p<0.1**			

Table 6: Empirical Estimation Models

The results are summarized in Table 6. In all the models, NSFR is a significant and negative factor in explaining the changes in Z-Score. However, we can clearly observe that the estimates in models (1) and (2) are much higher than the ones in the full model, which can be the result of omitting the important control variables. According to the full model (3), a unit increase in NSFR decreases Z-Score by about 11.3%. Period dummy is significant both in the model (2) and (3), but with different signs. After the inclusion of the important control variables, we can state that Z-Score is about 9.67% higher after 2018. The coefficient of the interaction term in model (3) is not significant and indicates that there is no change in the impact of NSFR on Z-

Score after 2018. From the control variables, the significance is only observed for ROA and CAR.

	(1)	(2)	(3)	(4)
VARIABLES	POLS	FE	RE	AB
Period	0.106	0.0967*	0.0861	0.102
	(0.279)	(0.0570)	(0.0570)	(0.0907)
NSFR	-0.696**	-0.113*	-0.126*	-0.137
	(0.267)	(0.0630)	(0.0651)	(0.0854)
Period*NSFR	0.0111	-0.0833	-0.0689	-0.0980
	(0.256)	(0.0542)	(0.0537)	(0.0819)
ROA/sigma ROA	0.119***	0.0237***	0.0271***	0.0158**
	(0.0176)	(0.00744)	(0.00742)	(0.00697)
CAR/sigma CAR	-0.00124	0.133***	0.127***	0.135***
	(0.00649)	(0.0127)	(0.0125)	(0.00671)
LLP/Gross loans	1.100	0.249	0.318	-0.579
	(1.968)	(0.886)	(0.861)	(0.837)
LT debt/TA	0.360	-0.204	-0.186	-0.222
	(0.322)	(0.175)	(0.179)	(0.251)
Log(Total Assets)	0.0382	0.00623	0.00649	0.0223
	(0.0400)	(0.0207)	(0.0206)	(0.0283)
EFF	0.0838	-0.0619	-0.0884	-0.282*
	(0.196)	(0.127)	(0.129)	(0.157)
Lag of Log(ZScore)				0.00508
				(0.0526)
Constant	2.754***	2.928***	1.754***	2.886***
	(0.658)	(0.286)	(0.532)	(0.440)
Observations	550	550	550	440
R-squared	0.845	0.682		
Number of ID		55	55	55

The dependent variable in all the models is the log of Z-Score. POLS is pooled OLS, FE is fixed effect, RE is a random effect, and AB is Arellano-Bond linear dynamic panel-data estimator.
Robust standard errors in parentheses. As can be observed from table 8 of the Hausman test, we reject the null hypothesis and should conclude that among the FE and RE, only fixed effects model is consistent. Also, POLS is not consistent as we find significant unobserved individual heterogeneity in F-test, presented in table 9. Finally, FE is preferred over AB in this case as we lose significance for Important variables.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Alternative estimators for the empirical models

The FE model, in this case, is appropriate because it helps to avoid omitted variable bias. The fixed effects model ensures that the analysis can control for all the time-invariant omitted variables. The Hausman test is also performed in order to differentiate between the fixed effects model and the random effects model. In the case of Table 8 below, fixed effects (FE) is preferred under the null hypothesis.

Coefficients				
	(b)	(B)	$(b-B)$	$\sqrt{diag(V_b - V_B)}$
	FE	RE	Difference	S.E.
Period	0.09667	0.0861	0.0106	0.0022
NSFR	-0.11315	-0.1255	0.0124	0.0044
NSFR*Period	-0.08332	-0.0689	-0.0144	0.0029
ROA/sigma ROA	0.02367	0.0271	-0.0034	0.0010
CAR/sigma CAR	0.13303	0.1268	0.0062	0.0010
LLP/Gross loans	0.24943	0.3183	-0.0689	0.0295
LT debt/TA	-0.20369	-0.1857	-0.0180	0.0148
Log(Total Assets)	0.00623	0.0065	-0.0003	0.0033
EFF	-0.06187	-0.0884	0.0266	0.0124
b **= consistent under Ho and Ha;**				
B **= inconsistent under Ha, efficient under Ho;**				
Test: Ho: difference in coefficients not systematic				
$\boldsymbol{\chi^2(8) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 54.45}$				
$\boldsymbol{Prob > \chi^2 = 0.0000}$				

Table 8: Hausman Test

$\boldsymbol{F(54, 486)}$	$\boldsymbol{1358.02}$
$\boldsymbol{Prob > F}$	0.000
$\boldsymbol{H_0: All\ u_i = 0}$: **where** $\boldsymbol{u_i}$ **is individual unobserved heterogeneity.**	

Table 9 – F-Test for Individual Heterogeneity

3.4.6. Systemic Risk Models

Post-GFC, there has been a growing range of comparable systemic risk methodologies that has been proposed by researchers in the existing literature that focuses on different features as part of their systemic risk measurement. However, there are two approaches based on the existing literature to measure systemic risk. The first approach looks at the failure of one financial institution, whose impact on the system causes marginal distress on the financial system due to the nature, scope, size, concentration, and connectedness of its financial activities with other financial institutions. In other words, this approach measures the systemic resilience due to individual failure of one bank or other banks within the financial system due to the contagion risk. The main objective of such an approach is to mitigate the contagion effect by containing systemic impact and avoiding moral hazard. This approach is also called the contribution approach.

In contrast, the second approach, known as the participation approach, looks at losses experienced due to single as well as multiple shocks to a firm due to substantial exposures to an affected industry, country, or currency. More specifically, the participation approach studies the resilience of an individual bank against single or multiple common shocks within the industry, a country or from a particular currency exposure. The policy objective of this approach is to maintain the overall functioning of the system and maximise banks' survivorship along with sustaining the mechanism of collective burden sharing. The variable used in the participation approach includes credit exposures to other financial institutions, market exposures to interest rates, credit spreads and currency, the bank's risk absorption capacity based on capital and liquidity requirements as well as confidential information accessible to banking regulators. We have summarised some of the key models used for systemic risk measurement using the contribution approach in Table 10 and the advantages and drawbacks for each model in Table 11.

	Conditional Value at Risk (CoVaR)	SRISK	Systemic Expected Shortfall (SES)	Distress Insurance Premium (DIP)	Systemic Contingent Claims Analysis (CCA)
Systemic Risk Measure	Value at Risk	Expected Shortfall	Expected Shortfall	Expected Shortfall	Expected Shortfall
Conditionality	percentile of individual return	threshold of capital adequacy	threshold of capital adequacy	percentage threshold of system return	various (individual or joint expected losses)
Dimensionality	multivariate	bivariate	bivariate	bivariate	multivariate
Dependence Measure	linear, parametric	parametric	empirical	parametric	non-linear, nonparametric
Method	panel quantile regression, multivariate dynamic conditional correlation (DCC GARCH)	dynamic conditional correlation (DCC GARCH) and Monte Carlo simulation	empirical sampling and scaling; Gaussian and power law	dynamic conditional correlation (DCC GARCH) and Monte Carlo simulation	empirical copula
Data Source	equity prices and balance sheet information	equity prices and balance sheet information	equity prices and balance sheet information	equity prices and CDS spreads	equity prices and balance sheet information
Data Input	quasi-asset returns	quasi-asset returns	quasi-asset returns	equity returns and CDS implied default probabilities	expected losses ("implicit put option")
Reference	Adrian and Brunnermeier (2016)	Brownlees and Engle (2017)	Acharya et al. (2017)	Huang et al. (2010)	Gray and Jobst (2011)

Table 10: Systemic Risk Models

	Advantages	Drawbacks
Conditional Value at Risk (CoVaR)	• Highlights the contribution of each firm to overall system risk • General enough to study the risk spill overs from banks to banks throughout the entire financial system • Have out-of-sample predictive power for realised correlation in tail events, so can oversee the build-up of systemic risk in a forward-looking mode and potentially be used in macroprudential policy applications • Reduces the effect of the arbitrary selection of a single level of confidence on expected losses	• Only provides individual measures that do not sum up to the total risk measure • CoVaR is over-susceptible to estimation errors than VaR; as the accuracy of CoVaR relies broadly upon the tail modelling accuracy • CoVaR model cannot be back-tested because the expected shortfall predictions cannot be validated via comparison with historical statistics
SRISK	• SRISK model delivers useful rankings of systemically risky firms at various stages of the financial crisis • This model was a significant predictor of the capital injections performed by the Fed during the crisis • The predictive ability of aggregate SRISK is stronger over longer horizons covering data from 15 to 20 years onwards	• SRISK presumes that the liabilities of a bank would remain constant around times of crisis • This model also fails to measure the marginal contribution of a bank to simultaneous changes of both the harshness of systemic risk and the dependence system over any combination of sample banks for any degree of statistical confidence and at any point in time because it does not employ multivariate density estimation

Systemic Expected Shortfall (SES)	• Easy to calculate and implement as relied on observable market data and statistical techniques • It can be used as a fundamental for a systemic tax because the measurement of MES is logically consistent, expressed in natural units • A good predictor of a firm's contribution to systemic risk • This measure scales naturally with the size of the firm	• Does not capture the true tails of the return distribution as it is computed from the moderately bad days of the market and not the worst performance of the market during an actual financial crisis • The data for this method is based on share returns only and exclude reference to a bank's size or its capital and liquidity requirements, which are considered essential elements of systemic risk
Distress Insurance Premium (DIP)	• The stress testing can be updated regularly • Robust and additional forecasting ability in anticipating the changes in correlations of asset return in relation to term structure variables and equity market • Strong power to identify systemic important financial institutions • Analyses the influence of general market changes on the performance of each bank and simultaneously integrates the feedback effect from the banking scheme to the rest of the economy	• The accuracy of the model reduces when systemic losses are not sufficiently presented in the historical statistics • is not a very useful early warning indicator of systemic risk because it underestimates systemic risk during a period of market growth and boom
	• The model integrates market-implied expected	• Assumptions are required regarding the

Systemic Contingent Claims Analysis (CCA)	losses (and endogenizes loss given default (LGD)) in the multivariate specification for joint default risk • This model can be used to quantify an individual institution's time-varying contribution to systemic solvency risk under normal and stressed conditions • This model can also serve as a macroprudential tool to price a commensurate systemic risk charge.	specification of the option pricing model (for the determination of implied asset and asset volatility of firms) because this model is driven by Black Scholes Option Pricing theory • Some of the assumption used includes a constant risk-free rate and normal distribution of asset return which do not reflect the reality in times of market stress • technique is complex and requires complete market data

Table 11: Systemic Risk Models Advantages and Drawbacks

We use the contribution approach in this chapter due to two main reasons. Conducting systemic risk analysis using a participation approach would not be possible due to the lack of access to confidential information only accessible to regulators. Secondly, the participation approach investigates the effect on individual firms when the system is already in crisis. Our definition of systemic risk is the failure of one firm and its contagion effect on the financial system. Hence, we consider the contribution approach to be best suited to address this issue. Additionally, after reviewing all the models, we use the CoVaR model as the main basis of this study to calculate systemic risk. The conclusion to use this CoVaR model is driven by a number of factors, including the availability of required high-frequency data to successfully compute systemic risk. Additionally, the ability of the model to capture spill over effects from institution to institution within the entire financial system and its out-of-sample predictive ability. A comparative study conducted by Sedunov (2016) reviews the institutional-level systemic exposures using the CoVaR model and SES model and finds that CoVaR has superior predicting power for within crisis performance during two systemic crisis periods witnessing the collapse of Long-Term Capital Management in 1998 and Lehman Brothers in 2008. Their findings also indicate that SES and Granger Causality does not accurately forecast the performance of the firms reliably during a crisis period as compared to the CoVaR model.

3.4.7. Systemic Risk Measurement

$CoVaR_{q,t}^{i|j}$ is the VaR[1] of bank i conditional on the event of bank j being in financial distress. Thus, $CoVaR_q^{i|j}$ is implicitly defined by the q-quantile of the conditional probability distribution, Adrian & Brunnermeier (2008):

$$\Pr\left(R_t^i \leq CoVaR_{q,t}^{i|j} \middle| R_t^j \leq VaR_{q,t}^j\right) = q \quad (3.9)$$

Bank j's systemic risk contribution is defined as the percentage difference of the VaR of the banking system conditional on the distressed state of bank j, that is $R_t^j \leq VaR_{q,t}^j$, and the VaR of the banking system is conditional on the benchmark state of the institution j (b^j), which is considered as one standard deviation around the returns.

$$\Delta CoVaR_{q,t}^{s|j} = \frac{100\left(CoVaR_{q,t}^{s|j} - CoVaR_{q,t}^{s|b^j}\right)}{CoVaR_{q,t}^{s|b^j}} \quad (3.10)$$

The CoVaR estimation is implemented through a three-step procedure.

1. First, the VaR of each institution j is computed by estimating the following univariate model, with conditional variance (σ) defined through a GARCH(1,1) specification:
$$R_t^j = \alpha_0 + \alpha_1 R_{t-1}^j + \varepsilon_{j,t}$$
$$where\ \varepsilon_{j,t} = z_{j,t}\sigma_{j,t}, with\ \ z_{j,t} \sim i.i.d(0,1)$$
$$\sigma_{j,t}^2 = \beta_0^j + \beta_1^j \varepsilon_{j,t-1}^2 + \beta_2^j \sigma_{j,t-1}^2$$
Considering the q-quantile of the given distribution for z, we can obtain the VaR of each institution j at each time period.
2. With the next step, a bivariate GARCH model with Engle's (2002) DCC specification is applied for the returns of each bank j and the banking system, $R_t = \left(R_t^j, R_t^S\right)'$, with joint dynamics
$$R_t = \mu_t + \varepsilon_t$$

[1] $VaR_{q,t}^i$ is defined as the q-quantile of individual bank's return distribution, such that: $\Pr\left(R_t^i \leq VaR_{q,t}^i\right) = q$.

$$\varepsilon_t = \Sigma_t^{1/2} z_t$$

Where Σ_t the 2 by 2 conditional covariance matrix of the error term ε_t and μ_t is the 2 by 1 vector of conditional means, and $z_t = \Sigma_t^{-1/2}\,(R_t - \mu_t) \sim i.i.d.(0, I_2)$. The conditional variances are modelled as GARCH (1,1)

$$\sigma_{j,t}^2 = \theta_0^j + \theta_1^j \varepsilon_{j,t-1}^2 + \theta_2^j \sigma_{j,t-1}^2$$

$$\sigma_{s,t}^2 = \theta_0^s + \theta_1^s \varepsilon_{s,t-1}^2 + \theta_2^s \sigma_{s,t-1}^2$$

And the conditional covariance $\sigma_{js,t} = \rho_{js,t}\sqrt{\sigma_{j,t}^2 \sigma_{s,t}^2}$

3. Based on the estimated the bivariate density of $\left(R_t^j, R_t^S\right)$ for each bank j $CoVaR_{q,t}^{s|j}$ is obtained as follows:

$$\Pr\left(R_t^s \leq CoVaR_{q,t}^{s|j} \middle| R_t^j \leq VaR_{q,t}^j\right) = q \quad (3.11)$$

Finally, a similar procedure is followed to obtain $CoVaR_{q,t}^{s|b^j}$, with the only difference of conditional events being now the benchmark state mentioned earlier.

3.4.8. Data and Empirical Results

3.4.8.1 Data Collection

The analysis is implemented based on the USD returns from 14 banks in 4 different emerging market economies for the ten years period between 15 January 2010 and 3 January 2020. Table 12 lists the sample of banks used in the systemic risk analyses. Data is sourced from Bloomberg Terminals and Thomson Reuters DataStream on a weekly basis. The main descriptive statistics of the examined sample of returns are presented in the table13. VaR and CoVaR measures are computed at the 95% confidence level. The quantile regressions are estimated using state variables along with the local market index returns for each respective country (Budapest Index, Jakarta Composite Index, FTSE Bursa Malaysia KLCI Index, and SPB mvIpc). The summary statistics for the market index returns are displayed in Table 14. As can be observed, mostly the average returns by banks and market index returns are close to 0, with a standard deviation close to 1%; the return series are also non-normally distributed with excess kurtosis and skewedness. The main state variables used in the analysis are changes in 3 months T-Bill rates, the Yield spread between 10-year local government bonds and 3-month

T-bill rate, and Liquidity spread as a difference in 3-month T-bill rate and 3-month interbank rate. Bank-specific variable includes bank returns, market-index returns and market volatility.

Banks	Country
OTPB	Hungary
BBCA.JK	Indonesia
BDMN.JK	Indonesia
BBNI.JK	Indonesia
BBRI.JK	Indonesia
BMRI.JK	Indonesia
ALLI.KL	Malaysia
AMMB.KL	Malaysia
HLBB.KL	Malaysia
MBBM.KL	Malaysia
PUBM.KL	Malaysia
RHBC.KL	Malaysia
BSMXB.MX	Mexico
GFNORTEO.MX	Mexico

Table 12 – Sample of banks based on ticker code

Country	Bank	mean	Sd	min	max	Skewness	kurtosis
Hungary	OTPB	0.08%	1.88%	-12.60%	6.48%	-0.96	8.96
Indonesia	BBCAJK	0.16%	1.37%	-4.76%	5.33%	-0.10	4.63
	BDMNJK	-0.01%	2.50%	-17.37%	14.68%	-0.28	10.91
	BBNIJK	0.12%	1.95%	-7.81%	10.15%	0.30	6.39
	BBRIJK	0.15%	1.80%	-6.93%	8.50%	0.01	4.87
	BMRIJK	0.10%	1.81%	-7.46%	10.33%	0.25	6.10
Malaysia	ALLIKL	0.01%	1.21%	-4.66%	3.70%	-0.10	3.93
	AMMBKL	-0.02%	1.11%	-4.14%	3.75%	-0.12	4.72
	HLBBKL	0.07%	0.88%	-4.43%	7.61%	1.14	15.13
	MBBMKL	0.02%	0.75%	-3.38%	2.60%	-0.34	5.82
	PUBMKL	0.05%	0.65%	-2.36%	3.57%	0.42	7.60
	RHBCKL	0.03%	1.19%	-4.70%	5.17%	-0.20	5.35
Mexico	BSMXBMX	0.06%	2.06%	-5.50%	30.48%	6.24	93.93
	GFNORTEOMX	0.07%	1.67%	-8.19%	6.16%	-0.06	4.75

Table 13 - Summary statistics of the bank returns

	mean	sd	min	max	skewness	kurtosis
Budapest Index	0.06%	1.10%	-6.29%	3.60%	-0.73	6.67
Jakarta Composite Index	0.08%	0.93%	-4.90%	3.77%	-0.68	6.65
FTSE Bursa Malaysia KLCI Index	0.02%	0.56%	-2.30%	2.00%	-0.19	4.68

SPB mvlpc	0.03%	0.86%	-3.33%	2.91%	-0.09	3.86

Table 14 - Summary statistics of market index returns

3.4.8.2 Empirical results

The CoVaR analyses results are summarized in Table 15, which displays the summary statistics of the estimated $\Delta CoVaR_{q,t}^{s|j}$ measure. Mean(std) measure is a proxy for the volatility of systemic risk contributions over time, while the Std(Mean)is a proxy for the dispersion of average systemic risk contributions. Finally, along with the summary statistics of the estimated $\Delta CoVaR_{q,t}^{s|j}$ measures, figures 12 to 15 illustrate the historical developments systematic risk measures on a country-to-country basis, whereas figure 16 plots the banks based on the change in delta CoVaR. Idiosyncratic averages and correlation matrix can be found in *Appendix C* on a country-specific basis.

Correspondingly for Hungary, Indonesia, Malaysia and Mexico, the financial distress of a bank, on average, increases the 5% VaR of the banking system by about 165.9%, 99.7%, 55.9% and 37.7% over its VaR when the financial institution is in its benchmark state. The average standard deviations of the $\Delta CoVaR_{q,t}^{s|j}$ Time series are correspondingly 67.6%, 22.2%, 13.7% and 9.1%, while the standard deviation across averages is NA (for Hungary due to only one bank in the sample), 30.3%, 14.4% and 47.3%.

	Hungary	Indonesia	Malaysia	Mexico
Mean	165.9%	99.7%	55.9%	37.7%
Mean(std)	67.6%	22.2%	13.7%	9.1%
Std(Mean)	NA	30.3%	14.4%	47.3%
Min	96.9%	36.3%	18.4%	2.9%
Max	520.2%	243.7%	177.9%	179.3%

Table 15 - Estimation Results of CoVaR and ΔCoVaR

Mean is the average $\Delta CoVaR_{q,t}^{s|j}$ for the examined period for the given country, Mean(std) is the average of the individual bank historical standard deviation measure of $\Delta CoVaR_{q,t}^{s|j}$, Std(Mean) is the standard deviation of historical averages for individual banks of the country, min and max are correspondingly minimum and maximum values for $\Delta CoVaR_{q,t}^{s|j}$ measures

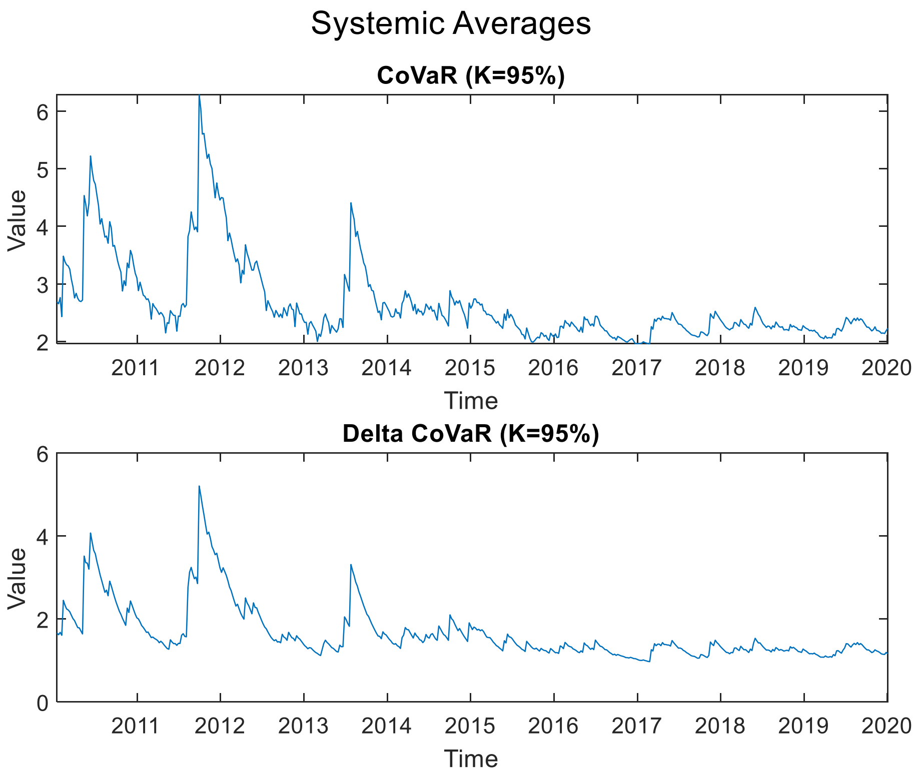

Figure 12 - Hungarian Banking System Systemic Risk Averages (Source: authors analysis)

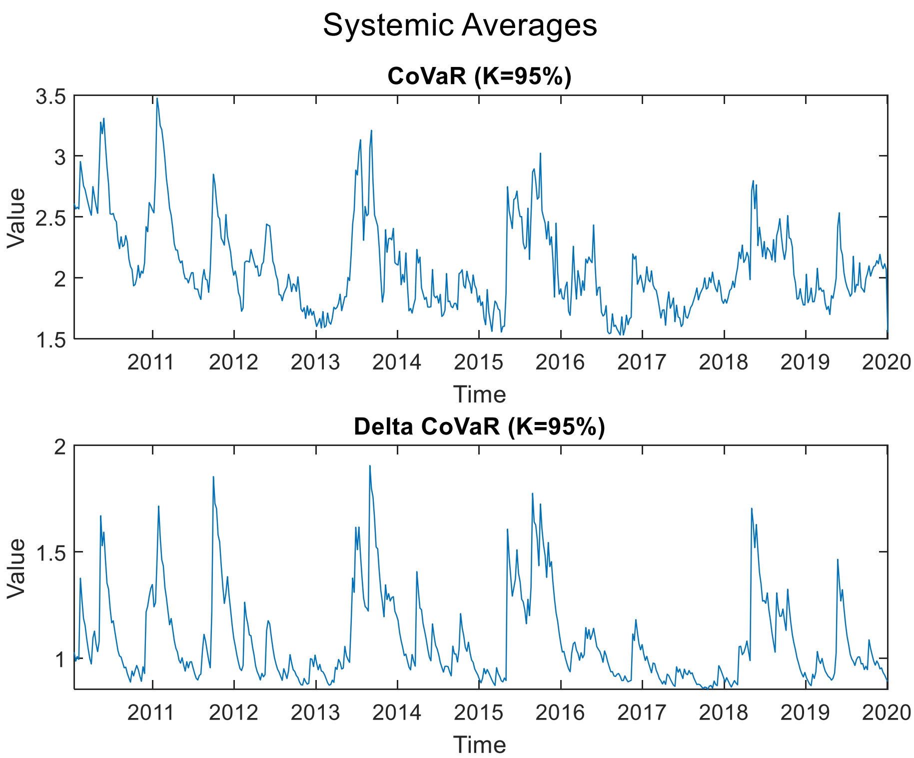

Figure 13 – Indonesian Banking System Systemic Risk Averages (Source: authors analysis)

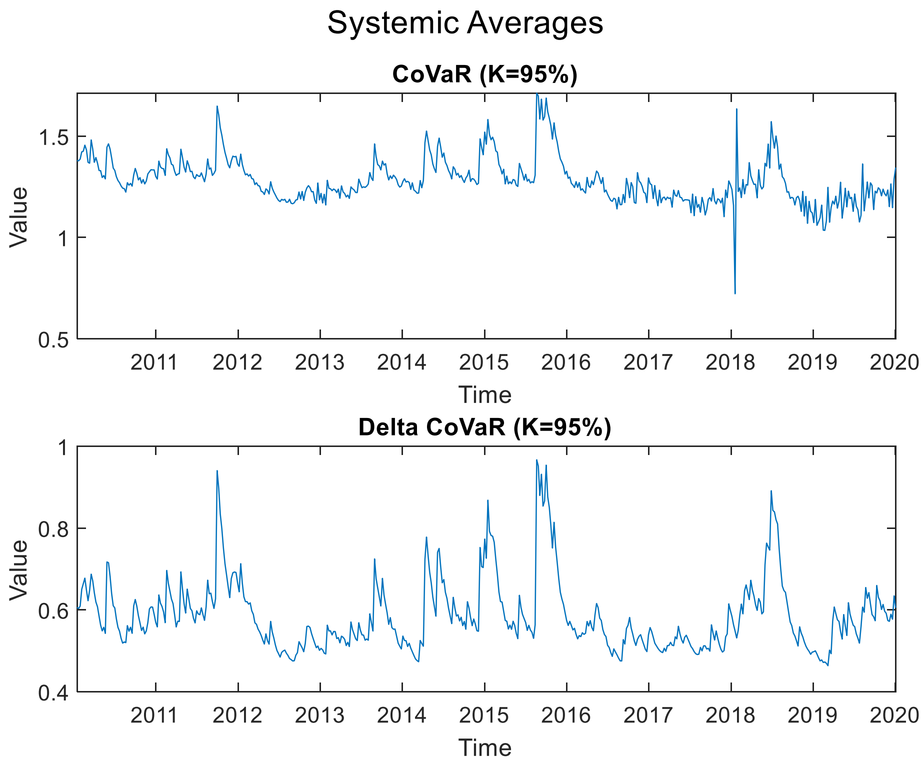

Figure 14 - Malaysian Banking System Systemic Risk Averages (Source: authors analysis)

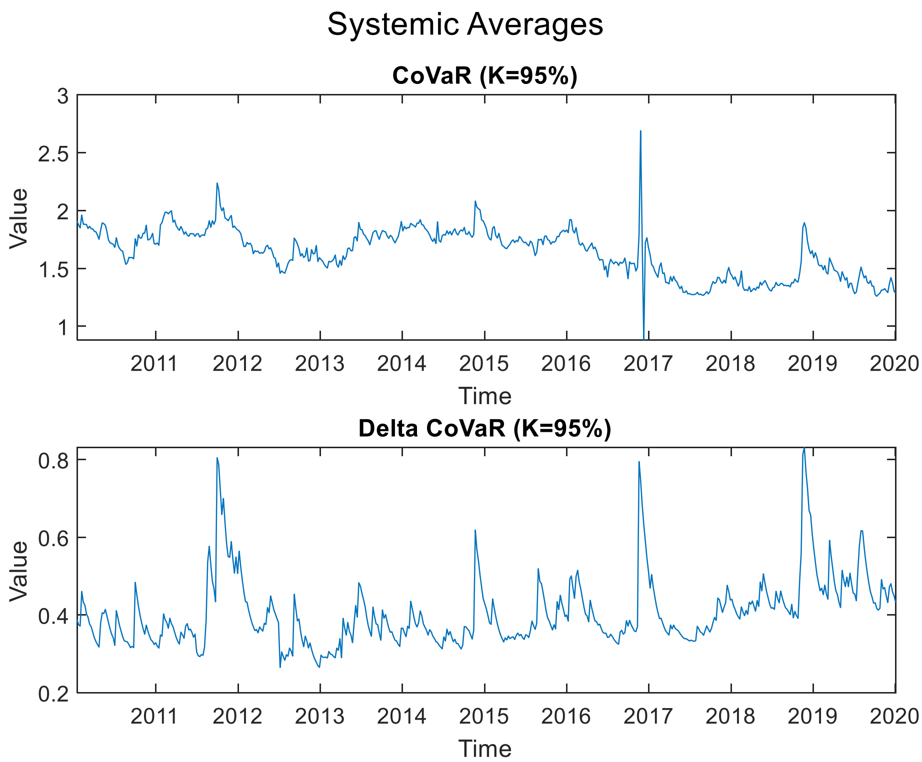

Figure 15 – Mexican Banking System Systemic Risk Averages (Source: authors analysis)

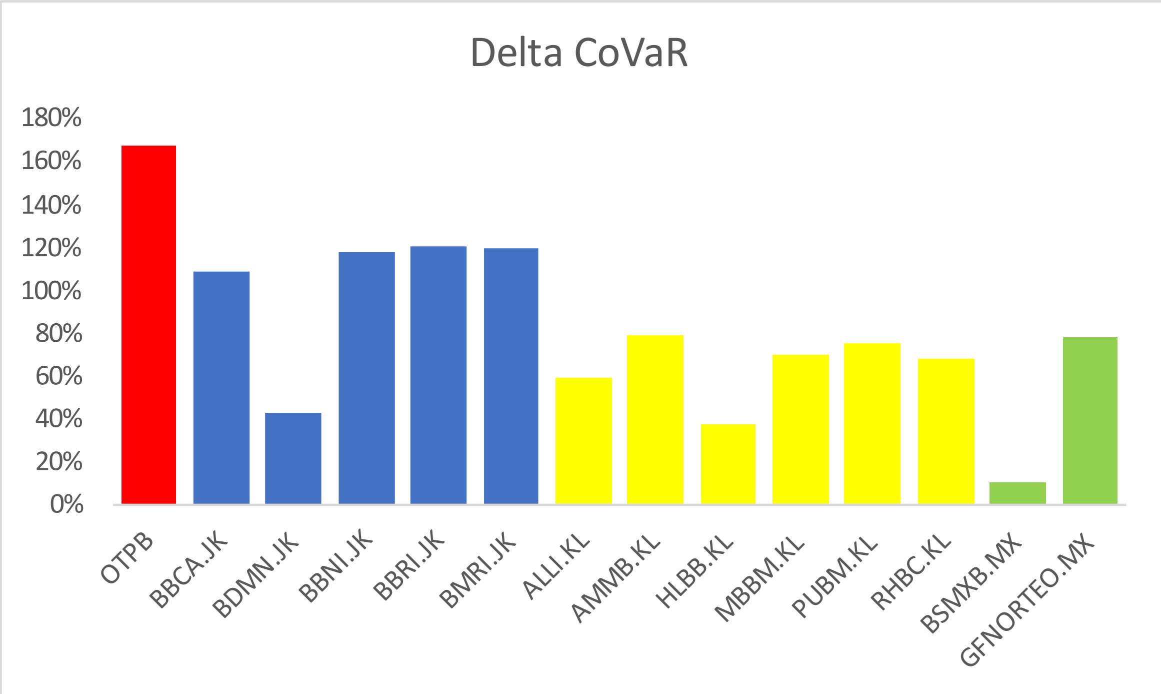

Figure 16 - Delta CoVaR based on banks (Source: authors analysis)

3.5. Discussions & Conclusion

The findings fail to fully support the hypothesis that new Capital and Liquidity Regulations, such as the Net stable funding ratio (NSFR), significantly and positively affect bank stability. The relationship between capital and liquidity requirement seems to be negatively based on the correlation matrix but not significant. This empirically shows that large banks, even in emerging markets, do not hold enough liquid assets as they have access to international markets and can raise funding relatively easily than their smaller counterparts as they have the advantage of attracting foreign investors and are more likely to meet international benchmarks to be listed on international markets despite illiquid local markets. However, this makes these banks equally exposed to changes in international markets as well as developments in their local markets. Similarly, holding higher liquid assets increases the default risk and decreases the stability of the banks as banks' are more prone to risk-taking activities to maximise profits.

These findings are inconsistent with most of the literature reviewed. For example, Boyarchenko (2013) found that both liquidity and capital requirement impact the risk-taking nature of banks by analysing the systemic risk in the US banking sector using BHCs data and established that prudential capital and liquidity requirement affect the systemic risk and return trade-off. A plethora of other literature, such as Marozva and Makina (2020) and Spinassou and Wardhana (2021), among others, indicated that liquidity requirements help control the risk of maturity transformation, where banks short-term deposits for long-term finance. They add that strengthening capital buffers requires the improvement of the quantity, quality, as well as reliability of capital adequacy.

However, if a bank has a stable balance between higher liquid and illiquid assets, it can sustain its stability. Looking into the role of NSFR requirements banks' with stronger ASF sources of funding can decrease default risk and, at the same time, improve stability. ASF includes Tier 1 capital, stable retail deposits, savings deposits and other sources of funding. Whereas on the other hand, banks with stronger RSF requirements face heightened default risk and diminish the banks' stability. RSF includes assets like securities, lines of credit and loans both residential and commercial. The reason RSF increases default risk is that though these assets strengthen the size of the balance sheet, at the same time, these assets are more illiquid and harder to utilize in times of uncertain economic conditions.

Previous research by King (2013) indicated that banks could meet NSFR by i) increasing ASF, ii) increasing the stakes of stable deposits against less stable deposits, iii) extending maturities of wholesale debt beyond a one-year timeframe, or iv) increasing the proportion of tier 1 capital. Consistent with the findings of the current study, King (2013) also argued that banks could reduce the RSF by shrinking the balance sheet loan portfolios and shifting the compositions of investments by selling low-rated investments for cash holding. They could also do this by replacing RSF with high-rated investments by changing the composition of loans from retail to corporate loans and mortgages to reduce the maturity to less than a year.

Likewise, as established from the literature review, systemic Risk Analysis implications are not homogeneous in every country; however, they comparatively reach a similar conclusion to the Z-source model. The Hungarian banking system is more exposed to systemic risk. Similarly, the Mexican banking sector is highly illiquid as a collapse of one bank increases the risk within the banking system by 47.3%. One factor to take into consideration in that all local indices had a return an average return of close to zero, and this is the same for the banking across all the countries analysed. Though, the extent of illiquid varies based on local market conditions and has been taken into consideration. However, to conclude, the effect of new liquidity requirements has no effect on systemic risk. One reason may be that market liquidity plays a bigger role in countering systemic risk.

Chapter 4 - Credit Risk, Liquidity Risk, Bank Liquidity Creation, and their joint implications on Systemic Risk

In this empirical chapter, we aim to examine the joint implications of credit and liquidity risk on bank stability and explore the effect of bank liquidity creation on systemic risk, given that there have been no other studies conducted which investigate this issue from conventional, hybrid and Islamic banking standpoints as mentioned in Chapter 1. The next section contextualizes our research by providing some important attributes of emerging markets linking these to conventional, hybrid and Islamic banking systems operating within these economies.

4.1. Introduction:

Emerging Markets offer the greatest opportunities since most of them are transitioning from the agricultural age to the industrial age, thus, shifting from non-user to users. Similarly, compared to developed economy banks, banks in an emerging market operate under a monopolistic competitive market structure (Godspower-Akpomiemie and Ojah, 2021), with banks in emerging markets being generally simpler businesses than same-sized institutions across the globe. These banks tend to have a strong deposit franchise, and their funding is generally dominated by deposits and equity with little use of volatile wholesale funding. Most marketers, as numerous studies show, are relatively consolidated where few banks have large deposit shares, offering sustainable scale advantages and marketing stability for bigger banks. It is imperative to note that emerging markets banks have come under intense pressure amidst the Covid-19 pandemic and its effect on the global economy (Rebucci et al., 2022). A careful review of previous crises shows that such banks are operating in a healthier macroeconomic environment and presenting much stronger balance sheets than in the past. At current valuations, these banks present a compelling asymmetric investment opportunity.

According to Khediri et al. (2015), Islamic banking emerged as an alternative financial institution which responded to the demand to have alternative solutions that were in compliance with the principles of Islamic law (Shari'ah). Like other banks, in terms of functions, these banks are assumed to play a significant intermediary role in transforming savings from the public. This is aimed at reinvesting in the economy by channelling accumulated funds to financial activities and entrepreneurs who are expected to make several contributions to the real economy by abiding by religious sensitivities. By conducting their financial operations within the parameters of Islamic finance and Islamic norms, Islamic banking ensures each financial contract refers to an identifiable and tangible underlying asset, as stated by Cox and Thomas (2005). Research has also highlighted the unique nature of Islamic financial principles, operations and products and has theoretically perceived Islamic banking to be a key contributor to the promotion of economic growth, making it suitable for this study. Moreover, as a result of its distinctive features, Islamic banks are exposed to more complexities in managing both their liabilities and assets, and this implies that these banks are expected to face a wider financing gap, therefore, presenting the need to discover whether they (Islamic banks) are exposed to greater capital and liquidity risks than their counterparts.

The role of credit and liquidity risk is of paramount importance in maintaining the stability of banks, making it a crucial and actively researched area within the fields of financial risk and banking stability. Researchers have made significant contributions by recognizing the significance of these risks and their impact on preserving the stability of financial institutions. Through their efforts, they have advanced the knowledge and understanding of these risks, which is essential for developing robust risk management frameworks and ensuring the resilience of banks. Molyneux and Nguyen (2017) have conducted extensive investigations into the intricate relationship between risk and bank stability, underscoring the paramount importance of comprehending and effectively managing credit and liquidity risk within the banking sector. It is essential to recognize that emerging markets possess distinctive characteristics and encounter specific challenges that differentiate them from developed markets. These challenges encompass heightened economic volatility, increased credit risk, and constrained access to stable funding sources. In this context, Athanasoglou, Daniilidis, and Delis (2014) have devoted their efforts to exploring the concept of credit risk procyclicality within emerging markets. Their valuable insights shed light on the particular obstacles faced by banks operating in these economies in managing credit risk effectively. Consequently, their research underscores the necessity of devising and implementing efficient strategies to safeguard bank stability. Another relevant aspect of research focuses on the relationship between bank concentration, competition, and crises, particularly in emerging markets. Beck, Demirgüç-Kunt, and Levine (2006) have conducted a comprehensive analysis in this area, demonstrating the elevated credit and liquidity risk associated with concentrated banking sectors in emerging markets. Their work highlights the implications of these risks for overall banking stability and underscores the importance of implementing appropriate measures to mitigate such risks.

When considering different banking models, including conventional, hybrid, and Islamic banking, researchers have identified distinct risk characteristics that warrant attention. For instance, Hassan and Lewis (2007) delve into the unique features and risk characteristics of Islamic banking, highlighting the differences between Islamic and conventional banking models. Their study sheds light on the impact of credit and liquidity risk on the stability of Islamic banks, contributing to a deeper understanding of risk management in this specific banking framework. In the case of hybrid banks, which combine traditional banking activities with nontraditional activities, DeYoung and Rice (2004) examine the associated risk characteristics. Their research analyzes the implications of such risk characteristics for bank stability, providing valuable insights into the management of credit and liquidity risk within hybrid banking models.

The rest of this chapter is organised as follows: Section 4.2 explores fundamental theories underpinning our research question. Section 4.3 of this chapter explores the relevant literature on bank credit and liquidity risk in relation to bank stability as well as bank liquidity creation and its impact on systemic risk leading to generating a research hypothesis. Section 4.5 provides a model specification to study the interaction between credit and liquidity risks, its implications for bank stability and model specification for measuring liquidity creation and its impact on systemic risk. Section 4.6 illustrates the data analysis and results of the methodology applied in section 4.5. Section 4.7 covers a discussion and conclusion based on existing literature and our findings.

4.2. Theoretical Framework

4.2.1. Theory of Financial Intermediation

The traditional Arrow-Debreu model (Arrow and Debreu, 1954) of resource allocation discourages the role of financial intermediaries by giving justification that firms or households can connect through the market themselves, and no role of financial intermediaries is inevitable. However, it fails to encompass actual practices and the significance of these intermediaries. For instance, these institutions are in a better position to manage and diversify idiosyncratic risk but are largely ignored by these conventional theories. Allen and Santomero (1997) argue that traditional theories of financial intermediation primarily set the context in terms of transaction cost and asymmetric information, which are becoming less relevant due to technical advancement and financial innovation. Their study discusses the two roles of financial intermediaries that are more relevant. First, they manage sophisticated financial instruments as well as markets and assist entities in transferring their risks. Second, banks reduce participation costs, that is, learning and participating effectively in the markets.

The idea of Pareto efficiency negates the need for intermediaries when markets are perfect (Allen and Santomero, 1997). Subsequently, the Modigliani-Miller theorem (Modigliani and Miller, 1958) also criticises the role of intermediaries and argues that households can themselves take any financial position and that intermediaries do not add value. But these extreme views and critiques are at odds when the adopted practices are observed. For ages, banks and insurance companies have been playing a vital role in the economy. As far as the financial markets are concerned, the financial intermediaries are the source of the development of financial markets.

Financial intermediation had historical ties with the concept of direct financing when there was no such intermediary to facilitate both the lenders and borrowers. The theory of financial intermediary relates to the need for such a body which aid in connecting the surplus units to the deficit units so that direct financing can be avoided (Bongomin et al., 2017). In addition, these institutions could overcome the limitations, risks, and challenges associated with the direct financing system (Rampini and Viswanathan, 2019). A financial intermediary can be said as a middleman who minimises or transforms risk in the economy. Financial intermediation does not only revolve around the concept of 'middle-man', but it also leaves a profound and positive effect on the economy and growth rate (Gretta, 2017). The study of Adediran et al. (2017) supported the role of financial intermediation in economic growth and tested their argument in the context of a developing country, that is, Nigeria, for the period of 1980 to 2014. Their study identifies a long-term relationship between financial intermediation and economic growth. It is found that the deficiency of production funds in the market in Nigeria is primarily due to ineffective financial intermediation. The information-based theory of financial intermediation developed by Bethune, Sultanum, and Trachter (2019) emphasises the significance of the financial intermediary due to a large amount of information. Investors mobilising their funds through these institutions have more information as opposed to an asymmetric information base available to otherwise individual investors, which helps avoid disparaging mechanisms. There are many other theories of intermediation (such as Arrow and Debreu, 1954; Ramakrishnan and Thakor, 1984) that support the accumulation of common knowledge, but this particular theory, that is, information-based theory, is distinguished in the form of information heterogeneity.

Recently, the theory of FinTech for financial intermediaries has revolutionised the concept of financial intermediation by introducing modern technologies in financial management systems. Huebner et al. (2019) have demonstrated how the contemporary definition of financial intermediation is superimposed on the functions of the traditional one. FinTech models have decreased the level of the traditional financial intermediary to some extent but offer improved user experience and more effective prices. FinTech indeed has diminished the basic notion of the financial intermediary through automation, but still, the concept of the middleman can be seen in peer-to-peer payment and crowdfunding business models (Bavoso, 2019). Nevertheless, contextually, universal banking permits financial intermediaries to become more diverse and grow larger, and this enables them to benefit from more efficient portfolio diversification to take even larger risks. However, permitting diversification is likely to increase the similarity of the portfolio of the banks, thereby decreasing the diversification of its system and increasing systemic risk.

4.2.2. Liquidity Creation Theory

The central function of banks in liquidity creation and enhancing economic growth can be traced back to the seminal work of Adam Smith (1776). The reincarnation of conventional ideas of liquidity theories affirms the primary role of banks in liquidity creation, but they argue on its creation, on and off-balance sheets (Bryant, 1980; Diamond and Dybvig, 1983; Holmström and Tirole, 1998; Kashyap, Rajan and Stein, 2002). Even in some cases, both these functions collapse with each other, for example, the issuance of riskless liquid from the bank to provide risky illiquid loans. In addition, banks' roles in mitigating risks are also addressed and have grabbed the attention of many researchers. For instance, Niepmanm and Schmidt-Eisenlohr (2017) discuss the bank’s role in managing risk in international trade. It is found that bank instruments such as letters of credit are popular enough that around 15 per cent of world exports are being settled through them.

The contemporary theories of financial intermediaries have also clearly marked two fundamental roles of banks in the economy, firstly, they transform the risk, and the other is the creation of liquidity. According to the basic liquidity creation theory, banks usually liquefy the illiquid assets; it can also be said banks finance their illiquid assets through liquid liabilities to create liquidity. Similarly, liquidity is also created through off-balance sheet activities (Sahyouni and Wang, 2019). There are some risks also associated with liquidity creation, but these vulnerabilities do not stop banks from creating liquidity. This argument is well explained in the study of Diaz and Huang (2017); excessive liquidity can cause to initiate an asset bubble in the banking sector as well as increase the vulnerability and the probability of a financial crisis. Burger and Bouwman (2015) discuss excessive liquidity as the predicate of future crises. The study of Tran et al. (2016) identifies that high liquidity-containing banks are more prone to liquidity risk, and they generally have low profitability. The theory of liquidity creation in the context of capital is also demonstrated by Tran et al. (2016), who argue that a well-capitalised bank is in a better position to create more liquidity. Hence, there is a positive and bidirectional interrelationship between capital and liquidity creation. Another relevant study by Ghenimi et al. (2017) sheds light on the relationship between liquidity risk, credit risk, and bank instability. Although no meaningful relationship between liquidity and credit risk is found, however, both risks individually as well as interactively affect bank stability. On the contrary, Calomiris et al. (2015) establish a theory on the requirement of liquidity; it is suggested that the banks' assets should be regulated instead of capital. The need to hold more liquid assets is expressed to withstand the liquidity risks. Thus, simultaneously credit and liquidity risks affect the stability of banks. Sahvouni and Wang (2019) also explain the relationship between the number of liquid assets, funding cost, and net income. They found that the higher the number of liquid assets a bank holds, it will enjoy the high net income and bear lower funding costs.

4.2.3. Profit and Loss sharing theory

PLS theory usually demonstrates the basic structure of Islamic finance, which prohibits interest. It contends the idea of partnership instead of a traditional agent-client relationship where banks share both profit and loss with their customers and act as business partners

(Farihana and Rahman, 2020). Theoretically, it is explained as a strong approach to strengthening Islamic banks by increasing their resilience against crisis (Fakir et al., 2019). Its meaning expands with the concept of the contractual agreement between two or more enterprises or people, which allows them to invest in a project and equally share the profit and losses associated with the project (Dar and Presley, 2000). In the banking business, the PLS theory can be extended to the relationship among the three participants, namely the user of capital, the bank (financial intermediary or the partial user of capital), and the depositor of funds in the bank. During the cycle, there are two kinds of partnerships or interactions that prevail; one is between the depositor and the bank, and the other is between the user and the bank. Under the influence of PLS theory, the financial intermediary (bank) does not receive any fixed interest; rather, banks and depositors share the profit and loss of the business linked with the user of capital (Hamza, 2016). In the case of capital loss, banks are subjected to bear all the financial losses while the entrepreneur or customers are exposed to labour and time costs (Farihana and Rahman, 2020). Also, Shariah forbids such banks from investing in prohibited businesses such as selling alcohol, pork, gambling, and others. In addition, the study of Abdul-Rahman et al. (2014) explains that during the financing of customers, PLS-based banking prohibits banks from demanding collateral assets. It is argued that some problems which are embedded in conventional banking, such as moral hazards and asymmetric information, are filtered out by PLS-based banks, and the whole project in which the banks are anticipated to invest is transparently monitored and supervised by these banks resulting in the increase of return and reduction of credit risk. Islamic financial system is free from debt as transactions based on interest or debt are prohibited in Islam. By leveraging the concept of interest-free financing in Islam, Shaukat and Alhabshi (2018) point out the widespread failure of interest-based debt financing regime and argue that ongoing episodes of exchange rate crisis or banking crisis are primarily stimulated by debt financing, the sub-prime mortgage crisis and financial contagion consequently, i.e., the GFC is the evidence to the shortcoming of debt financing. Their study advocates risk sharing-based financing as opposed to debt-based financing due to the greater financial instability attached to debt-based financing. The debate between PLS-based financial institutions and non-PLS-based has been a going concern, and in a similar context, Al-Amine (2015) argues that the equity and participatory investments models based on PLS theory are the best way to enhance the use of PLS products and limits the use of debt-based models. Their study endeavours to adopt product arrangements based on PLS major instruments like Mudaraba and Musharaka structures.

Two key instruments of PLS theory, *Mudaraba* and *Musharaka*, are based on the same principle of PLS in a financial transaction. These two instruments have the working mechanism of "rate of return", in which not only profit but also the risk (produced by the investment) is shared by both the financer and entrepreneur (Ibrahim, 2018). The fundamental notion of Mudaraba is that when two partners set up a business, profit and loss sharing is carried out in pre-arranged fashion. The partner who solely provides capital is known as "rab-al-maal", and he is only subjected to finance, while the other partner or entrepreneur who bears the responsibility of all the labour, managerial and physical work is known as "mudarib". The loss-sharing mechanism of Mudaraba is somewhat different, the partner who is obligated to provide finance will bear all the financial losses, and the other will bear the loss of his efforts and time. The second instrument of the PLS framework is Musharaka, in which both the partners mutually share their capitals in the mixed pool, thus, are mutually responsible for finance and management. Subsequently, both share the loss to the extent of their ratio of investment (Aburime, 2008). Thus, these instruments, under the influence of PLS theory, reflect the Islamic view of participatory, where the profit, as well as risk, are divided commensurate to their ratio of investment. Therefore, it appears viable in building a balanced distribution of income and discouraging monopolisation (Dar and Presley, 2000). Afkar et al. (2020) use the agency theory to find the relationship between mudarib, or fund manager and rab-al-maal or fund owner, in the mechanism of PLS. This theory was developed by Jensen and Meckling (1976), and explains the role of agents in managing the company or funds and generating profits according to the will of the fund owner. The funds provided by the owner must give some return to the fund manager as a management fee. This kind of tied investment is limited by the fund owner in terms of the type of business or management of funds. Although the ratio of profit and loss must be set in the beginning, thus, the whole structure remains compliant with the sharia (Al-Nasser Mohammed and Muhammed, 2017).

Al-Arabi (1966) suggests the idea of a two-tier Mudaraba, in which the savings would be mobilised and allocated by the banks on the Mudaraba basis or the banks would play the role of an entrepreneur (mudarib) for depositors and financers for borrowers. Islamic banks are subjected to sharing the profits with the depositors and the borrowers. The reason for this is the fact that depositors are the real owners of the capital used by banks (as mudarib) to generate profits, and since no fixed rate on capital is committed; therefore, banks are motivated to maximize the overall profit in order to enhance their absolute returns (Mehri et al., 2017).

Mansour et al. (2015) extend the concept of a two-tier partnership and introduces the role of financing under a three-tier partnership based on PLS theory. The new financial product is added with a risk moderator as the third participant with the function of absorbing risks of revenue sharing and premature default. The study proposes an alternative option to connect the Islamic financial principle's basic objective with the prevailing practices under the influence of the PLS principle. The novel financing structure advocates a dynamic mechanism for sharing profit and loss by participants recursively over the investment horizon.

4.2.4. Islamic Finance Theory

Islamic financial system is solely based on the pure equity and Profit and Loss Sharing (PLS) concepts. These frameworks are constructed upon moral and ethical principles according to the fundamentals and teachings of Islam. For instance, the Holy Quran (the sacred book of Muslims) prohibits all kinds of debts or debt-based contracts. Blitz and Long (1965) explain that the Islamic financial system pertains to the historical theory of usury condemnation. Therefore, forbidding and discouraging interest has been the nucleus of the system. Islamic financial system is misunderstood with only interest-free banking; however, it also covers intriguing aspects like the rights and duties of individuals, risk-sharing, the sanctity of contracts, profit and loss sharing models, equitable distribution, capitalisation, and financial intermediaries (Iqbal, 1997; Moisseron et al., 2015). Explicitly, Farooq and Zaheer (2015) explain the theory of Islamic finance and call it 'more resilient to shocks". The primary reason to withstand these shocks is its stress on risk-sharing and limitation on excessive risks. Expanding the theories of Islamic finance, it governs three fundamental principles, namely, the principle of equity, the principle of participation, and the principle of ownership. The principle of equity acts as a rationale for the prohibition of usury (riba) in a financial contract to defend the weaker party, that is, the borrower. Furthermore, this principle forbids the excessive uncertainty (gharar) involved in the covenant, thus, reducing the chance of asymmetric information. It also advocates the existence of an alms-giving or charity (zakat) system in the Shari'ah that is obligatory on every Muslim who meets the requisite criteria

(Hassan et al., 2019). The second principle depicts the true picture of profit that is associated with risk. As Shari'ah key role quoted that "reward (profit) comes with risk-taking," thus, it implicitly prohibits the advancement of riba, bridges the gap between financial activities and real activities, and ensures that whether a profit is generated with productive activity or with the mere passage of time (Ahmed et al., 2015). The third principle, which is the principle of ownership, is based on the prohibition of short selling. It mandates the complete ownership of the assets for selling or transacting and clearly warns that "do not sell anything until you don't have its ownership" (Hussain et al. 2016).

Islamic financing system offers key instruments for the ease of users in several ways. First, there is the term 'loan', which is theoretically explained as benevolent financing or (qard al hasan) it is basically financial assistance for needy people; no fee is charged against it. Ebrahim and Sheikh (2016) put stress on the incorporation of a benevolent loan in the Islamic financial system to minimise financial exclusion. In addition, there are other instruments of Islamic finance that come under the category of PLS, non-PLS, and fee-based products (Song and Oosthuizen, 2014). The fundamental instruments, including mudaraba (profit-loss sharing), musharaka (participation), murabaha (cost-plus financing), ijara (leasing), and salam (forward sale), act as the building blocks for deriving the complex financial instruments (Iqbal, 1997).

The rate of interest is the primary regime of the conventional financial system, which is demoralised in Islamic finance. There are several studies that have both theoretical and empirical explanations of the relationship between interest and favourable outcomes. Askari (2012) highlights that debt and leverages are the two major driving factors that are responsible for creating instability in the financial system. Unlike the Islamic financing system, these two features are involved in the form of "interest" in the conventional financial system. While explaining the effect of diminishing interest from the system, Al-Jarhi (2017) claims that the reduction of interest to zero will readily decrease the system of substituting the real resources for money; hence, the optimal output is maintained. Similarly, Samuelson's (1958) work illustrates the relationship between the rate of interest and resource allocation and explains that a zero level of interest rate yields the best possible results for the allocation of resources. The involvement of interest in the financial system for attaining allocative efficiency has also been discouraged by Friedman (1970). Another feature of the Islamic financial system is the risk-sharing which is based on the Profit and Loss sharing (PLS) model, in which all the partners share both the profits and risks. Sorensen et al. (2000) find that the risk-sharing concept is not only enhancing the integration of capital markets but also increases the efficiency of the whole economy. In contrast, the conventional financial system has a gap for risk-sharing, and the resources are mobilised based on the conventional loan contract. Belouafi et al. (2015) suggest that the financial system needs to be more focused on risk-sharing rather than risk-shifting, and active steps should be taken to bring equity finance against debt financing. Thus, a financial system could be constructed that can grow vigorously and encounter instabilities.

Money in the conventional financial system is considered a commodity that has a price, usually in terms of interest, and it has the same function as the commodity. Also, its price depends upon the balance maintained between the supply and demand of capital. While in Islam, money is not seen as a commodity having a price; consequently, its hoarding is prevented by the practice of zakat (alms) (Jouti, 2020). Thus, the velocity of money circulation is maintained by the implication of zakat. Further, the importance of Islamic finance is enlightened by Triki and BoujelbÃ (2017) in the context of humanitarian considerations through the advancement of zakat. Thus, the ultimate goal of this system is to make people happy and strengthen the whole culture through the distribution of wealth, and it implicitly brings social justice and equality to society. To summarise, the Islamic financial system provides an option for prosperity, fair wealth distribution, a way of moral and ethical investment, promotes resource mobilisation, a risk-sharing model, the concept of participation, a complete and pious system of Islamic banking, and bridges the gap between real activities and financial system (Mukhtar et al., 2018).

Contextually, the association between the actual economy and the financial sector has been cited in the literature as another factor that contributes to the stability of Islamic finances and indeed, the Islamic banking theory argues that Islamic banking can establish a link between the actual economy and the financial sphere, thanks to the Shari'ah obligation which requires all financial transactions to be backed by a tangible asset. Due to this, Njima and Zouari (2012) claimed that financial flows could meet the financing requirements of the real movements of services and goods. Banking stability can then begin with this theory that seeks to explain Islamic finance elements, which can make it stable finance.

4.3. Literature Review

4.3.1. Credit & Liquidity Risks and their Influence on bank stability

Bank stability refers to a bank's capacity to preserve its financial robustness and endure unfavourable circumstances or disruptions within the banking system. It encompasses the bank's ability to withstand credit losses and fulfil its obligations, including honouring deposit withdrawals and meeting payment commitments. Basel III regulations evaluate bank stability by assessing their capital adequacy, which represents the extent of capital banks possess to absorb losses and sustain solvency. At the same time, banks are inherently exposed to many risks, such as operational risk, credit risk, market risk, interest rate risk, liquidity risk and country risk, to name a few. Though some of these risks cannot be fully measured empirically, such as operational risk, and some risks can only be managed by the banks' given the indirect exposure of these risks, for instance, interest rate risk and market risk. However, the role of bank credit and liquidity risks have long been debated by many scholars and researchers in the context of the financial intermediation function of banks. During the GFC, these two risks also took the attention of policymakers and regulators as the banking sector suffered from enormous losses, bankruptcies and bank runs due to rapid growth in subprime lending prior to the GFC. For instance, Gefang et al. (2011) studied the role of both credit and liquidity risk during the GFC that brought many banks on the brink of collapse using Credit Default Swaps (CDS) rates on 12 global banks and LIBOR-OIS spreads with daily data from the beginning of January 2007 until mid-December 2009. They explain that between August 2007 and December 2008, credit risk had risen steadily. Before reaching heightened levels of credit risk during the GFC, there were two dips in levels of credit risk in December 2007 mainly because banks were forced to write down their loans along with Federal Reserve intervention with term auction facility. Though it helped banks to sustain low levels of credit risk for a month before the downward trend was inverted until early summer 2008, where there was a second but smaller dip in levels of credit risk, nonetheless, by late summer gradual increase in credit risk resumed as Lehman collapsed and AIG disclosed of liquidity shortages issues.

Liquidity risk was more volatile and abrupt during the GFC with three major peaks, for instance during the bank run on Northern Rock, liquidity risk was at its first peak in August 2007; this led to liquidity easing by central banks, for instance, ECB injecting EUR 95 billion overnight and

Federal Reserve injecting USD 24 billion. Their empirical analysis using LIBOR-OIS Spread on three major currencies reveals that in late August 2007, liquidity risk dropped much more rapidly in American markets as compared to European markets. Likewise, the second peak in liquidity risk was before the federal reserve introduced the term auction facility in December 2007. However, during the peak of GFC (late 2008), liquidity risk spiked dramatically after the collapse of Lehman's; moreover, the liquidity risk was higher in US markets, followed by British markets and the European markets. It can be argued that importance of liquidity risk is more important as compared to credit risk during the GFC (Gefang et al., 2011). However, there are significant concerns regarding the key variables used to indicate the level of credit and liquidity risk. However, the CDS market has grown significantly since 2004 but has been unregulated until 2014 with no centralised clearing. Hence, given the over-the-counter market structure, transparency and availability of the data used remain questionable. Additionally, CDS rates do not fully explain the events that took place during the GFC, as the information regarding CDS was largely private, making it harder for the market to make corrections (Chiaramonte and Casu, 2013). Nonetheless, CDS spreads are a good proxy for bank risk as they can mute the impact of credit rating downgrades on banks' debt as they capture information from bank balance sheet ratios, particularly Tier 1 ratio and leverage being the main determinants of CDS Spreads (Chava et al., 2018; Chiaramonte and Casu, 2013).

Secondly, Gefang et al. (2011) do not provide enough information regarding the role of LIBOR within financial institutions. This has been highlighted in the work of Fouquau and Spieser (2015), who focused on the importance of LIBOR by defining LIBOR as the benchmark for the interest rate paid on loans between one private or public bank to another. LIBOR also serves as a main reference point in multiple currencies for many inter-banking credit transactions, interest rate derivative contracts, exchange-traded contracts, bonds, and household credit. The extent of the use of LIBOR can be demonstrated by the total value of outstanding contracts. For instance, by mid-2011, the notional value of interest derivatives was 554 trillion USD; meanwhile, short-term interest rate contracts volumes traded in London's future and options amounted to 477 trillion euro (Fouquau and Spieser, 2015). They further investigate whether LIBOR was manipulated by the cartel referring to 12 main banks during the GFC using information from British Bankers' Association (BBA) on 1-,3-, and 6-month LIBOR rates, Repo rates and CDS rates between 2005 and 2008. Using factorial analysis, they report that LIBOR had been manipulated particularly during mid-October 2008; likewise, they also report a pattern of irregularities between LIBOR and historical interest rate benchmarks, which was also reported by King and Lewis (2015) and Chen (2020). Given the importance of LIBOR within money markets, these findings indicate that the conclusion reported by Gefang et al. (2011) may be flawed given that the study does not account for irregularities and manipulations in LIBOR, which has resulted in abolishing LIBOR and triggered inter-banking interest rate reforms (Chen, 2020).

King and Lewis (2015) also address the issue of LIBOR misreporting during the GFC when conducting their study on the role of credit and liquidity risk during the GFC. They use similar variables used in the Gefang et al. (2011) for 17 banks, five different maturities and control for misreporting using Jenson's Inequality. They report that both credit and liquidity risk was equally important for their role during the GFC. For instance, liquidity conditions within the inter-banking market are an important driver of a bank's funding costs. When the Fed Reserve launched a term auction facility and extended it during the GFC, the cost of short-term liquidity dropped by 100 bps, but the cost of long-term liquidity remained unchanged (King and Lewis, 2015). The rationale behind the higher cost of long-term funding is provided by Garcia-de-Andoain et al. (2016), who discovered that it was uncertainly attached to the future condition as compared to reduced short-term liquidity premium, which was mainly due to central bank intervention. This resulted in ample liquidity supply within the interbank markets in response to GFC.

Another interesting finding is that fluctuation in credit risk was largely responsible for the volatility within the interbank market, shoring up the funding cost for banks. For instance, King and Lewis (2015) claimed that one bps change in CDS spread increased the funding cost of banks by 4.3 bps during the GFC; such changes accounted for nearly a fifth of the LIBOR-OIS spreads. In other words, as the credit risk increased during the GFC, so did the cost of funding liabilities for banks increased until the central banks intervened. This effectively means that the liquidity premium within the interbank market is more sensitive to changes in credit risk. Despite interesting findings, their study lacks to address the role of these two risks originating from balance sheet activities. Furthermore, the role of abrupt changes in monetary policy base rates in the aftermath of the GFC; its impact on both the asset and liability side of the balance sheet has not been explored in their study. There is no doubt that banks' profitability and risk profile are exposed to changes in policy rates. To address this claim, Gomez et al. (2021) illustrate the impact of changes in interest rates on both the asset and liability side of the bank, referring to as the income gap, a standard measure for measuring changes in income from asset and liability sides due to changes in interest rate. Their study uses information from FR Y-9C on BHC in the US using variables such as a change in interest and non-interest income, change in equity, change in commercial and industrial loans, total loans, liquidity ratio and income gaps along with other variables. Their findings suggest that the income gap has a significant ability to predict banks' profit. For instance, when the Federal Reserve increases interest rate by 100 bps, banks with an income gap of the 75th percentile in a distribution curve reduce lending by 0.27 percentage points less than banks at the 25th percentile (Gomez et al., 2021). In other words, new banks or smaller banks have higher income gaps and tend to engage more in lending as compared to larger banks with lower income gaps during the interest rate raise. Nonetheless, these findings only indicate that the profitability of a bank is correlated to changes in interest rates but do not highlight the effect of changes in monetary policy rates on a bank's credit risk and liquidity risk. Moreover, the variables included in their research are questionable as no justification was provided as to why only changes in commercial and industrial loans were given specific attention as compared to other categories of loans on the bank's balance sheet, such as a change in residential loans or commercial real estate loans which were one of the main drivers of rising credit risk during the recent GFC. Furthermore, though the study includes liquidity ratio but does not include government securities as part of the calculation for liquidity ratio, which has been classified as HQLAs under the Basel III Liquidity Framework, their study also makes no mention of capital requirement. More broadly, the study is conducted only using US banks, which do not provide any indication of how banks in emerging markets are affected by changes in policy rates.

Morais et al. (2019) report that changes in core countries' monetary policy referring to changes in interest rates of the US, UK, and Euro area have a spillover effect into emerging economies that can affect the credit and liquidity risk dynamics of an emerging market economy. Using the Mexican banking sector, they measure the impact of changes in foreign monetary policy rates on credit behaviour by foreign banks operating in the Mexican banking system. They argue that a change in foreign policy rate is correlated with the credit supply to Mexican firms by respective countries' foreign banks. For instance, one standard deviation of decline in foreign monetary policy rate expands credit supplied through foreign banks by 2.1%, the loan maturity rises by 6.7%, and the probability of future loan default (credit risk) over a one-year time horizon also surges by 9.8%; in contrast, one standard deviation decrease in Mexican policy rate only increases loan supply on average by 0.6% for both national and foreign banks (Morais et al., 2019). One reason for lower credit supply by changes in the Mexican policy rate in comparison to changes in foreign monetary policy rate could be due to the exchange rate factor of USD against the Mexican Peso, which has not been controlled for or explored in their study. Moreover, the study is only based on the Mexican banking system, which is relatively small compared to other leading emerging market economies and does not explore the impact of foreign monetary policy rates on national banks.

Despite these shortcomings, Bräuning and Ivashina (2020) explore the role of US monetary policy in a wider context using a sample size between 1990 and 2016 covering 119 EMEs located in Africa, the Americas, Asia, and Europe. They use the DealScan database to extract reports of individual syndicate loan issuance to borrowers by home country lenders. They agree that outstanding dollar credit by foreign banks towards African, American, and Asian Emerging markets accounts for over 90 per cent of the credit and for Emerging Europe, this number is at 60 per cent indicating the influencing role of US monetary policy on EMEs credit cycle. Moreover, they agree that changes in US monetary policy disproportionately affect EME borrowers as compared to borrowers in developed markets for two main reasons. Firstly, a typical monetary policy easing in which the Federal Reserve cuts its policy rates by about four percentage points amplifies the loan volume towards emerging market borrowers exceeding the flow of loan volume into the developed markets by 32 per cent. In contrast, a monetary policy tightening has a pull-out effect by banks sharply contracting foreign credit into emerging market economies. This effect holds true for non-US banks, for banks with very small exposure to the US markets in their portfolio, borrowers in emerging markets which are highly reliant on US dollar-denominated credit and have limited trade links with the US, and for emerging market borrowing firms operating in non-tradeable sectors such as construction, finance & insurance, retail, and services to name a few. Secondly, the researchers claimed that given the differential effect between EMEs and developed markets; banks are often faced with few channels that drive banks risk-taking in response to changes in monetary policy. The prudent risk-taking channel is often consistent with traditional risk management models and productive risk-taking channels, often leading to riskier investments becoming more attractive in response to monetary policy easing and low yield in the home markets. Their findings indicate that foreign banks increase credit into emerging markets due to reaching for the yield effect. In other words, banks generate higher returns in emerging markets as compared to home markets which offer low yields and returns due to the easing of monetary policy, naturally making riskier investments in emerging markets an attractive choice for foreign banks. According to Bruno and Shin (2015), it is well to reason that banks' lower monetary policy rate reduces that Value at Risk (VaR) constraint, making banks increase their risk-bearing capacity.

One reason for such risk-taking behaviour by banks is that when the monetary policy rate is reduced banks' have access to more capital at a lower cost but also face lower profit margins in their home country due to lower policy rates which drive banks to invest in high yield high-risk assets in EMEs to maintain its profit margins. Nonetheless, such volatile markets and the risk associated with asset holdings also increase bank credit risk and leverage. However, this effect is more evident when the home country's monetary policy begins to be tightened, and the materialisation of non-performing loans becomes more common. This is because the cost of credit increases, thereby reducing the availability of foreign credit in EMEs, banks with existing credit contracts do not extend credit contracts to their EMEs borrowers due to higher credit costs associated with tightening of home monetary policy, which offsets the higher yields offered by EMEs borrowers. However, studies conducted by Bräuning & Ivashina (2020) and Morais et al. (2019) only shed light on the correlation between credit risk and change in foreign monetary policy rates on foreign banks or banks with exposure to dollar credit; these findings do not highlight the impact of change in the monetary policy of home countries on national banks. Additionally, the role of liquidity risk in changes in monetary policy is somewhat limited in these studies.

The role of liquidity and bank stability in changes in the central bank's monetary policy rate has been comprehensively studied using the dynamic asset pricing model (Drechsler et al., 2017). Their model has two types of agents in the markets that differ from each other based on their risk profiles. One agent is risk averse, seeking certainty and stability over uncertainty, while in contrast, the risk-tolerant agent is mainly interested in pooling its net worth, for instance, banks and other financial institutions. The rationale for banks being risk tolerant is that banks take risky leveraged positions using short-term risk-free rates. It is well known that banks use funding from their liabilities side to expand the asset side of the balance sheet, which also exposes banks to funding liquidity risk, also known as rollover risk (Diamond,1984; Allen and Gale, 1994). To overcome such a risk, banks usually hold two types of liquid securities: central bank reserve and government securities as part of their liquidity buffers. In turn, banks demand liquidity premiums as an opportunity cost for holding these assets in reserves. However, the liquidity premium is dependent on the central bank interest rate; therefore, by changing the interest rate, the central banks not only change the cost of holding liquid assets but also influence the banks' risk-taking. For instance, an increase in the policy base rate increases the liquidity premium but also increases the cost of taking leverage, thereby deterring banks from risk-taking. However, the aggregate decline in risk-taking also increases risk aversion resulting in increased risk premia. In contrast, a lower policy rate leads to cheaper liquidity and higher volatility over the long term. One reason for increased volatility is driven due to banks taking on greater leverage and engaging in increased risk-taking activities. This results in low returns and depressed assets, as witnessed during the recent GFC. However, cheaper liquidity eases liquidity risk concerns with the banking system but, at the same time, also increases credit risk and vice versa in an environment of tightening interest rates. These claims also echo some of the arguments raised in numerous studies highlighting ample access to liquidity and costly liquidity; both pose detrimental consequences for banks (Acharya et al., 2020; Acharya and Thakor, 2016; Bruno and Shin, 2015).

On the other hand, Armas (2020) explores the role of monetary policy in bank credit and liquidity through the lens of the Philippines' banking system, indicating that the local banking system remains the primary source of credit to various sectors accounting for 59 per cent of credit to GDP. However, since the Asian financial crisis, banks in the Philippines have been conservative when entering new lending contracts, given their ability to lend has been somewhat weakened, as reflected in the central banks' monetary policy stance. Their study focuses on the impact of monetary policy rate on three bank-specific features, namely liquidity, capital, and size, using the GMM estimator, highlighting three findings consistent with other theoretical and empirical findings and one novel finding. Firstly, liquidity is the main indicator of banks' ability to lend; secondly, banks' loan supply is dependent upon the monetary policy rate, where tighter monetary policy reduces lending activities; thirdly, the type of bank does not affect the lending responses to changes in monetary policy. However, their key finding suggests that the banks' lending channel in relation to changes in monetary policy rate does not exist in the Philippines' banking system. Further explaining that highly liquid banks responded more firmly than financial institutions with less liquid assets in the event of tightening monetary policy as liquid banks used these assets to bump up their liquidity buffers to insulate themselves against any financial crisis or large deposit withdrawal as well as to sustain their conservative lending activities.

Another reason for this is also the need to insulate from rising levels of credit risk; as the cost of borrowing for banks increases, likewise borrower also finds it difficult to pay back their outstanding loan during the period of tightening monetary policy (Armas 2020; Guinigundo, 2017). Similarly, using panel data from emerging market and employing the VAR model, it is evident that changes to monetary policy affect various asset types as well; for instance, changes in base interest rate plays an important role in the oscillations of stock prices and bank credit shocks also the impact housing prices (Singh and Nadkarni, 2017). Elaborating on this further, a lower policy rate declines both the stock prices and house prices but under a tightening policy rate, the effect is larger and more persistent on stock prices due to the rising cost of borrowing and reduced opportunity of lending. The relationship between Monetary Policy rates and credit risk among MENA banks is positive (Mahrous et al., 2020). Using 21 years of data on 15 countries located in the MENA region shows monetary policy rates above 6.3 per cent, which amplifies the level of credit risk and non-performing loans as the rising cost of paying outstanding loans makes it harder for borrowers to repay, making materialisation of NPLs increasing, likely endangering the financial stability of the banking system (Mahrous et al., 2020). If the monetary policy rate is above 6.3 per cent, the impact on credit risk is 1.9 per cent, but in the event of the monetary policy rate being lower than 6.3 per cent, the effect on credit risk remains positive, but the impact is dramatically reduced to around 0.27 per cent (Mahrous et al., 2020). Though their analysis takes inflation into account, the sample size of banks used in the study is small. Additionally, the majority of the countries in their analysis are dominated by Islamic banking, which are exposed to different risks as per Profit and Loss Sharing (PLS) theory and Islamic financing theory, which underpins Islamic banking system prohibiting riba (interest) based transactions which are not addressed nor explored in previous studies conducted. Nonetheless, the research carried out by Kabir et al. (2015) on credit risk in Islamic banks and conventional banks provides a puzzling picture. They employ both the market-based Distance-to-Default (DD) model as well as the accounting-based Z-score model to measure credit risk on banks located in both the MENA region and other emerging economies which have large Islamic banking footprints. They argue that credit risk among Islamic banks using the DD model is significantly lower in comparison to traditional banking counterparts; however, using the Z-score model and NPL ratio indicates elevated credit risk in comparison to conventional banking. Though it can be agreed that Islamic banking is not completely immune from credit risk, their study makes no attempt to explore the impact on Islamic banking in a wider context, particularly regarding the relationship between liquidity risk and financial stability. One reason for higher credit risk is because of the risks attached to Musharakah and Mudarabah contracts which are primarily based on partnership making it practically impossible to demand collateral for Islamic banks to hedge for credit risk from borrowers (Ashraf et al., 2016).

Another study explores the interaction between credit & liquidity risk and its impact on bank stability, using 8 MENA countries and 49 banks with a sample size of 7 years between 2006 – 2013 (Ghenimi et al., 2017). The main variables used include capital-to-asset ratio, NPL as a measure of credit risk, Return on Equity (ROE), ROA, net interest incomes, liquid asset to total asset ratio as a measure of liquidity risk, loan growth, net loans to total assets, Z-score to measure bank stability along with other macroeconomic variables such as inflation and GDP. By employing the GMM model, they reach the conclusion that bank stability has no correlation with the interaction between credit and liquidity risk (Ghenimi et al., 2017). However, it is important to note that they do highlight that these risks do amplify other underlying risks as they increase or decrease. For instance, credit risk increases the default risk of the bank, whereas banks' inability to secure liquid assets at a low cost could also drive banks towards bankruptcy, as evidenced during the recent GFC. Nonetheless, it is worth noting that their research does not address the changes in monetary policy base rate on both liquidity and credit risk; in addition, their analysis does not include LCR or NSFR ratios as liquidity measures under Basel III and does not distinguish the findings between Islamic and traditional banks.

Despite these shortcomings, one of the recent studies by Hassan et al. (2019) shows that interactions between both credit and liquidity risk on bank stability from both traditional and

Islamic banking perspectives. However, their analysis does not incorporate any macroeconomic variables nor any new liquidity measure introduced under Basel III. The analysis relies upon Z score and DD models using data from 8 years between 2007 – 2015 on a balanced dataset of 26 banks for each category (i.e., Islamic and traditional banking) (Hassan et al., 2019). Their findings are consistent with the work done by Ghenimi et al. (2017), highlighting a negative relationship between credit risk and liquidity risk within Islamic banks. Further adding that the negative relationship is consistent during the financial crisis for Islamic banks, but post-GFC, the negative relationship is also evident among traditional banks (Hassan et al., 2019). This could be due to changes in credit and liquidity risk pre-GFC amongst traditional banks. Moreover, the relationship between liquidity risk and bank stability among Islamic banks is also found to be negative (Hassan et al., 2019). One reason for such a difference could be due to a multi-governance system imposed on Islamic banks, for instance, Sharia supervisory board, as well as the national regulator assessing banks' compliance and exposure to risks indicating a better risk management approach towards mitigating risks as compared to their counterparts. However, little has been explored in these studies about the role of liquidity creation within banks and how they differ between traditional and Islamic banks.

4.3.2. The Role of liquidity creation in Banks

Liquidity creation is the prime motivation for the existence of banks. It is well known that banks create liquidity from both on and off-balance-sheet activities by financing illiquid assets such as credit cards, personal loans, corporate credit lines, mortgages, and business loans with relatively liquid liabilities, for instance, using various retail and business deposits as per the theory of financial intermediation (Bryant, 1980; Diamond and Dybvig, 1983). Though it is also understood that having liquidity is important for banks to fulfilling their obligation in a timely manner, it is also well evidenced in previous studies reviewed that having too much liquidity leads banks to engage in more risk-taking activities. However, this section explores the implications of banks' ability to create liquidity from balance sheet activities on the risk profile of the banks. Do bigger banks have the capacity to create more liquidity in comparison to their smaller counterparts. Additionally, how does banks' ability to create change during a crisis period and change monetary policy. For instance, Berger and Bouwman (2009) argue that though the classical theories of financial intermediation portray banks as turning liquid liabilities into illiquid assets and generating liquidity out of these illiquid assets, there exist no measures to measure such liquidity creation by financial institutions. They introduced a liquidity creation measure dividing both assets and liabilities of the balance sheet into three groups liquid, semi-liquid and illiquid, with the respective weightings of -½, 0, ½ depending upon balance sheet items based on asset or liabilities side (Berger and Bouwman, 2009). The asset and liability classes for each group are shown in *Appendix D,* along with the weightings.

They employ BBLC measure on all US commercial banks using data between 1993 and 2003 from Federal Reserve call reports excluding banks whose assets are below USD 25 million and with no exposure to real estate mortgages. Their categorisation of bank size is based on total gross assets, with banks having assets exceeding USD 3 billion classified as large, banks with assets between USD 1 - 3 billion classified as medium, and banks with assets up to USD 1 billion classified as small. Findings indicate that the US banking sector created liquidity of more than USD 2.8 trillion until 2003 (Berger and Bouwman, 2009). Moreover, empirical evidence also points out that large banks created as much as 81 per cent of overall liquidity though these banks only account for 2 per cent of all banks (Berger and Bouwman, 2009). Additionally, the relationship between liquidity creation and the value of the bank is positive, but the relationship between bank capital requirements and bank liquidity creation differs based on the balance sheet size of the banks. For instance, higher capital requirements are imposed by the regulator to improve the safety and soundness of banks, but such requirements harm liquidity creation among smaller banks and, on the contrary, enhances liquidity creation among large financial institutions (Berger and Bouwman, 2009). The reason smaller banks are disadvantaged when it comes to liquidity creation is that the balance sheet size of these banks is relatively small compared to their counterparts. Additionally, smaller banks have limited sources of attracting liquidity as they hold a very small market share within the interbank market as a net lender. It is also worth noting that these banks do not operate in international markets as compared to large banks. Despite these findings, this study does not address some important questions regarding the effect of changes in monetary policy on liquidity creation, is having more liquidity creation good for the economy and banking stability, and how banks' liquidity creation behaves during the crisis period. Moreover, these conclusions are made using data from one country in isolation, potentially leading to a lack of understanding as to whether similar conclusions can be made for banks operating in other countries.

However, some of the subsequent research conducted by Allen Berger and Christa Bouwman attempts to address some of the gaps identified in their previous research. For instance, Berger and Bouwman (2017) investigate the changes in banks' liquidity creation during financial crises and changes in monetary policy. The data used covers between 1986 - 2008, comprising different financial crises ranging from the 1987 stock market crash, the credit crunch of the early 1990s, the Russian debt crisis, and the dot com bubble to the GFC of 2008. The calculation of liquidity creation of banks' on and off-balance sheets and the size classification used for banks is the same as defined in Berger and Bouwman (2009). Their analysis explores whether the measure of liquidity creation could predict a looming financial crisis by detrending BBLC measure and GDP while accounting for monetary policy and market return. Their findings indicate that off-balance liquidity creation is a better indicator of a financial crisis in comparison to on-balance liquidity creation and total liquidity creation. The rationale for this conclusion is that during the last five crises studied, banks' off-balance detrend increased above the odds of 1, indicating an increased risk-taking in off-balance sheet transactions followed by a crisis in subsequent quarters. Moreover, prior to two quarters of the GFC, both total liquidity and off-balance sheet liquidity creation measures had a probability of 90% for an impending crisis. However, the former dropped due to changes in GDP, whereas the latter remained consistent in both quarters before the GFC hit the banks (Berger and Bouwman, 2017).

These findings reflect the off-balance sheet exposures held by banks during the GFC; for instance, by the end of 2007, J.P Morgan and Citi both had USD 1 trillion assets each on their off-balance sheet in the form of Structured Investment Vehicles (SIVs), but for Citi, these off-balance sheet SIVs represented about half of the bank's total assets (Crotty, 2009). The purpose of SIVs is supposed to be a standalone vehicle used for paying fees originating from banks with no obligations or commitments. However, banks used SIVs to borrow from short terms markets and use these funds to buy long-term illiquid but high-yield securities such as collateralised debt obligations and MBS (Crotty, 2009). This did increase banks off-balance sheet liquidity creation even after deducting the cost of short-term borrowing, but what drove these banks into crisis was a sharp collapse in demand for collateralised debt obligations and MBS due to increasing defaults among borrowers accompanied by housing pricing declines making these SIVs worthless (Berger and Bouwman, 2017; Crotty, 2009).

Nonetheless, Liquidity creation, both on and off-balance sheet, differs from a monetary policy rate perspective based on the bank size and economic conditions. For instance, a one percentage point change in policy rate increases liquidity creation among small banks by about 2.3 to 2.0 per cent, in monetary terms, equivalent to USD 333 Billion in the following two quarters (Berger and Bouwman, 2017). However, results for medium and large banks are weak and rather mixed. One reason for higher liquidity creation among smaller banks could be due to higher engagement by small banks towards SME segments as compared to their larger counterparts which mostly view SME lending as a risky business, something which has not been factored in their study. Likewise, during the crisis period, change in monetary policy slightly reduces liquidity creation among small banks but remains steady as compared to large banks, which may hoard liquidity during the crisis period and avoid taking lending positions in the interbank market.

Regardless of insightful results, Berger and Bouwman (2017) agree that these results are based on one standalone country. Additional cross-country research is required to further enhance understanding of bank liquidity creation during times of stress and changes to monetary policy. Furthermore, the pattern of bank liquidity creation might also differ based on the magnitude of stress felt by one economy. To illustrate this argument, during the Asian financial crisis of 1997, banks in Europe or the Middle East were not severely impacted by the crisis as compared to financial institutions based in Indonesia, South Korea and Thailand. Similarly, Berger et al. (2016) also studied to determine if the regulatory interventions seen during the GFC reduced or increased banks' liquidity creation. They utilise confidential data on the German banking sector between 1999 – 2009 and use ratios of asset side, liabilities side and off-balance sheet liquidity creation to total assets, loan to asset ratio, Z-score, and Risk-weighted assets to total asset as explanatory variables; they also use instrumental variables to address endogeneity concerns such as regulatory intervention and capital support dummies, the state vote share of a pro-business political party, a distance of banker to its insurer along with control variables such as total asset, return on equity, NPL ratio, tier 1 capital ratio, fees income to total income and loan portfolio concentration. Based on previous studies conducted, it is understood that both regulatory interventions and capital support are used to limit banks risk-taking activities and to promote safety and soundness within the banking system. Nonetheless, Berger et al. (2016) find that such actions also come with unintended consequences of a reduction in bank liquidity creation. It has been underlined in their conclusions that, on the one hand, regulatory interventions reduce liquidity creation, and on the other hand, capital support has no effect on bank liquidity creation.

One possible explanation behind a negative relationship between regulatory interventions and liquidity creation is that regulators might impose restrictions on affected bank's operations, such as limiting their balance sheet size or curbing banks' ability to grant new loans or deposits to contain spillover effects towards the wider banking system. These limitations, indeed would naturally curtail bank's ability to create liquidity. However, the most interesting debate is around the belief that capital support has no effect on liquidity creation is doubtful as that has not been the case during the recent GFC, where banks were engaging in risk-taking activities, Berger et al. (2016) argues that these results are different as German banking data falls short of a sufficient explanation. During the GFC, well-known German banks were engaging in risky activities and were at the centre of the GFC too. Perhaps a more reasonable explanation is that liquidity creation on the asset side of the balance sheet had declined due to bad loans and continued risky exposures to illiquid securities as banks sought to create new liquidity, whilst liquidity creation on the liabilities side of the balance sheet was somewhat higher but unstable as banks lured its customers with higher deposits rates to keep the bank liquid despite capital support to meet regulatory capital requirement effectively cancelling liquidity creation from liabilities side against asset side (Fecht et al.,2019; Berger et al., 2016; Acharya and Mora, 2015).

Likewise, Kapoor and Peia (2021) study the effect of quantitative easing on bank liquidity creation using US banks which took part in US Federal Reserve's large-scale asset purchase programs during the GFC by using the BBLC measure and employing the difference in difference estimation method. They explore whether three rounds of quantitative easing during the GFC by the federal reserve enhanced liquidity creation among banks. Banks' that were most affected by the quantitative easing policy continued to engage in risky lending practices in resemblance to their counterparts in all three rounds of quantitative easing (Chakraborty et al., 2020; Rodnyansky and Darmouni, 2017). Additionally, Kapoor and Peia (2021) add that predominantly first and third rounds of Fed's quantitative easing observed increased loan origination from banks when liquid assets were injected as part of quantitative easing. However, astonishingly bank liquidity creation did not increase until the third round of quantitative easing, which took place in 2012; the main cause for weak bank liquidity creation is primarily driven because banks continued to turn liquid assets received as part of quantitative easing into illiquid assets by taking lending positions within interbank markets as well as purchasing MBS (Kapoor and Peia, 2021). One of the factors not considered by previous studies reviewed the influence of senior executives in banks' pursuit of liquidity creation. According to Huang et. (2018), who studies the role of CEO optimism and bank liquidity creation covering normal as well as times of crisis highlights that CEO optimism influences how much liquidity a bank creates. They use the BBLC measure along with three key variable dummies such as the CEOs Optimism dummy being one if the post holder delays exercising 100 per cent or more in the money options during his tenure and 0 otherwise, Holder 67 dummy being one if the post holder delays exercising 67 per cent or more in the money options during tenure and 0 otherwise, and a dummy variable with the value being one if the post holder has been a net buyer of stock during the first five years of his tenure and 0 otherwise. They concluded by emphasising CEOs who are optimistically created more bank liquidity as compared to less optimistic CEOs; nevertheless, this positive link was stronger during the GFC, highlighting that liquidity creation was higher among optimistic CEOs (Huang et., 2018). However, their study has a few things which are not considered, for instance, the size of these banks, the ownership composition, the terms of loans, and loan composition. More importantly, Huang et. (2018) does not indicate if these banks were part of regulatory bail-out programs during the GFC because Kapoor and Peia (2021) argue that post-GFC bank liquidity creation increased due to quantitative easing by central banks rather than just CEO optimism.

Studies conducted in emerging markets relating to bank liquidity creation are rather limited as compared to an intense debate around bank liquidity creation within developed markets. Gupta and Kashiramka (2020) study the link between bank liquidity creation and bank stability in the aftermath of the GFC in conjunction with a recent significant rise in NPLs within the Indian banking sector. Using data sourced from the Reserve Bank of India (RBI) database ranging from 2007 -2019 comprising 91 commercial banks (28 public sector banks, 21 private sector banks, and 42 foreign banks) and including variables such as Z-Score to measure bank stability along with variables relevant to CAMELS framework. Additionally, they also use four different categories of BBLC measures covering on and off-balance sheet items as well as the maturity of assets and liabilities. After examining the results using OLS and GMM regression models they report three key findings. Firstly, a statistically significant positive relationship between bank liquidity creation and bank stability using on balance sheet items; secondly, when evaluating this relationship based on bank size the impact of liquidity creation on bank stability is negative unlike medium sized banks and finally the Z-score for public sector banks show higher instability as compared to private sector banks (Gupta and Kashiramka, 2020). Despite these findings it is worth pointing out that positive correlation between bank liquidity creation and bank stability contradicts findings of previous studies which report liquidity creation increases banking instability and can be used to predict an impending crisis within the banking industry (see Berger et al., 2019; Berger and Bouwman, 2017; Fungáčová et al., 2015). However, it can be argued that the basis on which previous findings has been concluded is based upon the dataset used to evaluate the relationship within developed markets where the nature and development of the banking system differ from the banking system within emerging markets.

Additionally, it should also be noted that banks within the developed market have higher bank liquidity creation as compared to emerging markets. For instance, US banks created average liquidity of 20% in 2003 (Berger and Bouwman, 2009); Russian banks created 28.60% of liquidity in 2007 (Fungáčová et al., 2015); and banks' from Western Europe created 28% of liquidity between 2014 and 2018 (Yeddou and Pourroy, 2020); in contrast, Indian banks only created 1.11% liquidity between 2007 -2019 when factoring in off-balance sheet activities (Gupta and Kashiramka, 2020). It should also be noted that different timeframes can influence varying results; however, based on previous studies, it is evident that banks within developed markets create more liquidity and are more prone to illiquidity and thus exposed to liquidity risk compared to banks with lower levels of liquidity creation within emerging markets. Additionally, the difference in conclusion based on bank size can be supported using the competition fragility hypothesis, which explains that in a competitive atmosphere, banks are implored to take on undue risk to stay afloat, effectively creating more fragility as a result (Keeley, 1990; Allen and Gale, 2004). In other words, smaller banks are more cost-sensitive as compared to their larger counterparts due lack of economies of scale often enjoyed by large financial institutions; to mitigate this risk and compete effectively, smaller banks' employ higher risk controls which leaves these banks incurring additional costs one such example is the cost of holding higher liquidity on its balance sheet. In contrast, the reduction in stability of large banks is driven by amplified liquidity creation, leading these banks to engage in excessive risk-taking activities creating a moral hazard problem with the stigma of being too big to fail (Gupta and Kashiramka, 2020).

Looking from a Malaysian banking perspective, Toh (2019) implements the Lerner index developed by Lerner (1934) to examine whether bank capital affects liquidity creation and bank diversification. They provide evidence using data from 28 commercial banks between 2001 - 2017, arguing that an increase in bank capital drove banks away from traditional banking services into more fee-based services such as underwriting and securities trading. Moreover, banks with higher capital ratios create less liquidity from on-balance-sheet activities such as deposit-taking and lending and instead, branch out and divert their assets into more niche markets to improve profitability. Liquidity creation from the on-balance sheet is reduced for all banks regardless of their size as capital ratios increase; nonetheless, off-balance sheet liquidity creation only declines for larger, listed domestic banks giving smaller, unlisted, and foreign banks a competitive advantage for providing more tailored off-balance sheet facilities needed for liquidity creation (Toh, 2019).

Likewise, using the same sample, their subsequent study investigates the impact of stock market liquidity on bank liquidity creation in the Malaysian banking sector (Toh et al., 2019). They employ various measures to gauge stock market liquidity, such as quoted bid-ask spread, Amihud Illiquidity ratio (Amihud, 2002), and Frequency of zero return days (Lesmond et al., 1999) along with other control variables, including Z-score and BBLC measure to quantify bank-level liquidity creation. Their finding points towards evidence of a positive link between liquid stock market and enhanced bank liquidity creation both on and off-balance sheet (Toh et al., 2019). Despite interesting findings, both studies do not consider how higher capital requirements and stock market liquidity would affect Islamic banks since the Malaysian banking sector also has numerous Islamic banks operating with sperate set of regulatory rules governing these banks. Additionally, study conducted on higher capital requirement by Toh (2019) has no variable addressing the financial crisis or accounting for liquidity requirement imposed under Basel III in post-GFC environment.

It can, perhaps, be defensible that more liquid capital markets lead to enhanced bank liquidity creation because banks can not only borrow liquidity via interbank markets but also use cheaper equity finance to raise fresh liquidity to partake in additional lending activities both on and off-balance sheet. Dang (2020) presents his case using 28 Vietnamese commercial banks whilst studying if fee based non-traditional banking services prevents banks from liquidity creation. To explain bank liquidity creation behaviour, they employ fixed effect and OLS models using variables such as size, income diversification, non-interest income, on and off-balance sheet BBLC measures and return of assets along with variables such as GDP and inflation. Based on their empirical findings they present a statistically robust case arguing that non-traditional banking activities reduces bank liquidity creation as it diverges banks away from its core function of financial intermediation (lending business) a main determinant of liquidity creation into a fee-based model where income is based on pushing services to generate liquidity by weakening banks core function (Dang, 2020). These findings refute previous work conducted by Toh (2019) in Malaysian banking context they argue that small banks are at advantage of creating liquidity by offering off-balance sheet services. Nevertheless, it should be noted that Dang (2020) work do not address the issue based on banks size, furthermore their work has acknowledged that Vietnamese banking sector suffered during the recent GFC but no regulatory variables including bank capital and liquidity ratios are included in their empirical analysis to address the liquidity creation behaviour during crisis period or post-GFC under Basel III environment.

Another relevant study by Hsieh and Lee (2020) explores the role of liquidity creation with credit risk in a wider cross-country context using 27 emerging Asian economies. They argue that banks with higher illiquid asset tend to increase their liquid assets, loans and credit, however, banks with higher level of core deposits increase their liquidity creation. They further add that banks that are more exposed to higher credit risk based on Ted spread decrease their liquid assets and increase loans and credit more rapidly (Hsieh and Lee, 2020). However, a few things to note that has not been addressed in their work more precisely there is not an actual measure for liquidity creation but rather a liquid asset variable based on balance sheet which is not exactly a measure of liquidity creation. Additionally, their work uses Ted spread to credit risk but given the bank level data used it would have more reason to draw on this risk using non-performing loans ratio which would portray a more accurate picture of credit risk for each bank. Additionally, they do not address the issue regarding countries which operate under dual supervision regime particularly Islamic and conventional banking systems. It is no doubt that based on the studies review there seems to be very limited evidence of research on liquidity creation within emerging markets and more specifically within the Islamic banking sector.

One of the few studies found exploring liquidity creation in Islamic banking context relates to Berger et al. (2019), they conduct a cross country study on 24 countries predominantly from Middle East and Asia using panel data of 690 banks both conventional and Islamic between 2000-2014. Their outcomes reveal that though conventional banks create more liquidity overall nonetheless liquidity creation within Islamic bank is much higher when compared based on liquidity created per asset (Berger et al., 2019). Similarly, when looking from the financial stability front conventional banks liquidity creation affects financial stability more adversely among high-income countries as compared to low-income countries where the effect is not noticeable (Berger et al., 2019). In contrast Islamic Banks' liquidity creation has no effect on financial stability within high-income countries and interestingly promotes stability within low-income economies (Berger et al., 2019). One reason for higher liquidity creation per asset is since Islamic banks engage more in on-balance sheet transection such as loans as compared to off-balance sheet activities and other financial instruments such derivatives, options and swaps which are mostly prohibited (Berger et al., 2019).

4.3.3. Financial stability and systemic risk

The financial stability of the system encompasses the overall well-being and resilience of the financial system during an economic depression. The amalgamation of banks, financial markets, and non-bank financial institutions plays a crucial role in mitigating systemic risks and unexpected disturbances. The implementation of Basel III regulations, which include liquidity requirements, ensures that banks maintain sufficient liquidity reserves to meet their obligations even in times of financial strain. The stability of financial systems has long been an important concern and remain in the limelight more so post-GFC. The crisis was primarily embarked on systemic risk as capital shortages rarely limited to one bank leaned to amplify as a financial contagion (Buch et al. 2019). Davydov, Vahamaa and Yasar (2020) examine how liquidity creation at the individual bank level helps mitigate systemic risk. It is found that the bank's liquidity creation contributes to strengthening the systemic linkage of individual banks however banks riskiness is negatively linked with liquidity creation. Laeven et al. (2016) discuss the relationship between bank size and the systemic risk as it is a hot topic since the most recent financial crisis and, thus, whether the bank capacity is a function of systemic risk or not. The study highlights several potential factors such as bank size and large banks are typically considered the centre of crisis. Moreover, systemic risk is also significantly associated with unstable funding and practice of more risky activities. Their study also advocates inverse relationship of bank capital and systemic risk. Thus, the combining effect of these factors are contributing more towards systemic risk and hence more predictive in assessing the bank performance, as compared to individual factor. Therefore, the simultaneous effects of these influencing measures are considered during study.

The empirical study by Ozsuca and Akbostanci (2016) evaluate the risk-taking nature of the banks over the decade of 2002-2012, specifically for Turkish banking system, and confirms the presence of risk-taking network of monetary policy. Their study concludes that large banks which have characteristics such as large size, more liquid and are well-capitalised are generally less risky and therefore add less to the systemic risk as compared to the smaller more volatile banks. The theoretical study of Calomiris et al. (2015) on liquidity risks of banks illustrate the need of liquid assets so that the risk of liquidity can be mitigated. The theory also identified that the stability of banks is the function of liquidity risk and credit. Roberts et at. (2019) find that banks that have implemented liquidity requirement such as LCR are more resilient than non-LCR complaint banks. Although LCR has a negative effect on liquidity creation, however, lower systemic risk consequently would allow greater bank lending in the long run. In an attempt to explore systemic risk exposures in the Chinese financial system, Fang et al (2018) advocate that the interconnectedness of financial institutions explains the systemic risk and is the major driver of the Chinese stock market crash of June 2015. They further argue that commercial banks appear less risky in turmoil periods whereas relatively riskier in tranquil periods when compared with other financial markets.

Another study in the same market by Wang et al. (2018) contends that, in a stress period, interconnectedness and systemic risk among the financial institutions is at their peak. To bring systemic risk at a prudent level, Acharya and Thakor (2017) discuss the role of macroprudential regulations in mitigating systemic risk that banks may be significantly prone to collective failure. The macroprudential assessment focuses on the systemic shortage of liquidity and capital with an aim to promote stability of the financial system. Their study finds that excessive leverage relative to the optimal level at individual bank level puts the financial system at greater systemic risk. Moreover, the likelihood of a bank run for liquidity reasons is higher not only for banks with a higher level of leverage but also when other bank portfolios are highly levered. Chen et al. (2018) distinguishes between bank-based and market-based financial systems to figure out the relationship between liquidity risk and bank performance. Based on a sample of commercial banks from advanced economies; macroeconomic, supervisory, and regulatory factors along with the availability of liquid assets and external funding are key forces that explain idiosyncratic liquidity risk. It further indicates the negative relationship between liquidity risk and bank performance in the case of a market-based system whereas no meaningful relationship in a bank-based system.

The transmission of liquidity into systemic risk through the balance sheet channel has been discussed in the literature. For instance, Zeldea (2020) demonstrates that cash, available for sale securities, and brokered deposits are statistically crucial in driving systemic risk. Their study set up a novel framework by first computing marginal expected shortfall for banks and embed it within a random forecast modelling setup. Zheng et al. (2019) discuss the relationship between liquidity creation in banks with failure risks conditional on bank capital for the U.S banks. It is argued that the relationship is significantly negative for small banks and the role of bank capital is highly pronounced during the GFC. Evidence of causes of bank fragility in the MENA region is documented by Ghemine et al. (2017). It is observed in their study that individual, as well as interactive effects of credit and liquidity risk, contribute significantly to bank stability however no time-lagged, as well as the contemporaneous relationship, exists between the liquidity and credit risks of the bank which is contrary to what is predicted by classic theories of the microeconomics of banking.

Andreou et al. (2016) argue that the managerial capacity of the banks is instrumental in the bank's liquidity creation and risk-taking behaviour. It is found that managers with higher skills typically create more liquidity and add more risk however de-leveraging balance sheets through liquidity reduction has been a common practice in periods of financial turmoil. Similarly, the effect of governance in liquidity creation has been observed by Diaz and Huang (2017). Bank liquidity is found to be the function of CEO education, compensation structure, ownership, and progressive practices. Acemoglu et al. (2015) explain the financial contagion in terms of transition phases. It is found the interconnectedness of financial institutions appear as a buffer for adverse but smaller shocks, however, after crossing certain threshold dense interconnectedness tends to amplify the negative shock and are appeared as the major force driving systemic risk.

Studies have also distinguished liquidity risk exposures between conventional and Islamic banking systems. The study of Jaara et al. (2017) emphasizes on the exposure of persuading factors of liquidity risks related to Islamic and conventional banks. Further, it aims on creating such a mechanism by which the liquidity risk could be mitigated, and a sound system could be developed in favour of aggressive risk management. The nature of Islamic banking is found as more prone to liquidity risk than conventional banks. This is because Islamic banks exhibit a distinct reliance on alternative financing modes, which, coupled with limited availability of short-term instruments, necessitates the use of specific liquidity management tools. These banks have established mechanisms and frameworks to effectively manage and mitigate liquidity risk, such as profit equalization reserves and Sharia-compliant liquidity management techniques. However, their susceptibility to liquidity risk is often perceived to be greater compared to conventional banks due to the unique features and adherence to Shariah principles in Islamic finance. The prohibition of interest-based transactions obliges Islamic banks to adopt alternative financial structures, including profit-sharing arrangements and trade-based transactions. This fundamental distinction curtails their access to conventional liquidity management tools, consequently amplifying liquidity risk (Ayub, 2009).

However, Zaheer and Farooq (2014) had contrasting findings. According to the researchers, Islamic banking branches are less prone to withdrawal risks in the face of liquidity stress and this impact remains constant after the introduction of an array of controls. Furthermore, Islamic operations appeared to attract more deposits than their conventional counterparts and this implied that religious branding was likely playing a role in this phenomenon. The authors additionally highlighted that Islamic banks were more likely to grant new loans when faced with liquidity crisis and that in some instances, their lending decisions are likely to be less sensitive to changes in deposits. The findings of these researchers suggested that a greater financial inclusion of faith-based cohorts via Islamic banking, for instance, might not only increase economic stability but banking stability. For drawing results, 204 banks of Middle East and North Africa region are selected for research and the approaches such as univariate and panel regression analysis are adopted. Moreover, the substantial differences of both the type of banking are addressed in the context of liquidity risk, and 92% of liquidity risk is due to financial crises, GDP, securities detained by banks, off-balance sheet items, banks' gearing and some others.

Boukhatem and Djelassi (2020) also examine the liquidity risks in the Saudi Banking system by using three specific indicators and compares its impact on Islamic and conventional banks over the period of 2008 to 2018. The methodology adopted for this study is least square dummy variable corrected. The study finds that the liquidity risks inherent somewhat different features across Islamic and traditional banking systems as well as across large and small banks. For instance, the financing-to-deposits indicator reveal that the funding gap is narrower for larger Islamic banks than smaller Islamic banks. Similarly, the funding structure of larger conventional banks are more fragile and unstable than that of larger Islamic banks. In addition, interbank ratio indicator identifies that Islamic bank are more dependent upon the interbank funding and net borrowing. While the last indicator i.e., liquidity-ratio indicator draws a fine line between Islamic and conventional banking in the context of capital. Thus, a contrary behaviour of both the banks are highlighted in the study. Louati, Abida, and Boujelbene (2015) inspect the nature of conventional and Islamic banking with respect to capital adequacy. The study is conducted over the period of 2005-2012, and on several countries of Middle East North Africa and South Asia. The study also reveals the inverse relationship of two main factors of conventional banks that are liquidity and credit risk.

Sukmana and Suryaningtyas (2016) explore the determinants of liquidity in the context of Indonesian traditional and Islamic banks. Mahdi and Abbes (2017) compare the relationship between capital, risk, and liquidity in the context of Islamic and conventional banking systems in the MENA region. It demonstrates the riskier nature of Islamic banks due to their involvement in relatively risky transactions such as Musharaka and Moudharaba as opposed to commercial operations. A similar study, carried out by Incekara and Cetinkaya (2019), brings Turkish evidence by comparing liquidity risk in conventional as well as in Islamic banks. It is found that non-performing loans, liquid assets, gross domestic product, and inflation are statistically meaningful in explaining the level of liquidity risk for Islamic banks whereas only non-performing loans and liquid assets are found significant for predicting liquidity risk as far as conventional banks are concerned.

On the contrary, Chakron and Gallali (2017) document relatively higher systemic risk for conventional banking system when compared with Islamic counterparts reflecting conventional banking system a real threat for the financial stability. However, Islamic banks tend to contribute significantly to systemic risk during financial turmoil. Market risk and size of the bank are primary factors that induce systemic risk that stem from Islamic banks particularly in the context of Middle Eastern countries. An interesting study by Shahzab et al. (2018) models the systemic, tail risk, and both upside as well as downside contagion effects of global Islamic indices including Dow Jones Islamic, Dow Jones Islamic Financial indices, Islamic indices from the USA, Japan, and the UK. It is observed that DJ Islamic World and US-based Islamic indices possess robust downside contagion effect and systemic risk exposure whereas DJ World financials and Japanese Islamic indices exhibit larger upside spillover effect.

Ongoing episodes of the financial crisis have highlighted the shortcomings of risk models. The literature has also been expanding in utilising a range of empirical methodologies for modelling systemic risk. A recent breakthrough is brought by Adrian and Brunnermeier (2016) by introducing the delta Conditional Value at Risk (CoVaR) approach to segregate systemic risk components. It takes differential between the value at risks of the financial institutions in two different states: in a state of financial distress and in a normal state. The advantage of the delta CoVaR approach is that it is the forward-looking systemic risk measure conditional on the balance sheet and macroeconomic variables. Other studies such as Sedunor (2016) endorses the outperformance of delta CoVaR methodology and assert that the measure is better than traditional systemic risk measures such as expected shortfall and Granger causality. Liu (2017) uses the CoVaR approach to model non-linearities of systemic risk and introduce regime-switching by means of Markov-switching quantile autoregression for the U.S large bank holding companies.

Karimalis and Nomikos (2017) introduce the copula based VaR and CoVaR to model systemic risk for portfolios of large European banks. Their study brings important conclusions. Firstly, liquidity risk is identified as the important determinant of systemic risk. Secondly, leverage and size contribute significantly to the systemic risk. Thirdly, macroeconomic variables such as industrial production, unemployment, stock market index, and GDP provide linkage between systemic risk and macroeconomy. Other notable studies that use CoVaR for modelling systemic risk in the context of China and the US are those conducted by Xu et al. (2018) and

Teply and Kvapilikova (2017) respectively. The intricated interdependencies among the sources of systemic risk are also modelled by Pourkhanali et al. (2016). Probability of defaults are obtained to assign credit ratings to the financial institutions and correlation structure among these rating classes are examined using canonical and D-vine copula. Their study concludes that second-tier financial institutions contribute the most to systemic risk. Dahir et al. (2017), using a two-step system GMM model, explores the relationship between liquidity risk, bank risk-taking, banking activities and funding liquidity risk for BRICS countries. It is found that the liquidity risk alters bank risk-taking behaviour and encourages more conservative holdings of the liquid asset as compared to the past.

Bai et al. (2018) construct a liquidity mismatch indicator to measure the gap between the liquidity of assets and liabilities that need to be funded to proxy the bank's liquidity risk. The results reveal that banks with higher liquidity mismatch have a more negative stock return as well as more positive stock return in subsequent crisis and non-crisis periods. Similarly, stocks of such banks earn a more negative return as well as more positive returns in the case of liquidity run. Shen et al. (2018) employ panel data instrumental regression approach to model liquidity risk and find that liquidity risk is negatively related to bank performance. Canadian evidence is brought by Li and Saiz (2016) which evaluate systemic risk in the network of financial market infrastructures by using extreme value methods. The methodology is to measure the probability of the tail event that two or more financial market infrastructures (FMI) have significant risk exposure to the same individual. The interdependence between FMIs is modelled by means of conditional probabilities that FMI has significant risk exposure to the entity given that other FMIs have a similar risk exposure on the same entity. Kleinow et al. (2017) compare four different methodologies to model systemic risk namely delta CoVaR, marginal expected shortfall, co-dependence risk and lower tail dependence. Results of their study conclude that different approaches lead to very different estimates of systemic risk which also vary with time however marginal expected shortfall appears most appealing.

Another strand of literature focuses on sophisticated data science approach to model risks as well as optimise predicting accuracy. The advantage of these approaches is that these approaches allow non-linearity, complexity, and spill over effects associated with various sorts of risks. Tavana et al. (2018) use artificial neural networks (ANN) and Bayesian networks (BN) to model liquidity risk. Using liquidity ratios, the two-phase ANN-BN approach is found self-confirming. Wang et al. (2021) use a machine-learning-based system to model systemic risk. In comparison to econometric and other machine learning approaches, the random forest classifier appears to be the most efficient classifier for simulating the expert voting process. Leo et al. (2019) reviews a growing literature pertaining to the application of machine learning approaches in banking risk management. It is concluded that there exists a huge gap and many aspects of risk management have remained unexplored with respect to machine learning applications. A similar study by Kou et al. (2019) also surveys existing methodologies as well as machine learning approaches such as big data analysis, sentiment, and network analysis for modelling systemic risk. Guijarro et al. (2019) uses sentiment analysis to assess liquidity risk. A natural language processing algorithm is used to extract sentiment from the Twitter microblogging service. It is found that investor's mood has little impact on the spread of the S&P 500 index. Bid-ask spread is among the most popular measures of liquidity risk.

The linkage between liquidity risk and credit cannot be neglected as far as systemic risk is concerned. As identified, both models of banking such as the financial intermediation perspective in Diamond and Dybvig (1983) or Bryant (1980), and the Monti-Klein framework suggest that the asset and liability structure of a bank are closely associated and especially with regard to fund withdrawals and borrower defaults. When financial institutions face liquidity constraints, their ability to extend credit or fulfill existing credit obligations may be impaired. Likewise, a decline in credit quality and an increase in default rates can diminish the value of assets held by financial institutions, thereby reducing their capacity to generate liquidity. Thus, understanding the intricate interconnections between liquidity risk and credit risk is imperative in effectively managing systemic risk. The recognition of the vital need to explore the relationship between liquidity risk and credit risk was significantly emphasized during the Global Financial Crisis (GFC) in 2008, where the inherent interdependence between these two risks became evident. The crisis vividly demonstrated how liquidity challenges and credit defaults originating from specific sectors of the financial system could swiftly spread, leading to extensive repercussions on overall financial stability.

One notable study emphasizing the connection between liquidity risk and credit risk is by Duffie and Zhu (2011). The authors analyze the feedback effects between liquidity risk and credit risk, emphasizing the importance of considering these risks jointly to understand systemic risk dynamics. Their research highlights the role of liquidity in amplifying the effects of credit shocks and the subsequent impact on overall financial stability. Furthermore, Acharya and Pedersen (2005) provide insights into the relationship between liquidity risk and credit risk. Their study highlights how liquidity shortages can lead to fire sales of illiquid assets, which further exacerbate credit risk and contagion effects within the financial system. The works of Brunnermeier and Pedersen (2009) and Adrian and Shin (2010) also contribute to the understanding of the intricate association between liquidity risk and credit risk. These studies investigate how liquidity constraints can lead to adverse feedback loops and systemic risk amplification, particularly during periods of financial stress.

By comparing systemic risk and bank size, Varotto and Zhao (2018) analyse common systemic risk indicators and introduce new superior systemic risk measures for the US and European banks. The new measure provides potential value addition to the Basel III framework. Khan et al. (2020) compare sophisticated risk models including dynamic panel probit model, hybrid artificial neural network, and Merton-KMV approaches to model credit risk in the non-financial sector of Pakistan. The hybrid neural network outperforms the other competing model. Using the hybrid neural network, Khan and Iqbal (2021) construct default risk factors to test its efficacy in Fama and French's (2015) five-factor model. O'Halloran and Nowacyzk (2019) use an artificial intelligence approach to model the effects of financial market regulation on systemic risk. It uses simulation technology accompanied by advances in graph and machine learning approaches to develop entire financial systems derived from the realistic distribution of bank data. In exploring machine learning's application in assessing credit risk, Bazarbash et al. (2019) discuss the strengths and weaknesses of machine learning tools. It brings at least four novel aspects firstly explaining common machine learning techniques in the non-technical language, secondly discuss challenges in credit risk modelling, thirdly income prospect prediction, and last but not least forecast modification in general conditions.

4.3.4. Research Hypotheses

Based on the existing theories and literature reviewed above, the following testable hypotheses have been formulated.

H_{1a}: *There is a reciprocal relationship between liquidity risk and credit risk, that is, liquidity risks influence credit risks and vice versa.*

H_{1b}: *Liquidity risk and credit risk jointly and individually contribute to bank stability.*

H_{1c}: *The overall bank liquidity creation reduces systemic risks for Islamic, Conventional and Hybrid banks.*

These hypotheses propose that credit and liquidity risk play a significant role in determining the stability of banks. Additionally, it is posited that the level of bank liquidity creation has a notable influence on the level of systemic risk present in the financial system. These hypotheses have been empirically tested to assess the extent to which credit and liquidity risk affect bank stability and how bank liquidity creation contributes to systemic risk

4.5. Research Methodology

4.5.1. Data Sample

For all banks, balance sheet information was obtained on a quarterly basis from FQ1 2015 until FQ1 2021, reported in USD using both Bloomberg Terminal as well as Refinitiv Eikon. The criteria for selection of the countries were chosen based on the Refinitiv Eikon Islamic Finance Development Indicator (IFDI) 2020, which measures Islamic finance development in various countries based on quantitative development, knowledge, governance, awareness, and corporate social responsibility activities within each country. The idea behind using IFDI as a criterion was to ensure the study captures all key countries within the Islamic finance market as well as provide a rich sample of Islamic banks and conventional banks operating within these markets. The ten countries used in this study include Malaysia, Indonesia, Bahrain, United Arab Emirates, Saudi Arabia, Jordan, Pakistan, Oman, Kuwait, and Qatar. This gave an initial panel data sample of 164 banks which was reduced to 134 banks and 3,350 observations after removing banks due to not serving within the commercial banking segment, either a wholesale bank or did not have consistent data for the required time frame. The data analysis is conducted using Stata software.

Countries	Conventional Banks	Conventional Hybrid Banks	Islamic Banks
Malaysia	0	7	2
Indonesia	19	15	1

Bahrain	3	0	5
United Arab Emirates	2	10	5
Saudi Arabia	1	3	6
Jordan	13	0	2
Pakistan	1	13	1
Oman	4	2	1
Kuwait	5	0	5
Qatar	4	1	3
Total	52	51	31

Table 16: Breakdown of Conventional, Conventional Hybrid and Islamic Banks based on countries

To avoid bias against both Conventional and Islamic banks. Bank type has been divided into three bank categories, namely Conventional Banks, Conventional Hybrid Banks and Islamic Banks. For a bank to be classified as Conventional Hybrid, one of the following criteria should be met. Firstly, the bank holds both Conventional and Islamic banking licenses from their national regulator to operate in both segments. Second, the Bank has an Islamic Banking unit or owns a subsidiary which provides Islamic Banking services. Thirdly, banks which have reported on their balance sheet owning Islamic banking assets and deposits, which also includes financing or investing in Musharaka, Mudaraba, Sukuk, Ijarah and Wakala Islamic Financing instruments. Using this criterion gives us 52 conventional banks, 51 conventional hybrid banks and 31 Islamic banks. Table 16 lists country by country breakdown of all three bank categories. The key variables used for this study are listed in Table 17 and are elaborated further in the subsequent sections.

Variables	Measures	Frequency
Bank Returns	$\frac{Last\ bank\ stock\ price\ _{t-1} - Current\ bank\ stock\ price_t}{current\ bank\ stock\ price_t} X\ 100$	Daily
Market Returns	$\frac{Last\ market\ price\ _{t-1} - Current\ market\ price_t}{current\ market\ price_t} X\ 100$	Daily
Credit Risk	Non-performing loans/ Total Loans	Quarterly

Liquidity Risk	[(Demand Deposits + Federal Funds Sold and Repo purchases+ Other inter-banking assets)-(Trading securities at FV+ Available for sale securities+ Cash due from other banks+ Federal Funds Sold under Repo agreement)]/Total Assets	Quarterly
Capital Adequacy Ratio (CAR)	Total regulatory capital to asset ratio	Quarterly
Loan Growth	Loan to asset Ratio	Quarterly
Net Interest Margin (NIM)	Net interest income to earning assets	Quarterly
Size	Log (Total Assets)	Quarterly
Liquidity	Deposit to Asset Ratio	Quarterly
Efficiency Ratio	Cost to income ratio	Quarterly
Financial Leverage	Debt to equity ratio	Quarterly
Return on Asset (ROA)	Net income/ Total assets	Quarterly
Return on Equity (ROA)	Net Income to equity ratio	Quarterly
Income Diversity	$(1 - \frac{Net\ interest\ income - other\ operating\ income}{Total\ operating\ Income})$	Quarterly
Inflation	Consumer Price Index	Quarterly
GDP	Real GDP Growth	Quarterly

Table 17 - Key variables used in this study

4.5.2. Measurement for credit, liquidity risk and bank stability

To test the first hypothesis $\mathbf{H_{1a}}$, we empirically examine the relationship between credit and liquidity risk as shown in equations 4.1 and 4.2 to first identify the general relationship between the two and identify whether a reciprocal relationship exists before measuring their individual and joint effects on bank default risk as shown in equation 4.4. Equation 4.1 seeks to investigate the relationship between credit risk and bank-specific variables and the macroeconomic variables of the country from which the bank is based. Equation 4.2, on the other hand, seeks to investigate the relationship between liquidity risk and bank-specific variables and the macroeconomic variables of the country from which the bank is based.

The empirical model used in this study to evaluate the relationship between credit and liquidity risk closely relates to studies conducted by Imbierowicz and Rauch (2014) and Ghenimi et al. (2017). Imbierowicz and Rauch (2014) observe the relationship between credit and liquidity risk using various proxy variables for credit and liquidity risk and employs a generalised structural equations approach to address concerns around potential endogeneity. To elaborate, endogeneity arises when an independent variable is correlated to the model's error term instead of being zero; this violation of the Gauss- Markov Theorem results in making the OLS regression estimation biased due to the reverse causality issue. To address this concern, we employ Panel Vector Auto-regressive (PVAR) model and GMM-style instrumental variables similar to Ghenimi et al. (2017).

*G*enerally, in VAR models, we consider the system of equations where the endogenous variables depend on their own and the lags of the other endogenous variables (in our case LR and CR), and then we can also include exogenous variables. In the panel VaR model, we also specify lag orders of dependent variables to be used as instruments. In our case, we have used lags of 1,2,3, and 4 for CR and LR as instruments. The lag number was chosen based on lag selection criteria.

$$CR_{i,t} = \beta_0 + \beta_1 CR_{i,t-1} + \beta_2 LR_{i,t-1} + \sum_{j=1}^{J} \beta_j \, Bank_{i,t}^{j} + \sum_{l=1}^{L} \beta_l \, Macro_t^{l} + \varepsilon_{i,t} \qquad (4.1)$$

$$LR_{i,t} = \beta_0 + \beta_1 LR_{i,t-1} + \beta_2 CR_{i,t-1} + \sum_{P=1}^{P} \beta_P \, Bank_{i,t}^{P} + \sum_{Q=1}^{Q} \beta_Q \, Macro_t^{Q} + \varepsilon_{i,t} \qquad (4.2)$$

Where i indicates for bank $i = 1 \ldots.., N$, t stand for the time in quarters $t = 1 \ldots.., T$. β_0 is the intercept. $CR_{i,t}$ and $LR_{i,t}$ represents credit risk and liquidity risk at bank i at time t. $Bank_{i,t}^{j}$ and $Bank_{i,t}^{P}$ is a vector of bank-specific variables consisting of ROA representing a measure of profitability based on banks assets, ROE representative profitability from the Investors' viewpoint, CAR signifying the total capacity of regulatory buffer a bank holds for risk management and mitigation purposes, log of total assets represents the size of a bank, Net Interest Margin (NIM) highlighting net income generating by banks' just from interest charges, Financial Leverage (Lever) demonstrating banks' risk appetite, Loan assets growth representing riskiness, Efficiency Ratio for the propose of gauging the management ability to utilize assets efficiently, Income diversity for accessing the banks income stability from other activities. Likewise, $Macro_t^l$and $Macro_t^Q$is a vector of macroeconomic variables such as GDP and Inflation. The selection of these variables has been well established on previous studies conducted in the spheres of both credit and liquidity risks by Bonfim (2009); Munteanu (2012); Imbierowicz and Rauch (2014): Kabir et al. (2015); Ghenimi et al. (2017); Lassoued (2018); Hassan et al. (2019); Mohammad et al. (2020); Gupta and Kashiramka (2020); Pham (2021).

$$Z - Score_{it} = \frac{CAR_{it} + ROA_{it}}{\sigma ROA_{it}} \quad (4.3)$$

To gauge banking stability, numerous models have been used in previous studies which rely on market-based information as well as accounting-based information. For instance, Kabir et al. (2015) studied both models Merton DD which uses market-based information and Z-score, using accounting-based information. However, it should be noted that the Merton DD uses bank stock price as a main input and relies on certain assumptions which are not practical in nature (Kabir et al., 2015). For instance, the assumption that the market remains liquid and trades continuously was not true during the GFC. Moreover, the stock price does not accurately reflect all the accounting information within an illiquid market. An alternative common measure used to measure the safety and soundness of a bank is using Z score using balance sheet information. Multiple studies use Z-score to measure bank stability, including studies conducted by Imbierowicz and Rauch (2014), and Ghenimi et al. (2017). Likewise, Chiaramonte et al. (2016) compare both DD and Z-score measures, highlighting that Z-score can accurately predict 74% of bank failures and is the main underlying determinant for the DD model. Moreover, the prediction power of the Z-score model remains stable for the three-year ahead window. To measure the stability of banks, this study also employs Altman Z-score (Altman, 1968) as a predictor of bank stability. Z-score is measured using CAR and ROA divided by the standard deviation of ROA of bank i at the time t as shown in equation 4.3. The higher the value of the z-score, the more stable the bank is said to be; similarly, the closer the z-score value to zero, the riskier and more unstable a bank is deemed to be.

$$
\begin{aligned}
Z - Score = {} & \beta_0 + \beta_1 Z - Score_{it-1} + \beta_2 Liquidity\ Risk_{it} + \beta_3 Credit\ Risk_{it} \\
& + \beta_4 Liquidity\ Risk * Credit\ risk\ _{it} + \beta_5 Size_{it} + \beta_6 ROA_{it} + \beta_7 CAR_{it} \\
& + \beta_8 Loan\ Growth_{it} + \beta_9 efficency_{it} + \beta_{10} Income\ Diversity_{it} + \beta_{11} Inf_t \\
& + \beta_{12} GDP_t + \varepsilon_{it} \qquad (4.4)
\end{aligned}
$$

After measuring the bank stability using Z-score to assess the impact of credit and liquidity risk independently as well as jointly on bank stability, the study employs the Z-score as the dependent variable to test our second Hypothesis $\mathbf{H_{1b}}$. This model seeks to address the aim and second objective of this study, where β_0 is the intercept, which is to be estimated, $Z - Score_{it-1}$ is lagged by one to ensure it captures the stability of bank consistently over time. $Liquidity\ Risk_{it}$ and $Credit\ Risk_{it}$ is the gauges independent impacts of liquidity and credit risk on bank stability. The interaction term of Liquidity and credit risk asses the joint impact of both risks on bank stability. $Size_{it}$ is log of total assets, ROA_{it} is the return on asset calculated as net income divided by total assets, CAR_{it} is Capital adequacy ratio, $Loan\ Growth_{it}$ is loan growth calculated as growth on a quarterly basis to annual growth in the prior year, $efficency_{it}$ is the efficiency ratio, $Income\ Diversity_{it}$ is income diversity. Inf represents changes in consumer price index, GDP is the GDP growth, $\varepsilon_{it}$is standard error term. $\beta_1, \dots\dots, \beta_{14}$are parameters to estimated using the dynamic general method of moments (GMM) estimator by Blundell and Bond (1998). The variables used in this regression have been established in the strand of previous literature on bank credit risk, bank liquidity risk and Bank stability, for instance Cole and Gunther (1995), Acharya and Viswanathan (2011), Cole and White (2012), He and Xiong (2012b), and Liu et al. (2021) for balance sheet related variables; Thomson (1992) and Aubuchon and Wheelock (2010) for the macroeconomic variables.

4.5.3. Measuring Bank Liquidity Creation

To answer the second research question of this study, it is important to measure bank liquidity creation before measuring systemic risk impact on bank liquidity creation. Hence, to measure bank Liquidity creation of banks, we use pioneering work conducted by Berger and Bouwman (2009) BBLC measure, as shown in *Appendix D,* as our main foundation to measure bank liquidity creation. However, one key challenge around implementing such a measure within our study was that the work of Berger and Bouwman (2009) does not necessarily address concerns about the different risk exposures around conventional and Islamic banking systems, given that certain financial instruments are prohibited underpinned by Islamic Finance theory and the concept of riba (interest) does not exist as per PLS theory. Additionally, Berger and Bouwman (2009) are based on US banks rather than a wider cross-country study. Nonetheless, these concerns have been addressed in their subsequent study, which measures liquidity creation among conventional and Islamic banks by slightly modifying the previous classification of balance sheet items (Berger et al., 2019). Though, their estimation seems rather biased towards conventional banks as they do not study banks which operate in both conventional and Islamic banking segments and cannot be classified as either fully-fledged conventional or Islamic banks. Hence, we address this bias by studying banks which operate in both segments as conventional hybrid banks.

To compute bank liquidity creation for each quarter, we largely adhere to Berger and Bouwman's (2009) three steps cat-fat process. In the first step, we assign all on and off-balance sheet items into three categories liquid, semiliquid and illiquid, as shown in Table 18. For the assets side of the balance sheet, this categorization accounts for the ease, cost and time required to dispose of these assets to meet liquidity demand. For liabilities and equity, consideration is given to the ease, cost and time required for a customer to obtain their liquid funds. As for off-balance sheet items, these are classified as on-balance sheet items. However, given that our sample represents a mix of high- and low-income economies, we modify the classification of real estate loans and consumer loans as the classification differs within these countries between being illiquid assets for low-income countries and semi-liquid for high-income countries (Berger et al., 2019). Hence, we use World Bank Atlas Method for classifying low- and high-income economies. Based on their methodology, countries which are classified in the High-income group include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. Similarly, countries classified as low-income economies include Indonesia, Malaysia, Pakistan, and Jordan.

Assets		
Illiquid assets (weight=1/2)	**Semiliquid assets (weight=0)**	**Liquid assets (weight=-1/2)**
Residential real estate loans (Low-income countries)	Residential real estate loans (High-income countries)	Reserve Repos and Cash Collateral

Other Consumer/Retail Loans (Low-income Countries)	Other Consumer/Retail Loans (High-income Countries)	Trading Securities and at FV through Income
Other Mortgage Loans	Loans and Advances to Banks	Available for Sale Securities
Commercial real estate loans (Mudaraba, Musharaka, Murabaha)		Held to Maturity Securities
Other Loans		At-equity Investment in Associates
Investment in Property		Other Securities
Other Earning Assets		Cash and Due from other Banks
Fixed Assets (Ijara)		
Goodwill		
Other Intangibles		
Deferred Tax Assets		
Discontinued Operations		
Other Assets		
Liabilities and equity		
Liquid liabilities (weight=1/2)	**Semiliquid liabilities (weight=0)**	**Illiquid liabilities and equity (weight= -1/2)**
Customer Deposits (Amanah, Mudaraba and Musharaka)	Other Deposits and Short-Term Borrowing	Long term debt
Deposits from Banks		Credit Impairment Reserves
Repos and Cash Collateral		Reserves for Pension
Trading liabilities		Deferred Tax Liabilities
		Other Liabilities
		Pref. Shares and Hybrid Capital
		Common Equity
		Non-Controlling Interest
Off-balance sheet guarantees		
Illiquid guarantees (weight=1/2)	**Semiliquid guarantees (weight=0)**	**Liquid guarantees (weight= -1/2)**

Guarantees	Other Off-Balance Sheet Exposure to Securitizations	Prohibited by Gharar
Acceptances and Documentary Credits Reported Off-Balance Sheet		
Committed Credit Lines		
Other Contingent Liabilities		

Table 18 - Bank Liquidity Creation Measurement Construction

The second step of bank liquidity measurement encompasses assigning weights to all the balance sheet items classified in the first step consistent with liquidity creation theory which highlights that liquidity is created when a bank finance illiquid asset with liquid liabilities; hence positive weights of $1/_2$ are allocated to both illiquid assets and liquid liabilities. To elaborate further, this effectively implies a transformation of \$1 of illiquid assets in the form of commercial loans into \$1 of liquid liabilities in the form of deposits (Amanah), generating \$1 for the public. In contrast, banks destroy liquidity by using liquid assets (e.g., cash) and illiquid liabilities (e.g., Debt) to finance liquidity liabilities. Hence negative weights of $-1/_2$ are placed on both liquid assets and illiquid liabilities categories. All items falling under the semiliquid category are kept neutral, assigning a weight of 0. Off-balance sheet items such as guarantees and credit lines act similarly on balance sheet items but are allocated a positive weighting as they provide customer access to liquid funds similar to deposits in the forms of Amanah or commercial real estate loans such as Murabaha.

$$Catfat = \Big[\frac{1}{2}(illiquid\ assets + liquid\ liabilites + illiquid\ gurantees) + 0(semiliquid\ assets + semiliquid\ liabilites + semiliquid\ \ gurantees) - \frac{1}{2}\ (liquid\ assets + illiquid\ liabilites + equity + liquid\ gurantees)\Big] /Total\ Assets \qquad (4.5)$$

In the third step, we construct liquidity creation measure by multiplying the weights allocated to liquid, semiliquid and illiquid classification to assets, liabilities, equities, and off-balance sheet items. The study conducted by Berger et al. (2019) also shows that bank liquidity creation can be further separated into total liquidity creation, asset side liquidity creation, liabilities side liquidity creation and off-balance sheet liquidity creation by summing up the weighted dollar term value in the respective categories. However, for the sake of simplicity, we illustrate the total cat-fat measure in equation 4.5 as computed by the studies conducted by Zhang et al. (2019). The compressed used by equation Zhang et al. (2019) provides total bank liquidity creation. However, we have modified the equation by removing liquid derivatives and guarantees as they are prohibited in Islamic banking, also specified by Berger et al. (2019) in their international bank liquidity creation construction. The final value of total bank liquidity creation is divided by total assets for normalization purposes to avoid the regression results being biased towards large banks.

4.5.4. Composition of systemic risk with bank liquidity creation

In order to examine the link between systemic risk and bank liquidity creation as per our third Hypothesis $\mathbf{H_{1c}}$. We first have to estimate systemic risk, given that we have already estimated bank liquidity creation in the previous section. To gauge the sensitivity of banks' systemic risk towards financial shock within the market, naturally measuring the coefficients of a linear relationship between indicators of one bank and the financial system would have been a way forward. However, banking literature on systemic risk refers to large shocks within the financial system as compared to minor changes within the financial system; these events do not take place every day. They are often referred to as high severity low-frequency events or, alternatively, tail events (Fahlenbrach et al., 2012). Hence to estimate extreme shock within the financial system, we follow Van Oordt and Zhou (2018) approach using daily bank stock data and market index data and regressing daily bank returns against market returns conditional to extreme shocks.

$$R_i = \beta_i^T R_m + \varepsilon_i, for\ R_m < -VaR_\alpha \ (4.6)$$

Where R_i denotes bank returns and R_m denotes to market returns on a daily basis within a financial system. Likewise, coefficient $\beta_i^T$is a measure of systemic risk bank i and T in the coefficient is an index of the relationship between bank i and the financial system in an event of extreme shock. VaR_α is Value at Risk, which is defined as the loss of dollar investment within the market exceeding the probability α. Given that β_i^T is regarded as systemic risk measure which means that banks with higher β_i^Tcoefficient are expected to suffer from higher capital losses in an extreme shock taking place within the market. Systemic risk is computed with α set at 5 per cent, which would naturally attract extreme events; however, this will result in a much smaller observation sample and using conventional OLS regression will not be an effective method. Hence, to address this issue, similar to Van Oordt and Zhou (2016); Van Oordt and Zhou (2018); Davydov et al.(2021), we use Extreme Value Theory to estimate systemic risk; as this approach also has a much smaller mean square error in comparison to OLS regression (Van Oordt and Zhou, 2018). Hence β_i^T can be rewritten as

$$\beta_i^T = \lim_{\alpha \to 0} \tau_i(\alpha)^{1/\xi_m} \frac{VaR_i(\alpha)}{VaR_m(\alpha)} \quad (4.7)$$

Where VaR_i and VaR_m is the value at risk of the bank R_i and market R_m with the probability of α. ξ_m is the market tail index and $\tau_i(\alpha)$ is the tail dependency between bank returns and market returns expressed as:

$$\tau_i(\alpha) = \Pr\left(R_i < -VaR_i(\alpha) \mid R_m < -VaR_m(\alpha)\right. \quad (4.8)$$

To estimate the market tail index, we implement Hill's Estimator (Hill, 1975), which has been widely used for tail index estimation literature by Schmuki (2008); Jia (2014); Van Oordt and Zhou (2016); Davydov et al.(2021) to estimate market tail index ξ_m. Hill estimator is empirically expressed as

$$\frac{1}{\xi_m} = \left(\frac{1}{n}\sum_{i=1}^{n} log \frac{R_{m,T}}{R_{m(n+1)}}\right)^{-1} \quad (4.9)$$

Where $R_{m,(1)} \geq R_{m,(2)} \geq R_{m,(3)} \geq \ldots\ldots \geq R_{m,(T)}$ is order of statistics of sample T of identically independent distributed realized non-negative market returns R_m. Likewise, n denotes upper-order statistics, often referred to as the number of threshold values representing extreme events counted in tail distribution. Studies conducted by Van Oordt and Zhou (2018) and Davydov et al.(2021) agree that all components of systemic risk can be estimated using existing estimators of EVT. Hence systemic risk β_i^T by combing all components where T is the total observations of bank and market returns and n as the worst stock returns expressed as

$$\beta_i^T = \tau_i \left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}} \frac{VaR_i(n/_T)}{VaR_m(n/_T)} \quad (4.10)$$

Where β_i^T is a measure of systemic risk, $\frac{1}{\xi_m}$ is the market tail index estimated using equation 4.10, $\tau_i(\frac{n}{T})$ is parameter of tail dependency estimated nonparametric approach essentially measuring $(n+1)$ the highest loss on bank returns. In other words, this component measures the tail dependence between bank and the market (Van Oordt and Zhou, 2016). In other words, this component measures the concentration of links between the bank and the market during extreme shocks. Fluctuations in this component are primarily due to changes in banks i in computing tail dependencies. Likewise, $\frac{VaR_i(^n/_T)}{VaR_m(^n/_T)}$ is the ratio of VaR_i bank i and VaR_m market index m. VaR_m primarily remains consistent for all bank, changes to market VaR_m is based on the difference change in bank tail risk VaR_i. This computation essentially measures bank tail risk but does not consider whether bank tail risk can be associated to extreme shocks within the market m. A linear additive link is acquired by taking log of systemic risk β_i^T, systemic linkage $\tau_i\left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}}$, and bank tail risk $\frac{VaR_i(^n/_T)}{VaR_m(^n/_T)}$ similarly to Davydov et al. (2021) and is empirically stated as

$$Ln\,(\beta_i^T) = Ln\,\tau_i\left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}} + Ln\frac{VaR_i(^n/_T)}{VaR_m(^n/_T)}$$
$$\approx log(Systemic\ Linkage) + \log(Tail\ Risk) \quad (4.11)$$

$$Ln\big(Risk_{i,t}\big) = \beta_0 + \beta_1 Catfat_{i,t-1} + \gamma_s(Bank - Specific\ Variables)_{i,t-1}$$
$$+ \phi Country\ FE_{i,t} + \omega Time\ FE_{i,t} + \varepsilon_{i,t} \qquad (4.12)$$

To evaluate the association between systemic risk and bank liquidity, we use the panel fixed effect model for estimation. Where the dependent variable is $Risk_{i,t}$ is the log systemic risk, systemic risk and tail risk for bank i at time t. Like Van Oordt and Zhou (2018), we also ignore all observations of systemic risk, which equates to zero to preserve liner additive linear relationship. β_0 is the intercept, bank liquidity creation measure of $Catfat$ is computed using equation 4.5. Bank-specific variables used in this model include CAR as measure of regulatory capital, ROA as a measure of profitability, deposit-to-asset ratio as a measure of liquidity, Non-interest income as a measure of income diversification, NPLs as a measure of credit risk and bank size; these variables has been in the existing literature on systemic risk and bank liquidity creation (Jia, 2014; Van Oordt and Zhou, 2016; Van Oordt and Zhou, 2018; Zhang et al.,2019; Davydov et al., 2021). Country-fixed effects were used to control for country-specific averages. We also include time-fixed effects in our model to address time-specific idiosyncratic factors that can influence systemic risk. Additionally, ε represents standard error for bank i at time t. The above approach discussed aims to answer the second research question, research aim and third research objective of this study.

4.6. Data analysis and results

4.6.1. Interactions between Credit and Liquidity risks and its impact on Bank stability

Variable	Obs.	Mean	Std. Dev.	Min	Max
CR	3,300	4.27	3.76	-9.51	37.87
LR	3,276	0.05	0.18	-0.65	0.78
CR*LR	3,246	0.13	0.94	-8.80	4.91
Z-Score	3,305	76.62	72.47	-208.15	865.52
ROA	3,330	1.04	1.11	-11.18	4.32
ROE	3,330	8.64	10.24	-132.53	37.37
CAR	3,305	18.77	6.55	-30.22	73.40
LnTA	3,330	9.11	1.54	4.79	12.55
NIM	3,330	3.50	1.68	-1.48	14.09
Lever	3,330	10.03	23.39	-2.09	867.09

Table 19: Descriptive Statistics

Table 19 above highlights descriptive statistics for all the variables used in equation first four equations of this chapter. A few data points which were missing were estimated using linear interpolation. Banks with no data at all were excluded from our analysis. Like Ghenimi et al. (2017) we also employ panel vector auto-regression (PVAR) developed by Love and Ziccchino (2006) since we are not sure whether credit risk influences liquidity risk or vice versa. Hence to gauge this influence between credit and liquidity risk, PVAR is implemented. We begin with choosing the appropriate lag order in the PVAR models by employing different moments and model selection criteria (MMSC) developed by Andrews and Lu (2001), particularly, Bayesian information criterion (MBIC), Akaike's information criterion (MAIC), and Hannan and Quinn information criterion (MQIC) are applied. Based on the three model-selection criteria, the lag order is preferred when it has the smallest MBIC, MAIC, and MQIC. The results reveal that the three statistics suggest different lag orders. Considering that for the first 2 lag orders, panel VAR models reject Hansen's over-identification restriction at the 5% alpha level, indicating possible misspecification in the model; thus, we chose lag 4 according to MAIC criteria.

lag	*CD*	*J*	*J p-value*	*MBIC*	*MAIC*	*MQIC*
1	0.98	46.50	0.00	-73.99*	14.50	-18.10
2	0.97	21.19	0.05	-69.19	-2.81	-27.27*
3	0.93	10.70	0.22	-49.54	-5.30	-21.60
4	0.91	1.37	0.85	-28.76	-6.63*	-14.78
No. of Obs = 1,865; No. of panels = 132						

Table 20: Lag selection criteria for PVAR

After checking the stability of the models and ensuring that all inverse roots of the companion matrix lie inside the unit circle so that the models are stable, as shown in Figure 17, we conduct impulse response analysis of the total sample as well as based on the type of bank type. The estimation output is in Table 21 (column 1), and the impulse response analyses are displayed in Figures 18 to 21. The results reveal that although credit and liquidity risks respond positively to the other's shock, still the response is not significant. Thus, there is no significant cross-relationship between liquidity risk and credit risk. Therefore, the causal relationship between liquidity risk and credit risk do not indicate any considerable co-movement. The results are mainly robust to the changes in bank types (see the columns (2)-(4) of table 21), although for hybrid and Islamic banks, we further lose significance, the general conclusion of no causal association between the two risk measures is observed. The same conclusions are also achieved with the Granger causality test (table 22), where we fail to reject the null hypothesis that CR and LR do not Granger cause each other.

VARIABLES	**(1) Full**		**(2) Conventional**		**(3) Hybrid**		**(4) Islamic**	
	CR	LR	CR	LR	CR	LR	CR	LR
L.CR	0.554***	0.00639	0.584***	0.00957	0.295	0.00449	1.335	-0.147
	(0.143)	(0.00616)	(0.176)	(0.0107)	(0.221)	(0.00897)	(3.684)	(0.674)
L2.CR	0.189*	0.00153	0.141	-0.00199	0.150	0.00741	0.122	-0.0104
	(0.106)	(0.00321)	(0.0991)	(0.00650)	(0.168)	(0.00723)	(0.332)	(0.0444)
L3.CR	0.00132	-0.00183	-0.000608	-0.00611	0.0473	0.00429	0.125	0.00734
	(0.0998)	(0.00246)	(0.0848)	(0.00615)	(0.155)	(0.00764)	(0.227)	(0.0300)

L4.CR	0.140*	0.00154	0.166	0.00809	0.337**	-0.00111	-0.365	0.0619
	(0.0849)	(0.00234)	(0.194)	(0.0129)	(0.139)	(0.00511)	(1.522)	(0.274)
L.LR	0.917	0.414***	4.613	0.327	0.456	0.463***	-0.512	0.466
	(0.655)	(0.0628)	(4.984)	(0.363)	(1.200)	(0.132)	(3.406)	(0.626)
L2.LR	0.178	0.266***	1.735	0.311*	-0.180	0.200**	1.051	-0.0122
	(0.455)	(0.0514)	(2.560)	(0.183)	(0.623)	(0.0909)	(3.846)	(0.676)
L3.LR	0.0664	-0.0962**	1.124	-0.239***	-0.444	0.0147	-0.0454	-0.0616
	(0.513)	(0.0439)	(0.918)	(0.0898)	(0.804)	(0.0812)	(1.235)	(0.195)
L4.LR	0.189	0.239***	1.395	0.189	-0.886	0.225***	-0.125	0.419
	(0.581)	(0.0429)	(1.729)	(0.126)	(0.765)	(0.0795)	(3.785)	(0.660)
ROA	0.0773	-0.00400	-1.636	-0.0150	-1.136	-0.0638	0.0880	0.0198
	(0.372)	(0.0194)	(1.424)	(0.100)	(0.980)	(0.0728)	(0.427)	(0.0656)
ROE	-0.0553	0.000135	0.140	0.00302	0.0959	0.00874	-0.00978	-0.00560
	(0.0496)	(0.00288)	(0.131)	(0.00927)	(0.132)	(0.00941)	(0.121)	(0.0218)
CAR	0.0284	-0.00141	0.0762	-0.00226	0.00853	-0.00201	-0.00523	0.00350
	(0.0245)	(0.00159)	(0.0650)	(0.00404)	(0.0391)	(0.00572)	(0.0736)	(0.0135)
LnTA	-1.021	-0.0193	-1.578	0.0587	0.128	0.0587	-1.116	0.317
	(1.337)	(0.0812)	(3.694)	(0.238)	(1.090)	(0.115)	(8.128)	(1.495)
NIM	-0.00777	-0.00718	0.314	0.00296	0.250	0.0340	-0.233	0.0398
	(0.185)	(0.0107)	(0.370)	(0.0235)	(0.622)	(0.0453)	(1.004)	(0.183)
Lever	-0.00384	-0.000666	0.697	0.000868	0.538	0.0973	0.0189	-0.00149
	(0.0713)	(0.00348)	(0.724)	(0.0531)	(1.733)	(0.123)	(0.0448)	(0.00834)
Loan	0.106	-0.0102	0.0349	-0.0337	-1.373	-0.000976	-0.254	0.0931
	(0.132)	(0.00785)	(1.012)	(0.0661)	(0.990)	(0.0968)	(2.523)	(0.457)
EffRatio	0.000641	-5.84e-06	0.000375**	-9.75e-06	0.00143	-0.000127	-0.00139	-0.000172
	(0.000390)	(1.26e-05)	(0.000148)	(1.26e-05)	(0.00178)	(0.000200)	(0.00305)	(0.000575)
IncomeDiv	-0.000549	2.36e-05**	-0.00133***	1.19e-06	-0.00258**	5.58e-05	0.000298	1.40e-05
	(0.000513)	(1.06e-05)	(0.000137)	(7.84e-06)	(0.00113)	(0.000125)	(0.000232)	(4.48e-05)
GDP	-0.0208*	0.000127	0.0119	0.000713	-0.0197	-0.000753	0.0151	-0.00303
	(0.0119)	(0.000722)	(0.0276)	(0.00208)	(0.0177)	(0.00142)	(0.0650)	(0.0111)

Inflation	-0.0519	0.000955	0.0655	0.00338	-0.112	-0.00643	-0.0260	0.000577
	(0.0467)	(0.00355)	(0.0613)	(0.00536)	(0.0711)	(0.00955)	(0.150)	(0.0252)
Observations	2,217	2,217	868	868	917	917	432	432
Standard errors in parentheses								
***** p<0.01, ** p<0.05, * p<0.1**								

Table 21 : PVAR Estimation Results for interactions between credit and liquidity risks

Equation	*Excluded*	*chi2*	*df*	*Prob>chi2*
CR	LR	2.342	4	0.673
	ALL	2.342	4	0.673
LR	CR	2.359	4	0.67
	ALL	2.359	4	0.67
Ho: excluded variable does not granger cause equation variable, H1: excluded variable causes granger-cause equation variable				

Table 22: PVAR Granger causality Wald Test

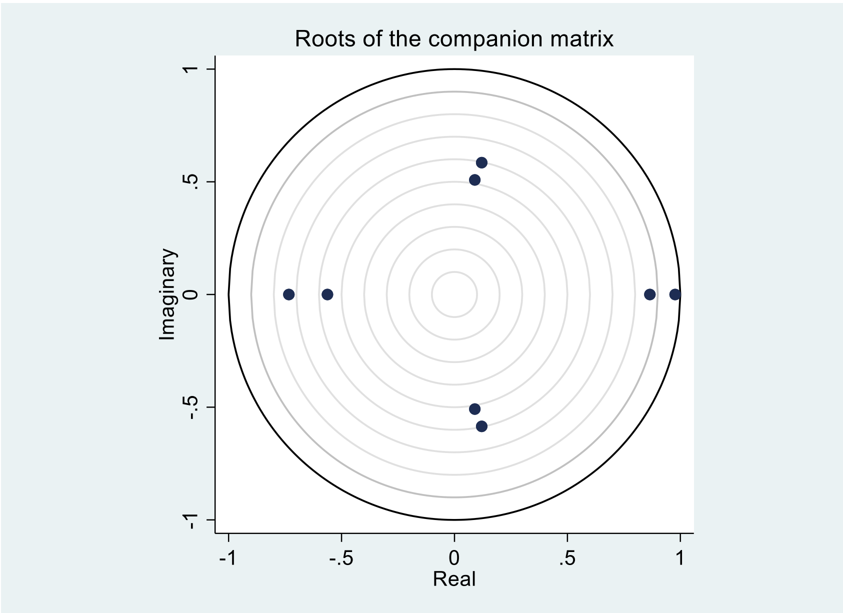

Figure 17: VAR stability test (Source: authors analysis)

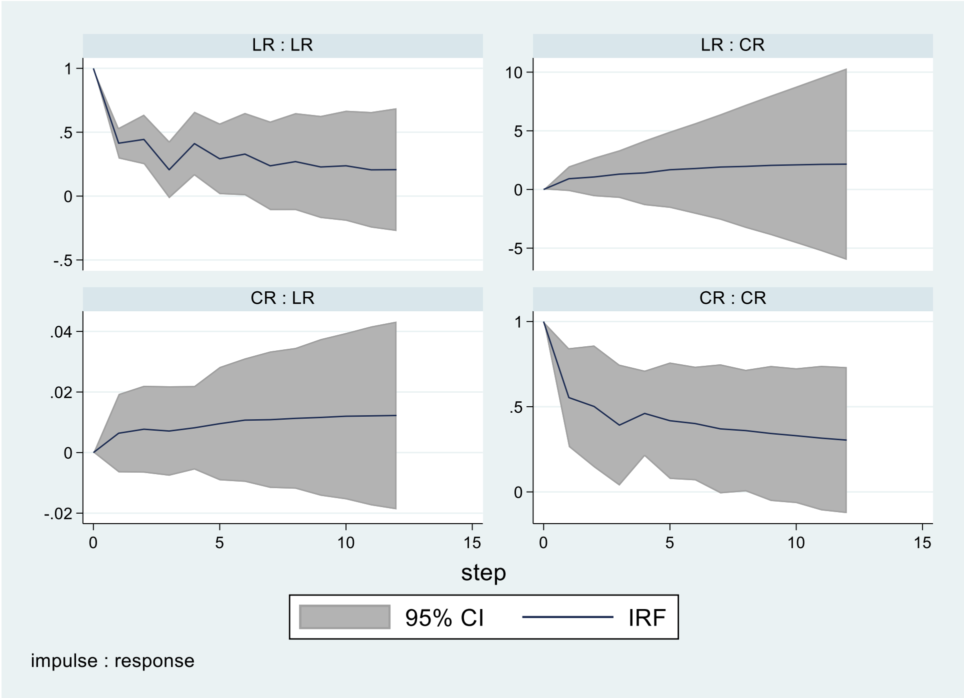

Figure 18: Impulse response function between credit risk and liquidity risk for all banks (Source: authors analysis)

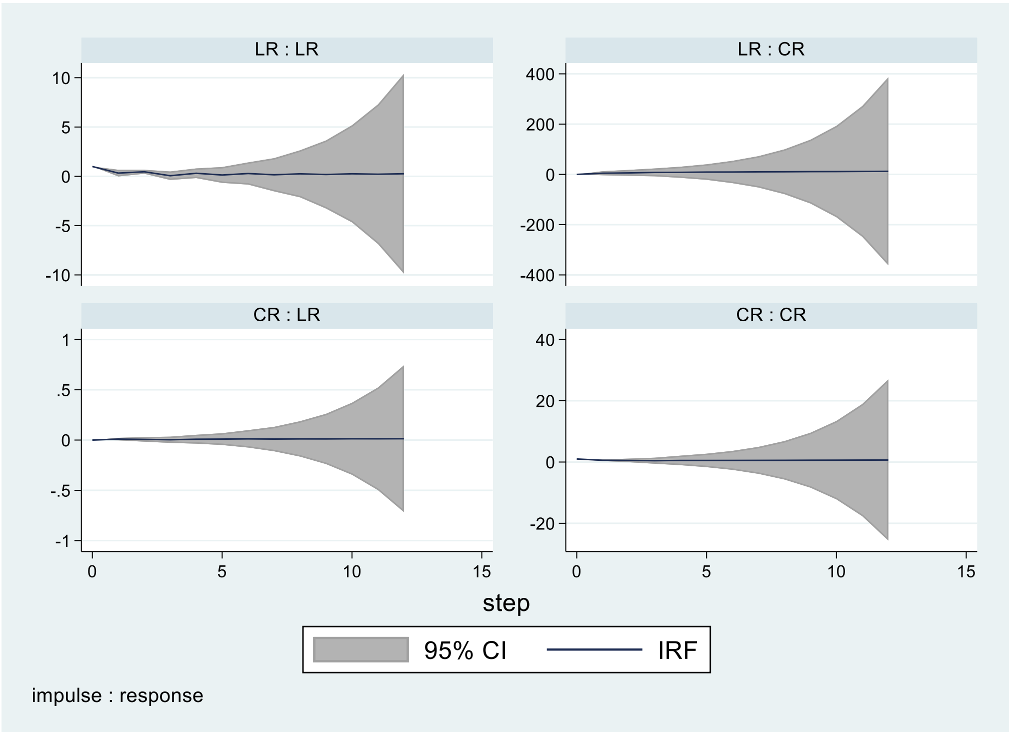

Figure 19: Impulse response function between credit risk and liquidity risk for conventional banks (Source: authors analysis)

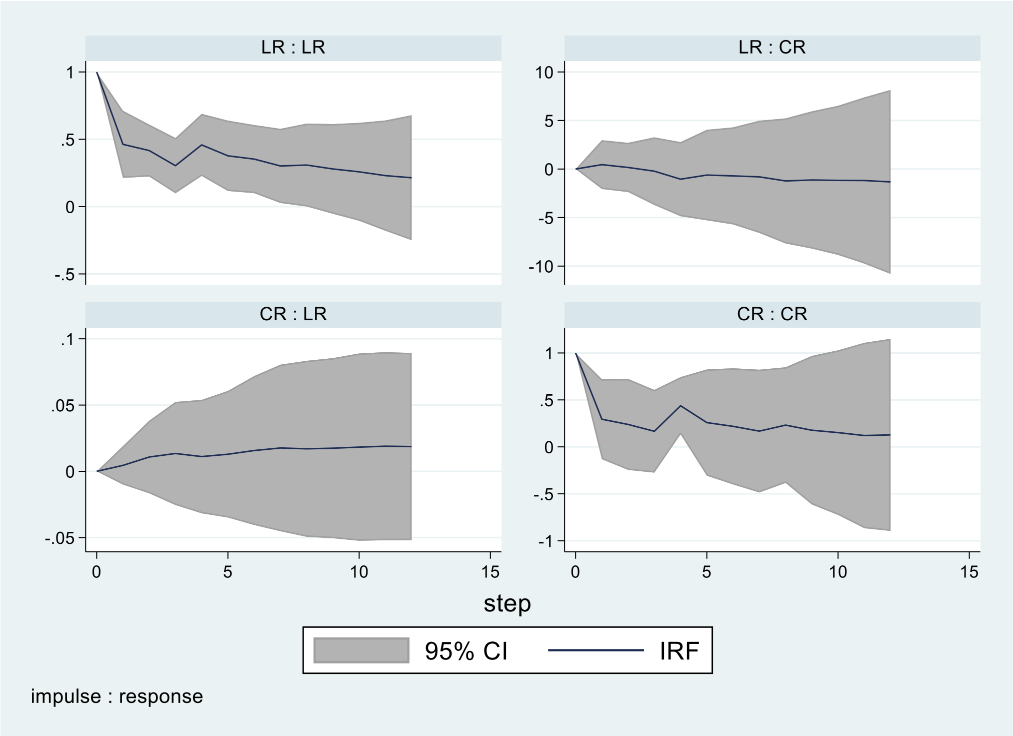

Figure 20: Impulse response function between credit risk and liquidity risk for hybrid banks (Source: authors analysis)

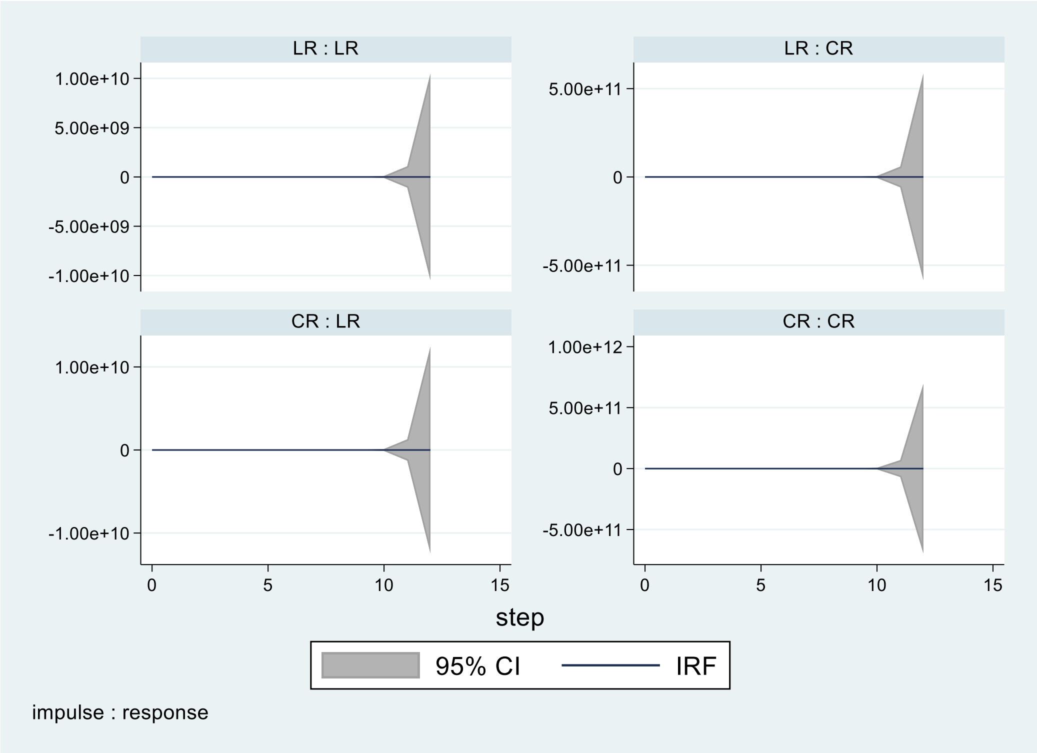

Figure 21: Impulse response function between credit risk and liquidity risk for Islamic banks (Source: authors analysis)

Table 23 summarizes the results for the Z Score model from equation 4.4. First, the results of the full model (column (1)) show that for the specification test of AR (2) we fail to reject the null hypothesis, which implies that the empirical model has been correctly specified because there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments used in the models are valid. In addition, in Hansen J-statistic test we again fail to reject the null hypothesis that over-identifying restrictions are valid, and hence the model specification is correct. The lagged dependent variable Z-score is highly significant and positive, showing that about 71% of the movement in ZScore has a dynamic character.

We also observe a significant impact of credit risk and liquidity risk. Higher credit risk and higher liquidity risk (inverse of liquidity ratio) significantly increase the possibility of bankruptcy. The coefficient of the interaction term for the two is also significant and negative, suggesting that there is a joint and negative influence of the interaction between liquidity risk and credit risk on banking stability.

For the other control variables, loan growth, size and efficiency have a significant negative effect on banking stability. Therefore, it may be interpreted as the ability of banks to attract new deposits, good managerial qualities and, a fortiori, a low probability of default. Also, small banks and those with lower managerial efficiency are more exposed to it. Positive coefficients are found for ROA and CAR, which means that more profitable banks with more capital are less exposed to risk. The income diversity is not significant. The results are robust among the sample of different bank types (columns (2) – (4)).

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
L.ZScore	0.710***	0.788***	0.513***	0.713***
	(0.00138)	(0.00500)	(0.0163)	(0.0842)
CR	-0.498***	-0.432*	0.123	-1.121
	(0.0302)	(0.254)	(0.152)	(0.757)
LR	4.139***	23.64***	-5.218**	-7.330
	(0.305)	(3.703)	(2.359)	(13.07)
CR_LR	-0.540***	-3.009***	0.924**	-0.303
	(0.0538)	(0.445)	(0.374)	(1.921)
LnTA	-6.633***	0.275	-0.478	2.521***
	(0.209)	(1.305)	(1.677)	(0.495)
ROA	0.285***	-0.833	2.005**	1.214
	(0.0621)	(0.694)	(0.805)	(1.484)
CAR	2.272***	1.614***	2.495***	1.945***
	(0.0154)	(0.120)	(0.0804)	(0.561)
Loan	-0.582***	14.17***	-5.278***	-0.616
	(0.145)	(1.031)	(1.484)	(0.959)
EffRatio	-0.000186***	-0.000387	0.00491	0.00477
	(5.34e-05)	(0.000556)	(0.00359)	(0.00465)
IncomeDiv	6.44e-05	-0.00142***	6.34e-06	0.000221
	(0.000190)	(0.000219)	(0.00105)	(0.000394)
GDP	-0.116***	-0.128***	-0.0341***	-0.0264
	(0.00414)	(0.0193)	(0.00850)	(0.0502)
Inflation	-0.299***	-0.245**	0.185***	0.154
	(0.0171)	(0.101)	(0.0662)	(0.252)
AR(1)	-3.8433	-2.7825	-2.664	-1.7226
	(0.0001)	(0.0054)	(0.0077)	(0.0850)
AR(2)	-.1238	-.1054	-.1291	1.1764
	(0.9015)	(0.9161)	(0.8973)	(0.2395)
Hansen test	105.54	29.09	36.20	16.70
	(0.99)	(0.99)	(0.99)	(0.99)
Observations	2,734	1,076	1,114	544
Number of ID	116	46	47	23

Hansen J-test refers to the over-identification test for the restrictions in GMM estimation. The AR1 and AR2 are the Arellano Bond test for the existence of the first- and second-order autocorrelation in first differences. Country-fixed effects are controlled for. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 23: Empirical results of bank stability based on bank type

4.6.2. Bank Liquidity Creation and Systemic Risk Results

Tables 24 and 25 are the analyses for two components of systemic risk measure as the dependent variable. Table 24 summarizes the results of the models with Systemic Linkage (L) as the dependent variable, while Table 25 illustrates the results with Bank Tail Risk (Tail) as the dependent variable. According to the results, bank liquidity creation is negatively associated with systemic linkages. Particularly, using the full sample results, we can conclude that a 1% increase in liquidity creation is associated with a 1.35% decrease in systemic linkage measures at the individual bank level, holding all the other effects fixed. The estimated coefficient remains negative also for the three different sub-samples for Conventional, Hybrid and Islamic banks, but the significance is only observed for the model of the Islamic bank sub-sample but with smaller economic significance. For Islamic banks 1% increase in liquidity creation is associated with a 0.43% decrease in systemic linkage measure at the individual bank level, holding all the other effects fixed. The negative association is also observed for bank tail measure, but the significance of the estimated coefficients is not proved in any sample. For the included control variables in the full sample, we can state that systemic linkage is significantly associated with ROA (negative effect) and size (positive effect); in the different subsamples, significance is only observed for deposit to assets in the Hybrid banks sub-sample. Credit risk, deposits to assets and ROA are among the control variables that have a significant causal association with bank tail risk.

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-1.347***	-1.944	-0.879	-0.427*
	(0.349)	(1.870)	(0.489)	(0.193)
CAR	-0.0568	-0.0889	-0.0404	0.0385
	(0.0384)	(0.0714)	(0.0895)	(0.0446)
ROA	-0.527***	-0.121	-0.720	-1.332
	(0.0978)	(0.153)	(0.588)	(0.707)

IncomeDiv	-0.00640	0.00219	0.00736	-0.0268
	(0.0283)	(0.0116)	(0.0179)	(0.0636)
CR	-0.0693	-0.0535	-0.135	0.139
	(0.0995)	(0.138)	(0.0829)	(0.0756)
Ln(Total assets)	0.823**	1.848	-0.0341	0.604
	(0.348)	(1.770)	(0.884)	(0.702)
Deposit/Assets	-0.00676	-0.0271	-0.0889**	0.0309
	(0.0128)	(0.0200)	(0.0269)	(0.0227)
Constant	8.419***	3.933	17.64***	-3.121
	(2.231)	(3.748)	(3.060)	(7.191)
Observations	2,223	1,039	785	399
R-squared	0.509	0.704	0.442	0.246
Dependent variable is Systemic Linkage, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Table 24: Empirical Results for Systemic Linkage Model and Bank Liquidity Creation

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-0.0379	-0.117	-0.0194	-0.0801
	(0.0342)	(0.0734)	(0.0103)	(0.0576)
CAR	-0.00491	0.00145	-0.00364	-0.0184
	(0.00612)	(0.00277)	(0.00588)	(0.0140)
ROA	0.00378	0.00558	-0.0663*	-0.179***
	(0.0116)	(0.0126)	(0.0283)	(0.0481)
IncomeDiv	-0.00236	-0.00357	-0.000586	0.00446
	(0.00178)	(0.00286)	(0.00267)	(0.00494)
CR	0.0248**	-0.0183*	0.0300**	0.0367***
	(0.00936)	(0.00756)	(0.00735)	(0.00645)
Ln(Total assets)	-0.0685	0.00908	-0.0537	-0.0984
	(0.0592)	(0.0562)	(0.0310)	(0.108)
Deposit/Assets	-0.00675	-0.00257	-0.00660***	0.00550
	(0.00387)	(0.00398)	(0.00109)	(0.00433)
Constant	2.615***	2.029***	1.890***	1.174*
	(0.549)	(0.224)	(0.175)	(0.583)
Observations	2,223	1,039	785	399
R-squared	0.285	0.203	0.364	0.677

Dependent variable is Bank tail risk, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 25 : Empirical Results for bank tail risk model and Bank Liquidity Creation

The results of the models with Systemic Risk (beta) measure are summarized in Table 26. Table 26 reveal that bank liquidity creation is negatively associated with systemic risk measure. Particularly, using the full sample results, we can conclude that 1% increase in liquidity creation is associated with a 1.38% decrease in systemic risk measures at the individual bank level, holding all the other effects fixed. The estimated coefficient can also be considered economically significant and consistent with the literature by Zheng et al. (2019), according to whom liquidity creation decreases stand-alone risk and the likelihood of bank failure. The estimated coefficient remains negative also for the three different sub-samples for Conventional, Hybrid and Islamic banks. Nevertheless, the significance is only observed for the model of the Islamic bank sub-sample, but with smaller economic significance. For Islamic banks 1% increase in liquidity creation is associated with a 0.51% decrease in systemic risk measure at the individual bank level, holding all the other effects fixed. For the included control variables in the full sample, we can state that systemic risk is significantly associated with the size, capital adequacy and profitability of a bank. Particularly, the causal effect of the size is positive, and for the capital adequacy and profitability is negative, meaning that according to the full sample, small banks with higher adequate capital and more profitability are less prone to risks. For the Islamic bank sub-sample, ROA is also negatively and credit risk positively associated with systemic risk measure. For the Hybrid sub-sample, significance is observed for the deposits to assets ratio, which negatively affects systemic risk measure.

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-1.380***	-2.037	-0.900	-0.508**
	(0.362)	(1.806)	(0.488)	(0.190)
CAR	-0.0616*	-0.0864	-0.0443	0.0196
	(0.0322)	(0.0713)	(0.0938)	(0.0575)
ROA	-0.526***	-0.118	-0.786	-1.515*
	(0.103)	(0.156)	(0.611)	(0.734)
IncomeDiv	-0.00863	-0.00123	0.00667	-0.0221
	(0.0273)	(0.0123)	(0.0203)	(0.0661)

CR	-0.0446	-0.0727	-0.107	0.177**
	(0.107)	(0.135)	(0.0874)	(0.0747)
Ln(Total assets)	0.754*	1.838	-0.0838	0.508
	(0.390)	(1.692)	(0.903)	(0.607)
Deposit/Assets	-0.0133	-0.0290	-0.0951**	0.0366
	(0.0144)	(0.0204)	(0.0259)	(0.0253)
Constant	11.02***	5.893	19.49***	-1.934
	(2.464)	(3.767)	(3.070)	(7.085)
Observations	2,223	1,039	785	399
R-squared	0.507	0.701	0.443	0.265
Dependent variable is Systemic Risk, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Table 26: Empirical Results for Systemic Risk Model and Bank Liquidity Creation

4.7. Discussion & Conclusion

The relationship between credit and liquidity is not significant across all conventional, hybrid and Islamic banks. Though there exists a relationship between credit and liquidity risk that is rather causal with no meaningful economic impact on banks. Based on the findings, it can be deduced that although there is a statistically significant relationship between credit and liquidity risk and bank stability, the practical significance or magnitude of this effect appears to be relatively small or insignificant. This implies that variations in credit and liquidity risk levels may not exert a substantial influence on the overall stability of banks in real-world situations. These results are consistent with the study conducted by Ghenimi et al. (2017), which also reached a similar conclusion. However, both credit and liquidity risk significantly impact bank stability, similar to Imbierowicz and Rauch (2014). Although when breaking these results based on bank type, there is a negative effect of credit and liquidity risk on bank stability for conventional banks, the joint relationship of credit and liquidity risk is also negative for Islamic banks but not statistically significant for Islamic banks. Additionally, Hybrid banks operating in both Islamic as well as conventional segments are more exposed to liquidity risk as compared to credit risk. The joint impact of credit and liquidity risk positively affects bank stability.

One reason for this finding is that Hybrid banks' credit risk has no impact on their bank stability, based on our findings, which potentially offsets the effect of liquidity risk. When looking into Islamic banks, the main determinants of bank stability for these banks are the size and capital adequacy ratio, which positively affect bank default risk. Whereas for Hybrid and Islamic banks, another factor negatively influencing their banking stability is loan growth; this is due to the fact the more these banks issue loans, the more illiquid these banks become, affecting their liquidity risk position. However, it should be noted that though loan growth among Islamic banks is negative, it is not statistically significant to affect bank stability. These findings contrast those of Bilgin et al. (2021), who discovered that banks with higher loan shares and growth are less riskier, and the ones with higher income diversifications are riskier. This also exhibited consistency with the view that conventional banking activities such as lending become more stable over time, making it more difficult to walk away from such an association.

Another factor which affects both conventional and hybrid banks is GDP growth and Inflation. This is because both banks are more exposed to interest rate fluctuation, given their large exposure to changes in interest rates. When looking at the overall sample, we find that credit risk, joint credit and liquidity risk, size, efficiency ratio, GDP and inflation all negatively affect bank stability. These findings support those of Mahrous et al. (2020), using data from 15 countries in the MENA region, who discovered that monetary policy rates above 6.3% amplified the level of non-performing loans and credit risk. This made it more difficult for borrowers to repay, making the materialization of NPLs increase, and this is likely to endanger the financial stability of the Islamic banking system.

From a bank liquidity creation and systemic risk standpoint, this study finds that Islamic banks bank liquidity creation decreases systemic linkage risk as compared to their counterparts, a finding contradicting the work of Alaoui Mdaghri (2022) who, through a regression analysis, discovered that liquidity creation diminishes both the NPLs of Conventional and Islamic banks and in equal measure, their system linkage risks. On the other hand, the greater the liquidity position among hybrid banks, the systemic linkage these banks would face. Examining from an overall sample, we can conclude that 1% liquidity creation decreases systemic linkage risk by 1.35%, whereas an increase of size by 1% increases systemic linkage risk by 0.82%.

However, when looking at bank tail risk, a 1% increase in ROA for Islamic banks decreases bank tail risk by 0.18% and 0.06% for hybrid banks. In the contrary, 1% increase in credit risk also increase bank tails risk for Islamic and hybrid banks by 0.04% and 0.03% but decreases bank tail risk for conventional banks by 0.02%. When evaluating the link of systemic risk with bank liquidity creation, we find that overall bank liquidity creation actually reduces systemic risk, and this result is statistically significant for Islamic banks as well. For conventional and Hybrid banks, a similar relationship is seen but not statically significant. Additionally, we also find a positive link between credit risk and systemic risk for Islamic banks but find no link between credit risk and systemic among conventional and hybrid banks. In comparison, there is a negative link between ROA and systemic risk among Islamic banks. However, for hybrid banks, an increase in liquidity decreases systemic risk.

We conclude by stating that there was no relationship found between credit and liquidity risk. For Conventional banks, credit risk, liquidity risk and joint credit liquidity risks affect their banks' stability. Likewise, there was no link found between bank liquidity creation and systemic risk. Although. It should be noted that credit risk does negatively influences bank tail risk among conventional banks. Whilst for Hybrid banks, liquidity risk and joint credit liquidity risks influence their bank stability. No association between bank liquidity creation and systemic risk is found, but if these banks increase their liquid deposits, they will see a decline in systemic linkage, bank tail risk and overall systemic risk. For Islamic banks, no significant relationship was found for credit and liquidity risk. Factors affecting these banks include the size of the bank and their capital adequacy ratio. On the other hand, Bank liquidity creation by Islamic banks does reduce systemic linkage risk as well as systemic risk. However, it should also be taken into consideration that an increase in credit risk among Islamic banks affects both bank tail risk and systemic risk positively.

Existing studies have considered the effect of either credit or liquidity risk; however, few studies have focused on the association between the two. Bank liquidity creation is likely to decrease rather than increase NPLs, although the liquidity creation process is considered risky through the rendering of banks more illiquid. As a result, policymakers ought to encourage bank liquidity creation to grow the economy, including that of emerging markets. In a vast economy, borrowers are more inclined to repay their debts, consequently reducing the NPLs of banks. The findings of this chapter also provide various recommendations for bank supervisors and bank management, especially on risk. The Global Financial Crisis disclosed distrust between banks, to a further extent, driven by large credit risks in their portfolios, which are likely to freeze the market from liquidity. Central banks and regulators were forced to intervene to prevent the collapse of the financial system. Nonetheless, the findings of this chapter suggest joint management of credit and liquidity risk, which could reduce uncertainties and, to a larger extent, increase bank stability. Therefore, the findings of this chapter underpin regulatory efforts such as the ones by the Dodd-Frank Act and the Basel III framework that have placed a strong emphasis on the significance of liquidity risk management together with the credit risk and asset quality of a bank.

Chapter 5 – Conclusion

This chapter presents a short conclusion to the thesis. In addition, we also outline the research limitations encountered during the study. Moreover, we highlight avenues for future research based on identified gaps within our analysis. We start by providing a generic conclusion, followed by a discussion of research limitations. The chapter closes with future research recommendations.

5.1. Conclusion

The GFC revealed the numerous vulnerabilities, risks, and challenges in the global and national financial systems. Despite this, the evolving regulations in the banking sector have proved ineffective in addressing the inherent issues that could impact the 2008 GFC. The Basel Committee advances these regulations on Banking Supervision and national regulators. The complexities experienced in the dynamic financial systems raise concerns over the effectiveness of the regulations offered by the different institutions. Therefore, understanding and effectively managing various risks is paramount in ensuring financial stability and sustainable growth at the national and international levels. The current study focused on the banks' major risks, including credit and liquidity risks, and how they stand out as critical factors with substantial impact on stability and overall systemic risk. In this light, the liquidity creation by banks and the regulatory frameworks that govern risk management help develop resilience and soundness in Islamic and Conventional banking. Chapters 2, 3 and 4 offer a comprehensive account of the interplay between credit risk, liquidity risk, systematic risk, liquidity creation, and regulatory frameworks. Examining the findings in these chapters and the multiple case studies, some insights reflect on the theoretical and practical aspects that can be adopted by policymakers, regulators, and practitioners to develop a robust regulatory framework.

The insights from the three analytical chapters highlight the need for the effectiveness of financial regulations in addressing systemic risk within the global financial system. The first study examines the international and national regulatory frameworks in the conventional, hybrid, and Islamic banking contexts. The research compares the guidance between the BCBS and the IFSB. The findings demonstrate that the IFSB converts BCBS guidance to make it Sharia-compliant for Islamic banks. Also, the investigation focuses on addressing credit, liquidity, and systemic risk in four countries: China, India, Malaysia, and Saudi Arabia. The variations in liquidity requirements and capital requirements across the countries are identified, highlighting that higher requirements are imposed on Indian banks than in other countries. The study also demonstrated an absence of a systemic risk framework in Saudi Arabia's banking system, and a weak mechanism has been adopted in the Malaysian banking sector. The second study focuses on Basel III's capital and liquidity regulations, specifically the stable net funding and higher capital adequacy ratios. The study utilised data from banks in emerging market economies in the past decade to investigate whether these requirements help mitigate default and systemic risks, considering the dynamic economic conditions. The findings indicate that the impact of these regulations on default risk and systemic risk is not conclusive, raising questions about their effectiveness. The third study explored the relationship between credit, liquidity, and bank default risks. Subsequently, the study established the effects of bank liquidity creation on systemic risk across different types of banks. The findings show a positive relationship between credit and liquidity risks but not a significant causal relationship. However, credit and liquidity risks statistically impact bank default risk, particularly for conventional and hybrid banks. The study also reveals that bank liquidity creation reduces the systemic risk for Islamic banks but increases bank tail risk for Islamic and hybrid banks. These findings suggest that substantial differences in national regulations are necessary for how the specific risks faced by banks in emerging markets are implemented. Furthermore, there is substantial evidence that a one-size-fits-all approach would be inadequate. This implies a need for a tailored regulatory strategy to manage risks in each country's banking industry effectively.

Integrating the findings from the three studies offers key insights that help address the research questions and objectives. The study shows no significant relationship between credit and liquidity risks across conventional, hybrid, and Islamic banks. However, both credit risk and liquidity risk were found to impact bank stability significantly. This implies that movements in credit risk do not necessarily correspond to liquidity risk but independently affect banks' stability. Bank stability is negatively affected by the collective impact of credit and liquidity risks. The key impacts on bank stability for Islamic banks include size and capital adequacy ratio. The hybrid banks' stability is largely exposed to liquidity risk, while bank liquidity creation has positive impacts. In addressing systematic risk, the study shows that bank liquidity creation decreases systemic linkage risk for Islamic banks. Suggestively, liquidity creation activities in Islamic banks reduce the interconnections between the institutions, which lowers the risk of a systemic crisis. Conversely, the hybrid banks' systematic linkage risk increases because of a greater liquidity position. Therefore, the findings implied that a combination of credit and liquidity risk could have different impacts on stability, depending on the type of bank. Fundamentally, the findings show that bank liquidity creation was linked to reducing systemic risk across the sample, especially for Islamic banks.

The study demonstrates that most countries adhere to Basel II or III requirements with different achievements having been made. For instance, Saudi Arabia is compliant with Basel III, while India seeks to meet minimum requirements. Nevertheless, different nations have additional regulatory provisions beyond Basel III. There are variations in regulations for public and private sector banks. Across all sectors, a risk-based approach has been adopted by practitioners in the banking industry. These considerations are important for the banks and regulators who optimise the banking system's stability. For instance, some nations implemented stress tests and administered surveys that seek information that can guide in ensuring stability. With such insights, there has been increased adoption of Basel III in response to changing macroeconomic factors such as the COVID-19 pandemic. These findings further support that effective risk management considers country-specific factors when designing regulatory frameworks and tailored solutions for the public and private sectors.

The insights emerging in the current study offer an enhanced understanding of risk interactions by highlighting the relationship between credit risk and liquidity risk and how systematic risk emerges and can be addressed. Fundamentally, the theoretical contribution of the study is that the credit and liquidity risks do not necessarily exhibit significant co-movement. Subsequently, the findings challenge the traditional conceptualisation that the banking industry should have a nuanced understanding of risk interactions. The study also demonstrates the importance of bank-specific factors, including size, capital adequacy ratio, and loan growth, in planning for bank stability and limiting systemic risk. Suggestively, increased efficiency at the national and international levels requires considering the heterogeneity of the various banks and assessing their risk profiles.

The Basel III and regulatory reforms investigated in this study show that adopting an effective guiding framework is critical in strengthening the banks' capital and liquidity requirements that can enhance financial stability. Adopting the regulatory frameworks and specific provisions requires risk management practices that effectively manage credit and liquidity risks to ensure stability. For instance, practitioners and regulators can adopt robust risk assessment frameworks, stress testing, and liquidity management strategies. The findings show increased potential for success when regulators adopt a risk-based approach and tailor regulatory provisions to address specific risks faced by banks in different market segments. In this context, the implementation of Basel III and other international standards enhances risk management when they are aligned with macroeconomic factors and issues emerging in the context of specific countries.

Liquidity requirements such as the NSFR are important considerations for practitioners in addressing the probability of a bank default by shaping how an institution can manage liquidity and mitigate the default risk. This is demonstrated by findings that show it is important to encourage bank liquidity creation. Therefore, there is evidence that policymakers and regulators can consider incentivising banks to engage in sound liquidity creation practices with the adoption of an appropriate regulatory framework that promotes the creation of liquid assets and ensure the institutions build the capability to meet their obligations in the financial system, which can reduce the potential for systemic risk. However, the study does not fully support the notion that new capital and liquidity regulations, such as the NSFR, significantly and positively affects bank stability. This implies that additional measures are required to pursue such objectives. Furthermore, stress tests, surveys, and monitoring demonstrated that the information gathered could be valuable in determining the banks' risk profiles. The stress tests can help the regulators to assess the resilience of the banking sector and specific institutions to demonstrate the impact of certain scenarios and promptly identify potential vulnerabilities. Resultantly, regulators can enhance the effectiveness of risk mitigation and the financial system's stability.

5.1.1. Theoretical and Practical Implications

The theoretical and practical implications emerging from the study require strategic considerations to transform the banking sector, focusing on country-specific contexts. Notably, various stakeholders should be involved in these practices, including bankers in the private and public sectors, regulators, and policymakers. The insights from the current study show the need to enhance the understanding of liquidity requirements for all stakeholders. Focusing on factors such as the NSFR and its impact on the probability of default can help enhance risk management and mitigation practices. These efforts align with the need to strengthen measures to mitigate systemic risks in the banking industry. Moreover, there is a consensus among researchers and the current study's findings that mitigating systemic risk has become an inherent consideration in the actions taken by policymakers and regulators. This includes improving measures such as NSFR, leveraging requirements, countercyclical buffers, and globally systemically important institution surcharges. However, there is a need to assess these measures' effectiveness in reducing systemic risk and promoting financial stability to ensure that the most effective practices are adopted premised on the macroeconomic factors and the bank's risk profiles.

The implications of the current findings demonstrate the importance of considering the interactions between credit and liquidity risks. The combined effect of credit risk and liquidity risk on the stability of the banks can be instrumental in developing appropriate risk management strategies. Therefore, all types of banks should implement integrated approaches that address both credit and liquidity risks, which can limit the interdependencies and potential magnification of their impacts. Similarly, considerations should be made in promoting liquidity creation and its role in managing the threats of systemic risk. Such undertakings require policymakers and regulators to recognise the importance of bank liquidity creation and its implications for systemic risk in line with the characteristics of the specific banks. Policymakers and regulators should also encourage banks in different market segments to implement sound liquidity creation practices that can contribute to financial stability premised on international and national frameworks that are appropriate for their operations. Moreover, the study demonstrates that tailoring the regulatory frameworks for emerging market economies is critical due to their potential impact on the global system. This implies that recognising emerging market economies' unique characteristics and challenges can help regulators develop and advocate for regulatory frameworks that align with their needs. For instance, the initiatives can consider the underdeveloped capital markets, high volatility of the economy, and liquidity constraints experienced in these countries.

A focus on Islamic and state-owned banks shows that regulatory challenges must be addressed. These institutions face distinct regulatory issues that need effective customisation of international frameworks such as Basel III. This is important to help address specific risks that emerge due to the unique characteristics of these banks. These strategies should be undertaken with adequate coordination and information sharing across the countries. Such an approach is critical given the global impact of systematic risks. Collaboration and knowledge sharing among policymakers and regulators across countries can harmonise the regulatory frameworks and create a level playing field. Additionally, the integration at a global scale can reduce the challenge of formulating and implementing regulations that are not aligned with the diverse interests of different countries and segments. Aligned with these developments is the need to foster transparency and disclosure concerning capital and liquidity. Such information is critical in how policymakers and regulators understand the risk profiles and their capacity to address financial crises. The information should also be standardised and consistent to ensure a comprehensive understanding at all times due to the dynamic nature of the banking sector. Stress testing, surveys, and scenario analyses can enhance the information used. Therefore, appropriate frameworks for continuous monitoring should be developed and implemented to enhance stress testing premised on the unique characteristics of the markets. Additionally, research on emerging market economies and evidence-based accounts can help to develop tailored regulatory frameworks and risk management solutions that are adequate for the unique experiences emerging in a particular country.

Based on the insights emerging from the current study, there is overwhelming evidence that the role of the different stakeholders and the specific needs emerging in each market requires strategies that promote a risk avoidance culture and professional development in the banking sector. Such actions should be established at all organisational levels, including training and education opportunities to enhance the company's risk management skills and knowledge. Such strategies should entail support from regulators and policymakers to ensure an industry-wide approach in adopting best practices and a risk avoidance culture.

Although the findings and implications of the current study show the potential for substantial improvements, some challenges might limit the achievements made. Focusing on emerging market economies, there are potential challenges to implementing constructive developments due to resistance to change, which might emerge from the banking institutions, regulators, policymakers, and other stakeholders. Subsequently, it is imperative to communicate the benefits and rationale behind the best practices that should be adopted to manage risks and achieve financial stability and profitability. The implementation of the regulations and frameworks can be limited in emerging economies due to resource constraints. This includes funding, technologies, and skilled personnel that can coordinate activities. There is a need for banks and regulators to foster talent development and invest in the necessary infrastructure to align national capabilities with those prevailing in the global context.

Another potential challenge is the regulatory complexity exemplified by limitations in implementing Basel III in some countries, such as India, and its modification for adoption in Islamic banking. The dynamic and evolving regulatory landscape can be challenging due to the different guidelines, standards, and requirements in standardising reporting from banking institutions on different market segments. This implies that regulations adopted should offer clear and consistent guidelines and a simplified framework that is understood and implemented across the industry. In this context, banks can engage with the regulators to ensure that the guidelines and frameworks adopted are understood and adequate depending on their risk profiles. The banks can contribute to developing the regulations and frameworks by ensuring that they voice their opinions and over quality data that can be used to describe the industry and establish the requirements that should be met. Regulators should implement adequate data infrastructure, governance frameworks, and analytical solutions in this context.

Challenges in international coordination and harmonisation can limit improvements in emerging economies. With the huge diversity and expansive nature of the global financial system, it can be challenging for the interests emerging across different jurisdictions. Furthermore, the diverse regulatory frameworks increase challenges in how regulators from different countries or representatives of different market segments achieve collaboration and cooperation. Further challenges from the insights gathered are balancing business objectives with risk management. Notably, the GFC was influenced by banks pursuing business objectives despite the potential risks associated with their actions. Therefore, when business objectives limit the focus on risk management, regulators must be proactive and advocate for strong governance, risk management frameworks, and performance monitoring strategies to align the banking practices with a risk avoidance culture. Given the long time taken to address the challenges faced following the 2018 GFC, it is evident that formulating and implementing appropriate frameworks and regulations can be time-consuming. Therefore, the regulators must offer adequate information about the roadmaps, frameworks, regulations, timelines, and implementation plans. It is important for the banks and other stakeholders to be prepared by allocating resources and sharing information based on their requirements and risk profiles.

5.1.2. Research Limitations

Similarly to other studies conducted on capital and liquidity regulation, our thesis has some research limitations. Therefore, we highlight some of these limitations to guide future avenues of research. First, the empirical nature of this thesis and its particular focus on emerging markets presents a limitation. We greatly depended on secondary databases and reports to conduct the empirical analysis. Hence, the lack of data availability and reporting within emerging markets affected our ability to conduct research at a broader scale and to study all the listed financial institutions within the MSCI EM index. In addition, to conduct systemic risk measurements, we needed high-frequency data to capture volatility within the country-specific financial markets. This was not available for all the countries within our initial sample size. This limited reporting is also attributable to the lack of activity within these financial markets and the lack of consistent reporting mechanisms.

This limitation was mitigated by comparing data availability from multiple databases, namely the Refinitiv Eikon and Bloomberg databases, to maximize our sample size. Moreover, we also faced significant challenges in gathering information for 3-month T-Bills, as this was required to calculate the change in the 3-month T-bill rate, the computation of yield spread, and the liquidity spread within these markets. One of the reasons for the lack of such information was that some of the countries in our initial sample either did not issue 3-month T-bills or had discontinued the issuing of 3-month T-bills. For instance, China discontinued its 3-month T-bills rate in 2016. Therefore, given this limitation, countries with no state variable data were excluded from the systemic risk analysis owing to missing or unavailable state variable data during FY2010 – FY2020. Should data reporting mechanisms and data availability improve in the future, research could be conducted on countries that are not explored in this thesis.

Furthermore, our study was also affected by the Covid-19 pandemic and the resulting lockdown measures, which led to a reduced sample size for bank default risk measurement owing to a lack of access to secondary databases. However, post Covid-19, this limitation was mitigated by reviewing all the country-specific data and increasing our sample size. This decision was driven by the idea that a larger sample size would deliver better results when studying the impact of NSFR on bank stability.

In Chapter 3, the computation of NSFR was time-consuming as it required the identification of bank balance sheet items in accordance with Basel III NSFR standards. Weights also needed to be assigned to each item for each financial year. Likewise, in Chapter 4, the computation of the BBLC measure required a significant amount of time because certain balance sheets and off-balance exposures were assigned weights, as specified in the study conducted by Berger and Bouwman (2016). In Chapter 2, analysing regulatory documents and reports required an understanding of the challenges faced within our selected sample of countries and the regulatory measures that they had implemented. This was in addition to the understanding of international regulatory requirements imposed by BCBS.

Moreover, we employed the CoVaR model for systemic risk measurement in both Chapters 3 and 4. This model has some limitations. For instance, CoVaR provides individual risk measures rather than the sum of total systemic risk within the financial system. Furthermore, the CoVaR model is more susceptible to estimation error than VaR. Therefore, the accuracy of the model is broadly dependent on the accuracy of tail modelling. It should also be noted that CoVaR modelling cannot be back-tested because the expected shortfall predictions cannot be validated by comparison with historical data. We also employed the GARCH model to capture the volatility within market data. Owing to data limitations within emerging markets, we chose to measure volatility on rolling weekly data. This did not capture volatility during day-to-day trading but rather on weekly closing market prices. As volatility cannot be predicted using the GARCH approach for smooth time series data, weekly data were the only alternative option that could be used. This was because using monthly data would have risked eliminating the volatility factor because the data would have been much smoother in comparison to weekly data.

5.1.3. Future Research Directions

Based on our research and our review of existing literature, we have identified six avenues of research that could provide new insights into the existing literature on financial risk and regulations. Future studies should address the following gaps in knowledge:

- The insights emerging from the current study demonstrate a need for further investigations on the components of NSFR liquidity requirements and their impact on the probability of a bank defaulting. Such a focus can offer more insights into addressing default risk and increasing the capacity of the banks to contribute to financial stability.
- There is a need for a comparative analysis focusing on liquidity requirements and systemic risk. Comparing liquidity measures such as NSFR, countercyclical buffers, institution surcharges, and leverage requirements can enhance the mitigation of systemic risk and identify the most effective measures for enhancing financial stability.
- Since most literature has focused on developed nations, further studies must examine credit risk, liquidity risk, and bank stability in emerging market economies. Such insights can be instrumental in pursuing effective risk management strategies and adopting unique challenges in these economies.
- There is inadequate research addressing the role of bank liquidity creation in systematic risk. Examining the relationship between these factors can help address issues of financial stability at different levels, including organisational, national, and global.
- Future studies should address the most effective regulatory framework in emerging markets. Such investigations can contribute to risk management and financial stability in emerging markets by highlighting the challenges, regulatory requirements, and the framework's impact on the banking sector.
- Future studies should address the risk profiles of the different types of banks in emerging markets. The insights gathered can foster a better understanding of the regulatory requirements and risk management practices that are most effective for each bank.

References

Abdo, M.M. and Onour, I., 2020. Liquidity Risk Management in Full-Fledged Islamic Banking System. Management and Economics Research Journal, 6(2).

Abdul Ganiyy, A., Zainol, Z. and Ahmad, N.H., 2017. Determinants of liquidity risk in dual and fully Islamic banking systems: Evidence from Malaysia and Sudan. Asian Journal of Multidisciplinary Studies, 5(1), pp.90-99.

Abdul Ganiyy, A.F., Ogunbado, A.F. and Ahmad, N.H., 2017. Islamic perspectives on liquidity risk management practices of Islamic banks in Malaysia and Bahrain. Asian Journal of Multidisciplinary Studies, 5(1), pp.100-108.

Abdul-Rahman, A., Latif, R.A., Muda, R. and Abdullah, M.A., 2014. Failure and potential of profit-loss sharing contracts: A perspective of New Institutional, Economic (NIE) Theory. Pacific-Basin Finance Journal, 28, pp.136-151.

Abdul-Rahman, A., Said, N.L.H.M. and Sulaiman, A.A., 2017. Financing structure and liquidity risk: Lesson from Malaysian experience. Journal of Central Banking Theory and Practice, 6(2), pp.125-148.

Aburime, T., 2008. Islamic banking theories, practices and insights for Nigeria. International Review of Business Research Papers, 5(1), pp.321-339.

Acemoglu, D., Ozdaglar, A. and Tahbaz-Salehi, A., 2015. Systemic risk and stability in financial networks. American Economic Review, 105(2), pp.564-608.

Acharya, V. V. and Pedersen, L. H. (2005). Asset pricing with liquidity risk. Journal of Financial Economics, 77(2), pp.375-410.

Acharya, V. V., Qian, J., Su, Y., & Yang, Z. (2021). In the shadow of banks: Wealth management products and issuing banks' risk in China. NYU Stern School of Business.

Acharya, V., Davydenko, S.A. and Strebulaev, I.A. (2012). Cash Holdings and Credit Risk. Review of Financial Studies, 25 (12), 3572–3609. Available from https://doi.org/10.1093/rfs/hhs106 [Accessed 9 February 2021].

Acharya, V.V & Richardson, M (2009) CAUSES OF THE FINANCIAL CRISIS, Critical Review, 21:2-3, 195-210, DOI: https://doi.org/10.1080/08913810902952903

Acharya, V.V. and Steffen, S. (2020). The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID. The Review of Corporate Finance Studies, 9 (3), 430–471. Available from https://doi.org/10.1093/rcfs/cfaa013 [Accessed 2 February 2021].

Acharya, V.V. and Thakor, A.V. (2016). The dark side of liquidity creation: Leverage and systemic risk. Journal of Financial Intermediation, 28, 4–21. Available from https://doi.org/10.1016/j.jfi.2016.08.004 [Accessed 18 February 2021].

ACHARYA, V.V. and VISWANATHAN, S. (2011). Leverage, Moral Hazard, and Liquidity. The Journal of Finance, 66 (1), 99–138. Available from https://doi.org/10.1111/j.1540-6261.2010.01627.x [Accessed 11 June 2021].

Acharya, V.V. et al. (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. The Review of Financial Studies, 32 (9), 3366–3411. Available from https://doi.org/10.1093/rfs/hhz005 [Accessed 13 February 2021].

Acharya, V.V. et al. (2020). Does the lack of financial stability impair the transmission of monetary policy? Journal of Financial Economics, 138 (2), 342–365. Available from https://doi.org/10.1016/j.jfineco.2020.06.011 [Accessed 15 April 2021].

Acharya, V.V., and Merrouche, O. (2013) 'Precautionary Hoarding of Liquidity and Interbank Markets: Evidence from the Subprime Crisis', Review of Finance, 17(1), pp. 107–160.

Acharya, V.V., and Mora, N. (2015) 'A Crisis of Banks as Liquidity Providers', Journal of Finance, 70(1), pp. 1 -43.

Acharya, V.V., Gromb, D. and Yorulmazer, T. (2012) 'Imperfect Competition in the Interbank Market for Liquidity as a Rationale for Central Banking', American Economic Journal: Macroeconomics, 4(2), pp. 184-217.

Acharyaa, V.V.,Fleming, M.J., Hrung, W.B., Sarkar, A. (2017) 'Dealer financial conditions and lender-of-last-resort facilities', Journal of Financial Economics, 123(), pp. 81-107.

Achsani, M. N. F. F., & Kassim, S. (2021). The determinants of credit risk under dual banking system: indonesian experience based on bank specific variables. Al-Muzara'ah, 9(2), 215-229.

Adediran, O., Ekejiuba, C.P., Matthew, O. and Adegboye, F.B., (2017). Co-integration analysis of financial intermediation and economic growth in Nigeria. Journal of Internet Banking and Commerce, 22(8), pp.1-12.

Adesina, K.S. (2019) 'Basel III liquidity rules: The implications for bank lending growth in Africa', Economic Systems , 43(2), pp. 100688

Adrian, T. and Shin, H. S. (2010). Liquidity and leverage. Journal of Financial Intermediation, 19(3), pp.418-437.

Adrian, T., Boyarchenko, N. (2013) 'Liquidity Policies and Systemic Risk', Federal Reserve Bank of New York Staff Reports, no. 661, pp. 1-44.

Afkar, T., Utomo, S.P., Miradji, M.A. and Hariawan, F., (2020). The Role of Profit-Loss Sharing In Development of MSMEs. International Journal of Economics, Business and Accounting Research, 4(01).

Agarwal, V and Taffler, R (2008) 'Comparing the performance of market-based and accounting-based bankruptcy prediction models', Journal of Banking & Finance , 32(), pp. 1541–1551

Aguiar, Mark, and Gita Gopinath. 2007. Emerging market business cycles: The cycle is the trend. Journal of Political Economy 115(1): 69-102.

Ahmed, H., Mohieldin, M., Verbeek, J. and Aboulmagd, F., 2015. On the sustainable development goals and the role of Islamic finance. The World Bank.

Ahsan, T and Qureshi, M.A. (2020) 'The nexus between policy uncertainty, sustainability disclosure and firm performance', Applied Economics, 53(4), pp. 441-453.

Aikman, D., Bridges, J., Kashyap, A. and Siegert, C. (2018) 'Would macroprudential regulation have prevented the last crisis?', Bank of England Staff Working Paper No. 747, pp. 1 -53 [Online]. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2018/would-macroprudential-regulation-have-prevented-the-last-crisis.pdf (Accessed: 23rd Dec 2019)

Ajibo, K.I., 2015. Risk-based regulation: The future of Nigerian banking industry. International Journal of Law and Management, 57 (3) pp. 201 – 216.

Al-Amine, M.A.B., 2015. Product development and maqāṣid in Islamic finance: towards a balanced methodology. Islamic Economic Studies, 23(1).

Al-Arabi, M.A., 1966. Contemporary banking transactions and Islam's views thereon'. Islamic Review, 11(3), pp.10-43.

Al-Jarhi, M., 2017. An economic theory of Islamic finance. ISRA International Journal of Islamic Finance, 9(2), pp.117-132.

Al-Nasser Mohammed, S. and Muhammed, J., 2017. The relationship between agency theory, stakeholder theory and Shariah supervisory board in Islamic banking. Humanomics, 33(1), pp.75-83.

Alaoui Mdaghri, A., 2022. How does bank liquidity creation affect non-performing loans in the MENA region?. International Journal of Emerging Markets, 17(7), pp.1635-1658.

Aldasoro, I; Faia, E (2016) 'Systemic loops and liquidity regulation', Journal of Financial Stability, 27(), pp. 1-16.

Alessi, L. and Detken, C., 2018. Identifying excessive credit growth and leverage. Journal of Financial Stability, 35, pp.215-225.

Ali, K., Hongbing, H., Liew, C. Y., & Jianguo, D. (2022). Governance perspective and the effect of economic policy uncertainty on financial stability: Evidence from developed and developing economies. Economic Change and Restructuring, 56(3), 1971-2002. https://doi.org/10.1007/s10644-023-09497-6

Allen F, E Carletti and D Gale (2009), 'Interbank Market Liquidity and Central Bank Intervention', Journal of Monetary Economics 56, pp 639–652.

Allen, B; Chan, K.K; Milne, A; Thomas, S (2012) 'Basel III: Is the cure worse than the disease?', International Review of Financial Analysis, 15(), pp. 159–166.

Allen, F (2014). How should bank liquidity be regulated? Federal Reserve of Atlanta: Financial Markets Conference paper Atlanta: Georgia (April 2014).

Allen, F and Gale, D (2004), ‘Financial Intermediaries and Markets’, Econometrica 72(4), pp 1023–1061.

Allen, F and Gu, X. (2018) 'The Interplay between Regulations and Financial Stability', Journal of Financial Services Research, 52(), pp. 233–248.

Allen, F. and Douglas Gale, 2004, Financial Fragility, Liquidity, and Asset Prices, Journal of the European Economic Association vol. 3, pp. 533-546.

Allen, F. and Santomero, A.M., 1997. The theory of financial intermediation. Journal of banking & finance, 21(11-12), pp.1461-1485.

Allen, F., & Gu, X. (2021). Shadow banking in China compared to other countries. The Manchester School, 89(5), 407-419.

Allen, F., Carletti, E., and Marquez, R. (2011) 'Credit Market Competition and Capital Regulation', The Review of Financial Studies, 24(4), pp. 983–1018.

Allen, Franklin, and Douglas Gale, 1994, Limited market participation and volatility of asset prices, American Economic Review 84, 933–955.

Alqahtani, F. and Mayes, D.G., 2018. Financial stability of Islamic banking and the global financial crisis: Evidence from the Gulf Cooperation Council. Economic Systems, 42(2), pp.346-360.

Alsharif, M., Nassir, A.M., Kamarudin, F. and Zariyawati, M.A., 2016. BASEL III: MAIN ISSUES FOR GCC BANKS. International Journal of Economics, Commerce and Management, 4(11), pp.541-563.

Altavilla, C.; Pagano, M. and Simonelli, S. (2017) “Bank Exposures and Sovereign Stress Transmission” Review of Finance. Available at SSRN: https://ssrn.com/abstract=2640131 or http://dx.doi.org/10.2139/ssrn.2640131

Altman, E.I. (2020). COVID-19 And The Credit Cycle. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3604361 [Accessed 3 February 2021].

Altman, E.I., “Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy,” Journal of Finance 23 (1968), pp. 589–609.

Altman, E.I., Iwanicz-Drozdowska, M., Laitinen, E.K., and Suvas, A. (2017) 'Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman’s Z-Score Model', Journal of International Financial Management & Accounting, 28(2), pp. 131-171

Altunbas, Y., Gambacorta, L. and Marqués-Ibáñez, D. (2011). Does monetary policy affect bank risk-taking? Journal of Financial Intermediation, 20(2), pp.123-149.

Amihud, Y (2002) 'Illiquidity and stock returns: cross-section and time-series effects', Journal of Financial Markets , 5(1), pp. 31 - 56.

Amin, S.I.M., Ali, M.H., and Nor, S.M., 2018. Cost efficiency and liquidity risk in banking: New evidence from OIC countries. International Journal of Business & Management Science, 8(2), pp.255-276.

Amran, N.H. and Ahmad, W., 2021. Will the Sharia Regulatory Framework and Moral Hazard of Too-Big-to-Fail Stir Liquidity Risk? Evidence from Major Players of Islamic Banks. Global Business and Management Research: An International Journal, 13(4), pp. 194-204.

Anderson, T.W. and Hsiao, C. (1982) 'Formulation and estimation of dynamic models using panel data', Journal of Econometrics, 18(1), pp. 47-82.

Andreou, P.C., Philip, D. and Robejsek, P., 2016. Bank liquidity creation and risk-taking: Does managerial ability matter?. Journal of Business Finance & Accounting, 43(1-2), pp.226-259.

Andrews, D.W.K. and Lu, B. (2001). Consistent model and moment selection procedures for GMM estimation with application to dynamic panel data models. Journal of Econometrics, 101 (1), 123–164. Available from https://doi.org/10.1016/s0304-4076(00)00077-4 [Accessed 27 June 2021].

Andriosopoulos, K., Chan, K.K., Dontis-Charitos, P., Staikouras, S.K. (2017) 'Wealth and risk implications of the Dodd-Frank Act on the U.S. financial intermediaries', Journal of Financial Stability, 33, pp. 366 - 379.

Anginer, D, Demirguc-Kunt, A and Zhu, M. (2014). How does competition affect bank systemic risk? 23 (1), 1–26. Available from https://doi.org/10.1016/j.jfi.2013.11.001 [Accessed 16 May 2023].

Arellano, M. and Bond, S. (1991) 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', The Review of Economic Studies, 58(2), pp. 277-297

Ariss, R.T., 2010. On the implications of market power in banking: Evidence from developing countries. Journal of banking & Finance, 34(4), pp.765-775.

Armas, J.C.A. (2020). BSP Working Paper Series Is bank lending channel of monetary policy evident in the Philippines? A dynamic panel data approach. Available from https://www.bsp.gov.ph/Media_And_Research/WPS/WPS202011.pdf [Accessed 16 April 2021].

Arora, R., 2021. Driving excellence in credit risk management practices in commercial lending-an empirical analysis of Indian public sector banks. International Journal of Business Continuity and Risk Management, 11(1), pp.1-24.

Arrow, K.J. and Debreu, G., 1954. Existence of an equilibrium for a competitive economy. Econometrica: Journal of the Econometric Society, pp.265-290.

Ashraf, D., Rizwan, M.S. and L'Huillier, B. (2016). A net stable funding ratio for Islamic banks and its impact on financial stability: An international investigation. Journal of Financial Stability, 25, 47–57. Available from https://doi.org/10.1016/j.jfs.2016.06.010 [Accessed 21 April 2021].

Askari, H., 2012. Islamic finance, risk-sharing, and international financial stability. Yale Journal of International Affairs., 7, p.1.

Athanasoglou, P. P., Daniilidis, I. and Delis, M. D. (2014). Bank procyclicality and output: Issues and policies. Journal of Economics and Business, 76(1), pp.97-113.

Aubuchon, C.P. and Wheelock, D.C., 2010. The geographic distribution and characteristics of US bank failures, 2007-2010: do bank failures still reflect local economic conditions?. Federal Reserve Bank of St. Louis Review, 92(5), pp.395-415.

Avdjiev, S., Gambacorta, L., & Schiaffi, S. (2020). The effects of prudential regulation, financial development and financial openness on banking stability. Journal of Financial Stability, 46, pp.100-745.

Avraham, D., Selvaggi, P. And Vickery, J. I. (2012), 'A Structural View of U.S. Bank Holding Companies' Economic Policy Review 18(2), pp 65-81. Available at SSRN: https://ssrn.com/abstract=2118036 or http://dx.doi.org/10.2139/ssrn.2118036

Ayadi, O. F., Arouri, M. H. and Rault, C. (2015). Bank size and systemic risk: International evidence. Journal of International Financial Markets, Institutions and Money, 35(1), pp.60-82.

Ayed, W.B., Lamouchi, R.A. and Alawi, S.M., 2021. Does the deposit structure affect Islamic bank's maturity transformation activities? The implications of IFSB liquidity guidelines. International Journal of Islamic and Middle Eastern Finance and Management.

Ayub, M. (2009). Understanding Islamic Finance (2nd ed.). John Wiley & Sons.

Ba, S. (2022). China's Implementation of Basel III: Progress and Solutions. In The New Cycle and New Finance in China (pp. 313-319). Singapore: Springer Nature Singapore.

Bagehot W (1873), 'Lombard Street: A Description of the Money Market, London: H. S. King'.

Bahago, K., Jelilov, G. and Celik, B., 2019. Impact of banking supervision on liquidity risk and credit risk: evidence from Nigeria. International Journal of Economics and Financial Issues, 9(3), p.200.

Bai, J;Krishnamurthy, A; Weymuller, C.H. (2018) 'Measuring Liquidity Mismatch in the Banking Sector', The Journal of Finance, 73(), pp. 51-93.

Baldwin, K., Alhalboni, M. and Helmi, M.H., 2019. A structural model of "alpha" for the capital adequacy ratios of Islamic banks. Journal of International Financial Markets, Institutions and Money, 60, pp.267-283.

Banco Central do Brasil. (2021). www.bcb.gov.br. Available from https://www.bcb.gov.br/en/about/covid-19-measures.

Bandyopadhyay, A. and Saxena, M., 2021. Linkage between Credit Risk and Liquidity Risk in Indian Banks: A Comparison of the Pre & Post Basel 3 Conditions.

Banerjee, R. N., Mio, H (2018) 'The impact of liquidity regulation on banks', Journal of Financial Intermediation, 14, pp. 30-44.

Bank Negara Malaysia. (2020). Press Release -2020 Bnm.gov.my. Available from https://www.bnm.gov.my/press-release-2020 [Accessed 30 January 2021].

Bank of England. (2021) Our response to coronavirus (Covid). Available from https://www.bankofengland.co.uk/coronavirus [Accessed 28 January 2021].

Barucci, E.; Colozza, T.; Milani, C. (2019) 'The effect of bank bail-outs in the EU', Journal of International Money and Finance, 95(), pp. 14-26.

Basah, M.Y.A., Mohamad, S.N.A., Aziz, M.R.A., Khairi, K.F., Laili, N.H., Sabri, H. and Yusuf, M.M., 2018. Risks in Islamic banks: challenges and management. Journal of Engineering and Applied Sciences.

Basel Committee on Banking Supervision (2015), "Making supervisory stress tests more macroprudential: Considering liquidity and solvency interactions and systemic risk", BCBS Working Paper.

Basel Committee on Banking Supervision (2016), "Literature review on integration of regulatory capital and liquidity instruments", Working Paper, No 30, March

Basel Committee on Banking Supervision (BCBS), 2021. The Basel Framework. Bank for International Settlements, pp.1-1626.

Basel Committee on Banking Supervision (BCBS). (2010). Basel III: International framework for liquidity risk measurement, standards and monitoring (December).

Basel Committee on Banking Supervision (BCBS). (2011). Basel III: A global regulatory framework for more resilient banks and banking systems (June 2011).

Basel Committee on Banking Supervision (BCBS). (2013). Basel III: The liquidity coverage ratio and liquidity risk monitoring tools (January).

Basel Committee on Banking Supervision (BCBS). (2014). Basel III: The net stable funding ratio (October).

Bauerle Danzman, S., Winecoff, W. K. and Oatley, T. (2017)'All Crises areGlobal: Capital Cycles in an Imbalanced International PoliticalEconomy',International Studies Quarterly, 61 (4), pp. 907–923

Bavoso, V., 2019. The promise and perils of alternative market-based finance: the case of P2P lending in the UK. Journal of Banking Regulation, pp.1-15.

Bayoumi, T., and Melander, O. "Credit matters: empirical evidence on U.S. macrofinancial linkages," IMF Working Paper No. 08/169 (2008)

Bazarbash, M., 2019. FinTech in Financial Inclusion: Machine Learning Applications in Assessing Credit Risk. IMF Working Papers, 19(109), p.1.

BCBS (2013) Monitoring tools for intraday liquidity management, Available at: https://www.bis.org/publ/bcbs248.pdf (Accessed: 15th Dec 2019).

Bechtel, A.; Ranaldo, A. and Wrampelmeyer, J. Liquidity Risk and Funding Cost (2019). University of St.Gallen, School of Finance Research Paper No. 2019/03 . Available at SSRN: https://ssrn.com/abstract=3391129 or http://dx.doi.org/10.2139/ssrn.3391129

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2006). Bank concentration, competition, and crises: First results. Journal of Banking & Finance, 30(5), pp.1581-1603.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2010). Financial institutions and markets across countries and over time: The updated financial development and structure database. World Bank Economic Review, 24(1), pp.77-92.

Beck, T., Demirgüç-Kunt, A. and Merrouche, O., 2013. Islamic vs. conventional banking: Business model, efficiency and stability. Journal of Banking & finance, 37(2), pp.433-447.

Belouafi, A., Bourakba, C.A. and Saci, K., 2015. Islamic finance and financial stability: A review of the literature. Journal of King Abdulaziz University: Islamic Economics, 28(2).

Berger, A & Bouwman, C (2009) 'Bank Liquidity Creation', The Review of Financial Studies, 22(9), pp. 3779-3837.

Berger, A.N. and Bouwman, C., 2015. Bank liquidity creation and financial crises. Academic Press.

Berger, A.N. and Bouwman, C.H.S. (2017). Bank liquidity creation, monetary policy, and financial crises. Journal of Financial Stability, 30, 139–155. Available from https://doi.org/10.1016/j.jfs.2017.05.001 [Accessed 30 April 2021].

Berger, A.N. et al. (2016). Bank liquidity creation following regulatory interventions and capital support. Journal of Financial Intermediation, 26, 115–141. Available from https://doi.org/10.1016/j.jfi.2016.01.001 [Accessed 5 May 2021].

Berger, A.N. et al. (2019). Liquidity creation performance and financial stability consequences of Islamic banking: Evidence from a multinational study. Journal of Financial Stability, 44, 100692. Available from https://doi.org/10.1016/j.jfs.2019.100692 [Accessed 19 May 2021].

Berger, D., Guerrieri, V., Lorenzoni, G., Vavra, J., 2017. House prices and consumer spending. The Review of Economic Studies 85, 1502–1542.

Bernanke, B., (2013) 'The Federal Reserve and the Financial Crisis' (Princeton University Press, Princeton, New Jersey).

Berrospide, J. (2012). Bank Liquidity Hoarding and the Financial Crisis: An Empirical Evaluation. Available from https://www.federalreserve.gov/pubs/feds/2013/201303/201303pap.pdf [Accessed 9 February 2021].

Berrospide, J.M., Edge, R.M., 2010. The effects of bank capital on lending: what do we know, and what does it mean? Int. J. Cent. Bank. 6 (4), 5–54.

Berrospide, Jose, Ralf Meisenzahl, and Briana Sullivan, 2012, Credit line use and availability in the financial crisis: The importance of hedging, Finance and Economics Discussion Series, Federal Reserve Board of Governors, 2012-27

Bethune, Z., Sultanum, B. and Trachter, N., 2019. An information-based theory of financial intermediation.

Bhansali, V., Gingrich, R. and Longstaff, F.A., 2008. Systemic credit risk: What is the market telling us?. Financial Analysts Journal, 64(4), pp.16-24.

Bhatt, S., 2021. ASSESS FORTE OF PUBLIC SECTOR BANKS IN INDIA. International Journal of Management (IJM), 12(6), pp.322-330.

Bianchi, J (2016) 'Efficient Bailouts?', American Economic Review, 16(12), pp. 3607–3659.

Bilgin, M.H., Danisman, G.O., Demir, E. and Tarazi, A., 2021. Economic uncertainty and bank stability: Conventional vs. Islamic banking. Journal of Financial Stability, 56, p.100911.

Birn, M., Dietsch, M., and Durant, D (2017) "How to reach all Basel requirements at the same time?," Débats économiques et financiers 28, Banque de France.

BIS (2010) Basel III: A global regulatory framework for more resilient banks and banking systems , Available at: https://www.bis.org/publ/bcbs189_dec2010.pdf (Accessed: 17th Oct 2019).

Bitar, M., Hassan, M.K., Pukthuanthong, K. and Walker, T., 2018. The performance of Islamic vs. conventional banks: Evidence on the suitability of the Basel capital ratios. Open Economies Review, 29(5), pp.1003-1038.

Black, F and Scholes, M (1973) 'The Pricing of Options and Corporate Liabilities', Journal of Political Economy, 81(3), pp. 637-654.

Blitz, R.C. and Long, M.F., 1965. The economics of usury regulation. Journal of Political Economy, 73(6), pp.608-619.

Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87 (1), 115–143. Available from https://doi.org/10.1016/s0304-4076(98)00009-8 [Accessed 11 June 2021].

Boateng, K. (2019). Credit risk management and performance of banks in Ghana: The ‘Camels’ rating model approach. Kwadwo Boateng (2018). Credit Risk Management and Performance of Banks in Ghana: the ‘Camels’ Rating Model Approach. International Journal of Business and Management Invention, 8(02).

Bonfim, D. (2009). Credit risk drivers: Evaluating the contribution of firm level information and of macroeconomic dynamics. Journal of Banking & Finance, 33 (2), 281–299. Available from https://doi.org/10.1016/j.jbankfin.2008.08.006 [Accessed 9 June 2021].

Bongomin, G.O.C., Ntayi, J.M., Munene, J.C. and Akol, C.M., 2017. Financial intermediation and financial inclusion of poor households: Mediating role of social networks in rural Uganda. Cogent Economics & Finance, 5(1), p.1362184.

Boora, K. and Jangra, K., 2019. Preparedness level of Indian public sector banks for implementation of Basel III: An empirical investigation. Managerial Finance, 45(2), pp. 172-189.

Boukhatem, J. and Djelassi, M., 2020. Liquidity risk in the Saudi banking system: Is there any Islamic banking specificity?. The Quarterly Review of Economics and Finance, 77, pp.206-219.

Bräuning, F. and Ivashina, V. (2020). U.S. monetary policy and emerging market credit cycles. Journal of Monetary Economics, 112, 57–76. Available from https://doi.org/10.1016/j.jmoneco.2019.02.005 [Accessed 26 March 2021].

Brei, M.; Gambacorta, L.; Peter, G.V. (2013) 'Rescue packages and bank lending', Journal of Banking and Finance, 37(2), pp. 490-505.

Brunetti, C., Harris, J.H., Mankad, S., Michailidis, G. (2019) 'Interconnectedness in the interbank market', Journal of Financial Economics, 133(), pp. 520-538.

Brunnermeier, M. K., and L. H. Pedersen, 2009, "Market liquidity and funding liquidity", Review of Financial Studies, 22(6), 2201–2238.

Brunnermeier, M.K; Garicano, L.; Lane, P.R.; Pagano, M.; Reis, R.; Santos, T.; Thesmar, D.; Nieuwerburgh, S.V. and Vayanos. D. (2016) 'The Sovereign-Bank Diabolic Loop and ESBies', American Economic Review, 106(5), pp. 508 - 512.

Brunnermeier, M.K. and Sannikov, Y. (2015) 'International Credit Flows and Pecuniary Externalities', American Economic Journal: Macroeconomics, 7(1), pp. 297 - 338.

Bruno, V. and Shin, H.S. (2015). Capital flows and the risk-taking channel of monetary policy. Journal of Monetary Economics, 71, 119–132. Available from https://doi.org/10.1016/j.jmoneco.2014.11.011 [Accessed 9 April 2021].

Bryant, J (1980) 'A model of reserves, bank runs, and deposit insurance', Journal of Banking & Finance, 4(4), pp. 335 - 344.

Bryant, J., 1980. A model of reserves, bank runs, and deposit insurance. Journal of banking & finance, 4(4), pp.335-344.

Buch, C.M., Krause, T. and Tonzer, L., 2019. Drivers of systemic risk: Do national and European perspectives differ?. Journal of International Money and Finance, 91, pp.160-176.

Buch, M.C. and Goldberg, L.S. (2015) 'International Banking and Liquidity Risk Transmission: Lessons from Across Countries', IMF Economic Review , 63(), pp. 377 - 410.

Bülbül, D., Hakenes, H., & Lambert, C. (2019). What influences banks' choice of credit risk management practices? Theory and evidence. Journal of Financial Stability, 40, 1-14.

Butzbach, O., 2016. Systemic risk, macro-prudential regulation and organizational diversity in banking. Policy and Society, 35(3), pp.239-251.

Calomiris, C.W., Heider, F. and Hoerova, M., 2015. A theory of bank liquidity requirements. Columbia Business School Research Paper, 2, p.10.

Calomiris, Charles W. and Heider, Florian and Hoerova, Marie, A Theory of Bank Liquidity Requirements (April 15, 2015). Columbia Business School Research Paper No. 14-39, Available at SSRN: https://ssrn.com/abstract=2477101 or http://dx.doi.org/10.2139/ssrn.2477101

Campbell, J.Y., Hilscher, J., and Szilagyi, J. (2008) 'In Search of Distress Risk', Journal of Finance, 63(6), pp. 2899 - 2939.

Cardno, C., 2018. Policy Document Analysis: A Practical Educational Leadership Tool and a Qualitative Research Method. Educational Administration: Theory & Practice, 24(4), pp.623-640.

Carletti, E., Goldstein, I., Leonello, A (2018) The interdependence of bank capital and liquidity, Available at: https://www.aeaweb.org/conference/2019/preliminary/paper/TirG3EKd (Accessed: 15th April 2019).

CBIRC (2018) Rules on Liquidity Risk Management of Commercial Banks, Available at: http://www.cbirc.gov.cn/chinese/files/2019/84B92E8736AC44B489C22A4399E00DFE.pdf (Accessed: 22nd Oct 2019).

Chakraborty, I., Goldstein, I. and MacKinlay, A. (2020). Monetary stimulus and bank lending. Journal of Financial Economics, 136 (1), 189–218. Available from https://doi.org/10.1016/j.jfineco.2019.09.007 [Accessed 12 May 2021].

Chakroun, M.A. and Gallali, M.I., 2017. Contribution of Islamic banks to systemic risk. International Journal of Banking, Accounting and Finance, 8(1), pp.52-92.

Chari, A., Jain, L. and Kulkarni, N. (2020). The Unholy Trinity: Regulatory Forbearance, Stressed Banks and Zombie Firms. Available from https://doi.org/10.3386/w28435 [Accessed 13 February 2021].

Chava, S., Ganduri, R. and Ornthanalai, C. (2018). Do Credit Default Swaps Mitigate the Impact of Credit Rating Downgrades?*. Review of Finance, 23 (3), 471–511. Available from https://doi.org/10.1093/rof/rfy033 [Accessed 12 March 2021].

Chen, H.K., Liao, Y.C., Lin, C.Y. and Yen, J.F., 2018. The effect of the political connections of government bank CEOs on bank performance during the financial crisis. Journal of Financial Stability, 36, pp.130-143.

Chen, J. (2020). LIBOR's poker. Journal of Financial Markets, 100586. Available from https://doi.org/10.1016/j.finmar.2020.100586 [Accessed 12 March 2021].

Chen, Y.K., Shen, C.H., Kao, L. and Yeh, C.Y., 2018. Bank liquidity risk and performance. Review of Pacific Basin Financial Markets and Policies, 21(01), p.1850007.

Cherry, S. et al. (2021). Government and Private Household Debt Relief during COVID-19. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3770124 [Accessed 22 January 2021].

Chiaramonte, L & Casu, B. (2013) The determinants of bank CDS spreads: evidence from the financial crisis, The European Journal of Finance, 19:9, 861-887, DOI: 10.1080/1351847X.2011.636832

Chiaramonte, L and Casu, B (2017) 'Capital and liquidity ratios and financial distress. Evidence from the European banking industry', The British Accounting Review, 49(), pp. 138-161.

Chiaramonte, L. et al. (2016). How Accurately Can Z-score Predict Bank Failure? Financial Markets, Institutions & Instruments, 25 (5), 333–360. Available from https://doi.org/10.1111/fmii.12077 [Accessed 9 June 2021].

Chopra, Y., Subramanian, K. and Tantri, P.L. (2020). Bank Cleanups, Capitalization, and Lending: Evidence from India. The Review of Financial Studies. Available from https://doi.org/10.1093/rfs/hhaa119 [Accessed 13 February 2021].

Chuliá, H., Fernández, J., and Uribe, J.M. (2018) 'Currency downside risk, liquidity, and financial stability', Journal of International Money and Finance, 89, pp. 83-102.

Claessens, S. (2017)'Global Banking: Recent Developments and Insightsfrom Research',Review of Finance, 21 (4), pp. 1513–1555

Claessens, S. and Neeltje van Horen. (2015). The Impact of the Global Financial Crisis on Banking Globalization. 63 (4), 868–918. Available from https://doi.org/10.1057/imfer.2015.38 [Accessed 15 May 2023].

Claessens, S. and Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. Emerging Markets Review, 15(1), pp.1-33.

CMA (2019) Prudential Rules, Available at: https://cma.org.sa/en/RulesRegulations/Regulations/Documents/Final%20Draft%20Prudential%20Rules%20(English).pdf (Accessed: 22nd Oct 2019)

Cole, R.A. and Gunther, J.W. (1995). Separating the likelihood and timing of bank failure. Journal of Banking & Finance, 19 (6), 1073–1089. Available from https://doi.org/10.1016/0378-4266(95)98952-m [Accessed 11 June 2021].

Cole, R.A. and White, L.J. (2011). Déjà Vu All Over Again: The Causes of U.S. Commercial Bank Failures This Time Around. Journal of Financial Services Research, 42 (1-2), 5–29. Available from https://doi.org/10.1007/s10693-011-0116-9 [Accessed 11 June 2021].

Coleman, N. and Feler, L., 2015. Bank ownership, lending, and local economic performance during the 2008–2009 financial crisis. Journal of Monetary Economics, 71, pp.50-66.

Covas, F., & Driscoll, J. C. (2014). Bank liquidity and capital regulation in general equilibrium. In Finance and economics discussion series, 2014-85Washington, D.C: Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board.

Cox, S. and Thomas, A., 2005. Liquidity management: developing the Islamic capital market and creating liquidity. Abdukader Thomas, Stella Cox and B. Kraty, Structuring Islamic Finance Transactions. London: Euromoney Institution Investor PLC, pp.171-183.

Crotty, J. (2009). Structural causes of the global financial crisis: a critical assessment of the "new financial architecture." Cambridge Journal of Economics, 33 (4), 563–580. Available from https://doi.org/10.1093/cje/bep023 [Accessed 5 May 2021].

Cucinelli, D., 2016. Can speed kill? The cyclical effect of rapid credit growth: evidence from bank lending behavior in Italy. The Journal of Risk Finance, 17 (5), pp. 562-584. https://doi.org/10.1108/JRF-03-2016-0035

Cuong-Ly, K; Chen, Z; Wang, S; Jiang, W (2017) 'The Basel III net stable funding ratio adjustment speed and systemic risk', Research in International Business and Finance, 39(), pp. 169-182.

Cuong-Ly, K.; Shimizu,K (2018) 'Funding liquidity risk and internal markets in multi-bank holding companies: Diversification or internalization?', International Review of Financial Analysis, 57(), pp. 77-89

D'Cruz, R.G. and Adnan Sundra & Low, 2021, May 4. The Banking Regulation Review: Malaysia. The Law Reviews, pp. 1-37. https://thelawreviews.co.uk/title/the-banking-regulation-review/malaysia

Dahir, A. M., Mahat, F., Razak, N. H. A., & Bany-Ariffin, A. N. (2019). Capital, funding liquidity, and bank lending in emerging economies: An application of the LSDVC approach. Borsa Istanbul Review, 19(2), 139-148.

Dahir, A.M., Mahat, F.B. and Ali, N.A.B., 2018. Funding liquidity risk and bank risk-taking in BRICS countries: An application of system GMM approach. International Journal of Emerging Markets.

Dalglish, S.L., Khalid, H. and McMahon, S.A., 2020. Document analysis in health policy research: the READ approach. Health policy and planning, 35(10), pp.1424-1431.

Dalhatu, S. S., & Sharofiddin, A. (2021). A Risk-Based Supervisory Framework for Islamic Banks in Nigeria. In The Importance of New Technologies and Entrepreneurship in Business Development: In the Context of Economic Diversity in Developing Countries: The Impact of New Technologies and Entrepreneurship on Business Development (pp. 1496-1520). Springer International Publishing.

Dalhatu, S.S. and Sharofiddin, A., 2020. Conceptual Framework on Risk-Based Supervision of Islamic Banks: A Proposed Risk-Based Supervisory Framework. International Research in Technology, Engineering, Science and Humanities (IJRTESH), 01(1), pp. 1-9.

Dang, V.D. (2020). Do non-traditional banking activities reduce bank liquidity creation? Evidence from Vietnam. Research in International Business and Finance, 54, 101257. Available from https://doi.org/10.1016/j.ribaf.2020.101257 [Accessed 19 May 2021].

Dar, H.A. and Presley, J.R., 2000. Lack of profit loss sharing in Islamic banking: management and control imbalances. International Journal of Islamic Financial Services, 2(2), pp.3-18.

Davies, H. and Green, D. (2008)Global Financial Regulation: The EssentialGuide. Cambridge: Polity

Davis, D.D, Korenok, O., Lightle, J.P (2019) 'Liquidity regulation, banking history and financial fragility: An experimental examination', Journal of Economic Behavior and Organization, [Online]. Available at: https://doi.org/10.1016/j.jebo.2019.09.005 (Accessed: 17th Oct 2019).

Davydov, D., Vähämaa, S. and Yasar, S. (2021). Bank liquidity creation and systemic risk. Journal of Banking & Finance, 123, 106031. Available from https://doi.org/10.1016/j.jbankfin.2020.106031 [Accessed 18 February 2021].

De Haas, R. and Van Horen, N. (2012). International shock transmission and bank lending: Evidence from the global financial crisis. Journal of International Economics, 89(2), pp.495-510.

De Larosière Report, 2009. Report of the High-level Group on Financial Supervision in the EU.

Degryse, H., Matthews, K. and Zhao, T. (2018). SMEs and access to bank credit: Evidence on the regional propagation of the financial crisis in the UK. Journal of Financial Stability, 38, 53–70. Available from https://doi.org/10.1016/j.jfs.2018.08.006 [Accessed 12 February 2021].

Deli, Y and Hasan, I (2017) 'Real effects of bank capital regulations: Global evidence', Journal of Banking and Finance, 82(1), pp. 217-228.

Demirgüç-Kunt, A. and Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. Journal of Financial Economics, 98(3), pp.626-650.

Demirgüç-Kunt, A. and Huizinga, H. (2013). Interest rates and bank risk-taking. Journal of Financial Economics, 109(3), pp.759-778.

Demirguc-Kunt, A., Pedraza, A. and Ruiz-Ortega, C. (2020). Banking Sector Performance during the COVID-19 Crisis. World Bank, Washington, DC. Available from https://doi.org/10.1596/1813-9450-9363 [Accessed 26 January 2021].

Dermine, J (2015) 'Basel III leverage ratio requirement and the probability of bank runs', Journal of Banking & Finance, 53(), pp. 266-277.

DeYoung, R. and Rice, T. (2004). Noninterest income and financial performance at US commercial banks. Financial Review, 39(1), pp.101-127.

DeYoung, R., Distinguin, I. and Tarazi, A. (2018). The Joint Regulation of Bank Liquidity and Bank Capital. Journal of Financial Intermediation, 34 (1), 32–46. Available from https://doi.org/10.1016/j.jfi.2018.01.006 [Accessed 14 January 2021].

DeYoung, R., Jang, K.Y. (2016) 'Do banks actively manage their liquidity?', Journal of Banking & Finance, 66(), pp. 143-161.

Dhiraj, N.S., Puneri, A. and Benraheem, H., 2019. A SUCCINCT ANALYSIS OF MITIGATING LIQUIDITY RISK IN ISLAMIC BANKS IN THE LIGHT OF LIQUIDITY AND RISK MANAGEMENT PRINCIPLES. International Journal of Islamic Business Ethics, 4(1), pp.527-539.

Diamond and Rajan (2000) 'A Theory of Bank Capital', The Journal of Finance, 55(6), pp. 2431-2465

Diamond, D and Dybvig, P (2007) 'Banks and Liquidity Creation: A Simple Exposition of the Diamond-Dybvig Model', Quarterly Journal of Economics, 93(2), pp. 189–200.

Diamond, D and Rajan, R (2005) 'Liquidity Shortages and Banking Crises', The Journal of Finance, 60(), pp. 615-647.

Diamond, D.W. (1984). Financial Intermediation and Delegated Monitoring. The Review of Economic Studies, 51 (3), 393–414. Available from https://doi.org/10.2307/2297430 [Accessed 8 February 2021].

Diamond, D.W. and Dybvig, P.H., 1983. Bank runs, deposit insurance, and liquidity. Journal of political economy, 91(3), pp.401-419.

Diamond, D.W., Hu, Y. and Rajan, R.G. (2021). Liquidity, Pledgeability, and the Nature of Lending. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3773076 [Accessed 17 February 2021].

Diamond, Douglas, and Anil Kashyap, 2016, Liquidity requirements, liquidity choice and financial stability, in John B. Taylor and Harald Uhlig, eds.: Handbook of Macroeconomics, Vol. 2. (North-Holland, Amsterdam).

Díaz, V. and Huang, Y., 2017. The role of governance on bank liquidity creation. Journal of Banking & Finance, 77, pp.137-156.

Diebold, F.X., Yilmaz, K., 2015. Financial and Macroeconomic Connectedness A Network Approach to Measurement and Monitoring. Oxford University Press, Oxford

Dietrich, A., Hess, K., &Wanzenried, G. (2014). The good and the bad news about the new liquidity rules of Basel III inWestern European countries. Journal of Banking & Finance, 44, 13-25.

Distinguin, I., Roulet, C., and Tarazi, A (2013) 'Bank regulatory capital and liquidity: Evidence from US and European publicly traded banks', Journal of Banking & Finance, 37(), pp. 3295 - 3317.

Dobler, M., Gray, S., Murphy, D., and Radzewicz-Bak, B. (2016) 'The Lender of Last Resort Function after the Global Financial Crisis', IMF Working Paper WP/16/10, pp. 1-63.

Dolfin, M., Knopoff, D., Limosani, M. and Xibilia, M.G., 2019. Credit risk contagion and systemic risk on networks. Mathematics, 7(8), p.713.

Dong, M. and Oberson, R., 2021. Moving toward the expected credit loss model under IFRS 9: capital transitional arrangement and bank systematic risk. Accounting and Business Research, pp.1-39.

Dow, S.C. (1996) 'Why should the Banking System be Regulated', The Economic Journal, 106(), pp. 698-707.

Drechsler, I., Drechsedl, T., Marques-Ibanez, D. and Schnabl, P. (2016) 'Who Borrows from the Lender of Last Resort?', The Journal of Finance, 71(5), pp. 1933-1974.

Drechsler, I., Savov, A. and Schnabl, P. (2017). A Model of Monetary Policy and Risk Premia. The Journal of Finance, 73 (1), 317–373. Available from https://doi.org/10.1111/jofi.12539 [Accessed 13 April 2021].

Drechsler, I., Savov, A. and Schnabl, P. (2017). The Deposits Channel of Monetary Policy*. The Quarterly Journal of Economics, 132 (4), 1819–1876. Available from https://doi.org/10.1093/qje/qjx019 [Accessed 12 February 2021].

Drehmann, M and Nikolaou, K (2013) 'Funding liquidity risk: Definition and measurement', Journal of Banking & Finance, 37(7), pp. 2173-2182.

Duc Khuong Nguyen, Canh Phuc Nguyen and Le Si Dang. (2022). Uncertainty and corporate default risk: Novel evidence from emerging markets. 101571–101571. Available from https://doi.org/10.1016/j.intfin.2022.101571 [Accessed 28 May 2023]

Duffie, D. and Zhu, H. (2011). Does a central clearing counterparty reduce counterparty risk? Review of Asset Pricing Studies, 1(1), pp.74-95.

EBA (2018) FINAL REPORT – GUIDELINES ON THE REVISED SREP AND SUPERVISORY STRESS TESTING, Available at: https://eba.europa.eu/sites/default/documents/files/documents/10180/2282666/6c2e3962-6b95-4753-a7dc-68070a5ba662/Revised%20Guidelines%20on%20SREP%20(EBA-GL-2018-03).pdf (Accessed: 22nd Oct 2019).

Eberl, Jakob, and Christopher Weber, 2014, ECB collateral criteria: A narrative database 2001–2013, IFO Working Paper Series No. 174.

Ebrahim, M. and Sheikh, M., 2016. Debt Instruments in Islamic Finance: A Critique. Arab Law Quarterly, 30(2), pp.185-198.

ECB (2018) Systemic liquidity concept, measurement and macroprudential instruments, Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op214.en.pdf (Accessed: 10th April 2019).

Edge, R. M., & Liangb, J. N. (2022). Financial Stability Committees and the Basel III Countercyclical Capital Buffer. International Journal of Central Banking, 76, 247-299.

Ekinci, R. and Poyraz, G., 2019. The effect of credit risk on financial performance of deposit banks in Turkey. Procedia Computer Science, 158, pp.979-987.

El-Gamal, M. A. (2006). Islamic Finance: Law, Economics, and Practice. Cambridge University Press.

El-Massah, S., Bacheer, S.M. and Al Sayed, O., 2019. Liquidity risk in the MENA region banking sector: does bank type make a difference?. The Journal of Developing Areas, 53(1).

Elayan, F.A., Aktas, R., Brown, K., Pacharn, P. (2018) 'The impact of the Volcker rule on targeted banks, systemic risk, liquidity, and financial reporting quality', Journal of Economics and Business, 96, pp. 69-89.

Elnahas, A.M., M. Kabir Hassan and Waheed, A. (2017). Religion and mergers and acquisitions contracting: The case of earnout agreements. 42, 221–246. Available from https://doi.org/10.1016/j.jcorpfin.2016.11.012 [Accessed 15 May 2023]

ELOUALI, J. and OUBDI, L., 2020. Liquidity Risk Determinants of Islamic Banks. IJBTSR International Journal of Business and Technology Studies and Research, 2(4), pp.7-pages.

Fahlenbrach, R., Prilmeier, R. and Stulz, R.M. (2012). This Time Is the Same: Using Bank Performance in 1998 to Explain Bank Performance during the Recent Financial Crisis. The Journal of Finance, 67 (6), 2139–2185. Available from https://doi.org/10.1111/j.1540-6261.2012.01783.x [Accessed 17 June 2021].

Fakir, A.E., Fairchild, R. and Tkiouat, M., 2019. A hybrid profit and loss sharing model using interest free-debt and equity financing: An application of game theory as a decision tool. The North American Journal of Economics and Finance, 49, pp.352-360.

Fang, L., Sun, B., Li, H. and Yu, H., 2018. Systemic risk network of Chinese financial institutions. Emerging Markets Review, 35, pp.190-206.

Fang, X., Jutrsa, D.; Peria , S.; Presbitero, A.; Ratnovski, L (2020) 'Bank capital requirements and lending in emerging markets: The role of bank characteristics and economic conditions', Journal of Banking and Finance, 105806(), pp. 1-19.

Farag, M., Harland, D., & Nixon, D. (2013). Bank capital and liquidity. Quarterly Bulletin, Bank of England.

Farhan, M., Alam, H.M., Sattar, A. and Khan, S., 2020. Credit Risk Management in Islamic Banking: A System Thinking Approach. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies, 11(16), pp.11A16J-1.

Farihana, S. and Rahman, M.S., 2020. Can profit and loss sharing (PLS) financing instruments reduce the credit risk of Islamic banks?. Empirical Economics, pp.1-18.

Farooq, M. and Zaheer, S., 2015. Are Islamic banks more resilient during financial panics?. Pacific Economic Review, 20(1), pp.101-124.

Fecht, F., Thum, S., Weber, P. (2019) 'Fear, Deposit Insurance Schemes, and Deposit Reallocation in the German Banking System', Journal of Banking & Finance, 105(), pp. 151 - 165.

Federal Reserve (2017) Liquidity Risk Management, Available at: https://www.federalreserve.gov/supervisionreg/topics/liquidity_risk.htm (Accessed: 22nd Dec 2019)

Ferguson, R. W. (2002). Should financial stability be an explicit central bank objective. Challenges to Central Banking from Globalized Financial Systems, 16-17.

Fiordelisi, F., Marques-Ibanez, D. and Molyneux, P. (2011). Efficiency and risk in European banking. Journal of Banking & Finance, 35(5), pp.1315-1326.

Fleckenstein, M. and Longstaff, F. (2020). The Market Risk Premium for Unsecured Consumer Credit Risk. Available from https://doi.org/10.3386/w28029 [Accessed 10 February 2021].

Foglia, A., 2018. Stress testing credit risk: a survey of authorities' approaches. Eighteenth issue (September 2009) of the International Journal of Central Banking, 5(3), pp.9-45.

Fouquau, J. and Spieser, P.K. (2015). Statistical evidence about LIBOR manipulation: A “Sherlock Holmes” investigation. Journal of Banking & Finance, 50, 632–643. Available from https://doi.org/10.1016/j.jbankfin.2014.03.039 [Accessed 12 March 2021].

Freixas X, A Martin and D Skeie (2011), ‘Bank Liquidity, Interbank Markets and Monetary Policy’, Review of Financial Studies 24(8), pp 2656–2692.

Freixas, X. and Jorge, J. (2007). “The Role of Interbank Markets in Monetary Policy: A Model with Rationing.” Department of Economics and Business, Universitat Pompeu Fabra, Working Paper 1027

Friedman, M., 1969. The optimum quantity of money. The Optimum Quantity of Money and Other Essays, pp.1-50.

Fungáčová, Z., Turk, R., Weill, L., 2015. High liquidity creation and bank failures. In: International Monetary Fund Working Paper No. 15/103, Retrieved 15 May 2021, from: https://www.imf.org/external/pubs/ft/wp/2015/wp15103.pdf

Galletta, S. and Mazzù, S., 2019. Liquidity risk drivers and bank business models. Risks, 7(3), p.89.

Gambacorta, L., Mistrulli, P.E., 2004. Does bank capital affect lending behavior? Journal of Financial Intermediation 13, 436–457

Gang, Y (2018) Deepen reform and opening-up comprehensively. Create new prospects for financial sector, Available at: https://www.bis.org/review/r181220h.pdf (Accessed: 22nd Oct 2019).

Gao, Y., Liao, S., Wang, X. (2018) 'Capital markets’ assessment of the economic impact of the Dodd–Frank Act on systemically important financial firms', Journal of Banking and Finance, 86, pp. 204-223.

Garcia-de-Andoain, C. et al. (2016). Lending-of-last-resort is as lending-of-last-resort does: Central bank liquidity provision and interbank market functioning in the euro area. Journal of Financial Intermediation, 28, 32–47. Available from https://doi.org/10.1016/j.jfi.2016.01.003 [Accessed 16 March 2021].

Gefang, D., Koop, G. and Potter, S.M. (2011). Understanding liquidity and credit risks in the financial crisis. Journal of Empirical Finance, 18 (5), 903–914. Available from https://doi.org/10.1016/j.jempfin.2011.07.006 [Accessed 11 March 2021].

Geske, R (1979) 'The valuation of compound options', Journal of Financial Economics , 7(1), pp. 63 - 81.

Ghenimi, A., Chaibi, H. and Omri, M.A.B. (2017). The effects of liquidity risk and credit risk on bank stability: Evidence from the MENA region. Borsa Istanbul Review, 17 (4), 238–248. Available from https://doi.org/10.1016/j.bir.2017.05.002 [Accessed 18 February 2021].

Ghenimi, A., Chaibi, H. and Omri, M.A.B., 2020. Liquidity risk determinants: Islamic vs conventional banks. International Journal of Law and Management.

Giordana, G and Schumacher, (2017) 'An Empirical Study on the Impact of Basel III Standards on Banks’ Default Risk: The Case of Luxembourg', Journal of Risk and Financial Management, 10(8), pp. 2 -21.

Gobat, J; Yanase, M; Maloney, J (2014) 'The Net Stable Funding Ratio: Impact and Issues for Consideration', IMF Working Paper , WP/14/106(), pp. 1-43.

Godspower-Akpomiemie, E. and Ojah, K., 2021. Competition and Market Discipline in the Banking Industry of Emerging Market Economies. Review of Development Finance, 11(1), pp.1-25.

Golub, S., Kaya, A. and Reay, M., 2015. What were they thinking? The Federal Reserve in the run-up to the 2008 financial crisis. Review of International Political Economy, 22(4), pp.657-692.

Golubeva, O., Duljic, M. and Keminen, R., 2019. The impact of liquidity risk on bank profitability: some empirical evidence from the European banks following the introduction of Basel III regulations. Journal of Accounting and Management Information Systems, 18(4), pp.455-485.

Gomez, M. et al. (2021). Banks' exposure to interest rate risk and the transmission of monetary policy. Journal of Monetary Economics, 117, 543–570. Available from https://doi.org/10.1016/j.jmoneco.2020.03.011 [Accessed 18 March 2021].

Goodfriend M and R King (1988), 'Financial Deregulation, Monetary Policy and Central Banking', Federal Reserve Bank of Richmond Economic Review 74(3), pp 3–22.

Granja, J., Leuz, C. and Rajan, R. (2020). Revised: Going the Extra Mile: Distant Lending and Credit Cycles. Available from https://doi.org/10.3386/w25196 [Accessed 12 February 2021].

Gretta, S.A.A.B., 2017. Financial inclusion and growth. The Business & Management Review, 8(4), p.434.

Guijarro, F., Moya-Clemente, I. and Saleemi, J., 2019. Liquidity risk and investors' mood: Linking the financial market liquidity to sentiment analysis through Twitter in the S&P500 index. Sustainability, 11(24), p.7048.

Guinigundo, D.C. (2017). Macroprudential frameworks, implementation, and communication strategies – The Philippines. Available from https://www.bis.org/publ/bppdf/bispap94.pdf.

Gupta, J. and Kashiramka, S. (2020). Financial stability of banks in India: Does liquidity creation matter? Pacific-Basin Finance Journal, 64, 101439. Available from https://doi.org/10.1016/j.pacfin.2020.101439 [Accessed 18 February 2021].

Hadi, M.A. and José Closs, S., 2016. Ensuring rigour and trustworthiness of qualitative research in clinical pharmacy. International journal of clinical pharmacy, 38(3), pp.641-646.

Halling, M., Yu, J. and Zechner, J. (2020). The Dynamics of Corporate Debt Structure. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3488471 [Accessed 17 February 2021].

Hamza, H., 2016. Does investment deposit return in Islamic banks reflect PLS principle?. Borsa Istanbul Review, 16(1), pp.32-42.

Harun, T.W.R., Kamil, N.K.M., Haron, R. and Ramly, Z., 2021. Bank Liquidity Risk and Capital Structure: A Conceptual Review of Theoretical and Empirical Research on Islamic Banking Perspective. International Journal of Academic Research in Accounting Finance and Management Sciences, 11(3), pp. 539–553.

Hasan, Z. (2014). Islamic Banking and Financial Crisis: Reputation, Stability and Risks. Edward Elgar Publishing.

Hassan, M. K. and Lewis, M. K. (2007). Handbook of Islamic banking. Edward Elgar Publishing.

Hassan, M., Aliyu, S. and Hussain, M., 2019. A contemporary review of Islamic finance and accounting literature. The Singapore Economic Review, pp.1-38.

Hassan, M.K., Khan, A. and Paltrinieri, A. (2019). Liquidity risk, credit risk and stability in Islamic and conventional banks. Research in International Business and Finance, 48, 17–31. Available from https://doi.org/10.1016/j.ribaf.2018.10.006 [Accessed 27 April 2021].

Hausman. J. A. (1978) 'Specification Tests in Econometrics', Econometrica, 46(6), pp. 1251-1271.

He, Liang (2019) 'The seed of a crisis: Investor sentiment and bank liquidity', Finance Research Letters, 29(), pp. 152 - 155.

He, Z. and Xiong, W. (2012). Rollover Risk and Credit Risk. The Journal of Finance, 67 (2), 391–430. Available from https://doi.org/10.1111/j.1540-6261.2012.01721.x [Accessed 11 June 2021].

Hidayat, S.E., Nadeem, M.M., AlMadaifa, A.J. and Ali, Z., 2018. Impacts of Basel III on Islamic finance. Journal of Islamic Financial Studies, 4(02), pp.123-133.

Hill, B.M. (1975). A Simple General Approach to Inference About the Tail of a Distribution. The Annals of Statistics, 3 (5), 1163–1174. Available from https://www.jstor.org/stable/pdf/2958370.pdf?refreqid=excelsior%3Ac9eed4ab3aec009a9f081879653f357e [Accessed 18 June 2021].

Hillegeist, S., Keating, E., Cram, D., Lundstedt, K., 2004. Assessing theprobability of bankruptcy. Review of Accounting Studies 9, 5–34.

Hlebik, S (2017) 'Liquidity Risk under The New Basel Global Regulatory Framework', Applied Economics and Finance, 4(6), pp. 78-90.

Holmström, B. and Tirole, J., 1998. Private and Public Supply of Liquidity. Journal of Political Economy, 106(1), pp.1-40.

Holmstrom, B., Tirole, J. (1997) 'Financial Intermediation, Loanable Funds, and the Real Sector', The Quarterly Journal of Economics, 112(3), pp. 663-691.

Hong, H; Huang, J; Wu, D (2014) 'The information content of Basel III liquidity risk measures', Journal of Financial Stability, 15(), pp. 91-111

Hoque, H; Andriosopoulos, D; Andriosopoulos, K; Douady, R (2015) 'Bank regulation, risk and return: Evidence from the credit and sovereign debt crises', Journal of Banking & Finance, 50(1), pp.455-474.

Hosen, M. N. and Ashraf, D. (2021). Risk management practices of Islamic banks: A systematic review. Journal of Islamic Accounting and Business Research, 12(4), pp.775-794.

Hsieh, M. and Lee, C. (2020). Bank Liquidity Creation, Regulations, and Credit Risk. Asia-Pacific Journal of Financial Studies, 49 (3), 368–409. Available from https://doi.org/10.1111/ajfs.12295 [Accessed 19 May 2021].

Huang, S.-C., Chen, W.-D. and Chen, Y. (2018). Bank liquidity creation and CEO optimism. Journal of Financial Intermediation, 36, 101–117. Available from https://doi.org/10.1016/j.jfi.2018.03.004 [Accessed 12 May 2021].

Hübner, J., Vuckovac, D., Fleisch, E. and Ilic, A. 2019. Fintechs and the new wave of financial intermediaries. Available at: https://www.alexandria.unisg.ch/publications/259703.

Hugonnier, J. and Morellec, E (2017) 'Bank capital, liquid reserves, and insolvency risk', Journal of Financial Economics, 125(), pp. 266-285.

Hussain, M., Maheshwari, D. and Hamid, M., 2021. A Study Of The Impact Of Non-Performing Assets Of Indian Banking System On Selected Public Sector Banks. International Research Journal Of Modernization In Engineering Technology And Science, 3(3).

Hussain, M., Shahmoradi, A. and Turk, R., 2016. An overview of Islamic finance. Journal of International Commerce, Economics and Policy, 7(01), p.1650003.

Hussien, M.E., Alam, M.M., Murad, M.W. and Wahid, A.N., 2019. The performance of Islamic banks during the 2008 global financial crisis: evidence from the Gulf cooperation council countries. Journal of Islamic Accounting and Business Research, 10(3), pp. 407-420.

Ibrahim, M.H. and Alam, N., 2018. Islamic economics and Islamic finance in the world economy. The World Economy, 41(3), pp.668-673.

Ibrahim, W.H.W. and Ismail, A.G., 2015. Conventional bank and Islamic banking as institutions: similarities and differences. Humanomics, 29 (1), pp. 43-60.

ICMA. (2020) COVID-19 Market Updates: Monetary policy. Available from https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/covid-19-market-updates/monetary-policy/#Malaysia [Accessed 30 January 2021].

Imbierowicz, B. and Rauch, C. (2014). The relationship between liquidity risk and credit risk in banks. Journal of Banking & Finance, 40 (40), 242–256. Available from https://doi.org/10.1016/j.jbankfin.2013.11.030 [Accessed 10 September 2019].

IMF (2008), Global Financial Stability Report, April 2008

IMF (2017) SAUDI ARABIA FINANCIAL SYSTEM STABILITY ASSESSMENT, Available at: https://www.imf.org/~/media/Files/Publications/CR/2017/cr17318.ashx (Accessed: 22nd Oct 2019).

IMF (2017b, December). PEOPLE'S REPUBLIC OF CHINA FINANCIAL SECTOR ASSESSMENT PROGRAM. IMF Country Report No. 17/403. Available at https://www.imf.org/-/media/Files/Publications/CR/2017/cr17403.ashx (Accessed: 10th June 2022).

IMF. (2021) Policy Responses to COVID19. Available from https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#I [Accessed 28 January 2021].

İncekara, A. and Çetinkaya, H., 2019. Liquidity risk management: A comparative analysis of panel data between Islamic and conventional banking in Turkey. Procedia Computer Science, 158, pp.955-963.

Ippolito, F., Almeida, H., Perez Orive, A., Acharya, V. (2019) 'Bank lines of credit as contingent liquidity: Covenant violations and their implications', Journal of Financial Intermediation, https://doi.org/10.1016/j.jfi.2019.03.004

Ippolito, F., Peydró, J.L.,Poloc, A. ,Sette, E. (2016) 'Double bank runs and liquidity risk management', Journal of Financial Economics, 122(), pp. 135-154.

Iqbal, Z., 1997. Islamic financial systems. Finance and Development, 34, pp.42-45.

Isanzu, J.S., 2017. The impact of credit risk on financial performance of Chinese banks. Journal of International Business Research and Marketing, 2(3).

Islam, A., Farooq, M. and Ahmad, A., 2017. Factors affecting liquidity position of Islamic banks. City University Research Journal, pp.27-36.

Ismail, R., Rahman, R.A. and Ahmad, N., 2013. Risk management disclosure In Malaysian islamic financial institutions: Pre-and post-financial crisis. Journal of Applied Business Research (JABR), 29(2), pp.419-432.

Izzeldin, M. et al. (2021). The impact of Covid-19 on G7 stock markets volatility: Evidence from a ST-HAR model. International Review of Financial Analysis, 74, 101671. Available from https://doi.org/10.1016/j.irfa.2021.101671 [Accessed 26 January 2021].

Jaara, O.O., Jaara, B.O., Shamieh, J. and Fendi, U.A., 2017. Liquidity risk exposure in Islamic and Conventional banks. International Journal of Economics and Financial Issues, 7(6), p.16.

Jarbou, T. and Niyama, J.K., 2020. Country comparative assessment of Islamic banks' financial economic situation. REVISTA AMBIENTE CONTÁBIL-Universidade Federal do Rio Grande do Norte-ISSN 2176-9036, 12(2).

Jayawarsa, A.K., Wulandari, I.G.A.A., Saputra, K.A.K. and Saputri, N.M.M.D., 2021. Public financial deposits in state owned banks: from an inflation perspective and bank Indonesia interest rates. International Journal of Business, Economics and Law, 24(1), pp.105-112.

Jedidia, K.B. and Hamza, H., 2015. Determinants of liquidity risk in Islamic banks: A panel study. Islamic Management and Business, 2(2), pp.137-146.

Jensen, M.C. and Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), pp.305-360.

Jia, M. (2014). Doctoral Thesis: Heavy-Tailed Phenomena and Tail Index Inference. Available from https://core.ac.uk/download/pdf/35317427.pdf.

Jobst, A.A. (2014) 'Measuring Systemic Risk-Adjusted Liquidity (SRL) - A Model Approach', IMF Working Paper: Monetary and Capital Markets Department WP/12/209, pp. 1-69.

Jouti, A.T., 2020. The Fourth Market theory and interest rate benchmarking in the Islamic finance industry. ISRA International Journal of Islamic Finance.

Joyce, M., Miles, D., Scott, A., Vayanos, D. (2012) 'Quantitative Easing and Unconventional Monetary Policy – an Introduction', The Economic Journal, 122(564), pp. 271 – 288.

Jung H. and Kim, D. (2015) 'Bank funding structure and lending under liquidity shocks: Evidence from Korea', Pacific- Basin Finance Journal , 33(), pp. 62 - 80.

Kabir, Md.N., Worthington, A. and Gupta, R. (2015). Comparative credit risk in Islamic and conventional bank. Pacific-Basin Finance Journal, 34, 327–353. Available from https://doi.org/10.1016/j.pacfin.2015.06.001 [Accessed 21 April 2021].

Kapoor, S. and Peia, O. (2021). The impact of quantitative easing on liquidity creation. Journal of Banking & Finance, 122, 105998. Available from https://doi.org/10.1016/j.jbankfin.2020.105998 [Accessed 11 May 2021].

Karimalis, E.N. and Nomikos, N.K., 2018. Measuring systemic risk in the European banking sector: a copula CoVaR approach. The European Journal of Finance, 24(11), pp.944-975.

Karolyi, G., Lee, K.H., Van Dijk, M., (2012) Understanding commonality in liquidity around the world. Journal of Financial Economics 105 (1), 82–112

Kashyap, A., Tsomocos, D. and Vardoulakis, A. (2020). Optimal Bank Regulation In the Presence of Credit and Run-Risk. Available from https://doi.org/10.3386/w26689 [Accessed 10 February 2021].

Kashyap, A.K., Rajan, R. and Stein, J.C., 2002. Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. The Journal of finance, 57(1), pp.33-73.

Kayesa, N.K. and Shung-King, M., 2021. The role of document analysis in health policy analysis studies in low and middle-income countries: Lessons for HPA researchers from a qualitative systematic review. Health Policy OPEN, 2, p.100024.

Keeley, M.C. (1990). Deposit Insurance, Risk, and Market Power in Banking. The American Economic Review, 80 (5), 1183–1200. Available from https://www.jstor.org/stable/2006769?seq=1 [Accessed 17 May 2021].

Keister, T. (2016) 'Bailouts and Financial Fragility', The Review of Economic Studies, 83(2), pp. 704–736.

Khalid, M.S., Rashed, M. and Hossain, A., 2019. The Impact of Liquidity Risk on Banking Performance: Evidence from the Emerging Market. Global Journal of Management and Business Research.

Khan, U.E. and Iqbal, J., 2021. The Relationship between Default Risk and Asset Pricing: Empirical Evidence from Pakistan. The Journal of Asian Finance, Economics and Business, 8(3), pp.717-729.

Khediri, K.B., Charfeddine, L. and Youssef, S.B., 2015. Islamic versus conventional banks in the GCC countries: A comparative study using classification techniques. Research in International Business and Finance, 33, pp.75-98.

Khokher, Z. and Alhabshi, S., 2019. Determinants of capital structure decisions among publicly listed Islamic banks. Management Science Letters, 9(10), pp.1577-1598.

Kim, D; Sohn, W (2017) 'The effect of bank capital on lending: Does liquidity matter?', Journal of Banking and Finance, 77(1), pp.95-107.

King, M. R. (2013). The Basel III net stable funding ratio and bank net interest margins. Journal of Banking & Finance, 37, 4144-4156.

King, T.B. and Lewis, K.F. (2015). Credit Risk, Liquidity and Lies. Finanace and Economics Discussion Series, 2015 (2012), 1–41. Available from https://doi.org/10.17016/feds.2015.112 [Accessed 12 March 2021].

Klein, M.A. (1971). A Theory of the Banking Firm. Journal of Money, Credit and Banking, 3 (2), 205. Available from https://doi.org/10.2307/1991279.

Kleinow, J., Moreira, F., Strobl, S. and Vähämaa, S., 2017. Measuring systemic risk: A comparison of alternative market-based approaches. Finance Research Letters, 21, pp.40-46.

Konovalova, N., Kristovska, I. and Kudinska, M., 2016. Credit risk management in commercial banks. Polish Journal of Management Studies, 13.

Kou, G., Chao, X., Peng, Y., Alsaadi, F.E. and Herrera-Viedma, E., 2019. Machine learning methods for systemic risk analysis in financial sectors. Technological and Economic Development of Economy, 25(5), pp.716-742.

Ladley, D (2013) 'Contagion and risk-sharing on the inter-bank market', Journal of Economic Dynamics & Control, 37(), pp. 1384-1400.

Lallour, A and Mio, H (2016) 'Do we need a stable funding ratio? Banks' funding in the global financial crisis', Bank of England Staff Working Paper No. 602, (), pp. [Online]. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/do-we-need-a-stable-funding-ratio-banks-funding-in-the-global-crisis.pdf?la=en&hash=925455009706E7D907FCF132D7F152AD2654CFC2 (Accessed: 08th March 2020)

Lassoued, M. (2018). Comparative study on credit risk in Islamic banking institutions: The case of Malaysia. The Quarterly Review of Economics and Finance, 70, 267–278. Available from https://doi.org/10.1016/j.qref.2018.05.009 [Accessed 9 June 2021].

Lawrence, B. (2012): "The Federal Reserve as global lender of last resort, 2007–2011", Winner: Best Paper Award, International Political Economy Society (IPES), University of Virginia, 9–10 November.

Leo, M., Sharma, S. and Maddulety, K., 2019. Machine learning in banking risk management: A literature review. Risks, 7(1), p.29.

Lerner, A.P. (1934). The Concept of Monopoly and the Measurement of Monopoly Power. The Review of Economic Studies, 1 (3), 157–175. Available from https://doi.org/10.2307/2967480 [Accessed 17 May 2021].

Lesmond, D. A., J. P. Ogden, and C. A. Trzcinka. 1999. A new estimate of transaction costs. The Review of Financial Studies 12 (5):1113–41. doi:10.2307/2645977.

Li, F. and Perez-Saiz, H., 2018. Measuring systemic risk across financial market infrastructures. Journal of Financial Stability, 34, pp.1-11.

Ling, D. X., Haron, R., & Hasan, A. (2022). BASEL III CAPITAL REGULATION FRAMEWORK AND ISLAMIC BANK'S RISK. IIUM Law Journal, 30(S2), 93-128.

Liu, X., 2017. Measuring systemic risk with regime switching in tails. Economic Modelling, 67, pp.55-72.

Liu, Y., Qiu, B. and Wang, T. (2021). Debt rollover risk, credit default swap spread and stock returns: Evidence from the COVID-19 crisis. Journal of Financial Stability, 53, 100855. Available from https://doi.org/10.1016/j.jfs.2021.100855 [Accessed 11 June 2021].

Louati, S., Abida, I.G. and Boujelbene, Y., 2015. Capital adequacy implications on Islamic and non-Islamic bank's behavior: Does market power matter?. Borsa Istanbul Review, 15(3), pp.192-204.

Love, I., & Zicchino, L. (2006). Financial development and dynamic investment behavior: Evidence from panel VAR. The Quarterly Review of Economics and Finance, 46, 190-210.

Lund, S., Daruvala, T., Dobbs, R., H€arle, P., Kwek, J.-H. and Falcon, R.(2013)'Financial Globalization: Retreat or Reset?'. [online]. Availablefrom:http://www.mckinsey.com/global-themes/employment-and-growth/financial-globalization [Accessed 29 January 2019].

Maatoug, A.B., Ayed, W.B. and Ftiti, Z., 2019. Are MENA banks' capital buffers countercyclical? Evidence from the Islamic and conventional banking systems. The Quarterly Review of Economics and Finance, 74, pp.109-118.

Mabrouk, A. and Farah, L., 2021. Liquidity Risk Management in the Islamic Banking: Portfolio of Ijara and Murabaha. European Journal of Islamic Finance, (18).

Mahdi, I.B.S. and Abbes, M.B., 2018. Relationship between capital, risk and liquidity: a comparative study between Islamic and conventional banks in MENA region. Research in International Business and Finance, 45, pp.588-596.

Mahmood, H., Gan, C., and Nguyen, C (2018) 'Maturity transformation risk factors in Islamic banking', Journal of Managerial Finance, 44(6), pp. 787-808.

Mahrous, S.N., Samak, N. and Abdelsalam, M.A.M. (2020). The effect of monetary policy on credit risk: evidence from the MENA region countries | Emerald Insight. Review of Economics and Political Science. Available from https://doi.org/10.1108\/REPS [Accessed 19 April 2021].

Malherbe, F. (2014) 'Self-Fulfilling Liquidity Dry-Ups', The Journal of Finance , 69(2), pp. 947 - 970.

Mansour, W., Ben Abdelhamid, M. and Heshmati, A., 2015. Recursive profit-and-loss sharing. Journal of Risk, 17(6), pp.21-50.

Marozva, G. and Makina, D., 2020. Liquidity risk and asset liability mismatches: evidence from South Africa. Studies in Economics and Econometrics, 44(1), pp.73-112.

Masood, O. and Javaria, K., 2017. Liquidity Risk Management and Financial Performance of Islamic Banks: Empirical Evidence from Global Islamic Banks. Journal of Islamic Financial Studies, 3(02), pp.62-70.

Matz, L.M., Neu, P., 2007. Liquidity Risk: Measurement and Management. Wiley Finance

Meegan, A., Corbet, S., Larkin, C. (2018) 'Financial market spillovers during the quantitative easing programmes of the global financial crisis (2007–2009) and the European debt crisis', Journal of International Financial Markets, Institutions & Money, 56(), pp. 128 -148.

Meh, C. "Bank balance sheets, deleveraging and the transmission mechanism," Bank of Canada Review Summer (2011): 23–34.

Mehran, H. and Thakor, A. (2011) 'Bank Capital and Value in the Cross-Section', The Review of Financial Studies, 24(4), pp. 1019–1067.

Mehri, M., Jouaber-Snoussi, K. and Hassan, M.K., 2017. Profit-sharing ratio as a screening device in venture capital. In Handbook of empirical research on Islam and economic life. Edward Elgar Publishing.

Mennawi, A.N.A. and Ahmed, A.A., 2020. The Determinants of Liquidity Risk in Islamic Banks: A Case of Sudanese Banking Sector. International Journal of Islamic Banking and Finance Research, 4(1), pp.38-49.

Milojević, N. and Redzepagic, S., 2021. Effects expectation of the revised exposure to banks Basel credit risk weighted assets standard. Strategic Management-International Journal of Strategic Management and Decision Support Systems in Strategic Management, 26(3).

Mirakhor, A. and Iqbal, Z. (2011). Introduction to Islamic Finance: Theory and Practice. John Wiley & Sons.

Misman, F.N. and Bhatti, M.I., 2020. The determinants of credit risk: an evidence from ASEAN and GCC Islamic banks. Journal of Risk and Financial Management, 13(5), p.89.

Misman, F.N., Bhatti, I., Lou, W., Samsudin, S. and Abd Rahman, N.H., 2015. Islamic banks credit risk: a panel study. Procedia Economics and Finance, 31, pp.75-82.

Modigliani, F. and Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. The American economic review, 48(3), pp.261-297.

Mohammad, S. et al. (2020). Liquidity risk exposure and its determinants in the banking sector: A comparative analysis between Islamic, conventional and hybrid banks. Journal of International Financial Markets, Institutions and Money, 66, 101196. Available from https://doi.org/10.1016/j.intfin.2020.101196 [Accessed 9 June 2021].

Mohanty, S.K; Akhigbe, A; Basheikh, A; Khan, H.R (2018) 'The Dodd-Frank Act and Basel III:Market-based risk implications for global systemically important banks(G-SIBs)', Journal of Multinational Financial Management, 47-48(), pp. 91-109.

Mohd Amin, S.I. and Abdul-Rahman, A., 2020. The role of regulation in Banking: Liquidity risk perspective. Iranian Journal of Management Studies, 13(3), pp.391-412.

Moisseron, J.Y., Moschetto, B.L. and Teulon, F., 2015. Islamic finance: a review of the literature. International Business & Economics Research Journal (IBER), 14(5), pp.745-762.

Mollah, S. and Zaman, M., 2015. Shari'ah supervision, corporate governance and performance: Conventional vs. Islamic banks. Journal of Banking & Finance, 58, pp.418-435.

Molyneux, P. and Nguyen, L. H. (2017). Risk in banking and capital regulation. Journal of Banking & Finance, 82(1), pp.203-214.

Morais, B. et al. (2019). The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach-for-Yield, and Real Effects. The Journal of Finance, 74 (1), 55–90. Available from https://doi.org/10.1111/jofi.12735 [Accessed 24 March 2021].

Muhammad Natsir et al. (2019). Foreign penetration, competition, and credit risk in banking. 19 (3), 249–257. Available from https://doi.org/10.1016/j.bir.2019.05.003 [Accessed 16 May 2023].

Mukhtar, S., Zainol, Z. and Jusoh, S., 2018. Islamic Law and Sustainable Development Goals. Tazkia Islamic Finance and Business Review, 12(1).

Munteanu, I. (2012). Bank Liquidity and its Determinants in Romania. Procedia Economics and Finance, 3, 993–998. Available from https://doi.org/10.1016/s2212-5671(12)00263-8 [Accessed 9 June 2021].

Newbury, L.B. and Izaguirre, J.C., 2019. Risk-Based Supervision in Low-Capacity Environments: Considerations for Enabling Financial Inclusion.

Niepmann, F. and Schmidt-Eisenlohr, T., 2017. International trade, risk and the role of banks. Journal of International Economics, 107, pp.111-126.

Nijs, L., & Nijs, L. (2020). Shadow Banking in Asia. The Handbook of Global Shadow Banking, Volume II: The Future of Economic and Regulatory Dynamics, 341-426.

Nikolaou, K (2009) "Liquidity (Risk) Concepts: Definitions and Interactions" ECB Working Paper No. 1008. Available at SSRN: https://ssrn.com/abstract=1333568

Ningsih, P.K., 2020. Contribution of Sharia Supervisory Board (SB) and Sharia Compliance Levels to Performance Indonesian Sharia Banking. Jurnal Manajemen (Edisi Elektronik), 11(1), pp.114-125.

Njima, NEB and Zouari, SM, 2012. Challenges and opportunities for the development of Islamic Finance in Tunisia. Journal of Academic Finance , 3 (1).

Noman AHM, Gee CS, Isa CR (2017) Does competition improve financial stability of the banking sector in ASEAN countries? An empirical analysis. PLoS ONE 12(5): e0176546. https://doi.org/10.1371/journal.pone.0176546

O'Halloran, S. and Nowaczyk, N., 2019. An artificial intelligence approach to regulating systemic risk. Frontiers in Artificial Intelligence, 2, p.7.

Olson, D. and Zoubi, T., 2017. Convergence in bank performance for commercial and Islamic banks during and after the Global Financial Crisis. The Quarterly Review of Economics and Finance, 65, pp.71-87.

Onagun, A.I., 2019. Capital Regulatory Requirements for Islamic Banks in the UAE: A Comparative Analysis. In Islamic Finance, Risk-Sharing and Macroeconomic Stability (pp. 81-94). Palgrave Macmillan, Cham.

Özşuca, E.A. and Akbostancı, E., 2016. An empirical analysis of the risk-taking channel of monetary policy in Turkey. Emerging Markets Finance and Trade, 52(3), pp.589-609.

Pan, H., & Fan, H. (2020). Research on the stability of the banking system with shadow banking under macroeconomic fluctuation. Frontiers in Physics, 8, 338.

Parashar, S.P., 2010. How did Islamic banks do during global financial crisis?. Banks and Bank systems, 5(4), pp.54-62.

Perves, M.M., 2015. Legal and regulatory framework in Islamic banking system: Bangladesh perspective. European Journal of Business and Management, 7(21), pp.179-188.

Petrella, G., and Resti, A. (2017) 'What drives the liquidity of sovereign bonds when markets are under stress? An assessment of the new Basel 3 rules on bank liquid assets', Journal of Financial Stability, 33(), pp. 297 - 310.

Petrone, D. and Latora, V., 2018. A dynamic approach merging network theory and credit risk techniques to assess systemic risk in financial networks. Scientific reports, 8(1), pp.1-14.

Pham, Hai Nam. (2021). How Does Internal Control Affect Bank Credit Risk in Vietnam? A Bayesian Analysis. The Journal of Asian Finance, Economics and Business, 8 (1), 873–880. Available from https://doi.org/10.13106/jafeb.2021.vol8.no1.873 [Accessed 9 June 2021].

Pierret, D (2015) 'Systemic Risk and the Solvency-Liquidity Nexus of Banks', International Journal of Central Banking, 11(3), pp. 193-227.

Piskorski, T., Seru, A., 2018. Mortgage market design: Lessons from the Great Recession. Brookings Papers on Economic Activity. (Spring): 429–513

Podpiera, J. and Weill, L. (2008). Bad luck or bad management? Emerging banking market experience. Journal of Financial Stability, 4(2), pp.135-148.

Popov, A. and Udell, G. F. (2012). Cross-border banking, credit access, and the financial crisis. Journal of International Economics, 87(1), pp.147-161.

Popov, A.I. and Udell, G.F. (2012). Cross-border banking, credit access, and the financial crisis. 87 (1), 147–161. Available from https://doi.org/10.1016/j.jinteco.2012.01.008 [Accessed 16 May 2023].

Pourkhanali, A., Kim, J.M., Tafakori, L. and Fard, F.A., 2016. Measuring systemic risk using vine-copula. Economic modelling, 53, pp.63-74.

Pushkala, N., Mahamayi, J. and Venkatesh, K.A., 2017. Liquidity and off-balance sheet items: A comparative study of public and private sector banks in India. SDMIMD Journal of Management, 8(1), pp.47-54.

Qadiri, H. and Alsughayer, S. (2021). Credit Risk and Disclosure Behavior in the Bank Industry: Evidence From Saudi Arabia. International Journal of Accounting and Financial Reporting, 11(3), pp. 1-24.

QCB (2012) The Qatar Central Bank, QFC Regulatory Authority And Qatar Financial Markets Authority Welcome New Law Regulating Financial Institutions, Available at: http://www.qcb.gov.qa/english/news/pages/newlawpressrelease.aspx (Accessed: 22nd Oct 2019).

Radzi, R.M. and Lonik, K.A.T., 2016. Islamic banks' risks: It's rating methodology and shariah assessment solutions. Journal of Islamic Banking and Finance, 4(2), pp.48-60.

Rafiq, M.S. and Siddiqui, D.A., 2018. Comparative Analysis of Credit Risk of Islamic and Conventional Banks:(A Case Study of Pakistan). Available at SSRN 3299515.

Rahaman, S.M. and Sur, D., 2021. Identifying Key Drivers of Non-Performing Assets in Indian Public Sector Banks: A Panel Data Analysis. IIM Kozhikode Society & Management Review, p.22779752211000146.

Ramakrishnan, R.T. and Thakor, A.V., 1984. Information reliability and a theory of financial intermediation. The Review of Economic Studies, 51(3), pp.415-432.

Ramaswamy, S (2017): Financial crisis and regulatory reforms. IngramSpark, Basel

Rampini, A.A. and Viswanathan, S., 2019. Financial intermediary capital. The Review of Economic Studies, 86(1), pp.413-455.

Rashid, U.S.A., Rahman, A.A. and Markom, R., 2018. THE REGULATORY FRAMEWORK ON LIQUIDITY RISK MANAGEMENT OF ISLAMIC BANKING IN MALAYSIA. International Journal of Business & Society, 19.

Rasli, S., Kassim, A.A.M. and Bhuiyan, A.B., 2020. Shariah Governance Characteristics and Risk-Taking of Local and Foreign Islamic Banks in Malaysia: A Conceptual Model. Journal of Accounting and Finance in Emerging Economies, 6(2), pp.441-451.

RBI - Notifications. (2011). Rbi.org.in. Available from https://www.rbi.org.in/scripts/NotificationUser.aspx?Id=5090&Mode=0 [Accessed 13 February 2021].

RBI (2019) Report of the Internal Working Group to review the Liquidity Management Framework, Available at: https://rbidocs.rbi.org.in/rdocs//PublicationReport/Pdfs/IWGREPORT17135173C7384084ACE10A75E8C35D93.PDF (Accessed: 22nd Oct 2019).

Repullo R (2005), 'Liquidity, Risk Taking, and the Lender of Last Resort', International Journal of Central Banking 1(2), pp 47–80.

Reserve Bank of India - Press Releases. (2021). Rbi.org.in. Available from https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx [Accessed 28 January 2021].

Risfandy, T., Trinarningsih, W., Harmadi, H. and Trinugroho, I., 2019. ISLAMIC BANKS'MARKET POWER, STATE-OWNED BANKS, AND RAMADAN: EVIDENCE FROM INDONESIA. The Singapore Economic Review, 64(02), pp.423-440.

Rizvi, N.U., Kashiramka, S. and Singh, S., 2018. Basel I to Basel III: Impact of credit risk and interest rate risk of banks in India. Journal of Emerging Market Finance, 17(1_suppl), pp.S83-S111.

Rizvi, N.U., Kashiramka, S. and Singh, S., 2021. Basel III in India: a double-edged sword. Qualitative Research in Financial Markets, 13(5), pp. 692-709.

Roberts, D., Sarkar, A. and Shachar, O., 2018. Bank liquidity creation, systemic risk, and basel liquidity regulations. FRB of New York Staff Report, (852).

Roberts, K., Dowell, A. and Nie, J.B., 2019. Attempting rigour and replicability in thematic analysis of qualitative research data; a case study of codebook development. BMC medical research methodology, 19(1), pp.1-8.

Rochet J-C and Vives X (2004), 'Coordination Failures and the Lender of Last Resort: Was Bagehot Right After All?', Journal of the European Economic Association 2(6), pp 1116–1147.

Rochet, J.C., 2018. Systemic risk: Changing the regulatory perspective. 23rd issue (December 2010) of the International Journal of Central Banking, pp.256-277.

Rodnyansky, A. and Darmouni, O.M. (2017). The Effects of Quantitative Easing on Bank Lending Behavior. The Review of Financial Studies, 30 (11), 3858–3887. Available from https://doi.org/10.1093/rfs/hhx063 [Accessed 12 May 2021].

Rosenkranz, P. and Lee, J. (2019). Nonperforming Loans in Asia: Determinants and Macrofinancial Linkages. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3357289.

Saad Azmat et al. (2020). Conventional vs Islamic banking and macroeconomic risk: Impact on asset price bubbles. 62, 101351–101351. Available from https://doi.org/10.1016/j.pacfin.2020.101351 [Accessed 15 May 2023].

Safiullah, M. and Shamsuddin, A., 2018. Risk in Islamic banking and corporate governance. Pacific-Basin Finance Journal, 47, pp.129-149.

Sahyouni, A. and Wang, M., 2019. Liquidity creation and bank performance: evidence from MENA. ISRA International Journal of Islamic Finance.

Sajjad Hussain, M., Muhaizam Bin Musa, M. and Omran, A., 2018. The Impact of Private Ownership Structure on Risk Taking by Pakistani Banks: An Empirical Study. Pakistan Journal of Humanities and Social Sciences, 6(3), pp.325-337.

Saleh, I. and Abu Afifa, M., 2020. The effect of credit risk, liquidity risk and bank capital on bank profitability: Evidence from an emerging market. Cogent Economics & Finance, 8(1), p.1814509.

Saliba, C., Farmanesh, P., & Athari, S. A. (2023). Does country risk impact the banking sectors' non-performing loans? Evidence from BRICS emerging economies. Financial Innovation, 9(1), 1-30.

Salim, B.F., Mahmoud, M.H. and Atiatallah, S., 2015. Role of Capital Adequacy Standard of (IFSB) on Minimizing the Financial Crisis Impact for Financial Institutions: Evidence from Middle East. European Journal of Economics, Finance and Administrative Sciences, (77).

Samanta, S., 2015. Basel III in India: Where are we heading?. MUDRA: Journal of Finance and Accounting, 2(1), pp.83-99.

Samuelson, P.A., 1958. An exact consumption-loan model of interest with or without the social contrivance of money. Journal of Political Economy, 66(6), pp.467-482.

Sarkar, S. and Sahoo, T.K., 2017. Analysis of capital requirements for public sector banks in India due to rising provision for NPAs and additional capital requirements under Basel-III. Indian Institute of Management Bangalore.

Sarker, N. and Bhowmik, P.K., 2021. Bank Liquidity Risk: Significance of Financial Disclosure and Governance Practice. Asian Economic and Financial Review, 11(9), pp.724-744.

Schmuki, S. (2008). Tail Dependence: Implementation, Analysis, and Study of the most recent concepts. Available from https://ethz.ch/content/dam/ethz/special-interest/mtec/chair-of-entrepreneurial-risks-dam/documents/dissertation/master%20thesis/masterthesis_sebastian_schmuki_final.pdf [Accessed 18 June 2021].

Sedunov, J., 2016. What is the systemic risk exposure of financial institutions?. Journal of Financial Stability, 24, pp.71-87.

Shaban, M., Hassan, M. K. and Al-Hares, O. M. (2019). Bank liquidity creation and systemic risk: A comparative analysis between Islamic and conventional banks. Journal of Financial Stability, 40(1), pp.77-91.

SHAH, S. M. R., Jianjun, L. I., & Qiang, F. U. (2020). What prompted shadow banking in China? Wealth management products and regulatory arbitrage. The Journal of Asian Finance, Economics and Business (JAFEB), 7(12), 63-72.

Shahzad, S.J.H., Arreola-Hernandez, J., Bekiros, S., Shahbaz, M. and Kayani, G.M., 2018. A systemic risk analysis of Islamic equity markets using vine copula and delta CoVaR modeling. Journal of International Financial Markets, Institutions and Money, 56, pp.104-127.

Sharma, G. D., Talan, G., & Jain, M. (2020). Policy response to the economic challenge from COVID-19 in India: A qualitative enquiry. Journal of Public Affairs, 20(4), e2206.

Shaukat, M. and Alhabshi, D.O., 2015. Instability of interest-bearing debt finance and the Islamic finance alternative. Islamic Economic Studies, 23(2).

Sheikh, S.M., Sabri, P.S.U., Akram, M.W., bin Dost, M.K. and Luqman, M., 2018. Determinants of Depositors Behavior with Respect to Liquidity Risk Management in Islamic Banks of Pakistan. Abasyn University Journal of Social Sciences (AJSS), 11(Special Issue-IGCETMA).

Singh, B. and Nadkarni, A. (2017). How Asset Prices Interact with Bank Credit and Monetary Policy? Evidence from Emerging Market and Developing Economies. Available from https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/WPS20171F862229BECC428DA690A3018 16EC05E.PDF.

Smith, A., 1776. An inquiry into the nature and causes of the wealth of nations: Volume One. London: printed for W. Strahan; and T. Cadell.

Song, M.I. and Oosthuizen, C., 2014. Islamic banking regulation and supervision: Survey results and challenges. International Monetary Fund.

Sorensen, B.E., Kalemli-Ozcan, S. and Yosha, O., 2000. Risk Sharing and Industrial Specialization: Regional and International Evidence. FRB of Kansas City Research Working Paper No. 00-06.

Spendzharova, A.B. (2016) 'Regulatory cascading: Limitations of policy design in European banking structural reforms', Journal of Policy and Society, 35(), pp. 227 - 237.

Spinassou, K. and Wardhana, L.I., 2018. Regulation of Islamic banks: Basel III capital framework and profit-sharing investment accounts (No. hal-01674376).

Spinassou, K. and Wardhana, L.I., 2021. Basel framework and profit-sharing contracts: Islamic banking through the lens of capital requirements.

Spuchľáková, E., Valašková, K. and Adamko, P. (2015). The Credit Risk and its Measurement, Hedging and Monitoring. Procedia Economics and Finance, 24, 675–681. Available from https://doi.org/10.1016/s2212-5671(15)00671-1 [Accessed 10 February 2021].

Stiglitz, J E (2010): "The financial crisis of 2007-8 and its macroeconomic consequences" in Griffith-Jones et al (2010)

Syamlan, Y.T. and Jannah, W., 2019. The determinant of credit risk in Indonesian Islamic commercial banks. Share: Jurnal Ekonomi dan Keuangan Islam, 8(2), pp.181-206.

Taiwo, J.N., Ucheaga, E.G., Achugamonu, B.U., Adetiloye, K. and Okoye, O., 2017. Credit risk management: Implications on bank performance and lending growth. Saudi Journal of Business and Management Studies, 2, pp.584-590.

Tavana, M., Abtahi, A.R., Di Caprio, D. and Poortarigh, M., 2018. An Artificial Neural Network and Bayesian Network model for liquidity risk assessment in banking. Neurocomputing, 275, pp.2525-2554.

Teply, P. and Kvapilikova, I., 2017. Measuring systemic risk of the US banking sector in time-frequency domain. The North American Journal of Economics and Finance, 42, pp.461-472.

Thakor, A.V. (2014) 'Bank Capital and Financial Stability: An Economic Trade-Off or a Faustian Bargain?', Annual Review of Financial Economics, 6(), pp. 185-223.

The Fed - Coronavirus Disease 2019 (COVID-19). (2021). Board of Governors of the Federal Reserve System. Available from https://www.federalreserve.gov/covid-19.htm [Accessed 27 January 2021].

Thomson, J.B. (1992). Modeling the bank regulator's closure option: A two-step logit regression approach. Journal of Financial Services Research, 6 (1), 5–23. Available from https://doi.org/10.1007/bf01046114 [Accessed 11 June 2021].

Thornton, H. (1802), An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (Nabu Press, London)

Tobias, A. and Brunnermeier, M.K., 2016. CoVaR. The American Economic Review, 106(7), p.1705.

Toh, M.Y. (2019). Effects of bank capital on liquidity creation and business diversification: Evidence from Malaysia. Journal of Asian Economics, 61, 1–19. Available from https://doi.org/10.1016/j.asieco.2018.12.001 [Accessed 17 May 2021].

Toh, M.Y., Gan, C. and Li, Z. (2019). Revisiting the Impact of Stock Market Liquidity on Bank Liquidity Creation: Evidence from Malaysia. Emerging Markets Finance and Trade, 55, 1176-1802. Available from https://doi.org/10.1080/1540496X.2018.1496420 [Accessed 17 May 2021].

Tran, Q.T. (2021) 'Economic policy uncertainty and cost of debt financing: International evidence ', North American Journal of Economics and Finance, 51(), pp. 101419.

Tran, T.T., Nguyen, Y.T. and Long, T., 2019. The determinants of liquidity risk of commercial banks in Vietnam. Banks and Bank Systems, 14(1), p.94.

Tran, V.T., Lin, C.T. and Nguyen, H., 2016. Liquidity creation, regulatory capital, and bank profitability. International Review of Financial Analysis, 48, pp.98-109.

Triki, M.W. and BoujelbÃ, Y., 2017. A Comprehensive Literature Review of Islamic Finance Theory from 2011 to 2016. Global Journal of Management and Business Research.

Tucker, P (2014) 'The lender of last resort and modern central banking: principles and reconstruction', BIS Working Paper 79, pp. 10-42.

Turner, P (2014) 'The exit from non-conventional monetary policy: what challenges? ', BIS Working Papers No 448, pp. 1 - 26 [Online]. Available at: https://www.bis.org/publ/work448.pdf (Accessed: 23rd December 2019).

Turner, P (2017) 'Did Central Banks Cause The Last Financial Crisis? Will They Cause The Next?', National Institute of Economic and Social Research Discussion Paper No. 484, pp. 1 -57 [Online]. Available at: https://www.niesr.ac.uk/sites/default/files/publications/DP484.pdf (Accessed: 23rd December 2019

Ullah, H., Wang, Z., Abbas, M. G., Zhang, F., SHAHZAD, U., & MAHMOOD, M. R. (2021). Association of financial distress and predicted bankruptcy: The case of Pakistani banking sector. The Journal of Asian Finance, Economics and Business, 8(1), 573-585.

Upadhyay, J.C., 2021. Profitability Analysis of the Nainital Bank Ltd., Uttarakhand (India). IJREM/5(1), pp. 35-40.

Van den Heuvel, S (2018). The Welfare Effects of Bank Liquidity and Capital Requirements Washington DC: Federal Reserve Board (June 2018).

Van den Heuvel, S., 2002. Does bank capital matter for monetary transmission? Federal Reserve Bank of New York Economic Policy Review 1–7.

Van Oordt, M. and Zhou, C. (2018). Systemic risk and bank business models. Journal of Applied Econometrics, 34 (3), 365–384. Available from https://doi.org/10.1002/jae.2666 [Accessed 17 June 2021].

Van Oordt, M.R.C. and Zhou, C. (2016). Systematic Tail Risk. The Journal of Financial and Quantitative Analysis, 51 (2), 685–705. Available from https://www.jstor.org/stable/pdf/43862331.pdf?refreqid=excelsior%3Aee5d314c0656989c5ec6f387a1446143 [Accessed 17 June 2021].

Varotto, S. and Zhao, L., 2018. Systemic risk and bank size. Journal of International Money and Finance, 82, pp.45-70.

Vazquez, F., & Federico, P. (2012). Bank Funding Structures and Risk: Evidence from the Global Financial Crisis; IMF working paper; European Department.

Vazquez, F., & Federico, P. (2015). Bank funding structures and risk: evidence from the global financial crisis. Journal of Banking and Finance, 61, 1-14.

Vein-Tran, D (2020). Funding liquidity and bank lending. Cogent Economics & Finance. Available from https://www.tandfonline.com/doi/full/10.1080/23322039.2020.1734324 [Accessed 17 February 2021].

Vives, X. (2006) "Banking and Regulation in Emerging Markets: The Role of External Discipline." The World Bank Research Observer, 21 (2), pp 179–206.

Vodová, P. (2013). Determinants which affect liquid asset ratio of Czech and Slovak Commercial; Silesian University in Opava; School of Business Administration in Karvina.

Waemustafa, W. and Sukri, S., 2016. Systematic and unsystematic risk determinants of liquidity risk between Islamic and conventional banks. International Journal of Economics and Financial Issues, 6(4), pp.1321-1327.

Wagner, Wolf. 2007. The liquidity of bank assets and banking stability. Journal of Banking & Finance 31: 121–39.

Wang, G.J., Jiang, Z.Q., Lin, M., Xie, C. and Stanley, H.E., 2018. Interconnectedness and systemic risk of China's financial institutions. Emerging Markets Review, 35, pp.1-18.

Wang, T., Zhao, S., Zhu, G. and Zheng, H., 2021. A machine learning-based early warning system for systemic banking crises. Applied Economics, pp.1-19.

Wei, X; Gong, Y; and Wu, H.M. (2017) 'The impacts of Net Stable Funding Ratio requirement on Banks' choices of debt maturity', Journal of Banking & Finance, 82(), pp. 229 - 243.

Willem van den End, W. and Tabbae, M (2012) 'When liquidity risk becomes a systemic issue: Empirical evidence of bank behaviour', Journal of Financial Stability, 8(), pp. 107-120.

Williams, B., & Rajaguru, G. (2022). The evolution of bank revenue and risk in the Asia-Pacific Region. Pacific-Basin Finance Journal, 71, 101693.

Wood, L.M., Sebar, B. and Vecchio, N., 2020. Application of rigour and credibility in qualitative document analysis: Lessons learnt from a case study. The Qualitative Report, 25(2), pp.456-470.

Xi, C., 2016. Why has Basel III become hard law for China? The domestic political economy of international financial law. The Domestic Political Economy of International Financial Law, pp.91-104.

Xu, Q., Chen, L., Jiang, C. and Yuan, J., 2018. Measuring systemic risk of the banking industry in China: A DCC-MIDAS-t approach. Pacific-Basin Finance Journal, 51, pp.13-31.

Yaacob, S.F., Rahman, A.A. and Karim, Z.A., 2016. The determinants of liquidity risk: A panel study of Islamic banks in Malaysia. Journal of Contemporary Issues and Thought, 6, pp.73-82.

Yeddou, N. and Pourroy, M. (2020). Bank liquidity creation: Does ownership structure matter? The Quarterly Review of Economics and Finance, 78, 116–131. Available from https://doi.org/10.1016/j.qref.2020.01.003 [Accessed 14 May 2021].

Zaheer, S. and Farooq, M., 2014, January. Liquidity crisis: are Islamic banking institutions more resilient. In IMF conference on "Macroeconomic Challenges Facing Low-Income Countries," Washington, DC.

Zainudin, S.M., Abdul Rasid, S.Z., Omar, R. and Hassan, R., 2019. The good and bad news about the new liquidity rules of Basel III in Islamic banking of Malaysia. Journal of Risk and Financial Management, 12(3), p.120.

Zedda, S. and Cannas, G (2020) 'Analysis of banks' systemic risk contribution and contagion determinants through the leave-one-out approach', Journal of Banking and Finance, 112(), pp. 105160.

Zeldea, C., 2020. Modeling the Connection between Bank Systemic Risk and Balance-Sheet Liquidity Proxies through Random Forest Regressions. Administrative Sciences, 10(3), p.52.

Zhang, D., Cai, J., Dickinson, D.G. and Kutan, A.M., 2016. Non-performing loans, moral hazard and regulation of the Chinese commercial banking system. Journal of Banking & finance, 63, pp.48-60.

Zhang, Q., & Wang, Z. (2023, May). Check for updates A Study of the Capital Replenishment Tools in Chinese Commercial Banks: Current State and Some Suggestions for Countermeasures. In Proceedings of the International Conference on Education, Humanities, and Management (ICEHUM 2022) (Vol. 741, p. 364). Springer Nature.

Zhanga, J; He, L; An, Y (2020) 'Measuring banks' liquidity risk: An option-pricing approach', Journal of Banking and Finance , 111(), pp. 105703.

Zheng, C., Moudud-Ul-Huq, S., Rahman, M.M. and Ashraf, B.N., 2017. Does the ownership structure matter for banks' capital regulation and risk-taking behavior? Empirical evidence from a developing country. Research in International Business and Finance, 42, pp.404-421.

Zheng, C., Wai Kong) Cheung, A. and Cronje, T. (2019). The moderating role of capital on the relationship between bank liquidity creation and failure risk. Journal of Banking & Finance, 108, 105651. Available from https://doi.org/10.1016/j.jbankfin.2019.105651 [Accessed 17 February 2021].

Zolkifli, N.A., Samsudin, K.J. and Yusof, M.B., 2019. Determinants of liquidity and market risk and the effect on bank performance in Bahrain and Malaysia banking. International Journal of Trade, Economics and Finance, 10(1), pp.8-16.

Appendix A: List of all Documents Analysed

SN	Document Name
Regulatory documents	
1.	The Basel Framework
2.	Guidance Note in Connection with The IFSB Capital Adequacy Standard: The Determination of Alpha in The Capital Adequacy Ratio for Institutions (Other Than Insurance Institutions) Offering Only Islamic Financial Services
3.	Guidance Note on The Recognition of Ratings by External Credit Assessment Institutions (Ecais) On Takāful and Retakāful Undertakings
4.	Guidance Note on Quantitative Measures for Liquidity Risk Management in Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
5.	Guidance Note on Sharī'ah-Compliant Lender-Of-Last-Resort Facilities
6.	Core Principles for Effective Islamic Deposit Insurance Systems
7.	Guiding Principles on Sharī`Ah Governance Systems for Institutions Offering Islamic Financial Services
8.	Guiding Principles on Liquidity Risk Management for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
9.	Guiding Principles on Stress Testing for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions And Islamic Collective Investment Schemes]
10.	Revised Capital Adequacy Standard for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
11.	Revised Guidance on Key Elements in The Supervisory Review Process of Institutions Offering Islamic Financial Services (Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes)
12.	Core Principles for Islamic Finance Regulation (Banking Segment) (CPIFR)
13.	Guiding Principles on Disclosure Requirements for Islamic Capital Market Products (Ṣukūk And Islamic Collective Investment Schemes) IFSB-19
14.	Revised Standard on Disclosures to Promote Transparency and Market Discipline for Institutions Offering Islamic Financial Services (Banking Segment)
China	
1.	Measures for the Liquidity Risk Management of Wealth Management Products of Wealth Management Companies. Order of China Banking and Insurance Regulatory Commission (2021) No. 14
2.	Notice of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Regulatory Rating of Commercial Banks China Banking Regulatory Commission (2021) No. 39
3.	Notice of the General Office of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Quality Management of Commercial Banks' Liabilities

4.	Notice of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Supervision and Evaluation of financial Services for Small and Micro Enterprises of Commercial Banks (for Trial Implementation)
5.	China Banking and Insurance Regulatory Commission on Printing a Notice of the "Guiding Opinions on the Innovation of Commercial Banks (Revision)"China Banking Regulatory Commission [201 9] No. 42
6.	Notice on Enhancing Disclosure Requirements for Composition of Capital
7.	Supervisory Guidance on Capital Instruments Innovation for commercial Banks CBRC [2012] No.56
8.	Notice on Measurement Rules of Capital Requirements for Bank Exposures to Central Counterparties
9.	Capital rules for commercial banks
10.	Notice on Issuing the Guidelines on Internal Control of Commercial B Yin Jian Fa [2014] No. 40
11.	Notice on Policy Clarification of Capital Rules
12.	Rules on Large Exposure of Commercial Banks
13.	Decree of China Banking Regulatory Commission No. 3, 2011
14.	Rules on Liquidity Risk Management of Commercial Banks
India	
1.	2010: Regulation and Supervision of Financial Institutions
2.	2011: Regulation, Supervision and Financial Stability
3.	2012: Regulation, Supervision and Financial Stability
4.	2013: Regulation, Supervision and Financial Stability
5.	2014: Regulation, Supervision and Financial Stability
6.	2015: Regulation, Supervision and Financial Stability
7.	2016: Regulation, Supervision and Financial Stability
8.	2017: Regulation, Supervision and Financial Stability
9.	2018: Regulation, Supervision and Financial Stability
10.	2019: Regulation, Supervision and Financial Stability
11.	2020: Regulation, Supervision and Financial Stability
12.	2021: Regulation, Supervision and Financial Stability
Malaysia	
1.	Wa`d
2.	Application to be Approved as Financial Holding Company Pursuant to Sections 280(2) and 280(3) of the Financial Services Act 2013 and Section 290(1) of the Islamic Financial Services Act 2013
3.	Capital Adequacy Framework (Basel II – Risk-Weighted Assets)
4.	Capital Adequacy Framework for Islamic Banks (Capital Components)
5.	Capital Adequacy Framework for Islamic Banks (Risk-Weighted Assets)
6.	Capital Funds for Islamic Banks
7.	Capital Funds
8.	Central Bank of Malaysia Act 2009
9.	Compliance
10.	Credit Risk
11.	LAWS OF MALAYSIA Act 618 Development Financial Institutions Act 2002
12.	Domestic Systemically Important Banks Framework

13.	Credit Card-i
14.	Financial Reporting for Islamic Banking Institutions
15.	Financial Reporting
16.	LAWS OF MALAYSIA Act 758 Financial Services Act 2013
17.	Fit and Proper Criteria
18.	Guidelines on Credit Transactions and Exposures with Connected Parties
19.	Guidelines on Credit Transactions and Exposures with Connected Parties for Islamic Banks
20.	Introduction of New Products
21.	LAWS OF MALAYSIA Act 759 Islamic Financial Services Act 2013
22.	Leverage Ratio
23.	Liquidity Coverage Ratio
24.	Murabahah
25.	Net Stable Funding Ratio
26.	Stress Testing Policy Document
27.	Credit Card
28.	Ijarah
29.	Qard
30.	Capital Adequacy Framework (Capital Components)
31.	Corporate Governance
32.	Hibah
33.	Financial Technology Regulatory Sandbox Framework
34.	Wakalah
35.	Prudential Standards on Securitisation Transactions for Islamic Banks
36.	Rahn
37.	Recovery Planning
38.	RESOLUTIONS OF SHARIAH ADVISORY COUNCIL OF BANK NEGARA MALAYSIA
39.	Restricted Committed Liquidity Facility
40.	Risk Governance
41.	Risk-Informed Pricing
42.	Risk-Weighted Capital Adequacy Framework (Basel II) – Internal Capital Adequacy Assessment Process (Pillar 2)
43.	Shariah Governance Framework for Islamic Financial Institutions
44.	Shariah Governance
45.	Single Counterparty Exposure Limit for Islamic Banking Institutions
46.	Single Counterparty Exposure Limit
47.	Statutory Reserve Requirement
48.	Tawarruq
49.	The Banking Regulation Review: Malaysia
50.	Wadi`ah
Saudi Arabia	
1.	Rules for Bank Accounts Updated September 2021
2.	Shariah Governance Framework for Local Banks Operating in Saudi Arabia February 2020
3.	Rules on Management of Problem Loans January 2020

4.	Key Principles of Governance in Financial Institutions under the Controland Supervision of the Saudi Central Bank (3rd Edition – Dhul Qidah 1442H/June 2021)
5.	Guidelines on Management of Problem Loans January 2020
6.	CLARIFYING MEMO ON POWERS AND RESPONSIBILITIES OF MEMBERS OF THE BOARD OF DIRECTORS OF SAUDI COMMERCIAL BANKS CONTENTS
7.	MANAGEMENT OF OPERATIONAL RISk
8.	ISLAMIC FINANCE IN SAUDI ARABIA: Leading the Way to Vision 2030
9.	Saudi credit regulations
10.	Saudi credit information law
11.	Commercial bank accounting standards
12.	BANKING CONTROL LAW
13.	Rules On Compensation Practices
14.	Establishment of the Bilateral Complaint Handling Process (BCHP) on Compensation Practices
15.	Rules on Compensation Practices
16.	DETAILS OF COMPENSATION Paid-Annexure

Appendix B – NSFR Calculation Criteria

NSFR calculation using NSFR standards 2010 and 2014 (BCBS, 2010; BCBS 2014)			
	2010		2014
Available stable funding (Sources)			
Tier 1 capital	100%		100%
Tier 2 capital			
Time deposits with a remaining maturity of one year or more			
Other borrowed money with a remaining maturity of one year or more			
Stable retail transaction deposits	90%		95%
Small time deposits with a remaining maturity of less than one year			
Stable retail saving deposits			
Less stable retail transaction deposits	80%		90%
Less stable retail saving deposits			
Wholesale transaction deposits	50%		50%
Wholesale saving deposits			
Large time deposits with a remaining maturity of less than one year			
Foreign deposits			
Other borrowed money with a remaining maturity of less than one year			
Transaction deposits of U.S. government			
Transaction deposits of states and political subdivisions in the United States			
Transaction deposits of foreign governments and official institutions			
Required stable funding (Uses)			
Unused commitments	5%		5%
Letter of credit			
Securities in 0% risk weight category			
Securities in 20% risk weight category 20% 20%	20%		20%
Securities in 50% risk weight category	50%		50%
Loans in 0% risk weight category			
Trading securities in 0% risk weight category			
Other assets in 0% risk weight category			
Loans in 20% risk weight category	65%		65%
Trading securities in 20% risk weight category			
Other assets in 20% risk weight category			
Loans in 50% risk weight category	85%		85%
Trading securities in 50% risk weight category			
Other assets in 50% risk weight category			
Securities in 100% risk weight category and no risk weight	100%		100%
Loans in 100% risk weight category and no risk weight category			
Trading securities in 100% risk weight category and no risk weight category			
Other assets in 100% risk weight category and no risk weight category			

Appendix C – Idiosyncratic Risks and Covariance Matrix Country Specific

Hungary

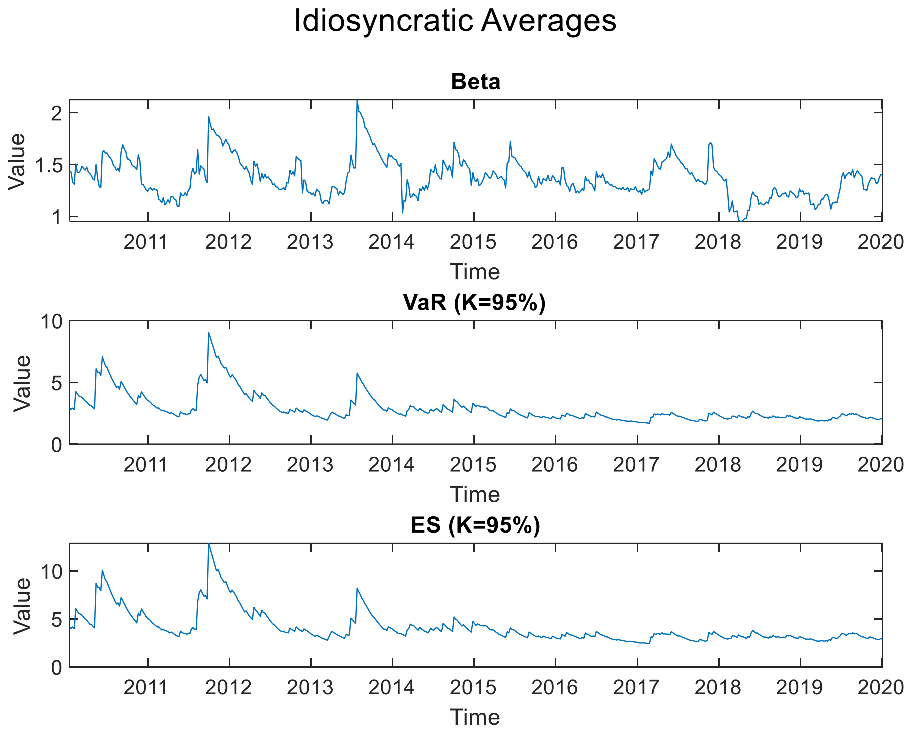

Figure 22 - Historic Idiosyncratic Averages Hungary (Source: authors analysis)

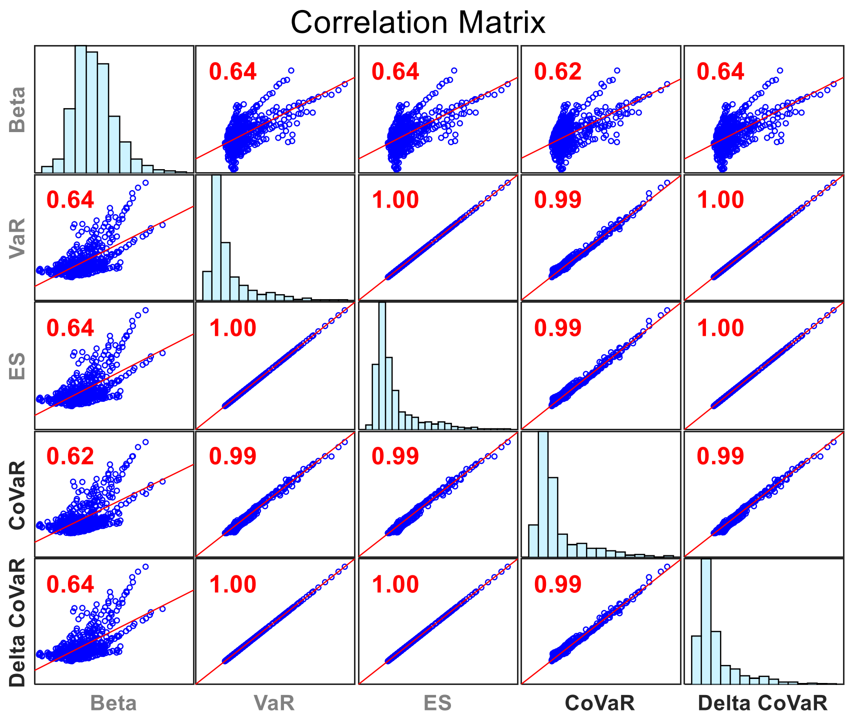

Figure 23 - CoVaR Correlation Matrix Hungary (Source: authors analysis)

Indonesia

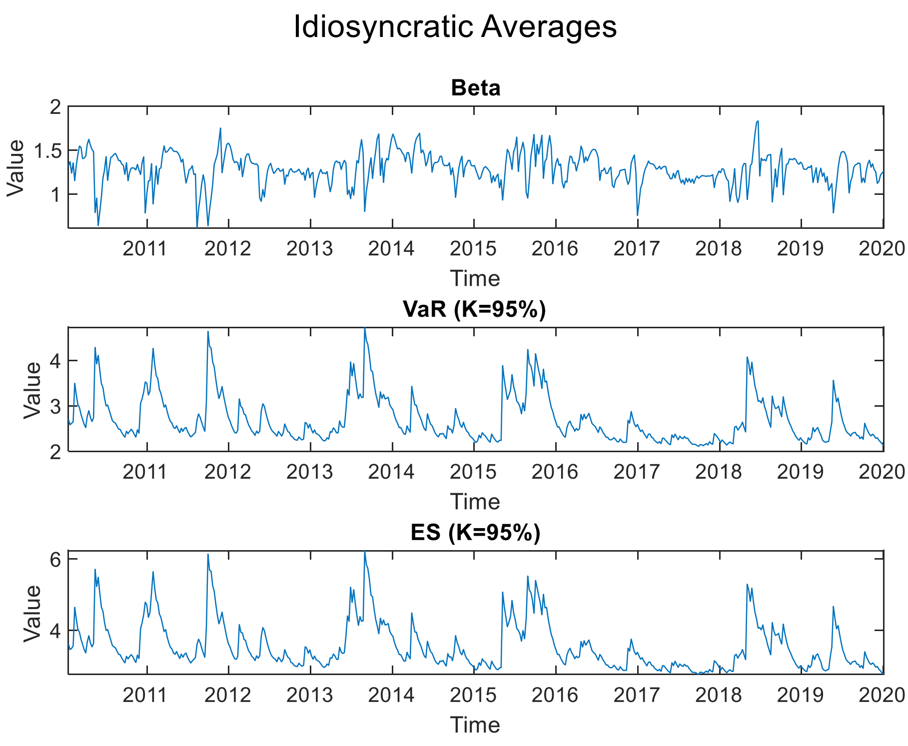

Figure 24 - - Historic Idiosyncratic Averages Indonesia (Source: authors analysis)

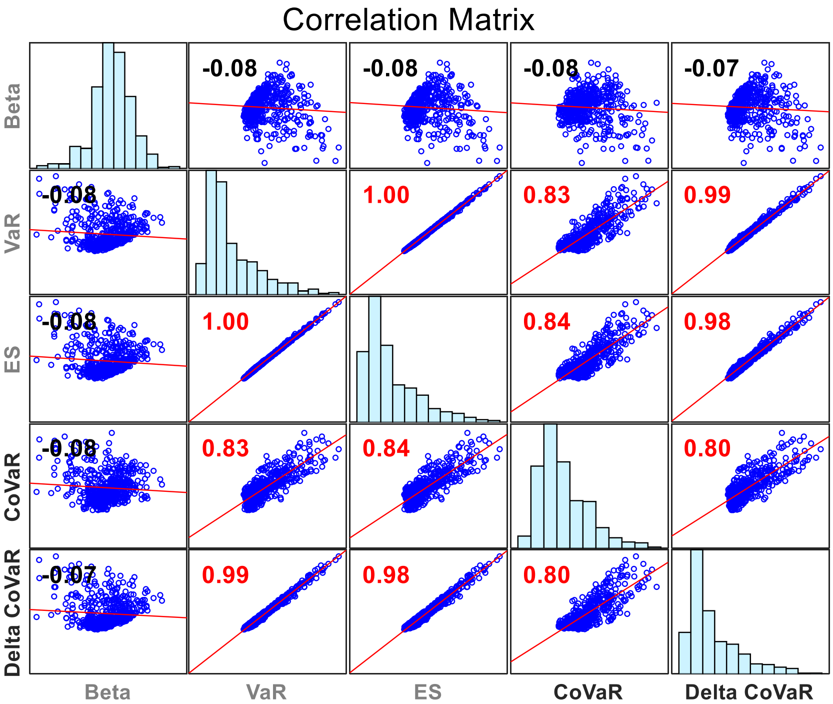

Figure 25 - CoVaR Correlation Matrix Indonesia (Source: authors analysis)

Malaysia

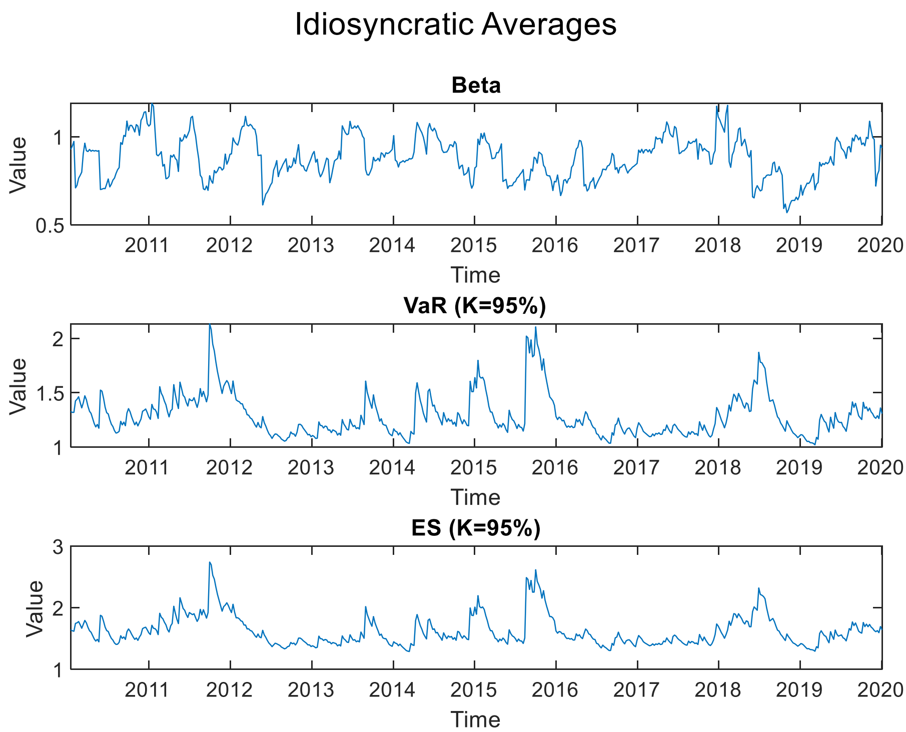

Figure 26 - Historic Idiosyncratic Averages Malaysia (Source: authors analysis)

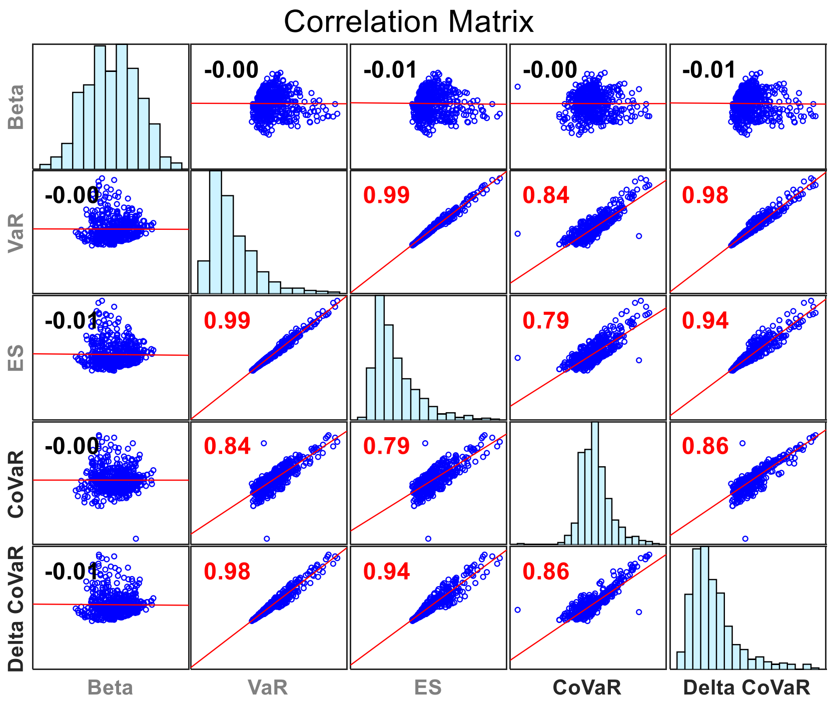

Figure 27 - CoVaR Correlation Matrix Malaysia (Source: authors analysis)

Mexico

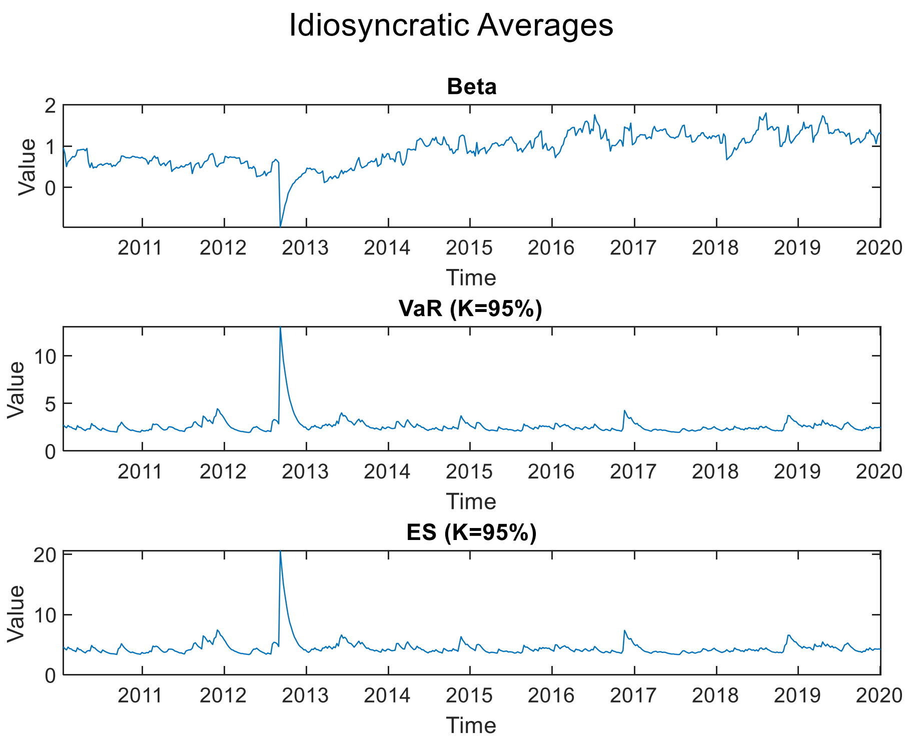

Figure 28 - Historic Idiosyncratic Averages Mexico (Source: authors analysis)

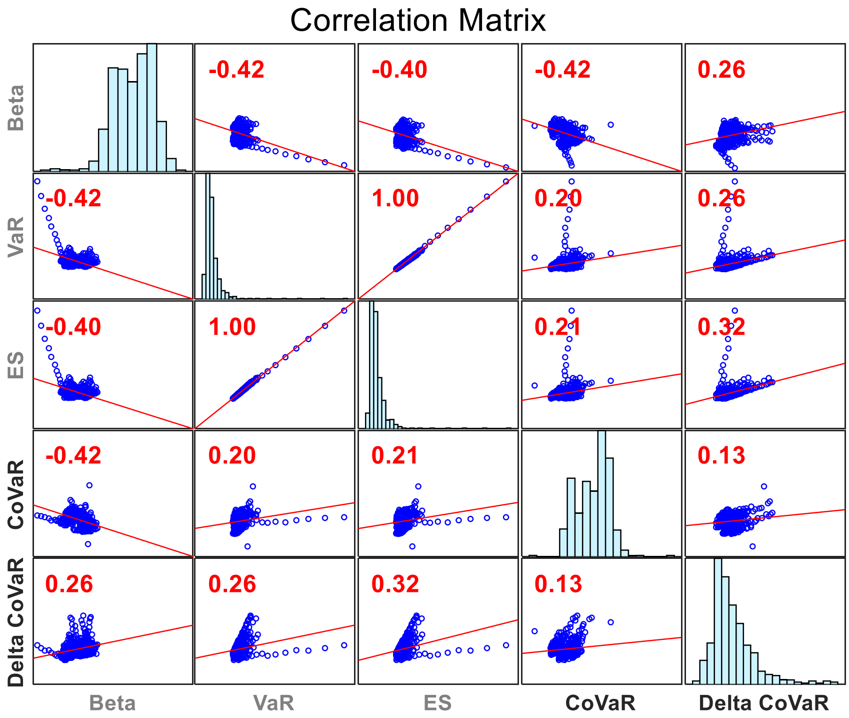

Figure 29 - CoVaR Correlation Matrix (Source: authors analysis)

Appendix D – Liquidity Creation Measurement Criteria

Assets		
Illiquid assets (weight=1/2)	**Semiliquid assets (weight=0)**	**Liquid assets (weight=-1/2)**
Commercial real estate loans	Residential real estate loans	Cash and due from other institutions
Loans to finance agricultural production	Consumer loans	All securities (regardless of maturity)
Commercial and industrial loans	Loans to depository institutions	Trading assets
Other loans and lease financing receivables	Loans to state and local governments	Federal fund sold
Other real estate owned	Loans to foreign governments	
Customers' liability on bankers' acceptances		
Investment in unconsolidated subsidiaries		
Intangible assets		
Premises		
Other assets		
Liabilities and equity		
Liquid liabilities (weight=1/2)	**Semiliquid liabilities (weight=0)**	**Illiquid liabilities and equity (weight= -1/2)**
Transaction deposits	Time deposits	Bank's liabilities on banker's acceptances
Saving deposits	Other borrowed money	Subordinated debt
Overnight federal funds purchased		Other liabilities
Trading liabilities		Equity
Off-balance sheet guarantees		

Illiquid guarantees (weight=1/2)	Semiliquid guarantees (weight=0)	Liquid guarantees (weight= -1/2)
Unused commitments	Net credit derivatives	Net participations acquired
Net standby letters of credit	Net securities lent	
Commercial and similar letters of credit		
All other off-balance sheet liabilities		
Off-balance sheet derivatives		
		Liquid derivatives (-1/2)
		Interest rate derivatives
		Foreign exchange derivatives
		Equity and commodity derivatives

Table 27 : Liquidity classification of bank activities based on categories "Cat" (Berger and Bouwman, 2009)

Basel III: Implications of Capital and Liquidity Regulations on Financial Stability during Economic Depression

Ali Hassan

School of Finance & Accounting

Westminster Business School

University of Westminster

A thesis submitted in partial fulfilment of the requirements of the University of Westminster for the degree of

Doctor of Philosophy in Finance

June 2023

Declaration of Authenticity and Copyright Permissions

This is to certify that this thesis titled "*Basel III: Implications of Capital and Liquidity Regulations on Financial Stability during Economic Depression*", presented for the examination of PhD in Finance at the University of Westminster, is solely my own work, except where specific references are made to the work of others.

I hereby declare the content of this thesis to be original and has not been tendered elsewhere in part or whole at the University of Westminster or any other institution for the award of a degree or any other qualification.

This thesis contains approximately 72,600 words, excluding the declaration of Authenticity and Copyright Permissions, Table of Contents and References.

Name: Ali Hassan

Sign: **Ali Hassan**

Date: 14/06/2023

Acknowledgements

I wish to acknowledge my appreciation to all the people who have accompanied me during this journey of producing this thesis in very challenging and trying times of a pandemic. It is hard to find enough words to thank my supervisory team Dr Abdelhafid Benamraoui, Dr Stefan Van Dellen, and Dr Issam Malki. Each of them allowed me to explore the magnificence of research in their own context by providing ample feedback, challenging my research output, and assessing & advising on the development of financial econometric models. This thesis would not have been possible without their guidance and support. They all taught me to find my own research path from abstracts to notes & research themes and into this final thesis output.

I would also like to pass on my sincere gratitude to Dr Abdelhafid Benamraoui for being a great supervisor, encouraging, motivating, and critically assessing my research to enhance the research quality of this thesis from the initial phase until the final submission. I would also like to extend this gratitude to the university support team, particularly Dr Dominic McLounglin, for providing well-being support during the midst of the pandemic when I was on the verge of giving this up whilst my dad was in ICU for 19 days due to Covid-19 with no cure available at that time, equally to my senior PhD fellow now Dr Sam Opio a full-time lecturer at the School of Applied Management, University of Westminster for his practical assistance and emotional support in time of need throughout his time in the PhD office.

I am thankful for the support given to me by Dr Stefan Van Dellen, particularly in providing comments on enhancing the work on bank systemic risk measurement models and providing a list of alternative databases for data collection during the lockdown. Moreover, I am also grateful for the support given by Dr Issam Malki for explaining to econometric models when I had doubts, assessing the empirical results produced as well during the construction phase of econometric models, along with useful comments and feedback on the overall chapters, equally to Dr David Coker for taking out time to provide training on Bloomberg Terminals for data extraction as well to the library support team for arranging remote access to Refinativ Eikon and Bloomberg Terminal during the lockdown.

I would like to thank my Annual Progression Review (APR) Assessors, Dr Basel Arwatani and Dr Sovan Mitra, for providing valuable feedback on enhancing my research during APR 1, APR 2, and APR 3. I would also like to express my gratitude to my PhD viva examiners, namely external examiner Professor Yacine Belghitar, Cranfield University and internal examiner Dr Julie Ayton, University of Westminster, for taking their time to go through this thesis and providing feedback on areas that could be further enhanced, added or clarified. I would also like to extend my appreciation to the chair and doctoral coordinator, Dr Kristina Vasileva, for her support during the pandemic, her advice and guidance during Doctorial Research Development Program (DRDP) meetings and workshops, as well as to the Graduate School Director, Professor Leigh Wilson, and Graduate School Manager, Richard Mccormack, to ensure smooth progression during my PhD journey.

I am also thankful to the student development team at the University of Westminster for providing me with a grant to undertake training in R Language. I would also like to pass on my thanks to PhD representative Coralie Guedes and equally to Claire Li (Jing Li) and Sonila Malko at the PhD Office in the Garden Room for all your intellectual discussions and support. Moreover, I would also like to pass on appreciation to my friend Hayk Sargsyan pursuing his PhD at Universitat Pompeu Fabra, for providing invaluable advice during my studies. I would like to thank all my friends outside of the University of Westminster for your generosity in giving me time and energy in reviewing drafts and providing networking opportunities.

I would like to pass on my sincere gratefulness to my parents for supporting me in this journey financially & emotionally and being the source of my strength despite very challenging times. Moreover, the family appreciation would be imperfect without mentioning the good deeds presented to me by my immediate relatives such as uncles, aunties, cousins, brothers, and sisters. My source of strength for my studies stems from my parents, who have always reminded me that to achieve success, hard work, patience, and determination are paramount to reap the benefits and rewards.

Abstract

The dynamic global financial system has made it necessary to implement adequate regulatory measures that can effectively guarantee financial stability at the national and international levels. This thesis consists of three self-contained analytical chapters that focus on the effectiveness of evolving financial regulations in addressing systemic risk within the financial system. Despite numerous regulatory reforms introduced following the 2008 GFC, they are still concerns over the role of these regulations in mitigating complex issues related to systemic risk. The first study focuses on international and national regulatory frameworks in the context of conventional, hybrid, and Islamic banking. It analyses the guidance provided by the Basel Committee on Banking Supervision (BCBS) and the Islamic Financial Services Board (IFSB) and examines the differences in the treatment of credit, liquidity, and systemic risk across four countries. The IFSB converts BCBS guidance to ensure compliance with Sharia principles for Islamic banks. Further insights show variations in liquidity and capital requirements imposed on banks in different countries, highlighting the need for country-specific regulations to address the unique risks. The second study uses data from emerging market economies to investigate the relationship between capital and liquidity regulations under Basel III and their impact on default risk and systemic risk. The study addresses whether the new liquidity and capital requirements, such as the net stable funding ratio and higher capital adequacy ratio, contribute to alleviating the default risk and systemic risk in emerging market economies. The third study focuses on the relationship between credit and liquidity risks and their impact on bank default risk. It also addresses the effect of bank liquidity creation on systemic risk across different types of banks. The findings suggest that while credit and liquidity risks are positively related, no significant relationship exists. The impact of credit and liquidity risks on bank default risk is significant for conventional and hybrid banks, while bank size and capital adequacy ratio play a greater role in the stability of Islamic banks. The joint interaction between credit and liquidity risk negatively influences banking stability. The key findings demonstrate that Basel III's liquidity requirements, such as the Net Stable Funding Ratio (NSFR), play an important role in forecasting banks' default probability and mitigating systemic risk. The insights gathered emphasise the importance of incorporating new mitigating measures, including NSFR, leveraging requirements, countercyclical buffers, and globally systemically important institution surcharges to promote financial stability. Additionally, it demonstrates the relevance of liquidity creation in determining bank stability and its implications for systemic risk. This study offers substantial contributions to the growing body of literature by highlighting the differences in regulatory frameworks, the importance of this approach in developing bank risk profiles, and how they are adequately addressed. The study also contributes to understanding how financial stability can be enhanced while reducing systemic liquidity risk. The study shows that banks, regulators, and policymakers must collaborate adequately across all levels to align risk management and improve regulations and guidelines. This includes sharing information and fostering coordination at the international level.

Keywords: Emerging Markets, Credit Risk, Liquidity Risk, Liquidity Creation, Systemic Risk, Financial Regulations

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ABCP - Asset-Backed Commercial Papers

ABS - Asset-Backed Securities

ASF - Available Stable Funding

ANN - Artificial Neural Networks

AT1 – Additional Tier 1 Capital

BCBS – Basel Committee on Banking Supervision (*interchangeably used as* BIS – Bank for International Settlements)

BBLC - Berger–Bouwman Liquidity Creation measure (BB measures)

BHC - Bank Holding Companies

BoE - Bank of England

BCB - Banco Central do Brasil

BNM - Bank Negara Malaysia

BN - Bayesian Networks

CAMELS - Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity approach

CAR - Capital Adequacy Ratio

CBIRC - China's Banking and Insurance Regulatory Commission

CBRA - Chinese Banking Regulatory Authority

CCoB - Capital Conservation Buffer

CCR - Counterparty Credit Risk

CCyB - Countercyclical Capital Buffer

CD - Certificate of Deposits

CDO – Credit Debt Obligations

CDS - Credit Default Swaps

CET1 – Common Equity Tier 1

CMA – Capital Markets Authority

CPP - Capital Purchase Program

CP – Commercial Papers

CoCo Bonds - Contingent Convertible Bonds

CoVaR – Conditional Value at Risk model

CRA - Credit Rating Agencies

CRD IV - Capital Requirements Directive IV

CRM – Credit Risk Mitigation

CR – Credit Risk

CRR – Cash Reserve Requirement

DD – Distance to Default Model

D-SIB - Domestically Systemic Important Banks

DGSE - Dynamic Stochastic General Equilibrium models

DCR - Displaced Commercial Risk

EAD - Exposure At Default

ECAI – External Credit Assessment Institutions

ECB - European Central Bank

EMEs – Emerging Market Economies

EVT - Extreme Value Theory

EWS - Early Warning Systems

FALLCR - Facility to Avail Liquidity for Liquidity Coverage Ratio

FCA – Financial Conduct Authority

FE - Fixed Effect model

FIMA - Foreign and International Monetary Authority

FMI - Financial Market Infrastructures

FPC - Financial Policy Committee

FSB - Financial Stability Board

FX - Foreign Currency exposures

GCC - Gulf Cooperation Council

GDP – Gross Domestic Product

GFC – Global Financial Crisis 2007-2008

GHOS – Governors and Heads of Supervisory agencies

GMM - Generalised Method of Moments estimation model

G-SIB - Globally Systemic Important Bank

GRACH - Generalised Auto-Regressive Conditional Heteroskedasticity model

HAR - Heterogenous Auto-Regressive model

HQLA – High-Quality Liquid Assets

HQLAAR - High-quality Liquidity Asset Adequacy Ratio

IAH - Investment Account Holders

IBA - Indicator-Based Approach

ICAAP - Internal Capital Adequacy Assessment Process

IFDI - Refinitiv Eikon Islamic Finance Development Indicator

IFIs -Islamic Financial Institutions

IFSB - Islamic Financial Services Board

IIFM - International Islamic Financial Market

IILM - International Islamic Liquidity Management Corporation

ILAAP - The Internal Liquidity Adequacy Assessment Process

ILOLR - International Lender of Last Resort

IMF – International Monetary Fund

IRB - Internal Rating-Based

KMV - Kealhofer, McQuown, and Vasicek Model developed by Moody’s Analytics

LCR – Liquidity Coverage Ratio

LGD - Loss Given Default

LIBOR – London Interbank Offered Rate

LLP – Loan Loss Provisions

LMC - Liquidity Management Centre

LMR - Liquidity Matching Rate

LOLR - Lender Of Last Resort

LTV – Loan-to-Value Ratio

LR – Liquidity Risk

MBS – Mortgage-Backed Securities

MDB - Multilateral Development Banks

MENA - the Middle East and North African region

MMF - Money Market Mutual Funds

MPO - Murabahah to the Purchase Orderer arrangement

MSCI - Morgan Stanley Capital International index

MSCI EMI – Morgan Stanley Capital International Emerging Markets Index

MSF – Marginal Standing Facility

NDTL - Net Demand and Time Liabilities

NIM - Net Interest Margin

NPA - Non-Performing Assets

NPL - Non-Performing Loans

NSFR – Net Stable Funding Ratio

OBS - Off-balance Sheet Exposures

OECD - Organisation for Economic Co-operation and Development

OIS – Overnight Index Swaps

OMO - Open Market Operations

OLS - Ordinary Least Square estimation model

OREO - Other Real Estate Owned ratio

PD - Probability of Default

PDCF - Primary Dealer Credit Facility

PLS – Profit and Loss Sharing Theory

PRA - Prudential Regulatory Authority

POLS – Pooled Ordinary Least Square estimation model

PSE – Public Sector Entities

PVAR - Panel Vector Auto-Regression model

QCB - Qatari Central Banking

QFMA - Qatari Financial Market Authority

QFCRA - Qatari Financial Centre Regulatory Authority

RBI – Reserve Bank of India

RBS - Risk-based supervision

RE – Random Effects model

Repo - Repurchase agreements

ROA - Return on Assets

ROE - Return on Equity

RSF - Required Stable Funding

RWA - Risk-Weighted Assets

SAMA - Saudi Arabian Monetary Authority

SCP - Structure, Conduct and Performance Theory

SIFI - Systemically Important Financial Institutions

SIV - Structured Investment Vehicles

SMEs - Small and Medium-sized Enterprises

SLR - Statutory Liquidity Requirement/Ratio

SLOLR - Systemic Lender of Last Resort

SPARC - Supervisory Program for the Assessment of Risk and Capital

SPV - Special Purpose Vehicles

SREP - Supervisory Review and Evaluation Process

SRL - Systemic Risk-adjusted Liquidity model

SRM - Single Resolution Mechanism

SRR - Special Resolution Regime

SSM - Single Supervisory Mechanism

SLRR - Statutory Liquidity Reserve Requirements

SRL – Systemic Liquidity Risk

TARP - Troubled Asset Relief Program

TSLF - Term Securities Lending Facility

UCB - Urban Co-operative Banks

UPSIA - Unrestricted Profit-Sharing Investment Accounts

VaR – Value at Risk

VIE - Variable Interest Entities

VIX - Cboe Volatility Index

Chapter 1 – Introduction

1.1. Introduction

The financial globalisation industry has grown significantly and rapidly over the last three decades. According to Lund et al. (2013), cross-border capital flows increased from US$0.5 trillion in 1980 to a peak of US$11.8 trillion in 2007. After that, they sharply decreased. Particularly in emerging economies, cross-border banks played a significant role in the financial globalisation process (Claessens, 2017). The rate and scope at which shocks are conveyed across asset classes, and nations has expanded in parallel with financial innovation and integration (Davies and Green, 2008). Stronger international regulatory cooperation has been called for as a result of the global financial crisis of 2007–2008, which served as a stark warning that insufficient regulation and supervision in nations at the centre of the financial system can have global repercussions (Bauerle Danzman et al., 2017).

The turmoil within the U.S. financial markets in 2007 signalled the onset of the 2007–2009 global financial crisis (GFC). The GFC led to the bankruptcy and subsequent bailout of large multinational financial institutions such as Lehman Brothers and Bear Stearns. This localised crisis rapidly spread to global financial markets, producing spill over effects on various financial institutions across the globe. The rapid advancement of the GFC demonstrated how closely financial institutions are interconnected. It also drew attention to the repercussions of this interconnectedness of both national and international financial systems.

After the GFC, regulators supported better capital adequacy requirements on banks and emphasised the necessity of enhancing micro-prudential regulations to increase transparency and market discipline. National and international regulators have increased bank capital requirements in line with Basel III. In addition, banks are required to meet the Net Stable Funding Ratio (NSFR) and Liquidity Coverage Ratio (LCR) as part of Basel III's new liquidity requirements. Furthermore, to promote the safety and soundness of financial systems and address their contagion risks, banks must comply with the countercyclical capital buffers of national regulators and adhere to the Globally Systemic Important Bank (G-SIB) surcharge. These new measures were introduced to minimise the risks posed by the 'too big to fail' effect, thereby increasing financial systems' stability.

Particularly around international banking regulation, there has been a significant reform push. Although the reforms have significantly increased the solvency and liquidity of internationally systemic institutions, flaws still exist (Aikman et al., 2018). Our key claim is that, despite recent governance changes at important standard-setting organisations, a core-periphery logic still exists, leading to a predominant focus on maintaining financial stability at the core of the global economy. This emphasis on the core, while crucial, unduly pushes aside issues that are particularly pertinent to developing and emerging countries. This issue is the centre of the investigation of this thesis.

1.1.1. Capital and Liquidity Regulation in the Context of Systemic Risk

Within nearly all economies, financial intermediation between lenders and borrowers has been a primary function of banks. In other words, banks act as liquidity providers and originators in financial systems. Bank capital regulations are important in terms of their role in ensuring banks' soundness and ability to engage in risk-taking activities to compete effectively against other financial institutions. Bank capital regulations originate from the 1988 Basel Accords on international convergence of capital measurements and capital standards. The 1988 Basel Accords focused on measuring banks' capital requirements against the losses they incurred from credit risk. Since then, several changes have been made to capital requirement measurement. For instance, to comply with Basel II, banks must set aside capital to account for losses incurred from market and operational risks. However, the capital buffers undertaken by banks during the GFC failed to protect them from the unexpected costs of vast illiquid asset exposures. Policymakers reacted to this by tightening capital requirements and introducing mandatory liquidity requirements as part of financial reforms, along with other regulatory requirements under Basel III.

Banking literature has sought to examine the reasons for banks to hold capital and the reasons that regulators require banks to hold capital. For instance, Berger et al. (1995) introduced the concept of a 'safety net' to explain governmental bodies' actions to promote the safety and soundness of the banking system. These government actions include deposit insurance, payment guarantees, and access to inter-banking money markets. It is important to note that governments do not take action to regulate and enforce capital regulation. They explain that although these measures insulate financial institutions from market volatility, they do not facilitate a fine-grained approach to risk pricing. Banks have access to private information and a dynamic portfolio, which creates information asymmetry problems that complicate the process of accurately pricing risk for the loans and deposits taken on as part of a bank's portfolio. To overcome these problems, regulators require that banks hold capital. The deposit insurance scheme protects only depositors and not the troubled financial institutions during market instability. Some researchers argue that a failure of one financial institution can trigger a domino effect owing to systemic risk within the financial system. Financial institutions contribute to deposit insurance schemes to mitigate risk from depositors. However, these safety measures are not sufficient to protect banks from a moral hazard problem.

Banks can engage in risky lending activities without having to face harmful consequences because the deposit insurance scheme will step in to pay off the depositors in the event of a bank failure. Hence, to prevent banks from entering risky positions, regulators require banks to set aside capital as part of capital requirements. This promotes safety and soundness within the financial system and upholds market discipline.

Similarly, traditional banking literature has extensively researched the role of liquidity in financial institutions. However, liquidity requirements implemented post-GFC and through Basel III have renewed the debate on the function of liquidity requirements concerning capital requirements.

The difference between capital and liquidity requirements as complements or substitutes of each other is discussed in Chapter 3. The importance of bank liquidity is investigated in work conducted by Diamond and Dybvig (1983) and Diamond and Rajan (2001), which explains how banks generate value on both the asset and liability sides of the balance sheet. On the asset side, banks lend to illiquid borrowers, using illiquid positions to create liquidity. On the liability side, banks provide on-demand liquidity to depositors. This makes it difficult to balance future cashflows generated from illiquid loans and demand from depositors. Given that banks are obliged to fulfil their responsibilities as financial intermediaries, they must meet depositors' liquidity demands in good time. The failure to meet depositors' demands invites speculation about liquidity issues, which could lead to a bank run. This could result in losses for banks on account of them having to engage in fire sales of illiquid assets for less than their realised value.

Liquidity risk was a key contributor to the meltdown of numerous financial institutions during the GFC. Some banks were exposed to immense amounts of risky illiquid assets, while others relied heavily on the interbank market to cover their short-term liabilities. Using data on the GFC to research US banks, Chen et al. (2021) have shown that different types of financial crises have different relationships to liquidity risk. For instance, liquidity risk hurts banking performance more when the safety and soundness of a financial system are the objects of wider public concern. Liquidity risk cannot be characterised as the sole contributor to banks' insolvency issues. Instead, it stems from low capital ratios and higher credit risk. These two factors act as a catalyst for bank liquidity risk. Liquidity risk diminishes a bank's survival prospects in a financial crisis, whereby banks with a low capital requirement and higher credit risk suffer more.

1.1.2. Research Motivation and Research Gaps

This section is divided into three subsections, which discuss the research motivation and gaps for each chapter of this thesis.

Chapter 2 - Regulatory Frameworks for Credit and Liquidity Risk Management Across Developing and Emerging Economies

The first and primary motivation underlying this chapter comes from the need to address concerns over the adequacy of Basel III requirements to mitigate systemic risk in conventional, Islamic and hybrid banks in emerging economies. The Basel III was issued by the BCBS as a new international regulatory framework in the aftermath of the GFC. It aims to mitigate systemic risk and increase banks' safety and soundness with enhanced capital adequacy requirements. Additional measures, including new liquidity requirements, were designed to mitigate the liquidity risk to which banks were exposed in the GFC.

Despite ongoing reforms post-GFC, international regulatory bodies such as the BCBS and the Financial Stability Board (FSB) have received significant attention from researchers and national regulators, who scrutinised the effectiveness of new regulations on financial institutions in developed and developing markets (Hsieh and

Lee, 2020). This scrutiny comes from research findings which reveal that despite having high capital levels, many banks across the globe were subject to instability, and the scale of exposure forced a few to file for insolvency. A high capital level, therefore, might not be adequate to reduce systemic risk.

This perceived inadequacy has been studied by researchers and regulators, leading to the development of additional regulations imposed at a national level, such as the Dodd-Frank Act (US), Ringfencing (UK), The Internal Capital Adequacy Assessment Process (ICAAP) and the Internal Liquidity Adequacy Assessment Process (ILAAP) (EU) (Tarullo, 2019). However, little is known about the additional national regulations and structural systems implemented in emerging markets. In addition, there are no Islamic banks in the G-SIBs list, banks owning more than 15% of the market share are domestically systemically important banks (D-SIBs) according to IFSB guidelines (IFSB, 2015). Equally, a financial stability assessment conducted by the IMF (2017) on the Saudi Arabian financial sector highlights various deficiencies: inadequate stress testing to address systemic risk, weak financial reporting to measure systemic risk, and limited guidance for mapping risk profiles to the Basel III framework. This is because the Saudi Arabian Monetary Authority has not yet developed a systemic risk framework. Likewise, neighbouring GCC countries (such as Kuwait and Qatar) lack adequate centralised shariah supervisory boards or adequate fiscal policy frameworks within central banks to deal with Islamic banks and enhance financial stability (IMF, 2019a; IMF, 2019b).

After examining liquidity regulations in the Indian banking sector, the RBI required that banks hold at least 4% of their assets in cash reserve ratio and hold Statutory Liquidity Ratio (SLR) across multiple asset classes. However, these additional requirements were based on limited research, and banks were already required to meet LCR and NSFR requirements as part of the Basel III liquidity risk framework. The 2013 Chinese inter-banking liquidity crisis was caused by regulators' failure to identify contagion risks in banks. Billions of dollars of emergency liquidity were injected into the interbank market to alleviate liquidity shortages (Chen et al., 2020). Chen et al. (2020) argue that Chinese markets' liquidity management would be improved by Basel requirements and liquidity measures introduced by the Chinese Banking Regulatory Authority (CBRA), such as High-quality Liquidity Asset Adequacy Ratio (HQLAAR) and Liquidity Matching Rate (LMR). Although Chen et al. (2020) address the main cause of the 2013 inter-banking liquidity crisis, they do not explore the roles of HQLAAR and LMR in improving bank liquidity. Therefore, research is lacking as it pertains to the adequacy of Basel III to address systemic risk and other country-specific risks and measures taken by regulatory bodies in developing countries. Chapter two aims to fill the literature gap by exploring various regulatory systems used to manage capital and liquidity risk in emerging markets from the perspective of single regulatory systems and dual regulatory systems, which include Islamic banking.

Since the release of Basel III for implementation, several events have taken place, which have introduced macroeconomic concerns that might influence the date and extent of Basel III implementation. Moreover, the Covid-19 pandemic presented unique challenges that might complicate contextual factors, giving regulators the opportunity to use innovative practices to meet Basel III requirements. These challenges might be elevated in dual banking systems, which involve both conventional and Islamic banking institutions (Abdul Ganiyy, Zainol, and Ahmad, 2017). These challenges might be further increased when a government or state-owned banks have higher inherent risks than privately owned banks.

Research has examined how the implementation of Basel III differs across various countries (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2018; Samanta, 2015). These studies highlight the impact of the Basel III implementation on investment and capital flow into the economy, profitability, and risk factors in banking (Rizvi et al., 2018; Samanta, 2015; Upadhyay, 2021). Some of these studies highlight that Islamic banks face particular challenges with Basel III compliance, which are created by the non-uniformity and voluntariness of IFSB rule application, and difficulties conforming to liquidity guidelines (Hidayat et al., 2018; Zainudin et al., 2019). Furthermore, studies highlight that Basel III implementation generates cost and readiness concerns for conventional banks (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2021). However, these studies fail to consider that banking supervisors adjust Basel III requirements in response to the unique set of risks faced by Islamic or state-owned banks (Jarbou and Niyama, 2020; Mohd Amin and Abdul-Rahman, 2020; Rashid, Rahman, and Markom, 2018). Chapter two fills this gap by examining how regulators adapt their laws to facilitate Islamic and state-owned/public sector compliance with Basel III.

Chapter 3 - Basel III: Implications of Capital and Liquidity Regulations on Financial Stability During an Economic Depression

This chapter starts by reviewing the existing literature on the effects of underlying liquidity risk drivers on additional bank risks in the context of amplified systemic risk during the GFC. Funding liquidity risk is crucial for the maintenance of financial stability. Liquidity risk can increase market illiquidity and thus block the transmission channel between illiquid markets. These cause credit risk, as witnessed in the GFC (Brunnermeier and Pedersen, 2009; He and Xiong, 2012). Hence, understanding the origins and dynamics of liquidity risk is paramount for banks that seek to limit their liquidity risks and for regulators and policymakers who aim to maintain and promote financial stability (Bechtel et al., 2019). Financial institutions gain liquidity risk from the liquidity mismatch between their assets and liabilities (Diamond and Dybvig, 1983). Banks finance their long-term assets with short-term liabilities. Through dependence on volatile sources of funding, for instance, using customer deposits for consumer lending or short-term interbank lending, these activities expose banks to liquidity shocks (Diamond and Dybvig, 1983; BCBS, 2013). Liquidity shocks thus take various forms; large value payment systems, unexpected deposit withdrawals, margin calls in stockbroking, credit line drawdown by corporate clients, and contingent payments as a result of the failure of payment and settlement systems (BCBS, 2013).

Although Basel III is firm-specific and risk-sensitive and can counter systemic risk, critics argue that financial reforms risk limiting credit availability and economic growth (Allen et al., 2012). For instance, these reforms forbid asset-driven liability structures, where banks compete for a larger share of the lending market to boost their assets, assuming that they will receive funding from wholesale markets. Banks would have to return to liability-driven asset structures (similar to those used in the 1960s before global financial deregulation), where before lending, banks must compete for larger shares of stable long-term deposits and funding to strengthen their balance sheets. These changes to regulatory reforms force banks to review internal processes and undertake new business responsibilities, such as the approval of consumer loans and credit, to effectively communicate changes to the business model; to provide opportunities for investors to gain stable long-term financing; and shift risky loans to long-term institutional investors who are better placed to absorb risks. The issue here is not the cost of higher capital and liquidity requirements but rather the operational challenges and consequences posed by stringent regulations, which threaten to starve the economy while Basel III is still incomplete, given that the economy relies heavily on credit. If implemented for an extended period, the alleged cure to the financial crises will become a risk to the financial system (Allen et al., 2012).

Banjaree and Mio (2018) examine the effect of stringent liquidity regulation in the UK with control variables such as asset returns; Tier 1 capital ratio; short-term interbank funding to total asset ratios; foreign deposit to total asset ratios; quarterly asset growth rate; and individual liquidity guidance ratios (similar to LCR). They use the Ordinary Least Square (OLS) regression model to estimate the impact of liquidity regulation on UK banks. Their findings indicate that banks bound by stringent liquidity requirements did not change their balance sheet size but instead changed their asset and liability structures to meet Basel III's requirements. Financial institutions facing higher liquidity requirements found alternative sources of stable funding rather than relying on retail deposits, non-financial corporate deposits, or interbank banking markets. In 2010, BCBS proposed two standards for managing liquidity risk and reducing systemic risk after a GFC. The liquidity requirements under LCR and NSFR rest on largely untested assumptions about the rate of cash outflow and inflows and (in NSFR’s case) the percentage of stable and less stable deposits; hence, the use of historical data can shed light on underlying assumptions and policy implications (Hong et al.,2014). However, new liquidity regulations have been studied from different standpoints, such as their implications on lending, profitability, and default risk. But research into the implications of new liquidity regulation on systemic risk remains scarce. Moreover, given the different implementation dates provided by BCBS for NSFR, the post-effect of NSFR on bank default risk within emerging markets has not been fully studied. Chapter three of this thesis fills this gap by investigating the implications of capital and liquidity regulations on bank stability and contribution towards systemic risk. It starts by reviewing the existing literature on the effects of capital and liquidity requirements on bank risks in the context of systemic risk.

Chapter 4 - Credit Risk, Liquidity Risk, Liquidity Creation, and Their Joint Implications on Systemic Risk

This chapter was motivated by examining the intensifying pressure financial institutions face during crises to act as liquidity providers and absorb the negative implications of economic shocks and downturns. It is crucial to understand what causes liquidity and credit risk within a bank and how these two risks interact. We define liquidity risk as “the risk when a large institution runs out of reserved liquid assets and is unable to meet its obligations upon maturity (due to illiquid market conditions that prevent it from converting its illiquid assets to liquid assets), triggering a bank run and consequent liquidation, which exposes the financial system to systemic risk”. Similarly, credit risk is the loss-given default arising from a counterparty’s inability to meet its obligations, which, following the terms and conditions, results in credit issuers bearing losses (Spuchľáková et al., 2015). However, financial intermediation theory emphasises that banks play a key role in risk transformation because they accumulate liquid deposits on their liabilities and generate profits by issuing illiquid assets and off-balance sheet activities (Diamond, 1984).

Holding higher liquid assets and investments does not make financial institutions immune from credit and default risks. Acharya et al. (2012) explore the link between cash holdings (i.e., liquid assets) and credit risk and default risk. They explain that the firm’s short-term default probability reduces when liquid asset reserves are held. However, over a one-year horizon, the relationship between liquidity and default probability becomes positive because the firm faces a difficult choice between maintaining liquidity positions and investing to generate future cash flows. This increases firms’ credit spread, thereby resulting in higher credit risk and forcing banks to face the direct and indirect impacts of default risk (Acharya et al., 2012). A bank’s decision to adjust its liquidity holdings is a direct impact of short-term default risk. An indirect impact of default risk is the diminishing future cash flow faced by banks, which leads to a higher default probability and amplifies credit risk. Acharya et al. (2012) argue that when default risk increases, firms’ responses to increasing liquidity may only partially decrease risk because a firm’s stability and risk depend on its asset and liability structure.

Acharya and Thakor (2016) provide a theoretical model for the relationship between bank leverage, liquidity creation, and systemic risk. They argue that higher leverages that arise from banks’ lending activities foster liquidity creation, which indirectly increases systemic risk by making financial contagion and bank runs more likely. In contrast, Davydov et al. (2021) examine the effect of liquidity creation on systemic risk, using four different BB measures and covering liquidity creation both on- and off-balance sheets. They use Extreme Value Theory (EVT) to measure banks' systemic risk, tail risk, and systemic linkage. The study uses controls for size, asset volatility, balance sheet composition, and bank-specific measures. Their findings show that liquidity creation decreases systemic risk. Moreover, Acharya and Thakor (2016) argue that on an individual level, high liquidity creation decreases a bank's systemic risk contribution. However, these findings do not consider bank leverage or the risk of a bank run which might significantly affect the findings, as evidenced by GFC. Their study also ignores the impact of credit and liquid risk on bank default risk.

1.1.3. Importance of Research and Significance

This study has significant ramifications for academics and researchers interested in understanding how capital and liquidity risks interact with systemic risk within emerging markets in the aftermath of the GFC and in light of international regulatory reforms. In addition, this research offers significant insights that can help international regulatory organizations develop future international regulatory directives regarding capital and liquidity regulations aiming to reduce financial contagion inside the global financial system. In a similar vein, national regulators in emerging markets should consider this research as it will help them better manage country-specific risks and reduce the likelihood of financial contagion among financial institutions operating in developing countries, as well as better align their regulatory frameworks with regard to capital and liquidity regulation in alleviating financial contagion.

By utilising Basel III, this study expands upon the body of literature that already exists in the fields of credit, liquidity, and systemic risk. However, there have been numerous studies done on credit and liquidity issues in the context of developed economies since the GFC. However, although fulfilling the role of financial intermediation as defined by Diamond and Dybvig (1983), banks operating in emerging economies are very different from their counterparts in the West in terms of their exposure to underlying risks and the nature of their banking operations.

A portion of the literature that already exists examines the distinction between conventional and Islamic banking, the latter of which has a stronger domestic presence in some emerging nations. For example, Azmat et al. (2020) contend that the primary driver of financial intermediation within conventional banks is a consideration of risk and rewards, which leads to asset bubbles within the financial system. By contrast, Islamic banking caters to a religiously inclined audience rather than just a concept of risk and reward. Due to this, a contract for Islamic financing must be risk-sharing in nature or based on the sale or purchase of a real asset (Elnahas et al., 2017). The ability of Islamic banking deposits to be converted into risky lending is constrained due to this difference in nature. This difference in nature means that the conversion of Islamic banking deposits into risky lending is limited.

Another body of research examines the causes of high nonperforming loans (NPLs) on the balance sheets of domestic and international banks in emerging nations. Compared to their counterparts in developed economies, where a few major players control a sizable portion of the market share, the competitive environment for banks in emerging nations is comparatively high (Claessens and van Horen, 2015). Likewise, the presence of foreign banks affects the financial stability of the host country through various channels. For instance, a financial crisis in the home country of a foreign bank can influence the domestic financial stability of the host country due to the contagion spill over effect (Popov and Udell, 2012). Likewise, the influence of foreign banks on credit risk in host nations depends on whether or not they employ "cherry-picking" techniques or make use of high-quality screening technology. If foreign banks implement cherry picking strategy to attract only high-quality borrowers, this will, in turn, result in domestic banks being forced to expand their loan portfolios towards risky borrowers (Natsir et al., 2019). This strategy can lead to higher levels of NPLs across domestic banks and also increase overall credit risk within the host country. In contrast, several researchers (Anginer et al., 2014; Noman et al., 2017) have argued that the relationship between banking competition and systemic risk is negative, as higher competition within banks encourages managers to diversify their risks, thereby reducing financial fragility within the system. Countries with weak supervision and regulations, poor private monitoring mechanisms, state-owned banks and policies restricting competition are more prone to bank systemic risk.

1.1.4. Research Questions and Contributions to Knowledge

This section presents the overarching research question for this research and each chapter's underlying research questions and contribution to knowledge.

The fundamental overarching research question we attempt to address in this thesis is:

Do changes to capital and liquidity requirements in the global financial regulatory framework lessen systemic risk and bank default risk in developing markets?

Chapter 2 further investigates two pressing underlying research questions:

- First, are standardised capital and liquidity regulations better placed to mitigate risks faced by banks?
- Second, whether country-specific regulatory frameworks are needed to cater for additional risks that banks may face while operating within emerging markets?

Since the release of Basel III for implementation, several events have taken place, which have introduced macroeconomic concerns that might influence the date and extent of Basel III implementation. Moreover, the Covid-19 pandemic presented unique challenges that might complicate contextual factors, giving regulators the opportunity to use innovative practices to meet Basel III requirements. These challenges might be elevated in dual banking systems, which involve both conventional and Islamic banking institutions (Abdul Ganiyy, Zainol, and Ahmad, 2017). These challenges might be further increased when the government or state-owned banks have higher inherent risks than privately owned banks.

Research has examined how the implementation of Basel III differs across various countries (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2018; Samanta, 2015). These studies highlight the impact of the Basel III implementation on investment and capital flow into the economy, profitability, and risk factors in banking (Rizvi et al., 2018; Samanta, 2015; Upadhyay, 2021). Some of these studies highlight that Islamic banks face particular challenges with Basel III compliance, which are created by the non-uniformity and voluntariness of IFSB rule application, and difficulties conforming to liquidity guidelines (Hidayat et al., 2018; Zainudin et al., 2019). Furthermore, studies highlight that Basel III implementation generates cost and readiness concerns for conventional banks (Boora and Jangra, 2019; Rizvi, Kashiramka, and Singh, 2021). However, these studies fail to consider that banking supervisors adjust Basel III requirements in response to the unique set of risks faced by Islamic or state-owned banks (Jarbou and Niyama, 2020; Mohd Amin and Abdul-Rahman, 2020; Rashid, Rahman, and Markom, 2018). This study examines how regulators adapt their laws to facilitate Islamic and state-owned/public sector compliance with Basel III. This chapter contributes to literature and practice by filling these gaps. It uses qualitative analysis, compares BCBS and IFSB regulation with four countries' national regulatory guidance and regulations, and investigates factors that account for the different risk outcomes between Islamic and conventional banks and private vs public banks.

Chapter 3 examines post-GFC regulatory reforms, investigating Basel III's new capital and the effect of liquidity requirements on systemic risk in the financial system. This chapter makes three contributions to financial risk management literature.

- First, there has been emerging research conducted on Basel III's new minimum liquidity requirements and its ability to predict banks' default probability on a bank-specific level (Hong et al., 2014; Chiaramonte and Casu, 2017; Cuong-Ly et al., 2017; Bai et al., 2018). However, to the best of our knowledge, this chapter is the first to study banks' default probability using the components of NSFR liquidity requirements. In its examination of the impact of NSFR requirements on default risk in the post-transition regulatory landscape, this study uses the Morgan Stanley Capital International (MSCI) index, bank-level data on emerging markets, and the Z-source method, along with the new liquidity measures such as NSFR.
- Second, this chapter makes a novel contribution to the investigation of new liquidity requirements' impact on systemic risk. Although Cuong-Ly et al. (2017) attempt to examine systemic risk, they do not fully consider new mitigating measures such as NSFR, leverage requirements, countercyclical buffers, and globally systemically important institution surcharges. These are important measures to promote financial stability and reduce systemic liquidity risk. This study uses similar MSCI emerging market data, employing CoVaR methodology (Adrian and Brunnermeier, 2009) to study financial institutions' contribution towards systemic risk and to gauge new liquidity requirements' effectiveness at mitigating systemic risk.
- Finally, this chapter's third contribution is its scope. It studies emerging market economies that have thus far been ignored in the literature. Liquidity requirements play a crucial role within these markets where capital markets are

underdeveloped, more volatile and not less liquid than their Western counterparts.

Chapter 4 considers two main research questions:

- First, it examines the role of credit and liquidity risk on bank stability.
- Second, it studies the extent to which bank liquidity creation affects systemic risk. The research fills the gaps identified in the existing literature (Davydov et al., 2021; Zheng et al., 2019; Ghenimi et al., 2017; Imbierowicz and Rauch, 2014; Diamond and Dybvig, 1983).

Most of these studies are conducted in developed markets, but there are few such studies being conducted in an emerging market setting post-GFC (Ghenimi et al., 2017). Ghenimi et al. (2017) investigate the effect that credit and liquidity risk have on bank stability in the Middle East and North African (MENA) region, studying 49 banks in eight countries. However, they do not distinguish Islamic banking from traditional banking in that region in their empirical analysis. Moreover, their study does not explore the role of these risks in the bank systemic risk context.

Chapter 4 makes three contributions:

- To the best of my knowledge, it is the first study to investigate the relationship between credit risk, liquidity risk, and its implications on default risk, using a cross-country analysis of emerging markets post-GFC
- Second, the study examines the direct link between bank liquidity creation and systemic risk, which, to the best of my knowledge, remains unexplored in Emerging Market Economies (EMEs). Banks in these economies are more prone to volatile trading environments because the economies are highly dependent on banks for economic growth and are exposed to higher NPLs.
- The third contribution is this study’s novel scope because it is the first study of its kind to consider cross-country EMEs. This study also investigates how systemic risk differs across conventional, hybrid, and Islamic Banks.

Gupta and Kashiramka (2020) studied liquidity creation's impact on financial stability in India. They measure liquidity creation at a bank level, with variables such as BBLC, capital ratio, NPA, ROA, deposit growth, total stock market cap, total bank credit provided, bank size, dummy, and Z-score measure. They argue that liquidity creation improves financial stability since it allows banks to perform financial intermediation effectively. However, their analysis uses Z-scores to capture the whole banking sector’s financial stability rather than using systemic risk measures to capture the change in risk. They agree that the effect of liquidity creation on bank stability varies significantly between emerging and developed countries and endorse a cross-country analysis for liquidity creation in emerging markets.

1.1.4.1 Theoretical Contributions

The approach adopted in the current study focuses on gathering a wide variety of data from different sources. Therefore, the insights emerging from the study address the gaps in knowledge and contribute to a better understanding of critical issues under investigation. The study's theoretical contribution includes exploring the regulatory frameworks from international and national perspectives. The current research offers detailed insights into the regulatory frameworks for capital and liquidity requirements faced by banks and the role of regulators and policymakers in such contexts. By analysing the specifics of these frameworks, the study contributes to understanding how regulatory policies are formulated and implemented to address financial risks and how the current course of action can be improved.

The study addresses the association between regulatory frameworks and risk factors. The study focuses on various risks that emerge in the banking sector and how they integrate to affect operations. These include credit, liquidity, default, and systemic risks. By examining the relationship between regulatory measures and risk factors, the study enhances our theoretical understanding of how regulations and risk management practices influence the stability and risk profiles in the banking sector. Furthermore, the study adopts different econometric methods to assess the relationship between regulatory frameworks and risk factors. By applying these methods in the context of banking institutions in emerging economies, the study contributes to the methodological advancements in assessing the effectiveness of regulatory measures and their implications for risk management.

The study focuses on emerging economies, which the literature has not explored substantially. The investigation offers valuable information in understanding and responding to these markets' unique challenges and dynamics by highlighting the specific contexts of these countries. Subsequently, the study expands the theoretical knowledge of how regulatory frameworks and risk factors interact in different financial systems and how international systems interact with national needs.

1.1.5. Aims and Objectives

The aim of this thesis is to investigate whether the implementation of Basel III requirements by banks in emerging markets is sufficient to address bank-specific risks and systemic risks among banks in emerging markets. Based on this aim, we seek an understanding of:

- The details of the regulatory framework for the capital and liquidity requirements faced by the financial institution,
- How Basel and IFSB frameworks have an impact on credit risk, liquidity risk, default risk, and systemic risk by adopting a range of econometric methods

The first study (Chapter 2) aims to investigate the differences between the capital and liquidity regulations framework set by Basel III, IFSB, and national regulators under single and dual supervisory regimes within emerging markets. First, Basel III and IFSB standards are compared with respect to capital adequacy, credit risk, liquidity risk, and systemic risk. Then, the study investigates national regulators' management of dual supervisory regimes, focusing on capital adequacy, systemic risk, credit risk, and liquidity risk. The study then investigates the additional regulatory provisions besides the minimum provisions outlined in Basel III. To conclude the study, we analyse the differences in regulations applied to public and private sector banks within emerging market economies.

The first empirical study (Chapter 3) aims to examine the effect of capital and liquidity regulations introduced under Basel III on bank default risk and systemic risk. We use NSFR standards to study their pre and post-2018 effect on mitigating default risk and their contributions towards systemic risk. The relationship between capital and liquidity regulations is examined. Second, we evaluate NSFR for banks and their probability of default risk using the Z-score model. Third, we analyse the marginal contribution of banks towards systemic risk using Conditional Value at Risk (CoVaR).

The aim of the second empirical study (Chapter 4) is to examine the joint impact of credit and liquidity risk on bank stability and to explore the effect of liquidity creation on systemic risk. We achieve this by examining the interactions between credit and liquidity risk. Second, the impact of credit and liquidity risk on bank default risk is evaluated. Finally, the role of bank liquidity creation, and its implications for bank systemic risk, is analysed.

1.1.6. Thesis Structure

The thesis is organised as follows. Chapter 2 focuses on the regulatory capital and liquidity frameworks that national regulators impose on conventional and Islamic banks and on public and private financial institutions. We gather information from national regulators in China, India, Malaysia, and Saudi Arabia for this study. Chapter 3 investigates the newly introduced Basel III liquidity requirements' effect on bank default risk. It uses the 'difference in difference' pre and post-effect of NSFR on bank default risk and measures its impact on systemic risk using CoVaR by employing bank-level data and available market-level data on emerging economies from Bank Focus, Refinitiv Eikon, and Bloomberg Terminals. Chapter 4 explores the effect of bank liquidity creation on bank liquidity and credit risk using three distinct banking models. Additionally, this study also uses extreme value theory to evaluate conventional, hybrid, and Islamic banks' contributions to systemic risk. Chapter 5 summarises the research findings of the thesis and gives policy recommendations.

Chapter 2 – Regulatory Frameworks for Credit and Liquidity Risk management across developing and emerging economies

2.1. Introduction

Although the exact cause of the 2008 financial crisis is still under debate, a consensus exists that explosive credit growth was a contributing factor, with credit derivatives enabling the magnification of the systemic risks linked with the housing bubble in the USA (Alessi and Detken, 2018; Cucinelli, 2016). Credit growth was enabled by the availability of liquidity in the financial institutions in the U.S., which resulted in excessive risk-taking that ultimately led to the global financial crisis (Harun et al., 2021). In this chapter, we seek to answer two sub-questions:

1. Are standardised capital and liquidity regulations better placed to mitigate risks faced by banks?
2. Are country-specific regulatory frameworks needed to cater for additional risks that banks may face while operating within emerging markets?

This study examines the regulatory frameworks by the IFSB and BCBS aimed at achieving and maintaining stability after the financial crisis. It also covers the implementation of these frameworks by national regulators, together with the innovations put in place to compensate for contextual challenges. Moreover, these issues are examined in the context of Islamic versus conventional banking systems and public or state banks versus private banks. The structure follows a view of the banking system, which differentiates Islamic versus conventional banks, private sector versus state-owned and examines changes in regulations after the GFC. Further, a detailed review of risks in the banking system is presented, followed by a theoretical framework and a description of the document analysis method. The findings that seek to answer the two sub-questions are presented, and a conclusion of the chapter is provided.

2.1.1. The Islamic versus conventional banking

The Islamic financial system emerged in the 1980s and is, therefore, relatively new (Jarbou and Niyama, 2020). The first Islamic bank was opened in Egypt in 1963, although it was closed in 1967 (Perves, 2015). The Islamic banking system has grown tremendously over the last 20 years, although the sustainability of this growth is unknown (Abdul Ganiyy, Zainol, and Ahmad, 2017; Safiullah and Shamsuddin, 2018; Sheikh et al., 2018). For instance, the total assets amounted to $195 billion in 2000, and this increased to $1.4 trillion in 2015 and currently standards at above $3.2 trillion (Misman and Bhatti, 2020; Safiullah and Shamsuddin, 2018). Between 2009 and 2012, Islamic banks in the Gulf Cooperation Council (GCC) had a 17.4% asset growth, 18.2% net lending growth and 19.9% customer deposit growth compared to conventional banks, which achieved 8.1%, 8.1%, and 10% growth within the same period (Mahmood, Gan, and Nguyen, 2018). Globally, the Islamic financial services industry experienced 8.3% asset growth in 2017 (Dhiraj, Puneri, and Benraheem, 2019). Further, considering the numerical growth of the banking system, from one bank in 1975, there are currently more than 200 Islamic banks that operate in over 80 countries (Khokher and Alhabshi, 2019).

2.1.1.1 The foundational principles of Islamic Banking

Islamic banks are like conventional banks in that they have similar objectives, the means to achieve those objectives, and legal and constitutive arrangements (Jaara et al., 2017). The difference is in their mechanism and philosophy of operations (Jaara et al., 2017). Islamic banking is based on the principles of prohibiting interest (riba), prohibiting excessive uncertainty (Gharar) and profit and loss sharing (Abdo and Onour, 2020; Bitar et al., 2018; Farhan et al., 2020; Jaara et al., 2017).

The prohibition of interest in transactions is a means to prevent exploitation (Jaara et al., 2017). The Shariah foresees situations in business where money borrowed returns a lower profit than expected or where the borrower becomes exposed to losses making them unable to pay a fixed return, all of which are prejudicial against the borrower (Ibrahim and Ismail, 2015). In a profit-sharing agreement, the money borrowed is utilized in productive projects that generate capital and profit. Thus, in the Islamic banking system, capital gain is permitted (Jaara et al., 2017). Because loss is shared between the borrower and the lender, the lender becomes an active participant and not a spectator in the investment decision, which balances the risk (Jaara et al., 2017; Radzi and Lonik, 2016). Further, beyond participating in the lending decision, the Islamic banks also act as advisers, investors, traders and agents contingent on the situation and the demands of the customer (Onagun, 2019).

The profit and loss sharing arrangement should lead to more responsible lending and greater resilience than the conventional banking system, where the lender shields themselves from risks associated with the lending decision by employing a guaranteed collateral (Jaara et al., 2017; Syamlan and Jannah, 2019). This arrangement is supported by other foundational doctrines of Islam that recognize the duties of individuals, the sanctity of contracts, property rights, and social justice (Jarbou and Niyama, 2020). Moreover, the money cannot be invested in activities prohibited by Shariah, such as gambling, pork, weapons, pornography, conventional banking, and alcohol (Jarbou and Niyama, 2020; Perves, 2015). Furthermore, the banks are obligated to give alms, fairly share their gains and losses, and encourage the productive use of funds (Farhan et al., 2020; Perves, 2015).

Under these foundational systems, Islamic banks have products (activities) just like conventional banks. These include Musharaka, Mudharaba, Murabaha, Salam, Ijara and Istina. One such product is the profit-sharing investment accounts, which is the equivalent of bank deposits in conventional banking (Baldwin et al., 2019). However, in the Islamic banking context, the underlying asset is usually originated and managed by the bank, and the bank receives a share of the profit for its role in managing the fund, but the loss is borne by the account holder. Thus, they have variable returns, and the capital is not guaranteed, thereby putting the account holders at risk (Maatoug, Ayed, and Ftiti, 2019).

Another product is the Mudarabah saving account. The cash from these accounts is invested in long-term projects, and the profits (not fixed) are shared with the depositors (Sheikh et al., 2018). Mudarabah accounts can have a restricted time and unrestricted time. For the restricted type, the bank seeks the permission of the depositor to mix their funds with their funds, while the unrestricted ones can be administered by the banks independently (Sheikh et al., 2018). In both cases, agreements are in place to share risk between the bank and the depositor.

2.1.1.2 Islamic versus conventional banks through the 2008 financial crisis

Because of the growth of Islamic banking, in many countries, there are dual banking systems – Islamic and conventional with only Iran and Sudan running full Islamic banking systems (Abdul Ganiyy, Zainol, and Ahmad, 2017; Spinassou and Wardhana, 2021). Studies show that Islamic banks were negatively impacted during the 2008 financial crisis (Hussien et al., 2019; Olson and Zoubi, 2017). The Islamic banking system, however, by having their banking transactions all asset-linked and trade based, experienced a lesser effect of the global financial crisis (Masood and Javaria, 2017; Parashar, 2010). This could be due to generally higher liquidity levels in Islamic banks compared to conventional banks (Masood and Javaria, 2017).

2.1.2. State-owned versus private sector banks

A privately-owned bank is one in which most of the shares are owned and controlled privately by individuals or private institutions (Hussain et al., 2018). State-owned banks may have more advantages compared to their privately-owned counterparts. For instance, political connections in publicly-owned banks may lead to greater deposit collection at higher prices than their privately-owned counterparts, leading to greater market power (Risfandy et al., 2019). Another advantage that state-owned banks have over private banks is trust developed over many years from a feeling that their deposits are guaranteed (Jayawarsa et al., 2021).

Political connections and influence may be detrimental to state-owned banks. For instance, Zhang et al. (2016) indicated that in China, political influence means that state-owned banks lend mostly to state-owned enterprises, and their decisions are strongly influenced by the government. Studies reveal that CEOs of state-owned banks can make use of their political connections to influence the lending decisions of the banks, leading to the sensitivity of the bank to crises (Chen et al., 2018). Authors established that state-owned banks had higher lending during the financial crisis and, consequently, higher levels of non-performing loans (Coleman and Feler, 2015; Ekinci and Poyraz, 2019). As explained by Coleman and Feler (2015), lending is allocated inefficiently and is politically motivated.

2.1.3. Regulatory changes following the financial crisis

The BCBS was created in 1974 after the disturbances that had been witnessed in the international currency and the banking market (Hidayat et al., 2018). Its purpose then was to ensure that the banking system attains reliability (Hidayat et al., 2018). This led to the establishment of Basel I. Because of the weaknesses that remained unaddressed, the Basel II framework was introduced, enabling greater sensitivity to risk and especially the introduction of operational risk (Hidayat et al., 2018). The 2008 financial crisis revealed the failure of Basel II's ability to factor in pro-cyclicality (Hidayat et al., 2018).

Liquidity risk was among the main factors that resulted in the worldwide failure of the banking system, which called for the need for real risk management of the banking system while focusing on liquidity (Harun et al., 2021; Mennawi and Ahmed, 2020; Pushkala, Mahamayi, and Venkatesh, 2017). Indeed, the authors assert that the failure of banks was evident even with liquidity support from their countries' central banks (El-Massah, Bacheer, and Al Sayed, 2019; Jaara et al., 2017). Further, the financial crisis shed light on the need to maintain a satisfactory degree of capital for loss absorption (Spinassou and Wardhana, 2021). This highlighted the banking system's delicateness and the need for a regulatory framework that addresses stability concerns (Maatoug, Ayed, and Ftiti, 2019). Because of this, the BCBS came up with new regulations (Basel III framework) that focus on liquidity as a means of mitigating liquidity risk and restraining the probability of a bank run for the achievement of greater market stability (Harun et al., 2021; Milojević and Redzepagic, 2021).

Basel III is a voluntary and global regulatory framework for the banking system on stress testing, capital adequacy, and market LR (Jaara et al., 2017). This is already under application in different jurisdictions. For example, the US Federal Reserve has required large banks since 2012 to conduct liquidity stress testing (Marozva and Makina, 2020). Specifically, the Basel III framework contains financial reforms on leverage ratio and capital and liquidity requirements to strengthen risk management and corporate governance and improve bank disclosures and transparency to withstand the challenges of operating within a fluctuating environment (Hidayat et al., 2018; Spinassou and Wardhana, 2021). Liquidity requirements help control the risk of maturity transformation whereby a bank uses short-term deposits for long-term finance (Hidayat et al., 2018). Further, strengthening capital buffers requires the improvement of the quantity, quality, as well as reliability of capital adequacy.

The rest of the chapter is organized into four sections, including a literature review, theoretical framework, methodology and discussion and conclusion. In the literature review section, we examine the existing literature on supervisory approaches and the advantages of one approach over the other. Then we examine the literature on risk management and how risk management in Islamic banking differs from conventional banking with a focus on the challenges faced by Islamic banks. The chapter further examines the implementation of Basel III and whether differential regulations exist between Islamic and conventional banks and between state-owned and private banks. The theoretical framework draws from the literature examined and attempts to establish relationships between the concepts examined. Particularly the proposed relationship between Basel III implementation and state/private bank ownership versus implementation and Islamic/conventional banking focus. Our study suggests, through a conceptual diagram, possible relationships to be examined during data analysis.

In the methodology section, we discuss the qualitative analysis method used. Particularly, we justify the use of the qualitative approach and the accompanying techniques for data collection and analysis. Also, describe in detail the steps involved in data analysis and how validity and reliability are achieved. In the final section – discussion and conclusion – this study presents the findings and compares them with the literature. Moreover, the researcher presents the patterns established during the analysis. Further, the researcher identifies any new knowledge gained, the limitations of the research and recommendations for further studies.

2.2. Literature Review

In this section, we examine the existing literature on supervisory approaches and the advantages of one approach over the other. This is followed by an examination of the literature on risk management and how risk management in Islamic banking differs from conventional banking, with a focus on the challenges faced by Islamic banks. The chapter further examines the implementation of Basel III and whether differential regulations exist between Islamic and conventional banks and between state-owned and private banks.

2.2.1. Banking supervision

Banking supervision is based on two approaches: risk-based and compliance-based approaches. The compliance-based approach is traditional and involves checking boxes to determine whether rules have been complied with (Dalhatu and Sharofiddin, 2020). Risk-based supervision (RBS), on the other hand, is a modern approach based on principles, and its focus is on identifying areas of the highest risk within a banking system. An RBS framework is operationalized through the evaluation of the risks inherent in the banking system and the quality of the risk control measures undertaken to address these risks (Dalhatu and Sharofiddin, 2020). It can enhance the soundness and safety of the banking system and result in increased efficiency of resource allocation (Newbury and Izaguirre, 2019).

The concept of risk-based supervision is addressed in the Basel framework. The Basel committee called for effective risk-based supervision as part of fulfilling the core requirements for regulators. This effectiveness was described as going beyond examining the balance sheet of banks to considering the wider macroeconomic environment. The Basel Framework requires the evaluation of risk from a wider perspective than the balance sheet, recommending a macro perspective (BCBS, 2021, p. 1525-1626).

The macro perspective described includes the macroeconomic environment, concentration risk build-up, and business trends. Thus, as described, achieving risk-based supervision involves examining macroeconomic trends and their potential impact on the banking sector. Further, it is achieved through early interventions as well as timely supervisory actions. The Basel framework further identifies that achieving risk-based supervision means that supervisors must do more than passive evaluation of compliance with rules.

The IFSB recognizes, advocates for, and adopts the risk-based approach (supervision). The body defines the approach as risk assessment and management by the supervisor (IFSB-16, 2014, p.2). In the IFSB-13, the body urged supervisors to use risk-based approaches. In the IFSB-16 report, it is indicated that the body recommended that supervisors review the risk-based approach and address the implications of various risk categories for supervisors. In subsequent releases, we noticed a word-by-word similarity in views about the risk-based similarity between the provisions of IFSB and BCBS.

In a study conducted by Ajibo (2015), the author examined the reliance on credit rating information and recapitalization and established that though they have relevance in the banking sector, the future of banking should lean towards a risk-based supervision (RBS) framework. The RBS framework is part of the Basel II framework that ought to have been rolled out by banks. Therefore, it is assumed that banks in emerging countries have rolled out risk-based supervision and are in the process of implementing the Basel III requirements.

Dalhatu and Sharofiddin (2020) listed the challenges of implementing RBS in the context of Islamic banks. The author argued that RBS was developed for the conventional banking system and, thus, is grossly inefficient. The author explained further that the inefficiency comes from the RBS' failure to address the unique need of the risks in Islamic banks and omit the Internal Shariah audit and the Shariah board. This view is supported by Dalhatu and Sharofiddin (2021), who termed the RBS framework as unable to accommodate the unique risks inherent in Islamic banking, as well as the unique control of risk management functions in Islamic banks. In chapter two, we only identify, where information is provided, whether the respective bank utilises the RBS framework and does not seek to establish its efficiency or deficiency in risk management.

2.2.2. Risk management in banks

Islamic banks face almost the same risks as their conventional (interest-based) counterparts (Yaacob, Rahman, and Karim, 2016). However, risk management in Islamic versus conventional banks differs because the Basel protocol cannot directly be applied to the Islamic banking system (Perves, 2015). Moreover, Islamic banks face new and unique risks resulting from their liability and asset structures which differ from the conventional banking system and which stem from the need to comply with Shariah laws (Ismail, Rahman, and Ahmad, 2013).

2.2.3. Capital adequacy

Bank capital is vital to the stability of the financial market because it safeguards each institution against failure and reduces systemic risk (Rochet, 2018). The IFSB recognizes the presence of displaced commercial risk (DCR) whereby the Islamic banks are under pressure to pay the investment account holders cash returns that align with the benchmark for the conventional deposit rate of return when the actual returns on the accounts may be lower (Baldwin et al., 2019). This diminishes the bank's capital in the case where the bank uses its capital to pay investment account holders. Baldwin et al. (2019) denote such a scenario in the 1980s when a bank (the International Islamic Bank for Investment and Development) allocated all its profit to investment account holders. The presence of displaced commercial risk thus threatens the capital adequacy of Islamic banks. Although DCR is unique to an Islamic bank, conventional banks also face market risks that threaten their working capital. Therefore, both banking systems require adequate capital. The Basel frameworks provide for three types of capital that must be maintained by a bank: (a) regulatory capital, (b) capital conservation buffer, and (c) countercyclical buffer.

2.2.3.1. Regulatory capital

The Basel framework lists three types of capital as eligible regulatory capital: common equity tier 1 (CET1), additional tier 1, and tier 2. CET1, according to the Basel framework, comprises (a) common shares issued by the bank, (b)share premium coming from the CEIT1 instruments, (c)retained earnings, (d) other comprehensive income and disclosed earnings accumulated, (e) common shares issued by consolidated subsidiaries, and (f) regulatory adjustments in the computation of CET1. Additional tier 1 comprises (a) instruments issued by a bank that meet tier 1 requirements but do not fall under CET1, (b) the stock surplus resulting from selling additional tier 1 instruments, and (c) instruments from consolidated subsidiaries held by third parties which meet tier 1 and not CET1 requirements. Additional tier 1 instruments must not have a maturity date unless they have an automatic rollover. Tier 1 capital is thus predominantly the banks' shares as well as its retained earnings. Tier 2 capital, according to the Basel Framework, comprises (a) bank-issued instruments that do not meet the criteria for tier 1, (b) share premium from tier 2 instruments, (c) the third party held instruments from consolidated subsidiaries that do not meet the criteria for tier 1, (d) loan loss provisions, and (e) regulatory adjustments in the computation of tier 2. (BCBS, 2021).

The Basel framework further indicates that tier 1 capital is the sum of CET1 and additional tier 1, and total regulatory capital is the summation of tier 1 and tier 2 capital. The capital requirements as a percentage of risk-weighted assets are shown in figure 1 below.

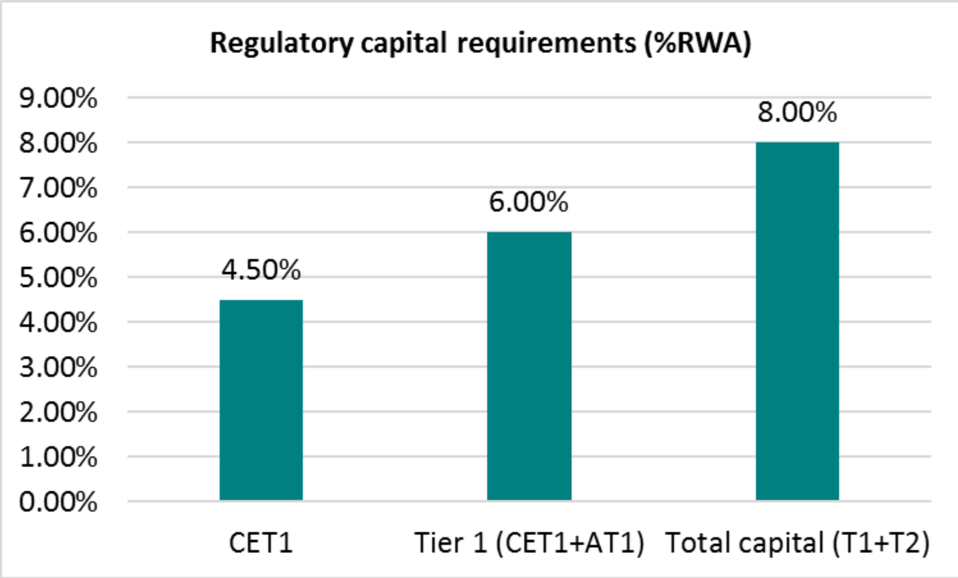

Figure 1. Regulatory capital requirements by the BCBS adapted from BCBS, 2021

2.2.3.2. Capital conservation buffer

The CCoB is one of the macro-prudential rules introduced by the BCBS in the Basel III framework as a means to mitigate the risks that stem out of pro-cyclical consequences of bank capital (Maatoug, Ayed and Ftiti, 2019). Banks are required to have buffers above the minimum regulatory requirements. The conservation buffer enables banks to build buffers in periods where there is no financial stress.

According to the Basel Framework, a CET1 conservation buffer is set at 2.5% of RWA for all banks (BCBS, 2021, p.151/1626). The Basel Framework further indicates that the buffer should be available for withdrawal but should not be used for competition with other banks. The IFSB acknowledges the importance of the capital conservation buffer and its use, keeps its meaning and recommends a value of 2.5% of RWA (IFSB-2015, p. 14). IFIs that fail to meet the conservation buffer submit a conservation plan. Further guidance on conservation buffer includes forbidding the inclusion of capital raised from Sukuk issuance.

2.2.3.3. Countercyclical buffer

The Basel III framework provides for the need for a CCyB for banks that are systemically important (BCBS, 2021, p.139-1626). The countercyclical buffer aims to account for the macroeconomic environment in which the banking sector operates by building up reserves during periods of excessive economic growth to cushion the banks against losses (during economic contractions). The determination of when to activate the countercyclical buffer is left to the supervisor, and some of the tools used include credit growth and credit-to-GDP. The value of the countercyclical buffer is set at a minimum of 0% and a maximum of 2.5% of RWA (BCBS, 2021, p.156-1626; India Data 2014, p.86). The Basel Framework further indicates that while buffer increase decisions following the announcement by the national authorities need to be implemented over 12 months, the reduction of countercyclical buffers should be immediate.

The IFSB recognizes CCyB and instructs national supervisors to consider pro-cyclicality in their stress testing and for Islamic Financial Institutions (IFIs) to consider the Basel III capital framework. Moreover, the IFSB considers the introduction of countercyclical buffers to reduce pro-cyclicality. The required level is left to the determination of the supervisory authority.

In Islamic banking, the computation of the capital adequacy ratio considers profit-sharing investment accounts, which are unique to the Islamic banking system and are a hybrid of equity and debt (Baldwin, Alhalboni, and Helmi, 2019). Baldwin, Alhalboni, and Helmi (2019) noted that regulators in Islamic banks had chosen the path of adopting the standards of the BIS as much as possible. In the computation of the capital adequacy ratio, the formula for Islamic banks is a modified version of the BIS formula. The modification involves an adjustment factor (alpha), which comes from subsidizing the returns of the account holder using the bank's equity. The IFSB estimates the alpha for each country based on the normally distributed return of Islamic banks' assets and thus does not include the alphas of the individual banks based on the risk profile of the asset (Baldwin et al., 2019).

2.2.4. Systemic risk

Systematic risk is the probability that the failure of one bank could have ripple effects leading to the failure of other banks (Karimalis and Nomikos, 2018). Following the financial crisis, most regulators have put pressure on the control of systemic risk through many policy reforms (Butzbach, 2016). First, regulators sought to reduce the too-big-to-fail problem of banks by encouraging de-diversification, size reduction, separation of investment banking and retail banking and risk exposure reduction through tightening liquidity and capital (Butzbach, 2016). The Basel framework recommends the imposition of higher loss absorbency with tier 1 capital for systemically important banks (BCBS, 2021, p. 160/1626). The aim of this is to tame banks from increasing their systemic importance.

The risk control measures by the IFSB concern controlling factors that may contribute towards systemic risk. For instance, protecting the Investment Account Holders (IAH) ensures the avoidance of Unrestricted Profit-Sharing Investment Account (UPSIA) withdrawals that may result in systematic risk. Another example is controlling the possibility of a bank run when Islamic investors withdraw their funds due to poor performance. Further, the FSB advocates for systemic protection through a public safety net.

2.2.5. Credit risk

The BCBS defined credit risk as the likelihood that a bank would lose partially or fully an outstanding loan because of credit events leading to a high probability of default (Isanzu, 2017). It is also the likelihood of a counterparty or a borrower failing to meet their obligations according to the agreed terms (Bahago et al., 2019; Basah et al., 2018; Isanzu, 2017; Qadiri and Alsughayer, 2021; Rafiq and Siddiqui, 2018; Saleh and Abu Afifa, 2020; Taiwo et al., 2017). The default usually emanates from the failure to settle an obligation, restructure, change of credit rating, moratorium/repudiation, and bankruptcy (Bahago et al., 2019; Isanzu, 2017; Qadiri and Alsughayer, 2021).

Credit risk is considered the largest exposure for most banking institutions (Dong and Oberson, 2021). It was addressed in Basel I through the introduction of CAR. In Basel II, banks were permitted to compute the RWA using two methods, the standardized approach and the advanced approach. The advanced or internal rating-based (IRB) approach permits banks to define one or three of the parameters for credit risk compute including the exposure at default (EAD), loss given default (LGD), and probability of default (PD) (Dong and Oberson, 2021). The determination of the banks that may adopt the IRB approach is subject to their operational nature, risk profile, and capability to meet the requirements for eligibility (Dong and Oberson, 2021).

Given that banks derive their income mainly from the interest charged to borrowers, advancing loans to customers is their crucial function (Bahago et al., 2019). Poor administration of credit leads to reduced profitability as well as distress and/or failure (Taiwo et al., 2017). This makes it critical for the bank to determine the risk for each loan and each borrower as a primary means of credit risk minimization and management (Konovalova, Kristovska, and Kudinska, 2016). Credit risk is carried out by the financier (bank) and involves the complete or partial loss of both the interest and principal. Credit risk is measured in previous studies through the percentage of NPLs (Misman et al., 2015). The loan becomes non-performing when the principal or interest remains due by 90 days or more (Misman et al., 2015).

2.2.5.1. Credit risk management in Islamic banking

In Islamic banking, credit risk could arise due to several events. First, the Islamic bank may be exposed to credit risk when a client fails to remit the proceeds of a Murabaha contract based on the pre-determined terms. Credit risk may also occur in a Musharakah contract when a customer fails to buy their agreed share based on predetermined terms and conditions (Farhan et al., 2020). Salam or parallel Salam if the contracted asset is not provided as pre-agreed upon, leading to the entire loss of an investment (Farhan et al., 2020). Further, failure to meet the commitments for Istina or parallel Istina contracts may expose the Islamic bank to credit risk (Farhan et al., 2020). Lastly, credit risk may occur if the lessee in an Ijarah contract fails to pay lease rentals according to the terms agreed (Farhan et al., 2020). Aside from these events, Dalhatu and Sharofiddin (2020) state that credit risk in Islamic banking may stem from a mismatch between the credit portfolio and the growth of assets.

According to Safiullah and Shamsuddin (2018), Islamic banks are exposed to higher credit risk in their profit and loss-sharing financing arrangement because of the borrowers' moral hazards where they could share losses with the bank. Additionally, restrictions on the use of instruments to mitigate credit risk, such as derivatives, may also increase their exposure to credit risk. However, the partnership contract between the borrower and the lender in an Islamic bank setting could decrease information asymmetry, facilitate a better understanding of the creditworthiness of the borrower and improve the problem of adverse selection (Safiullah and Shamsuddin, 2018). Credit risk management is thus important as it leads to maximizing the risk-adjusted return rate of a bank (Taiwo et al., 2017).

2.2.5.2. Credit risk management in the public sector/state-owned banks

Some researchers indicate that NPAs are a major problem in India’s public sector banks (Bhatt, 2021; Hussain, Maheshwari, and Hamid, 2021; Pushkala et al., 2017). One of the main ways the public sector banks in India manage credit risk (high NPAs) is through initiating high levels of provisioning, which are reported in balance sheets (Pushkala et al., 2017). The NPAs, on the other hand, were never reported (Pushkala et al., 2017). Rahaman and Sur (2021) find several factors that influence NPAs in India, and among them are corruption and laws. As it pertains to credit risk management, Arora (2021) established that the credit risk management practices of Indian banks involved implementing know your customer (KYC), a strong mechanism for loan review and appraisal, being aware of the risk management mechanisms of other banks, controlling for wilful defaults, having a multi-tier process for credit approval, and risk-based appraisals.

2.2.6. Liquidity risk

Liquidity as a concept does not have a universally agreed definition because it emanates from different economic viewpoints (Marozva and Makina, 2020). In banking, it is defined as the capability to meet financial obligations on time (El-Massah, Bacheer, and Al Sayed, 2019; Khalid, Rashed, and Hossain, 2019; Tran, Nguyen, and Long, 2019; Yaacob et al., 2016). Liquidity risk, on the other hand, refers to the probability that a bank will fail to meet its obligations (Abdul-Rahman, Said, and Sulaiman, 2017; Dhiraj, Puneri, and Benraheem, 2019; El-Massah et al., 2019; Ghenimi, Chaibi, and Omri, 2020; Mennawi and Ahmed, 2020; Yaacob et al., 2016). Other authors use different terms in defining liquidity risk. For instance, Bahago, Jelilov, and Celik (2019) defined liquidity risk as the likelihood of customers exceeding the available bank calls on cash or that the bank's income through a bay window as well as what it can raise through the issuance of equity or debt is unable to cover the operating obligations leading to a halt in bank operations. Further, liquidity risk may emanate from the lack of a hedging instrument at an economical price or the inability of a bank to sell its assets at or above its market value (Abdo and Onour, 2020; Bahago et al., 2019; Chen et al., 2018).

Liquidity risk management refers to the strategies or procedures that banks put in place to enable them to balance the supply (asset) and demand (liability) of liquidity (El-Massah et al., 2019). A balance is necessary as excess liquidity is unfavourable to the bank as it reduces bank profitability due to the loss of opportunity (Abdo and Onour, 2020; Jedidia and Hamza, 2015; Mennawi and Ahmed, 2020). Some of the strategies involve monitoring the variations in the maturities of assets and liabilities and future funding needs while considering different scenarios, such as the ability of a bank to quickly liquidate their positions when faced with adversity (Abdo and Onour, 2020; Bahago et al., 2019; Mennawi and Ahmed, 2020).

2.2.6.1. Regulatory provisions

The Basel committee came up with standards that are aimed at enhancing the sound management of liquidity in banking institutions (Mennawi and Ahmed, 2020). This includes the LCR and the NSFR (Marozva and Makina, 2020; Yaacob, Rahman, and Karim, 2016). The LCR is a means to promote the resilience of banking institutions during short periods of stress, ensuring that they have HQLA lasting 30 calendar days (Yaacob et al., 2016). According to the Basel III standard, the bank's LCR should be 100%, which means that their stock of HQLA equals their total net cash outflows (BCBS, 2021). However, GN-6 (2015, p.1) indicates that the initial percentage required was 60%, and banks were to increase the value each year by 10% to reach 100% by 2019. Moreover, the HQLA is permissible for use during systemic and idiosyncratic stress events. The characteristics of HQLA include less risky assets, its valuation is easy and certain, its correlation with risky assets is low, and the asset is listed on a recognised and developed exchange. The NSFR is aimed at ensuring that banks keep stable their funding profiles as it relates to their off-balance sheet activities and their asset composition, which in the end, restricts their overdependence on wholesale short-term funding.

NSFR is only a complement of the LCR, having a horizon of one year and coves idiosyncratic stress (Yaacob et al., 2016). The components of the NSFR include the ASF, which refers to the liability and equity funding that can be relied on over a year under extended stress conditions and the RSF, which is based on the liquidity attributes as well as the residual maturities of different assets under the scenario of extended idiosyncratic stress. The ratio of ASF and RSF is 100%.

The purpose of the leverage ratio is twofold (a) limit the build-up of extreme leverage levels that would destabilize the process of deleveraging, which can destroy the wider financial system, and (b) strengthen the risk-based framework for capital adequacy with a backstop measure that is non-risk. The minimum leverage ratio in Basel III is 3% (Hidayat et al., 2018). The leverage ratio is measured using tier 1 capital, and the measure of exposure is a non-derivative and on-balance sheet (Jaara et al., 2017).

According to Hidayat et al. (2018), the leverage ratio ought not to be a problem for Islamic banks since they rely on fixed assets.

2.2.6.2. Liquidity risk in Islamic banking

The IFSB acknowledges the liquidity challenges faced by Islamic banks. According to IFSB, using the liquidity standards requires infrastructure improvements such as Shariah-compliant deposit insurance, Systemic Lender of Last Resort (SLLOR) scheme, and a regular and sufficient supply of HQLAs. The IFSB recognizes the role of LCR in short-term stress scenarios. The definition of LCR and HQLAs is similar to in the case of BCBS, except for the replacement of non-compliant with compliant assets. The level 1 assets in Islamic banking comprise (a) banknotes and coins, (b) central banks reserves that can be drawn during times of stress, (c) Sukuk and Shariah-compliant securities guaranteed or issued by sovereigns, *Multilateral Development Banks* (MDBs), Public Sector Entities (PSEs), or the International Islamic Liquidity Management (IILM) Corporation. The definitions and requirements for levels 2A and 2B remain like the BCBS except for the inclusion of Sukkuk and allowable Shariah-compliant instruments.

The IFSB acknowledges the NSFR and includes five tools that are relevant for liquidity monitoring. These include (a) mismatch in contractual maturity, (b) funding concentration, (c) unencumbered assets, (d) market-associated tools for monitoring, and (d) LCR by their significant currency (GN-6, 2015, p.1). IFSB provides discretion to the supervisors on parameters such as run-off rates. They argue that these parameters need to be studied with the consideration of the business model, funding profile, and products offered by the IFIs and additionally consider the market and stress situation and consider smaller IFIs.

Liquidity risk bears the same importance in Islamic banks as in conventional banks (El-Massah et al., 2019). Of all the banking risks, it is regarded as the most influential as it could result in the collapse of the bank and cause instability in the entire banking system, for instance, the 2000 to 2001 banking crisis in Turkey and the collapse of South Africa’s Islamic Bank Limited (Abdul Ganiyy, Zainol, and Ahmad, 2017; Harun et al., 2021). Basel III requires banks to maintain high quality and high levels of liquidity, and the standard liquidity ratio should be 2:1 (Abdo and Onour, 2020; Sarker and Bhowmik, 2021). However, Islamic banks are often forced to have higher levels of liquidity above prudential and legal requirements compared to conventional banks (Abdul Ganiyy et al., 2017; Dhiraj et al., 2019; Harun, Kamil, Haron and Ramly, 2021; Jedidia and Hamza, 2015). In essence, Liquidity remains the biggest challenge that Islamic banks face (Harun et al., 2021; Hidayat et al., 2018; Jedidia and Hamza, 2015).

Theoretically, the Islamic banking system should have no problem with keeping high quality and sufficient liquid assets because of the concept of profit and loss sharing, which reduces the overall bank risk, and a two-window model should make them insolvency proof (Amin, Ali, and Nor, 2018; Jaara et al., 2017; Waemustafa and Sukri, 2016). For instance, Mudaraba deposits and savings should enable them to finance debt-based assets, restricted investment accounts should help in financing equity investment and short-term and cash financing should cater for regular withdrawals (Mennawi and Ahmed, 2020). Moreover, contractual risks with the potential to generate liquidity challenges ought to be managed through parallel contracts, securitization and careful documentation, especially for salam, istina, and ijara, while looking for the opportunity to trade them in the secondary market whenever possible (Dhiraj et al., 2019). Sukkuk contracts can also be used as a liquidity management solution (Harun et al., 2021).

The biggest challenge lies in the translation of these concepts into real-life situations in the face of market imperfections and information asymmetry (Jaara et al., 2017; Jedidia and Hamza, 2015). One such imperfection is that many assets in Islamic banks are debt-based, and therefore, the restrictions on selling debt render them illiquid during distress (Yaacob et al., 2016). Moreover, even when Mudaraba exists in two tiers, the banks are still subjected to liquidity risk because the capital value of the demand deposit is guaranteed and is redeemable on demand and at par, and they rely on short-term deposits for funding long-term projects (Jedidia and Hamza, 2015; Waemustafa and Sukri, 2016).

Islamic banks have constrained sources of liquidity in general as they lack the flexibility that is eminent in conventional banking (Hidayat et al., 2018; Jaara et al., 2017; Zolkifli, Samsudin, and Yusof, 2019). This flexibility includes the money market instruments (interest-based) and the sale of debt instruments often used in the conventional banking system but which are prohibited for Islamic banks based on Sharia principles (El-Massah et al., 2019; Jaara et al., 2017; Yaacob et al., 2016). They also include the inability to engage in interbank transactions with conventional banks or turn to the central bank as the lender of last resort because the Central banks' lending instruments in many countries are not Sharia-compliant (Abdul Ganiyy, Ogunbado, and Ahmad, 2017; Dhiraj et al., 2019; Elouali and Oubdi, 2020; Harun et al., 2021; Mennawi and Ahmed, 2020; Yaacob et al., 2016). The shariah compliance issues include riba, tawarruq and ijarah inah (Jedidia and Hamza, 2015).

Solutions such as securitization are minimally used in Islamic banking, and given that they handle real assets and business cycles, liquidity risk lies in the dependence on the cooperation of business partners and a good business condition to maintain high liquidity (Islam, Farooq, and Ahmad, 2017; Yaacob et al., 2016). Where innovative instruments are used to handle liquidity risks, the instruments are not globally acceptable and thus are not adaptable, cannot be traded, and lack the flexibility witnessed for the instruments used in conventional banking systems (Dhiraj et al., 2019).

The IILM Corporation has in the past employed temporary solutions to tackle the liquidity challenge (Hidayat et al., 2018). Most of the liquidity management solutions used by Islamic banks include assets that generate lower profits, for instance, central bank deposits and cash, among others and are thus less effective than the instruments used in the conventional banking system (Hidayat et al., 2018). This leads to the need for Islamic banks to resort to using short-term financing techniques that could help them achieve the same profits as the conventional banking system. Such techniques introduce further risks (Harun et al., 2021). For instance, Perves (2015) stated that in Bangladesh, 60% to 70% of Islamic banks' investments are mark-up based (Tawarruq contract) as opposed to Murabahah. Further, Islamic banks many times operate in markets where Islamic interbank money markets are either underdeveloped or non-existent (Elouali and Oubdi, 2020; Ismail, Rahman, and Ahmad, 2013; Mabrouk and Farah, 2021). Further, the banks operate where there are no Islamic capital markets and especially Sharia-compliant secondary financial markets (Dhiraj et al., 2019; Elouali and Oubdi, 2020; Harun et al., 2021; Waemustafa and Sukri, 2016).

2.2.6.3. Liquidity risk in the public sector/state-owned banks

According to Pushkala et al. (2017), public sector banks in India are shielded by a liquidity cover (repos). However, other studies indicate that the high level of NPAs in the public sector banks in India lowered the liquidity levels of the banks, although an empirical examination of their relationship returned insignificant findings (Bandyopadhyay and Saxena, 2021; Bhatt, 2021).

2.2.7. The implementation of Basel III

The Basel Framework aims to provide standards to ensure the prudential regulation of banks. Further, implementation is in a consolidated manner. According to the Basel Framework, the scope of implementation of the Basel framework is unlimited and includes all active banks without discriminating against Islamic banks (BCBS, 2021, p.1).

2.2.7.1. Contextual provisions for Islamic banks

The Basel accord, especially Basel III, is criticized for its inability to address Islamic banking risks, which many times emanate from the uniqueness of the banking system (Mohd Amin and Abdul-Rahman, 2020). Moreover, many Islamic banks operate within the same regulatory environment as conventional banks (Mohd Amin and Abdul-Rahman, 2020). The IFSB has the role of providing prudential standards and prescribing ways of adapting the conventional requirements (BCBS standards) for Islamic banks. The guidelines provided by the IFSB permit the implementation of local adjustments by regulators (Spinassou and Wardhana, 2021).

Changes have occurred in the regulation of Islamic banking pre-2008 financial crisis and post-crisis period. Some of these changes correspond to the need to adjust BCBS provisions to the Islamic banking environment. In 2002, the Liquidity Management Centre (LMC) was created to aid the development of a Sharia-compliant secondary liquid market (Mennawi and Ahmed, 2020). Post-crisis, the IILM corporation launched a short-term Sukuk program to foster cross-border liquidity management (Mennawi and Ahmed, 2020). The IFSB-2 standard, which was published in 2005, was amended in March 2011 through the introduction of guidance on the determination of a new regulatory Capital Regulation.

The Basel III framework requires banks to maintain two minimum liquidity standards – the NSFR and the LCR (Alsharif et al., 2016; Amran and Ahmad, 2021; Ayed, Lamouchi, and Alawi, 2021; Galletta and Mazzù, 2019). The role of the LCR is to provide cash within 30 days of stress, while the NFSR is meant to enable the bank to address maturity mismatch in their balance sheets (Alsharif et al., 2016; Mennawi and Ahmed, 2020). The IFSB modified the NSFR and LCR to include Sharia-compliant assets through the publication of the IFSB-12 in March 2012.

IFSB developed 23 principles for liquidity management by Islamic banks which made the board of directors responsible for coming up with the policies, strategies, and framework for liquidity risk management as well as the degree of tolerance to liquidity risk (Mennawi and Ahmed, 2020; Syamlan and Jannah, 2019; Yaacob, Rahman, and Karim, 2016). Senior managers were to implement these policies and strategies while ensuring timely and effective liquidity management (Mennawi and Ahmed, 2020).

IFSB-15 was announced in December 2013. It featured the revised standard for capital adequacy for Islamic financial services in line with Basel III (Maatoug, Ayed, and Ftiti, 2019). The Basel committee requires banks to hold sufficient capital to absorb losses, including 8% of risk-weighted assets as the minimum capital with tier 1 exceeding 4% of risk-weighted assets as well as 3% of the total assets (Golubeva, Duljic, and Keminen, 2019; Misman and Bhatti, 2020; Onagun, 2019; Spinassou and Wardhana, 2018). The Tier 1 capital, according to the Basel committee, comprises reserves, paid-up capital, reserves and retained earnings. Tier 2, on the other hand, comprises subordinated debts and hybrid instruments, which contradict the Shariah law (Onagun, 2019).

The IFSB thus have modified capital requirements that are aligned with the Sharia. The capital components based on the IFSB are divided into Tier 1 and Tier 2, where Tier 1 is further subdivided into common equity (CET1) and Additional (AT1) (Onagun, 2019). AT1 includes instruments with a high level of loss absorbance (Sukuk Musharakah) and some reserves, while CT1 capital comprises common equity shares, retained earnings as well as some reserves (Onagun, 2019). Tier 1 capital enables the banks to absorb losses while they are still solvent, while tier 2 absorbs additional losses beyond tier 1 and includes instruments (Wakalah or Sukuk Mudarabah), premiums paid on the instruments and reserves or general provisions (Onagun, 2019). The minimum maturity of the tier 2 capital should be five years, and the profit distribution must not be associated with IIFS credit rating (Onagun, 2019).

In October 2014, the IFSB issued a guidance note (IFSB-GN-6) in which the attributes of HQLAs were described as assets that are active, less volatile and less risky and advocated for the implementation of Basel III's NFSR, LCR and implementation schedule (Hidayat et al., 2018; Mennawi and Ahmed, 2020). These were published in April 2015 (Ayed, Lamouchi, and Alawi, 2021).

Most of the bank risk management strategies and tools do not apply to Islamic banks. Therefore, in some jurisdictions where Shariah law is not the fundamental law of the country, central banks often create Shariah-compliant risk management facilities for Islamic banks (Dhiraj et al., 2019). Further, many countries have begun to create Sharia-compliant instruments for liquidity management, including interbank investment accounts, commercial papers, certificates of deposit, commodity murahaba, money market and Sukuk (Mennawi and Ahmed, 2020).

Aside from developing Sharia-compliant instruments, two-thirds of national regulators often permit Islamic banks to customize the capital requirements of conventional banks before applying them to the Islamic banking system (Spinassou and Wardhana, 2021).

2.2.7.1.1. Pakistani case

To help Islamic banks in Pakistan to minimize risk, the central bank in Pakistan (The State bank of Pakistan) provided several guidelines. First, the central bank requires Islamic banks to come up with a financing strategy to identify maximum exposures to credit risk (Farhan, Alam, Sattar, and Khan, 2020). The bank’s board of directors is deemed responsible for regulating asset allocation, risk appetite, as well as risk divergence and coming up with a catalogue that describes all permitted and relevant financing activities of the bank. The board is also responsible for developing Sharia-compliant strategies for how banks handle inherited credit risks. Further, expert review is required for the entire life of a project, and Islamic banks are required to come up with measurement and reporting strategies for credit risks emanating from different financial contracts, including counterparty risks in Salam and Istina.

The central bank permits the development of Shariah-compliant procedures for each contract, including considering all possible risks in pricing decisions and determining the return rate of their contracts. The banks are required to have an administrative mechanism for handling defaulters, and measures for recovering loans may include (a) proactively negotiating with the customer, (b) using a debt collection system, (c) enforcing collaterals or guarantees, (d) permitting debt restructuring or rescheduling,

(e) imposing penalties and fines and (f) giving customers enough time to make payment (Farhan et al., 2020). The central bank further advised Islamic banks to come up with strategies and policies for fulfilling their commitments in Parallel Istina and parallel Salam contracts as well as on leased products and provide Takaful coverage against products that were deemed essential (Farhan et al., 2020).

Credit risk management is governed by some basic guidelines beyond which the bank is permitted to come up with innovative ways to control risk (Bülbül, Hakenes, & Lambert, 2019). The challenge of leaving credit risk management to the board without active banking supervision by the regulator (inadequate supervision) is the potential for insolvency issues, as experienced in Ghana (Boateng, 2019). We, however, did not find evidence of Islamic banks in distress in Pakistan, although a recent study revealed that while local banks were in good health, foreign banks in Pakistan were at risk of bankruptcy (Ullah et al., 2021). Ulla et al. (2021), however, classified banks into public, private, and special banks and did not mention the banks in their sample, whether they were Islamic or not.

2.2.7.1.2. Indonesian case

Indonesia enacted laws that necessitate the supervisory board in sharia financial institutions and sharia companies (Ningsih, 2020). The role of the supervisory board is to ensure the banks operate as per the Sharia laws by providing counsel to the board of directors. They also provide mediation between the national sharia board and bank management as it pertains to fatwas. Lastly, the supervisory board act as a representative of the national sharia board in implementing DSN fatwas (Ningsih, 2020). Compared to the case of Pakistan, Indonesia seems to have better supervision because of the presence of a national board other than the bank’s board of directors. Studies on the role of the Sharia supervisory board only focus on corporate governance characteristics, which does not align with this study.

2.2.7.1.3. Bangladesh case

The country has provisions in its laws for Islamic banking, but there are no laws that specifically address Islamic banking (Perves, 2015). In 1984, the country's first provision for Islamic banks was made in the income tax ordinance, where profits paid on Mudaraba were considered as an expenditure. In the 1990s, the country established an Islamic economic division to handle varied matters about Islamic banking. In 2004, the central bank (Bangladesh Bank) established its first Shariah-compliant investment bond, and in 2007, the central bank issued the Mudaraba Perpetual Bond (Perves, 2015).

In 2009, the central bank instructed Islamic banks to identify risks associated with investment and financing contracts to ensure capital adequacy. This instruction was based on the IFSB-2. Further, in 2009, the central bank issued guidelines for Islamic banks as a supplement to the existing bank laws, regulations, and rules. Perves (2015) states that these guidelines so far do not provide a comprehensive framework on how to handle priority cases in situations where the International Financial Reporting Standards (IFRS) and The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) conflict leading to the possibility of having incomparable financial statements.

Aside from the efforts, the central bank also introduced the Islamic Interbank Fund Market (IIFM) to improve Islamic banks' instruments for managing liquidity. Further, the parliament amended the Banking Companies Act of 1991 to terminate Islamic banking services offered through conventional banks to prevent the misappropriation of funds and ensure full compliance with Sharia principles (Perves, 2015). Additionally, specific guidelines for risk management include:

- The central bank permits Islamic banks to maintain a statutory liquidity rate of 10% instead of 20% of their total deposit liabilities in the conventional banks to ensure increased availability of liquidity for investment to ensure their profitability (Perves, 2015)
- The central bank permits Islamic banks to come up with their mark-ups and profit-sharing ratios based on their business environment to provide more independence in following Shariah law (Perves, 2015)

Bangladesh has a more advanced regulatory system compared to Pakistan and Indonesia in that aside from supervision; the central bank has a huge role in risk management in Islamic banks. These provisions touch on capital adequacy and liquidity and may correlate with other bank-specific risks.

2.2.7.1.4. The UAE case

The central bank of UAE has certain guidelines that apply to both Islamic and conventional banks within their jurisdiction. Rather than the 8% recommended by the Basel Committee, the central banks require banks to have a minimum CAR of 12% and that the tier capital should be 67% of tier 1 (Onagun, 2019). Further, banks in UAE require the approval of central banks to include tier 3 capital in their capital base (Onagun, 2019). Further, UAE banks are permitted to compute risk charges using internal rating and standardized approaches (Onagun, 2019). This case presents a move from the basics (sharia supervisory boards and a higher supervisory board) and active supervision to country-specific regulations that set the capital adequacy ratio above the minimum requirements in the Basel accord. It is not clear, however, whether these increased measures for Islamic banks have resulted in increased stability of these banks.

2.2.7.1.5. Malaysian case

Malaysian has an Islamic Interbank Money Market (IIMM) established in 1994 to help distressed Islamic banks through the provision of short-term lending effectively and efficiently (Waemustafa and Sukri, 2016). The author, however, argues that the secondary market was not tested during the 1998 crisis when banks were in distress. Another important concept in Malaysia is that the central bank introduced Mudarabah-based Sukuk (Islamic bond) to provide lending as a last resort (Waemustafa and Sukri, 2016). Malaysia, just like Bangladesh, has focused more on having institutions that mirror the conventional banking system to provide liquidity during crises.

2.2.7.1.6. The effectiveness of national regulations on risk management

The additional regulations of provisions for the Islamic banks are meant to enhance supervision and, in turn, help manage bank risk with the aim of ensuring the stability of the banking system. The findings from the study of Bahago et al. (2019) revealed that banking supervision influences Islamic banks' credit and liquidity risks. In all the countries examined, the degree of supervision is incremental from the establishment of supervisory bodies (shariah boards at the bank level and a national or higher board), institutions to help with risk management (such as Islamic insurance companies, Intermarket liquidity, and lender of last resort) and increased capital and liquidity regulations. Even with these, conventional banks still seem to have better structures, regulations, and institutions to help with supervision and risk management compared with Islamic banks. The absence of a parallel Shariah-compliant system that mirrors the degree of supervision and regulation of conventional banking systems in many countries could amplify credit and liquidity risks.

Holding on to this inferiority narrative, it thus seems that an examination of the risks of the Islamic and conventional banks should reveal worse risk outcomes for Islamic banks. The study of El-Massah et al. (2019) compared liquidity risk in Islamic and conventional banks in the MENA region. The authors investigated the determinants of liquidity risk in a sample of 257 banks comprising 167 conventional banks and 90 Islamic banks for the period encompassing 2009-2016. The authors established that the type of bank (Islamic or conventional) did not influence the determinant of liquidity risk. The authors concluded that Islamic and conventional banks similarly mobilize funds. Furthermore, they concluded that banks operating under similar micro-and macro-economic conditions are influenced by similar international and domestic liquidity regulations.

This comparison may have been conducted without considering the different liquidity funding processes between Islamic and conventional banks and their different approach to liquidity risk. Therefore, it cannot be authoritatively concluded that all Islamic banks have a low liquidity risk despite less regulation and the absence of liquidity support institutions in some countries. Moreover, while the findings of El-Massah et al. (2019) highlight an important aspect that Islamic banks are not inferior to their conventional counterparts, the study fails to acknowledge certain concepts. First, the regulatory challenges facing Islamic banks in certain countries are not acknowledged, and the authors seem to support the notion that all the countries examined had homogenous regulations. It raises the concern of whether the findings would differ if some countries had better risk management provisions for Islamic banks. Thus, though not captured, the regulatory context (the presence of additional national regulations for the Islamic banking sector other than those issued by the IFSB) needs to be considered as it pertains to its role in advantaging or disadvantaging Islamic banks compared to conventional banks.

A comparable study was conducted by Ghenimi, Chaibi, and Omri (2020). The authors analysed the differences and similarities of the determinants of liquidity in Islamic and conventional banks. Their sample comprised 27 Islamic banks and 49 conventional banks in the MENA region, and data were collected between 2005 and 2015. Their findings indicate that the liquidity risk of both banking systems is influenced by a set of variables, and the difference comes from the influence of macroeconomic variables. While the liquidity risk of conventional banks is influenced by macroeconomic factors, Islamic banks' liquidity risks are not influenced by macroeconomic factors. This, in a way, could suggest that liquidity risk management in the Islamic banking system is better as it is more resilient to macroeconomic factors.

The study of Ghenimi et al. (2020) raises more questions than answers. First, does this imply that Islamic banks are immune to economic crises? In that case, what is the causative factor? Can these studies be generalised to all Islamic banks, or what contextual differences do the banks in the MENA region have compared to Islamic banks in other emerging countries? We argue that these findings are not reflective of the real economy. The reason is that Islamic banks, as partners with their customers, also depend on the economy to generate more output, and factors like inflation erode the working capital of both conventional and Islamic businesses. Moreover, Islamic banks are tied to real estate contracts which, in a situation like the GFC, would still be impacted.

In another study that compared Islamic banks and their conventional counterparts, Salim, Mahmoud, and Atiatallah (2015) compared the capital adequacy of conventional banks (using the Basel II) and their Islamic bank counterparts (using IFSB) in the Middle East. The authors included three conventional banks and three Islamic banks in their sample. The findings of the study reveal that Islamic banks are more solvent, have higher liquidity and are more capitalized compared to conventional banks using Basel II, but conventional banks are more efficient and more profitable. The findings of Salim et al. (2015) contradict those of El-Massah et al. (2019) while reinforcing those of Ghenimi et al. (2020) as better solvency, capital, and liquidity outcomes should translate to lower risk profiles compared to their conventional counterparts. However, the authors' use of Basel II instead of III may have influenced the findings as Basel III helps in addressing the shortcomings of Basel I and Basel II (Golubeva, Duljic, and Keminen, 2019). When authors compare Islamic banks with conventional banks, they do not consider the structure of Islamic banks' businesses and the unique set of risks associated with Islamic banking. In that scenario, these methodologies, without being translated to capture contextual differences, may make Islamic banks appear to have a better performance compared to conventional banks, and this may be the case in the study of Salim et al. (2015).

The finding on better capital outcomes for Islamic banks aligns with the results of Bitar et al. (2018). The authors examined the influence of different types of bank capital on the efficiency and profitability of Islamic and conventional banks. According to their findings, IFSB capital guidelines have higher effectiveness in enhancing the performance of Islamic banks compared to BCBS guidelines. These findings suggest that IFSB guidelines are superior compared to the BCBS guidelines. No study has, however, examined IFSB and BCBS to establish additional or different shariah-compliant regulations that could spur better risk performance in Islamic banks. Without such as study, the findings of Bitar et al. (2018) are only speculative and may only be the result of methodological bias that does not take into account the uniqueness of Islamic banking when comparing the risk profiles of Islamic and conventional banks.

In addressing the superiority of IFSB, some authors (such as Rasli, Kassim, and Bhuiyan, 2020) share the context argument. In their conceptual model, the authors assumed that the Islamic banks operating in Malaysia have more effective Shariah governance, which would result in lower risk-taking. This lower risk-taking is established in the study of Waemustafa and Sukri (2016), who revealed that Islamic banks had higher liquidity compared to their conventional counterparts, which could translate to having lower liquidity risk. However, the findings do not indicate whether the higher levels of liquidity also translated to lower profits than conventional banks due to missed investment opportunities.

The concept of Shariah governance may be based on the ability to motivate banks to pursue lower-risk businesses, which essentially highlights the difference between Islamic and conventional banking systems. In conventional banking systems, banks take calculated risks to maximum risk-return profiles and are, in return, supported by different institutions to manage credit and liquidity risks alongside their capital and liquidity provision requirements. On the other hand, the Islamic banks, by missing investments, return lower than their conventional counterparts, which is a liquidity risk when deposit-making clients move their money to the conventional system where it can earn better returns or when all profits are paid out to investors, resulting in acute liquidity shortages.

A more precise study was conducted by Ningsih (2020). The authors measured the participation ratio, efficiency, and effectiveness of the sharia supervisory board to Indonesian Islamic banks. Although this study does not examine the national regulations to show their contribution to the performance of the boards, the author does present some useful findings. For instance, the author states that the supervisory board is not valuable when it comes to Islamic banks' lending activities and is less efficient. The context of supervision cannot be ignored, as the supervisory power is provided by the central bank, which also enables the supervision process through the provision of necessary tools. This finding agrees with our arguments.

Authors have examined the direct influence of national regulation on the risk profile of Islamic versus conventional banks. Although the study by Mohd Amin and Abdul-Rahman, (2020) was not contextual but covered a wide range of countries in the OIC countries between 2000 and 2014, the findings could help reveal the role of banking regulations. The findings indicate that the restrictions placed on banking activities and their capital requirements could significantly influence liquidity risk, but the impact of regulatory capital is higher in conventional banks as opposed to Islamic banks. This finding thus highlights that additional regulations beyond the bare minimum instituted by the Basel accord could impact risks in the banking system.

Based on the findings of these reviews and the cases examined, several gaps have been established which require proper investigation. First, no study has examined the structural differences between the risk profiles of Islamic and conventional banks. Second, no study has critically examined the differences in IFSB and BCBS regulations before concluding which is superior. Third, no study has examined additional risk management techniques taken by Islamic banks to mitigate the unique risks that arise from their low returns. Chapter two bridges these gaps through a qualitative comparison of country-specific regulations and risk management techniques undertaken by Islamic, conventional, and Hybrid banks in emerging economies.

2.2.7.2. Contextual provisions for public sector banks

We did not find studies that directly indicated whether regulators are more biased towards state-owned banks. However, the few studies established showed a trend of decreased efficiency of state-owned banks due to political influence and the pressure to fulfil government agendas. Thus, even though a similar regulatory environment might apply to both public and private banks, the influence through requirements such as to loan state-owned enterprises might make it difficult for the banks to maintain their stringent internal risk management. Further, the government might provide bank managers with risk-taking incentives such as capital injection. A study conducted by Zheng et al. (2017) examined the relationship between the capital regulation of banks and their risk profile, considering their ownership structure. The findings show that banks that experience higher capital regulation have better stability when it mitigates credit risk. The findings of this study peg stability on the ability to mitigate credit risk, which might be out of alignment with government welfare programs such as forgiving debt.

Another study sought to establish the existence of a moral hazard in the regulation of state-owned banks (Zhang et al., 2016). The authors analysed 16 state-owned banks in China together with 11 rural banks and tested for the existence of moral hazard in their lending decisions. The motivation for the study emanated from capital injection by China into the banking system and scrutiny over non-performing loans. The findings showed that an increased NPL ratio increased riskier lending leading to increased deterioration of the quality of loans and the instability of the financial system. In this case, lending discipline is reduced through less severe consequences as the government seldom withdraws operating licenses for state-owned banks. This prevents the need to explore disciplinary mechanisms put in place to regulate credit and liquidity risks in public banks and how these compare with private and Islamic banks. Studies on public banks only speculate the presence of a weaker regulation of public banks without solid evidence. This study fills this gap by examining public bank-specific regulations and risk management structures that could influence credit, liquidity, and systemic risks.

2.3. Theoretical Framework

The theoretical framework is based on the perceived relationships between the banking systems and the international regulatory bodies. We conceptualize a hierarchical implementation of the Basel III framework. At the top of the hierarchy are the international regulators. For our research, we consider BCBS to be at the top of the hierarchy, given that they independently come up with requirements for banks and their regulators. Second in the hierarchy is the IFSB. Although it is also an international standard-setting body, there is sufficient evidence that it Islamizes the Basel rules – examines their applicability in the Islamic banking system and suggests Shariah-compliant methods and instruments meet the BCBS standards.

The third in the hierarchy are the national regulators or supervisors. These interpret and issue regulations for the banks operating within their jurisdiction. The regulations might be in strict compliance with Basel III, or it might be a modified version that takes the local context into account. The study predicts similar laws for all banks with provisional clauses that align with the government's economic agenda for state banks and provisions to ease compliance by Islamic banks. In turn, these have an impact on banks' capital adequacy, systemic, credit, and liquidity risks. The conceptual diagram is shown in figure 2 below.

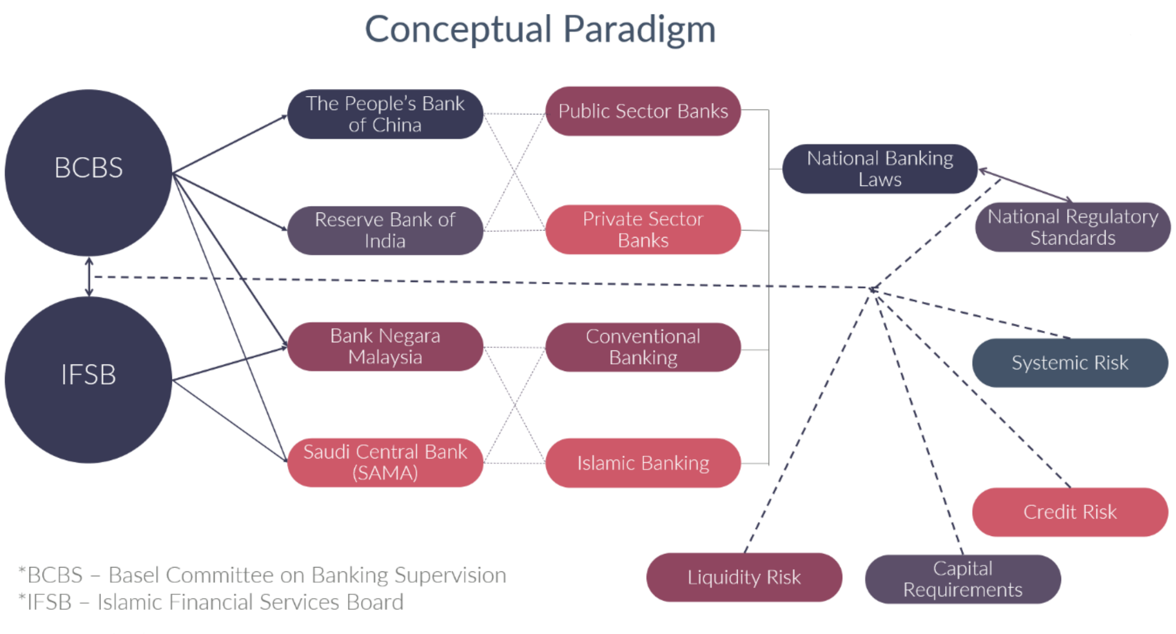

Figure 2. The interrelationship between the regulatory bodies and the banking systems (Source: Authors Conceptualisation)

Based on the figure above, we conceptualize that the BCBS and the IFSB though independent, have some form of interaction (through similar regulations) and that the BCBS regulations, especially Basel III, influence all banks, while the IFSB only influences aspects of conventional banking (Islamic banking windows) and Islamic banks. Further, the interaction of BCBS and IFSB influences the regulation and management of capital requirements, liquidity, credit, and systemic risk.

This model contributes to filling the research gaps by exploring various regulatory systems used to manage capital and liquidity risk in emerging markets from the perspective of single regulatory systems and dual regulatory systems, which include Islamic banking. The findings will aid a fair comparison of the banking systems (Islamic versus conventional, public versus private) based on risk profiles, mitigation, degree of compliance with Basel III, and additional regulations to mitigate emerging risks. This chapter further examines the role played by standard capital and liquidity regulations in mitigating bank risks and country-specific regulations in place to counter additional risks.

2.4. Research Methodology

The overall aim of this study is to investigate whether the implementation of Basel III requirements by banks in emerging markets is sufficient to address bank-specific risks and systemic risks among banks in emerging markets. Chapter two seeks to fulfil a part of this aim by (a) investigating the differences between capital and liquidity regulations framework set by Basel III, IFSB, and national regulators under single and dual supervisory regimes within emerging markets; (b) investigating national regulators' management of dual supervisory regimes, focusing on capital adequacy, systemic risk, credit risk, and liquidity risk; (c) investigating the additional regulatory provisions besides the minimum provisions outlined in Basel III; and (d) analysing the differences in regulations applied to public and private sector banks within emerging market economies. To achieve this, we chose qualitative research, particularly using document analysis. This section describes document review as a research methodology – its definition, data collection and analysis, and validity and reliability. We also justify the selection of the method and the accompanying analysis methods.

2.4.1. Document analysis method

Documents refer to virtual or physical artefacts designed to function within a certain context (Dalglish et al., 2020). Documents are also described as social products which present the reality that reflects broader norms and values as opposed to only reflecting facts adequately and independently (Wood, Sebar, and Vecchio, 2020). In this study, these documents refer to policy and regulatory reports, including banking laws and reports from the relevant regulatory or supervisory body. Documents can also be public or private (Kayesa and Shung-King, 2021). The documents analysed in this study are accessible to the public as they are produced within the context of activities conducted in the public sector. Dalglish et al. (2020) indicated the possibility of using documents to aid in answering the research questions.

According to Dalglish, Khalid, and McMahon (2020) document analysis is among the methods that are commonly employed in policy research. Document analysis can be defined as a systematic procedure employed in the review and evaluation of documents for the provision of context, generation of questions, and supplementing other data, corroborating other sources, and tracking changes over time (Dalglish et al., 2020).

Document analysis is efficient, cost-effective, straightforward, unobtrusive, and manageable (Cardno, 2018; Wood et al., 2020). The cost-effectiveness comes about because of the availability of documents. Moreover, this data collection method does not require ethical approval for publicly available documents, which saves time (Cardno, 2018). Some of the challenges with the method include the accessibility of documents, their authenticity, and the sufficiency of the details (Cardno, 2018). The operationalisation of the method is a systematic procedure that involves making the materials ready (document collection), data extraction, data analysis, and distillation of findings (Dalglish et al., 2020; Kayesa and Shung-King, 2021).

2.4.1.1. Document collection

The data collection involved first searching for relevant regulatory bodies or bank supervisors and then using the search function to get the webpage link to the required documents. We observed that these regulators/supervisors were not necessarily central banks. For India, Saudi Arabia, and Malaysia, the regulator was the central bank. However, for China, the regulatory body was a separate entity – China Banking and Insurance Regulatory Commission (CBIRC). We searched for banking laws, supervisory reports, and policy documents published between 2010 and 2021. The documents established were in English and thus did not require any translation. Further, they were available for downloading and thus did not require any special permissions. The downloading process also involved renaming documents to reflect the country and year (for annual reports). Table 1 below shows the number examined by country. A full list containing document names is provided in *Appendix A*.

Regulatory Institution	No. of documents extracted
BCBS (International Regulatory Framework)	1
IIFB (Regulatory Framework for Islamic Banks)	13
The People's Bank of China (China)	14
Reserve Bank of India (India)	12
Bank Negara Malaysia (Malaysia)	50
Saudi Central Bank (Saudi Arabia)	16
Total	**92**

Table 1: No. of Documents analysed by each regulatory authority.

2.4.1.2. Data extraction, analysis, and distillation of findings

We imported the documents into qualitative analysis software (NVIVO). The analysis of the documents collected was conducted in iteration. This involved (a) reading, (b) first-cycle coding, (c) second-cycle coding and theming, (d) establishing the relationship between themes and concepts and (e) reporting.

2.4.1.2.1 Reading

Reading through the documents is the first and one of the most important steps in qualitative analysis. Dalglish et al. (2020) insist that researchers ought to read documents from beginning to end, which includes the annexes, explaining that the process of reading may be tedious but has the potential to provide the needed nuggets. The purpose of reading the entire document is to gain an overall perspective or meaning associated with the research question (Dalglish et al., 2020; Kayesa and Shung-King, 2021). we read through the documents once. This reading led to noting down important points and keywords, which were pursued further in the next stage of analysis (thematic content analysis).

2.4.1.2.2. First cycle coding

In the first cycle coding stage, we used the key points and keywords noted in the reading phase to search the documents and code within context. The challenge of conducting the second reading of all documents is that some documents were very long (more than 500 pages), and though the context were all useful, not all were necessary for answering the research questions. Thus, to ease information processing through the first cycle of coding, we used the search function to highlight important parts of the documents. The search was set at exact as most of the keywords were technical phases whose synonyms or generalisations would not be meaningful. The results of the search were each examined within a broader context to extract meaning and code within a broad context. These codes were categorised broadly into general nodes. For instance, the word collateral or security was categorised broadly under the node credit risk.

2.4.1.2.3. Second cycle coding and theming

During the second coding, we examined each node, read through each of the codes and reclassified them under a different node, or created a child node under its current node. This process helped in refining the codes to only what is relevant within the node. Further, the nodes were given more descriptive names (themes), and the child nodes under them were considered subthemes. The reclassification and sub-grouping process also helped in gaining more insights into the data. Using the example of collateral/security, we sub-grouped it as credit protection (3 hierarchy, child node) under credit risk mitigation (2 hierarchy, child node), which was within credit risk management (1 hierarchy, node). During our study, we took caution to ensure that the nodes and child nodes are not too many and that the data are comparable between countries and between banking systems.

2.4.1.2.4. Establishing relationships between data concepts

Establishing relationships occurred during the analysis phase. This involved noting meanings and relationships between the data. The purpose of this phase was to establish the interconnectedness between the concepts beyond the classification of nodes and child nodes. The main method used to note possible relationships was through examining co-current codes and tree maps where they could be generated.

2.4.1.2.5. Reporting

In this study, the findings are reported in a narrative format in the order of the themes and subthemes. Where comprehensive statistics were available, we entered the data into Excel and presented the data using visual graphs to improve the conciseness of the report. We further presented the relationships established in diagrams to demonstrate the findings further.

2.4.2. Validity and reliability

Just like other qualitative research methods, document analysis presents the need for ensuring reliability, authenticity, validity, representativeness, and motivated authorship (Dalglish et al., 2020; Roberts, Dowell, and Nie, 2019). These were mitigated by enhancing rigour through triangulation between and across the documents and ensuring an adequate sample size (Dalglish et al., 2020; Hadi and José Closs, 2016). We examined more than a single document for each regulatory body. For India, these were annual reports from the year 2010 to 2021 (14), Saudi Arabia (16 documents), Malaysia (50), and China (14). These provided a point of data intersection and confirmation. Further, information especially referring to the regulatory provisions of the Basel Framework of the IFSB was triangulated using 13 documents from the IFSB and 1 document from the BCBS (the Basel Framework).

We achieved validity through the data collection, ensuring that each of the documents was relevant. First, the authorship of the documents was authoritative entities, which ensures that the reports reflect the true picture of the banking system. Secondly, the source of the documents was directly from the regulators' website, ensuring the content of the documents was unaltered and contained information as intended. Third, the documents were analysed unaltered, as they were in English and thus did not require translation.

2.5. Discussion on Findings

In this section, we report the findings from the content analysis conducted in which banking reports, laws, and regulations, as well as IFSB and BCBS regulations, were examined and compared with existing literature. This analysis seeks to answer the two sub-questions:

1. How do standardised capital and liquidity regulations mitigate risks faced by banks?
2. What country-specific regulatory frameworks are in place to cater for additional risks that banks may face while operating within emerging markets?

We thus focus on examining the implementation of the Basel accord and IFSB regulations and guidance while examining country-specific deviations and additional requirements to suffice their contextual issues. We also compare regulations and guidance between countries. The findings are presented based on the themes and sub-themes established during the analysis.

2.5.1. The focus of regulatory efforts

We established that the regulators in different countries had a certain focus on their regulatory efforts, which determined the course of the regulations. The efforts included risk-based supervision and stability.

2.5.1.1. Banking stability

Banking stability was recognized as the role of the supervisor (or regulator) by the BCBS and in the reports for India and Saudi Arabia. This is in line with the assertion of Ferguson (2002) that financial stability is indeed the fundamental aim of the central bank (the regulator). This fundamental role may not differ even though not acknowledged in the reports from Malaysia and India. This concept only changes when the IFSB is considered, as the findings reveal that while the BCBS considers stability as the role of the regulator, the IFSB considers stability as managed by national and supranational bodies. We established two patterns: banks that focused on achieving stability from a systems perspective and those that focused on achieving stability through regulations targeted for implementation by individual banks.

2.5.1.1.1. Achieving systemic versus individual bank stability

We found information on systemic stability in coded documents from India. The phrase systemic stability was mentioned 23 times in the code report. This could imply that the country has challenges with stability or that its achievement is the major focus of regulatory efforts. Measures put in place to achieve systemic stability included: (a) Focusing on the entire banking system rather than addressing individual banks, (b)

Collaborative supervision of international banks of Indian origin through supervisory alliances and supervisory colleges, and (c) Capacity building for financial institutions.

Of the three measures, supervisory colleges form part of the recommendations by the BCBS.

> "*In line with the BCBS principles on cross border consolidated supervision, the Reserve Bank [of India] is instituting supervisory colleges for Indian banks with considerable overseas presence*." (RBI, 2015, p.94)

Both the BCBS and the IFSB acknowledge the need for supervisory colleges. It is evident that the IFSB adopted the supervisory college from BCBS. The scope of adoption is stated as follows,

> "*Broadly, the scope of the engagement and an appropriate structure of the supervisory college would be guided through BCBS's Good Practice Principles on Supervisory Colleges; however, in particular, issues relating to the following should be included in the scope of the supervisory college: (a) the regulatory and legal framework for IIFS; (b) divergence of Sharī`ah compliance practices and integration of SSBs; (c) key disclosures on IIFS' operations as indicated under IFSB-4 and confidentiality; and (d) cross-border insolvency of IIFS as part of a group operating in more than one jurisdiction*." IFSB, 2016, p.31

The main role of the supervisory college is to gain an enhanced understanding of the risk profiles of banking groups while strengthening the supervision of individual branches by means of cooperation and exchange of information between supervisors. The literature examined did not provide evidence of supervisory colleges in China, Malaysia, or Saudi Arabia. It seems, therefore, that only India has instituted a supervisory college for monitoring cross boarder banks. We further did not find any empirical studies that linked cross-border banking supervision with stability.

The efforts by India towards building stability align with the recommendations of the Basel framework. First, the pooling or aggregation of data for decision-making align with the requirement for using aggregate or sectoral data for decision-making by regulators as a step towards ensuring financial stability. Second, supervisory alliances for information sharing align with the recommendations for supervisors to access stability assessments from other regulators. Further, the annual reporting of stress tests conducted and factors that could affect financial stability is in line with Basel recommendations for macroprudential surveillance.

Contrary to examining financial institutions as an interconnected system, countries such as Malaysia focused on examining the stability of individual banks that make up the system. This was evidenced by the regulations targeting banks and their internal supervision and risk control. Further, the regulator relied on independent auditors and mainly used licensing/declining to license deviant banks as a control mechanism. Thus, regulatory efforts focus on the responsibility of the board of directors to come up with an acceptable risk strategy, implemented and monitored by senior management and externally monitored by external auditors. As opposed to the case of India, where the regulator conducted capacity building collectively, Malaysia instructed its financial institutions to ensure they have experts in risk management.

2.5.1.1.2. Factors that impede the stability of the conventional banking system

Factors influencing the stability of the banking system were mainly derived from the BCBS. The BCBS identifies shadow banking as having adverse impacts on the stability of the banking system. Indeed, research indicates that shadow banking collapses during economic downtowns, leading to systemic risk that damages the financial stability of a country (Pan and Fan, 2020). Of all the countries, only India addressed the issue of shadow banking, although they indicated that shadow banking is not in India.

> "*The shadow banking sector, as it is understood globally, does not exist in India.*" (RBI, 2011, p97)

We established from the literature that shadow banking is a problem in China (Acharya, Qian, Su, and Yang, 2021; Allen and Gu, 2021; Shah, Jianjun, and Qiang, 2020) and Malaysia (Nijs and Nijs, 2020). The BCBS also identifies weaknesses in a country's banking system as having the potential to harm domestic and international financial stability. Another factor identified in the Basel framework as impacting financial stability included macroeconomic factors such as high government expenditure or borrowing and liquidity shortages or excess could negatively influence the stability of the financial system.

The BCBS thus recommends the implementation of its core systems to promote financial stability. While indicating the importance of the core principles in the Basel framework, the BCBS shows the need for supervisors to come up with additional and tailored ways (BCBS, 2021, p. 1530/1626). Thus, it is expected that supervisors will modify the BCBS recommendations and their implementation in line with the stability needs of their countries. The extent of implementation and modification, compared with the implementation and/or modification of IFSB guidelines, are presented in the succeeding sections.

Further, BCBS recommended proactive addressing of the serious threats to banking stability. Being proactive would involve early identification of threats and addressing them to avert instability, a concept that reflects risk-based supervision discussed in the next sub-section. Further, the process of being proactively involved in conducting stress tests and macroprudential surveillance on the banking system which were identified as part of the measures currently being undertaken by India regularly.

2.5.1.1.3. Factors that impede the stability of Islamic banks

As in the case of conventional banks, the IFSB recognized stability barriers for the Islamic banking system. One of these factors includes the absence of a Shariah-compliant lender of last resort (SLOLR). The IFSB further indicates that the stability of the Islamic banking system is threatened by the lack of support infrastructure and systems. Further, another infrastructure mentioned as contributing towards the stability of Islamic financial institutions is an Islamic deposit insurance system, which the report indicates has been difficult to implement. The two major issues raised - SLOLR and support infrastructure systems -point to challenges with liquidity support systems. This is discussed in succeeding sections.

Stability strategies currently in place include the issuance of guiding principles and prudential standards for the global Islamic financial sector. These principles include the prioritization of financial stability over business efficiency. The IFSB's guidance shows a preference for a lower risk appetite and a preference for stability. Further, the guidance gives the responsibility of ensuring compliance to the supervisor (regulator) and not to the directors of the banking establishment. This implies the assumption of a systemic stability system in countries that license Islamic banks.

2.5.1.2. Risk-based supervision

According to the findings, the risk-based supervisory approach was recommended for adoption in India in 2013.

> "*In line with the BFS directives, 28 banks have been assessed under the RBS framework (SPARC – Supervisory Program for Assessment of Risk and Capital) beginning 2013-14. These banks account for approximately 60 per cent of the banking sector's assets and liabilities and cover a cross-section of banks (on an ownership basis).*" (RBI, 2014, p88)

Before this period, the supervisor employed the capital adequacy, asset quality, management capabilities, earnings sufficiency, liquidity position, and sensitivity to market risk (CAMELS) approach. The risk-based approach, on the other hand, utilizes the supervisory program for the assessment of risk and capital (SPARC) approach. Thus, the supervisor initiated the phased migration of banks to the risk-based approach in 2012 and successfully migrated all banks to the RBS framework in the financial year 2017-2018. The use of risk-based supervision in India is supported by literature, as Pushkala et al. (2017) explained that the approach shields the banking system from global shocks.

In Malaysia, risk-based supervision is recognised and implemented at the bank level through stress testing and acting towards improving risk management and capital if undesired results are established (Stress Testing Policy Document, 2017, p.15). Thus, the responsibility of implementing and monitoring risk-based supervision is passed down to the banking institution. Further, the role of the central bank in Malaysia is to review the conduct of banks in the identification, control, and handling of business risks (D'Cruz and Adnan Sundra & Low, 2021, p.4/37).

2.5.2. Basel III implementation in banking institutions

2.5.2.1. Implementation schedule

We examined if implementation schedules, especially for Basel III, are outlined in the Basel Framework. The findings indicate that instruments that do not meet Basel III requirements are being phased out in the period encompassing 1 January 2013 to 1 January 2022, which implies that the set deadline for Basel III framework implementation is 2022. The document, however, indicates that there is a revised date announced in March 2020 with the revised date provided in India's 2020 annual report on Regulation, Supervision, and Financial Stability as moved to January 2023 because of the COVID-19 pandemic (p. 133). Deferring the implementation was further reported to be endorsed by Governors and Heads of Supervisory agencies (GHOS) (Regulation, Supervision, and Financial Stability, 2021, p.137).

For India, the implementation of Basel II and III has been based on a phase-by-phase basis. The schedules extracted from its annual reports is shown in table 2 below.

Aspect implemented	Implementation phase	End Dates
Basel II Regulatory capital	Stage 1	31 March 2008
	Stage 2	31 March 2009
Basel I minimum capital requirements	Parallel run with Basel II	31 March 2013
Basel III leverage ratio	Test parallel run	1 January 2017
Basel conservation buffer	Contracted deadline	1 January 2019
Basel III capital regulations	Extended end date	31 March 2019

Table 2: Phased implementation of the Basel framework in India

The information on the implementation of the Basel Framework in Saudi Arabia focused more on the date when the regulator (SAMA) issued instructions to begin implementation. This includes Basel I capital adequacy in 1992, Basel II in 2008, and Basel III risk-based capital in December 2012. Further, SAMA indicated that the starting date for implementation of phase I of Basel III was in January 2013, based on the timelines issued by BCBS. Following the same timelines, LCR was introduced in 2015 and NSFR in 2016, which the report indicates was two years ahead of the Basel III deadlines. The report further indicates that banks in Saudi Arabia attained compliance with the Basel III requirements (leverage, capital, and liquidity standards) by June 30th, 2018. Based on the available information, Saudi Arabia has met the full requirements of Basel III, while India is still struggling to meet the standards.

Information about Malaysia and China's state of Basel III implementation was not very explicit. However, the literature indicates that the banking regulator in China has relentlessly pursued the implementation of Basel III requirements (Xi, 2016).

The challenges facing the implementation of Basel III standards were largely contextual, although the COVID-19 pandemic has also been a factor recognised by regulators across different countries. Acknowledged challenges included the banking structure. India's banking system acknowledges the presence of different types of banks -SCBs, rural banks, urban banks, and cooperative banks. Some of these banks are struggling to meet minimum regulatory requirements but play a large role in the economy and thus cannot be shut down. Though not explicit in the findings, the struggle could be due to the macro-economic situation in India during the periods examined, as Upadhyay (2021) noted that the years 2019 and 2020 were the most difficult for India’s banking system. This makes the regulator, in consideration of these banks, come up with a flexible implementation schedule for the Basel III requirements.

Some researchers have argued that the full implementation of Basel III could have some downsides. For instance, Golubeva et al. (2019) argued that considering the definition of eligibility for liquid assets implies that the liquidity of the banking system would depend heavily on government securities and other public sector liabilities such as central bank deposits. Deterioration of the liquidity might occur because of inelastic demand, and possible default by the government might, in turn, make securities ineligible as liquid assets. Further, compliance would also result in reduced lending margins and negatively influence the performance of banks (Golubeva et al., 2019).

2.5.2.2. Comparison of Basel III and IFSB requirements

We observed several references to the Basel frameworks in the IFSB guidelines and standards, which is indicative of the attempt to interpret the standards to the Islamic banking settings in terms of their applicability. This was captured in one of the guidelines,

> “*Further, the Standard also provides guidance on the application of new features introduced by the BCBS in its Basel III documents, with necessary adaptations for IIFS – namely, the capital conservation buffer, the countercyclical buffer and the leverage (or common equity to total exposures) ratio*.” (IFSB-15, 2013, p.4)

The statement above clearly shows that IFSB guidelines are largely adapted from the Basel Framework to fit the Islamic banking context. This implies that the IFSB frameworks may be largely an attempt to create an Islamic replica of the BCBS standards by directly implementing what is directly applicable while modifying what cannot be directly implemented. This perspective of the IFSB is further reinforced by the IFSB-22, which indicates that the equity investments through ICIS computed through the look-through approach are based on the Basel framework beginning of January 2017 (BCBS, 2021, p.15). Other references were made to Basel II and Basel III in IFSB issues. The scope applicability of the IFSB guidelines and standards is, however, limited to Islamic financial institutions. The relationship between the two frameworks is illustrated in figure 3 below.

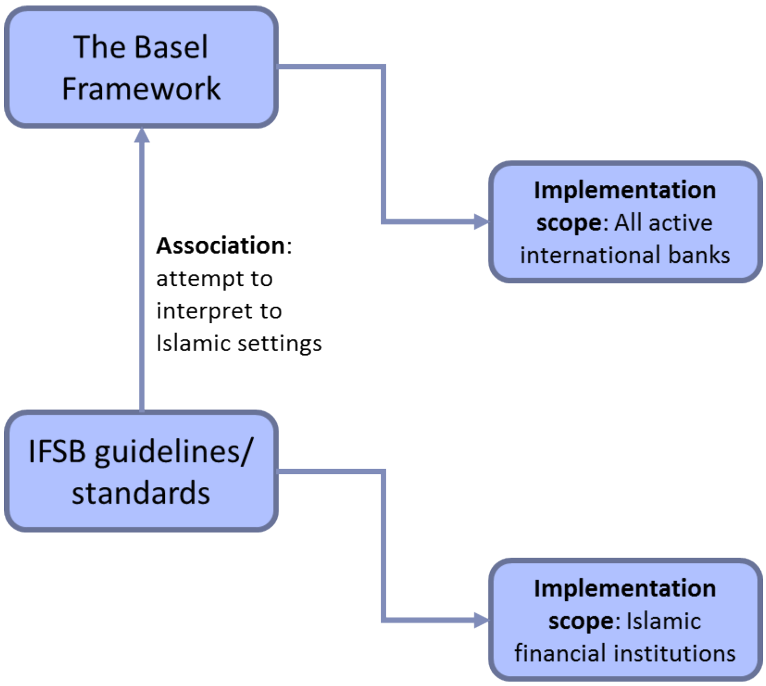

Figure 3: The relationship between Basel Framework and IFSB guidelines and standards (Source: NVivo Output by Author)

The findings of this study are in line with previous studies. For example, Ling, Haron, and Hasan (2022) compared the Basel III framework with IFSB guidelines using mixed methods analysis that included document analysis. Their findings reveal that IFSB guidelines are adapted from the BCBS wit modifications aimed at meeting the asset-liability structure and uniqueness of Islamic banks.

2.5.3. Capital Adequacy

2.5.3.1. Regulatory capital

2.5.3.1.1. Deviations in the regulatory capital between BCBS and ISFB

The tiers of regulatory capital are similar for both IFSB and BCBS standards. CET1 holds the same meaning, while AT1 has the modification of including Shariah-compliant instruments and some reserves. The same case is for tier 2 capital, where the instruments are regarded as those that are Shariah-compliant. Further, regulatory capital from subsidiaries will be acceptable only if the subsidiary is an Islamic financial institution. The eligible capital requirements for Islamic financial institutions are similar to the Basel III requirements. Deviations thus seem to be only in definitions where instruments are Shariah-compliant and the consolidated subsidiaries are Islamic financial institutions.

2.5.3.1.2. Regulatory capital in different countries

China had similar definitions for regulatory capital, but during our study, we did not find the exact percentage RWA for CET1, AT1, T2 and total capital. Although we found deviations in regulatory requirements for banks only in India, as shown in figure 4, while other countries maintained the BCBS standards. This included countries with Islamic banks. This is expected as the IFSB has similar requirements by per cent RWA. The exact percentage RWA for China was not available in the documents reviewed, although the reports from China acknowledge similar definitions as in the BCBS.

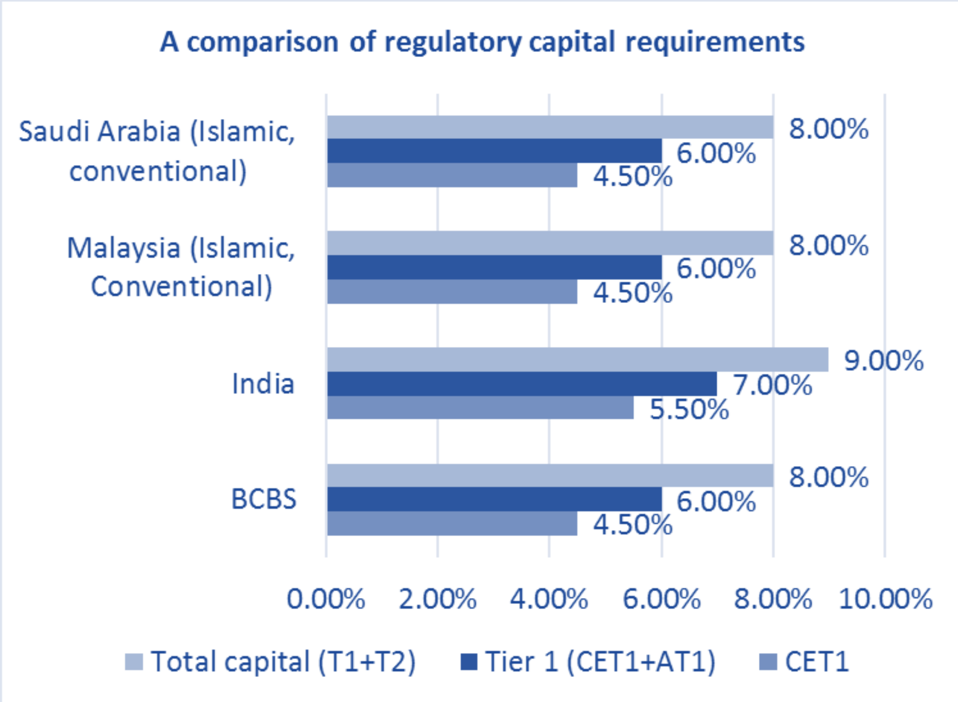

Figure 4: Comparing regulatory capital requirements between countries (Source: NVivo Output by Author)

Based on these findings, India's higher regulatory capital requirements imply a means to adapt the Basel III requirements to its context. Although India had higher regulatory capital requirements, the reports reviewed indicate that the overall performance may be lower; as the country projected, it would take time to increase the average regulatory capital, but it would settle above the regulatory guidelines. An examination of existing literature revealed that China's regulatory capital requirements are higher than Basel III requirements, although small and medium-sized banks are under funding pressure (Ba, 2022; Zhang and Wang, 2023). On the contrary, although Saudi Arabia maintains a regulatory standard similar to the BCBS, Saudi banks (conventional and Islamic) reported higher capital adequacy ratios. Particularly in 2018, Islamic banks had a CAR of 20.3%, and the average CAR for all banks was 20.8% RWA.

2.5.3.2. Capital conservation buffer

From a country perspective, China acknowledges the use of conservation buffers, but the information is not sufficient as it pertains to how much. India requires a conservation buffer of 2.5% of RWA. According to the 2019 report, the implementation of the conservation buffer was based on a phase-by-phase basis, with a 0.625%

increment per year to achieve 2.5% of RWA by March 2019. However, because of economic difficulties (stress) faced by the Indian banks, the end date was revised to March 2020, it was further extended to September 2020 and then due to COVID-19-related stress, it was deferred again till October 2021 (India data 2019, p. 113; India Data 2020, p. 133; India Data 2021, p. 142). Malaysia required Islamic banks to maintain a capital conservation buffer of 2.5% (Capital Adequacy Framework for IB (capital components), p. 6), the same as conventional banks. Saudi Arabia had fulfilled all the Basel III requirements, including a capital conservation buffer (minimum 2.5% of RWA).

2.5.3.3. Countercyclical buffer

Countries such as Saudi, China, India, and Malaysia recognized countercyclical buffers. Saudi Arabia recognizes countercyclical downturns of a single industry or the wider economy and, thus, instituted the National Development Fund to provide countercyclical support. Malaysia requires both Islamic and conventional banks to have countercyclical buffers as a percentage of their RWA. For India, the framework for implementing a countercyclical buffer was put in place in 2015, which defined its constituents, indicators that lead to its activation and how it is calibrated. The implementation was expected to take place over four quarters. In 2020 and 2021, the supervisor did not find a necessity for activating a countercyclical buffer after empirically testing its indicators.

Even though some information was missing from the documents analysed, we established findings that show that the capital adequacy requirements of China and India, in general, are higher than Basel III. For instance, the minimum capital adequacy ratio under Basel III is 10.5%, while that of China is 15%.

> "… *according to the Guidelines on Supervisory Ratings of Commercial Banks, the weighting of the key risk components is as follows: capital adequacy (15 per cent), …. According to the risk characteristics and regulatory priorities of various types of banking institutions, the regulatory authorities of the CBRC may adjust the weight of each rating element by five percentage points." (IMF, 2017b, p69)*

Further, India's RBI Prudential Norms on Capital adequacy indicate that "*Banks are required to maintain a minimum Capital to Risk-Weighted Assets Ratio (CRAR) of 9 per cent on an ongoing basis*" (RBI, 2022, p4)

This represents a modification to align with contextual factors. We also established that without additional regulations, banks in countries like Saudi Arabia have surpassed minimum regulatory requirements. The study of Edge and Liangb (2022) sought to examine the relationship between financial stability committees and countercyclical buffers under Basel III. The findings show that countries with stronger financial stability boards are more likely to increase their countercyclical buffers. Although the authors do not indicate the possibility of a reverse relationship, the presence of higher buffers could be predictive of stronger FSBs in India and China

2.5.4. Systemic risk

2.5.4.1. Assessment of domestic systemically important banks

In Malaysia, the supervisor recognizes the need for risk identification and management for DSIBs and differentiates them by three criteria – size, substitutability, and the interconnectedness of the bank. The determination of systemic importance follows an indicator-based approach (IBA) whereby the level of systemic risk is determined by financial distress or bank failure. This is based on an assessment of (a) the indicators related to the distressed or failed financial institution, such as critical functions, material exposures, and contributing factors to the systemic impact, (b) the alignment of policy objectives to the regulatory framework, and (c) supervisory overlay. This leads to the clustering of the banks by buckets. The list of DSIBs is reviewed on an annual basis, and changes to the list are noted. In India, the identification of DSIBs is based on the IBA used for identifying GSIBs. This includes their size, complexity, interconnectedness, and lack of substitutability. Based on their IBA score, banks in India and classified into four buckets.

One of the regulatory mechanisms for reducing systemic risks is to put stringent measures on systemically important banks (Butzbach, 2016). Thus, the identification of these banks is a step towards limiting their growth as a systemic risk management process. The Basel Framework outlines an IBA for evaluating the systemic importance of GSIBs. The advantage of the approach is its ability to measure indicators that hold systematic importance. The measurement of this importance, according to the framework, ought to be based on LGD and not the probability of the bank's failure. The indicators are similar to what is applied in Malaysia and India, and although the documents analysed show an acknowledgement of GSIBs in China, the technique of determination is not provided and thus assumed to be based on the Basel framework. Moreover, given the full implementation of Basel III in Saudi Arabia, we assume a similar methodology is adopted.

2.5.4.2. Systemic risk control measures

We only found comprehensive information on systemic risk control measures in Malaysia and India. In China, the regulator limits GSIB to GSIB exposure to 15% of net tier 1, and Saudi Arabia recognized the need to control for systemic risk. Measures undertaken by others are detailed.

2.5.4.2.1. Systemic control measures in Malaysia

According to the Malaysian Financial services Act 2013, the systemic risk stems from two scenarios: that the failure of a bank influences another bank or that the liquidity problems in a bank affect the entire financial system. In Malaysia, the methods of controlling for systemic risk were based on (a) higher capital buffers required from DSIBs and (b) risk identification and control through policy formulation following IBA classification. On higher capital requirements, DSIBs are expected to hold capital to meet the requirements of higher loss absorbency (HLA), including higher than the minimum CET1, tier 1, and tier 2 capital ratios and capital buffers. The HLA requirements as a percentage of RWA are 0.5% for bucket 1, 1% for bucket 2, and 2% for bucket 3. The national authority further indicates that the countercyclical buffer is a step towards handling systemic risk by preventing its build-up during excessive growth. Moreover, IBA classification facilitates policy measures that correspond to the level of systemic risk that they pose to the country's financial system.

2.5.4.2.2. Systemic control measures in India

According to the regulator, the regulatory and policy objectives in India are all inclined towards maintaining systemic stability (RBI, 2011, p.96). The policy tools include the specification or revision of norms of exposure, differentiating risk weights for sectors that are sensitive (such as the real estate sector), specifying loan ratios, and standard assets provisioning. Systemic risk in India is thus controlled in various ways. First, systemic risk is controlled through restricted access to non-collateralised lending and borrowing in money markets. Second, the reserve bank also limited inter-bank liabilities as a means of controlling contagion risks from banks' interconnectedness. Third, the regulator created a financial stability unit (FSU) which carries out macro-prudential surveillance by conducting systemic stress tests and prepares financial stability reports bi-annually (RBI, 2010, p.105). Moreover, the regulator prohibited investment in zero-coupon bonds unless they have a sinking fund provided by the issuer, as a large-scale investment could pose systemic problems (RBI, 2011, p. 105). Further, the regulator limited interbank exposures to 25% or T1 capital for GSIBs. In 2013, the reserve bank came up with a policy that required DSIBs to have higher capital to be subjected to more stringent regulations. The additional CET requirements include 0.2% (bucket 1), 0.4% (bucket 2), 0.6% (bucket 3), and 0.8% (bucket 4).

2.5.5. Liquidity risk

The liquidity risk measures established from the findings are classified in Figure 5 below:

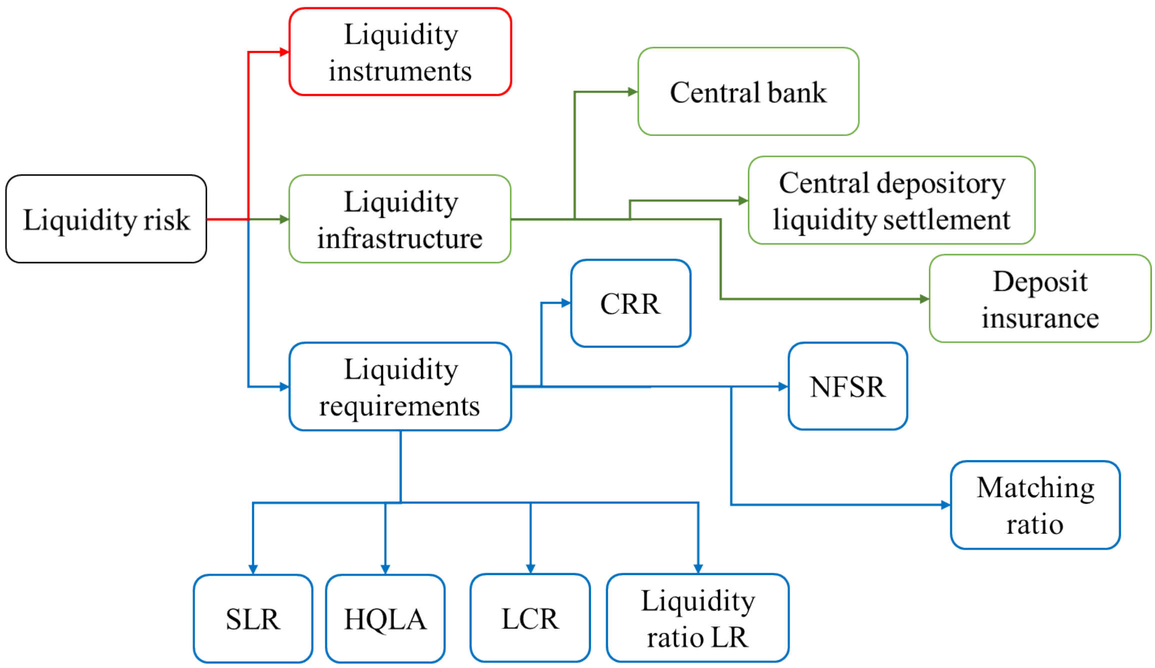

Figure 5. Liquidity risk measures (Source: NVivo Output by Author)

2.5.5.1. Liquidity Risk Management in Saudi Arabia

SAMA indicates that it considers strong liquidity adequacy as the foundation of a banking system and, thus, that liquidity ratio guidance has been provided for banks in

Saudi Arabia since 1966. Moreover, Saudi banks complied with Basel III requirements for liquidity by 2018 June 30th. The regulator controls liquidity risk in the banking sector through certain policies. For instance, banks in Saudi Arabia are required to maintain liquidity reserves of a minimum of 15% on their deposit liabilities. Moreover, the LCR and NSFR were fully compliant with Basel III as of June 2018. By 2018, the NFSR was far above the regulatory requirements, with banks having an average NSFR of 127% in 2018, up from 122% in 2017. Some of the tools used in Saudi Arabia for liquidity management in Islamic banks include Sukkuk because of its ability to provide fixed returns.

2.5.5.2. Liquidity Risk Management in China

The indicators for liquidity used in China include the LCR, HQLA adequacy ratio, NSFR, liquidity ratio and liquidity matching ratio. The regulator divides commercial banks into two: those whose assets are less than RMB200 billion (required to fulfil the minimum regulatory requirement for HQLA adequacy ratio as well as the liquidity matching ratio) and those whose assets are more than RMB 200 billion (required to fulfil the minimum regulatory requirements for LR, LCR, NSFR and liquidity matching ratios). The minimum regulatory requirements are shown in figure 6 below:

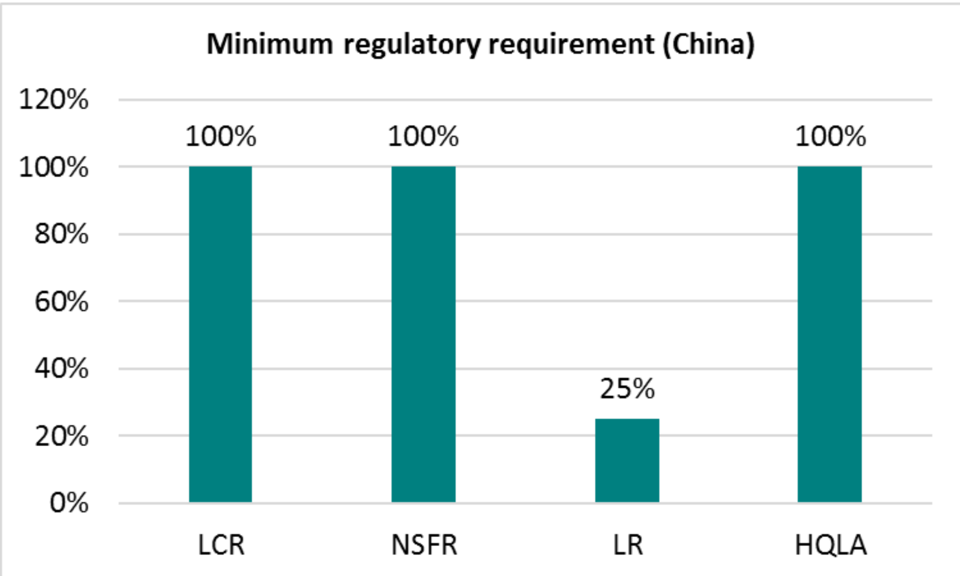

Figure 6. The minimum regulatory requirement for liquidity in China (Source: NVivo Output by Author)

The role of monitoring and regularly analysing the liquidity risk of commercial banks is carried out by the regulator. Banks that do not meet the minimum requirements take corrective measures within a time limit prescribed by the regulator. However, in scenarios of stress, the regulator shall consider the macroeconomic situation and evaluate the factors influencing each bank's liquidity profile and take the appropriate measures. The rules for leverage ratio were adopted in China in 2012 and corresponded to the requirements of Basel III.

2.5.5.3. Liquidity Risk Management in India

In India, the final guidelines on LCR were issued in 2014 for introduction in early 2015, with the minimum requirement set at 60% to reach 100% by early 2019. Banks in India are required to hold government securities under the following conditions: (a) they have achieved the minimum SLR, (b) the security held is within the range permissible by the Reserve Bank under Marginal Standing Facility (MSF) and Facility to Available Liquidity for Liquidity Coverage Ratio (FALLCR) (2% of their Net Demand and Time Liabilities (NDTL) and below 11% of NDTL). Thus, Level 1 HQLA is government securities. Further, the regulator set to implement NSFR in 2018 with a minimum requirement of 100%. However, the implementation was deferred to October 2020. The leverage ratio was implemented in India in January 2017 using an indicative value of 4.5%. However, in 2018, the regulator advised DSIBs to have a minimum liquidity requirement of 4% and other banks to have a minimum liquidity requirement of 3.5%.

2.5.5.4. Liquidity Risk Management in Malaysia

Malaysia required banks to have HQLAs to maintain the minimum required LCR levels. The LCR levels were initially 60% in June 2015 and are expected to reach 100% by January 2019. Further, the supervisor recognized the following as HQLAs, which are in alignment with Basel III: liquidity facilities from the central bank, foreign currency purposed for covering liquidity needs of the domestic environment, and use of level 2 assets with increased haircuts. In Malaysia, level 1 HQLAs comprised cash, placements (including overnight deposits, term deposits, Wadiah, commodity Murabaha, surplus cash in certain accounts -RENTAS and eSPICK, SLRR balances), other central bank placements, debt securities and marketable securities. While level 1 HQLAs are unlimited, levels 2A and 2B should not exceed 40% of total HQLAs, and level 2B should not exceed 15% of HQLAs. The HQLAs are immediately usable as contingent liquidity and thus should be convertible to cash within 30 days of stress and must only be withdrawn during stress; thus, in ordinary conditions, banks are required to maintain non-SLRR HQLA.

The NSFR was implemented in Malaysia in June 2015. The requirement is for banks to keep a minimum of 100%. The regulator allows banks to have a higher NSFR than the minimum set by Basel III if they deem their liquidity risk to be higher, and such banks must always maintain their high amount.

2.5.6. Credit risk management

We searched the documents to identify the credit risk management techniques employed in the four countries. This is shown in figure 7 below.

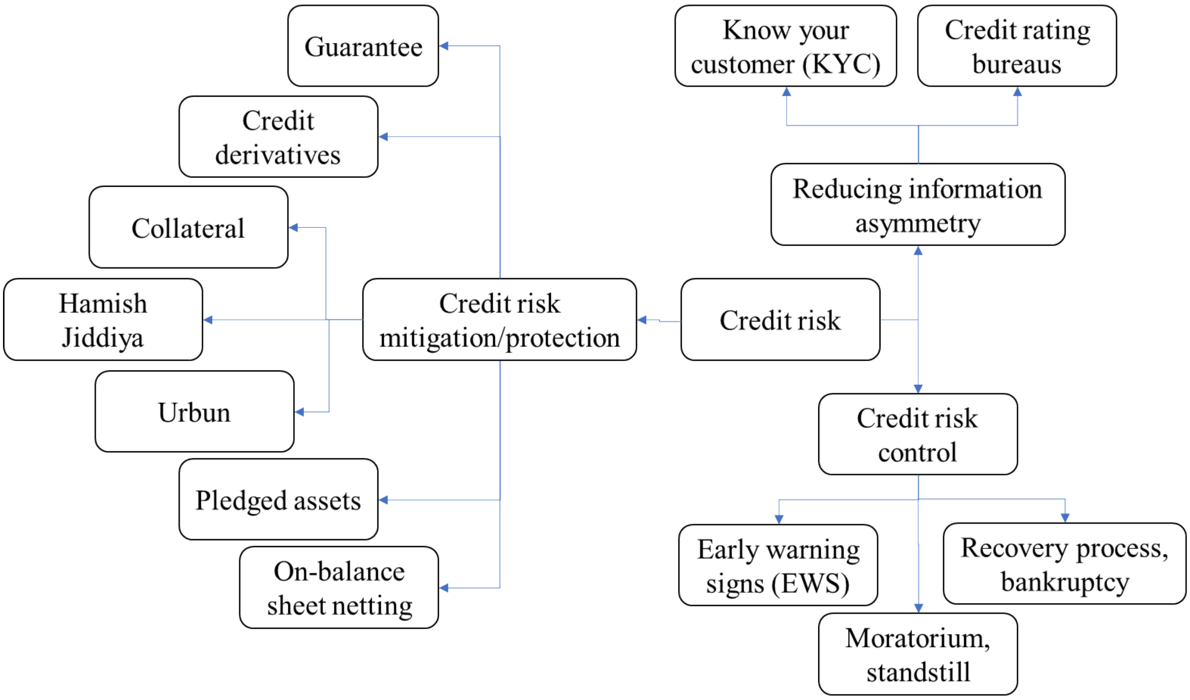

Figure 7. The credit risk mitigation techniques identified from the documents (Source: NVivo Output by Author)

2.5.6.1. Credit Risk Management in Saudi Arabia

Credit risk management in Saudi Arabia is profound, with defined stages of examining the borrower, their ability to pay and their commitment to paying loans extended. In Saudi Arabia, credit risk is measured through NPL and coverage ratios. Credit risk management is conducted in various ways, including specific laws that regulate banks' exposure to credit risk, methods of reducing information asymmetry between the lender and the borrower, and management of potential default.

2.5.6.1.1. Laws associated with the issuance of credit facilities

Saudi has come up with laws to control credit risk. For instance, The Saudi Banking Control Law 2014, article 8 prohibits banks from issuing loans above 25% of their reserves and invested or paid-up capital (p.6). Further, banks are prohibited from using their shares as security for any financial liability, guarantee, or loan or granting loans to their employees for amounts exceeding their four monthly salaries (p.7). Saudi laws also require the incorporation of credit risk management into the bank's regular processes of credit management (Saudi rule 2, 2020, p. 15).

2.5.6.1.2. Reducing asymmetry of information

Another credit risk management technique is the reduction of information asymmetry by collecting borrower information across banks and rating the borrower through a credit bureau. Saudi Arabia has a fully functional credit bureau owned by banks and licensed by SAMA. Information asymmetry is also reduced through due diligence, as SAMA requires the lender to establish the creditworthiness of the borrower, the soundness of the collateral provided, and that the prospect of the business-funded is reasonably successful.

2.5.6.1.3. Handling cases of potential default

SAMA has instituted a time-based technique for handling potential defaults. The timeline and actions are presented in figure 8 below:

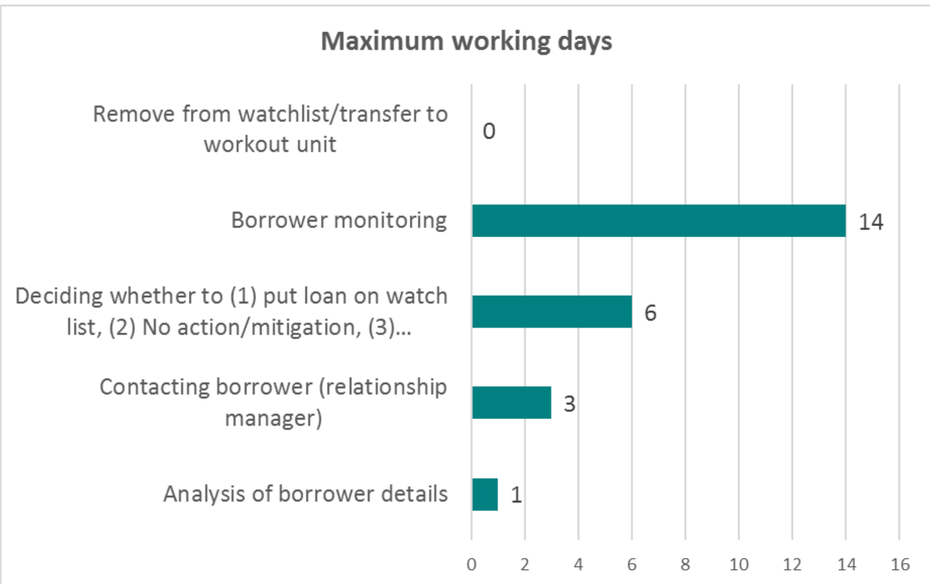

Figure 8. A time-based trigger for handling potential default (Source: NVivo Output by Author)

The last action (removal from the watch list/transfer to the working unit) is not given a timeline as it is left to the bank to determine based on its internal credit policy. The regulator argues that when loans are permitted to stay within the originating unit for a long, it results in the generation of NPLs, and thus, the working unit is the last option for banks. The regulator thus advises that this decision should be dependent on factors such as the unsustainability of the loan, severe depletion of the firm's equity, and previous unsuccessful restructuring and therefore warranting drastic measures to speed recovery. The loan recovery process stipulated by the regulator includes the recognition of NPLs through Early Warning Systems (EWS), restructuring, provisioning, the valuation of the creditor's collateral, legal process/recovery/foreclosure, managing foreclosed assets, monitoring and reporting of NPL and work out effectiveness. The legal process stated above is about the bankruptcy law that came into effect in August 2019. This process is aided by an EWS unit, which operates outside of the originating unit but is incorporated into the bank's credit risk management department.

2.5.6.1.4. Standstill agreement

Saudi laws permit loan restructuring. However, this restructuring needs to be compared to other options, such as bankruptcy or enforcement, in terms of the value it could create. The Saudi laws indicate that where a borrower owes several creditors or where a creditor has had a long-term relationship with the borrower, the formalisation of a standstill agreement is required. This involves a period where no lender is permitted to enforce rights against the creditor to give breathing space for the creditor to come up with a survival strategy. During this period, the lenders joined to come up with a unified approach. The approaches may include extending additional credit for working capital or postponement of the interests due.

2.5.6.1.5. Credit protection

Aside from the credit risk mitigation techniques mentioned, Sukuk is also used as a debt instrument in Saudi Arabia because of its ability to provide stable earnings. Rather than debt, the literature indicates the suitability of Sukkuk as a tool for liquidity management for the same reason – earnings stability (Harun et al., 2021).

2.5.6.2. Credit Risk Management in China

2.5.6.2.1. Credit risk

The issuance of credit by commercial banks, according to the regulator, should be reflective of the commercial bank's credit level and their risk appetitive (characteristic), and they must have sound processes for credit risk determination in receivables. Even though collateral is stressed, the regulator recognizes that there are unsecured, uncommitted loans granted to individuals on a revolving basis. Further, the banks are obliged to recognize the credit risk inherent in their loan portfolios and the creditworthiness of the borrower (collateral holder). Taking this recognition into account, the regulator requires commercial banks to cancel facilities granted to a borrower, such as cancellable corporate overdrafts, when their credit quality deteriorates. Further, the banks use LGD in evaluating a facility and PD when evaluating highly leveraged borrowers or those whose assets are held for trading. China also requires a 2%-4% risk weight on the collateral. Further, the law requires no correlation between the collateral value and the counterparty's credit quality.

2.5.6.2.2. Counterparty credit risk

One of the methods of controlling credit risk is through hedging utilizing derivatives. This introduces counterparty credit risk. The regulator defines counterparty credit risk (CCR) as the probability of defaulting before settling the final cash flows due to a transaction. This is differentiated from credit risks due to loan default, as the risk is not unilateral. Although the credit risk mitigation methods lead to the transfer or reduction of credit risk, they lead to an increase in residual risks leading to the need to control the residual risks. Commercial banks are expected to comply with (1) ensure compliance of collateral and guarantee management with the regulator's requirements; (2) the degree of cover must be explicitly specified; (3) CRM impacts are not double counted. Further, to mitigate credit risk, the bank must ensure that they possess the right to quickly take legal possession or liquidate the counterparty's collateral in case of insolvency, default, or bankruptcy. Further, the collateral must be valued every six months, pledged over the life of the exposure, segregated from the assets of the custodian, and its value has no relationship with the counterparty's credit quality.

2.5.6.3. Credit Risk Management in India

The determination of credit risk is conducted through stress testing and monitors credit growth in different sectors. Further, the country implemented the standard approach for credit risk in 2013. Additionally, under the internal rating-based approach, banks were permitted to adopt either Advanced or foundation internal rating-based approaches.

2.5.6.3.1. Credit risk mitigation facilities

CDS was formulated in 2010 as the derivative market. India also has deposit insurance and credit guarantee corporations.

2.5.6.3.2. Provisions

The regulator also requires provisions to guard against asset deterioration. For instance, the provisions for standard commercial real estate assets were increased from 0.4% to 1%. Further, in the spirit of building up provisions (dynamic or ex-post specific provisions) during periods when banks have good earnings, banks in India were advised to attain a minimum of 70% for their provision coverage ratio. The regulator argues that during credit booms, banks have the tendency to lower their credit standards leading to asset quality deterioration. India also required a 2% provision for the first two years following the restructuring of standard advances from NPAs. For accounts upgraded from NPA to a moratorium, the 90-day norm for NPAs does not apply.

2.5.6.3.3. Reducing information asymmetry

Credit Rating Agencies (CRAs) keep borrowers' credit information and avail them to lenders for access to customers' credit history. The Indian regulator argued that increased information sharing between lenders reduces the rate of default and average rate of interest, increases lending and deepens the credit markets. However, in 2011, the regulator worked towards ensuring the banks to do excessively relied on CRAs. Aside from the CRAs, the central bank also instituted a Central Repository of Information on Large accounts (CRILC) to perform the functions of collecting, storing, and disseminating credit data. CRILC captures both funded and non-funded exposures and aims to help banks to recognize problems with asset quality early enough and to make informed decisions on credit (India data 2014, p.82). Since

CRILC handles only large borrowers, banks were advised to furnish information on lenders for the fund and non-fund-based exposure exceeding 50 million rupees. Another method of reducing information asymmetry is to know your customer (KYC) norms that were stressed by the regulator. KYC has also been reported in the literature as a bank-level credit risk management technique (Arora, 2021).

2.5.6.3.4. Banking regulations and policies

In 2012, India revised the exposure of Urban Co-operative *Banks* (UCBs) to commercial real estate and housing and real estate from 15% of their deposits to 10% of their assets. Further, a policy framework was instituted in January 2014, which aims to enable banks to detect problematic accounts early, restructure viable accounts promptly, and recover or sell unviable accounts promptly. In 2015, the regulator formulated large exposure limits in line with the BCBS framework. The regulator also instituted a peer-to-peer platform for unsecured crowdfunding, which evaluates the lender's creditworthiness and also collects loan payments. Additionally, the bankruptcy law was passed in 2016 to strengthen the framework for resolving corporates.

2.5.6.3.5. Early Warning Systems (EWS) and corrective mechanisms

According to the regulator, it stepped efforts towards the identification of risky credits, tracking and monitoring disbursals and appropriately pre-empting delinquency and ensuring that the retrieval processes, where applicable, are fast and cost-effective. There has been effected by creating mechanisms to issue EWS. In 2015, strategic debt restructuring was introduced in India 2015, where secured creditors joined up to form a joint lenders forum. This is to convert the loans due to them from an entity into shares and, thus, collectively become the major shareholders and divest the holdings earliest.

2.5.6.4. Credit Risk Management in Malaysia

Credit protection in Malaysia under the standardised approach is conducted under credit derivatives, guarantees, and financial collaterals. The IRB approach, on the other hand, uses the value at risk (VaR) method to measure credit risk. The IRB approach utilises the principles of LGD, PD, and EAD. The identified risk can be mitigated through wide-ranging techniques set by the supervisor. Some of the infrastructure in place to provide credit protection include the Credit Guarantee

Corporation and Cagamas Berhad. For moratorium, this is limited to the situation when a counterparty is facing natural disasters, and this consideration is done internally at the bank level. An independent party is required to review and monitor the internal processes for granting a moratorium. This should be no more than six months following the application by the obligor.

The credit risk management techniques in the conventional system do not differ much from the techniques used by India and Saudi Arabia. First, the banks are required to immediately and unconditionally cancel revocable and cancellable commitments such as overdrafts because of the deterioration of creditworthiness. Second, the banks use LGD, EAD and PD to estimate the credit risk. The supervisor requires banks in Malaysia to perform stress tests to determine the impact of credit risk on the bank's IRB regulatory capital. Further, for purposes of reducing information asymmetry, banks in Malaysia may establish a credit bureau for the collection of credit information and any other information deemed fit, and banks are permitted to disclose this information to other financial institutions. Credit risk mitigation (CRM) techniques include (1) collateral, (2) credit derivatives and guarantees, and (3) on-balance sheet netting. Further, the contract in place for credit protection is irrevocable unless, on the occasion where the lender does not fulfil their part of providing credit.

2.5.6.4.1. Credit risk exposure in Islamic banking

The seven Islamic financial contracts exposed to credit risk are listed as follows:

- Murabaha and MPO with a non-binding AP: exposure to credit risk emanates outstanding balance following the purchase
- MPO with a binding AP: the exposure is equal to the cost of asset acquisition
- Salam and Salam with parallel Salam: exposure is equal to the amount paid by the bank
- Ijarah with binding AL: exposure is equal to the cost of acquiring the asset after signing an AL, and the exposure comes from the outstanding lease amount after signing an LC
- Ijara with no AL: the exposure is based on the balance lease amount
- Musharakah with a sub-contract: the bank is exposed to credit risk
- Mudarabah and Sukuk: no credit risk exposure

Even though co-ownership in Islamic banking signals an equity risk (for instance, in the Masyarakat mutanaqisah), when a wa'ad is applied to permit the transfer of the asset to the obligor, this leads to the creation of credit risk. Islamic banks are allowed to employ risk weighting under the regulatory retain, provided that the risk profile is the same as the ijarah or Murabaha contracts. They are permitted to hold non-financial collateral such as residential and commercial real estate, physical collateral and financial receivables. Moreover, Islamic banks are subjected to similar credit risk mitigation mechanisms as conventional banks, except that mitigation techniques are sharia compliant. For instance, credit insurance is replaced with credit trade takaful. Additional credit risk mitigation mechanisms available for Islamic banks include (a) Hamish jiddiyah, a security deposit before a contract or sale is executed and (b) urbun, which is earnest money to assure contract performance.

2.5.7. Compliance of risk management with BCBS versus IFSB

The risk definition and mitigation methods above complied with BCBS. About the IFSB, the provisions were somewhat similar to the BCBS requirements, except for the replacement of the non-compliant instrument with equivalent Shariah-compliant instruments. For instance, IFSB Islamic banks are permitted to use the services of credit rating agencies recognised by External Credit Assessment Institutions (ECAI) for the assessment of the creditworthiness of, for instance, Takaful and retakaful. Moreover, IFSB provides for Shariah-compliant instruments such as Tahawwut (Shariah-compliant hedging).

This aligns with the statement by Ganiyy et al. (2017) that the Islamic banking system could be considered an Islamised conventional system. They further explain that in many cases, the banking regulator uses the same rules for both Islamic and conventional banks, which was practised especially in Saudi Arabia, where there was almost no distinction between the regulations for Islamic and conventional banks. The provisions of the IFSB, which largely mirror the BCBS, and especially Basel III, could also be a contributing factor to the almost similar (Islamised) regulatory treatment. Thus, in terms of compliance with Basel III, it was more about which tools an Islamic bank can use to achieve regulatory requirements as opposed to adapting to a differing regulatory standard that adapts to the uniqueness of Islamic banking.

2.5.7.1. Credit risk

Changes to the BCBS were mainly a response to the contextual nature of the regulatory environment. For instance, banks used some aspects of Basel II requirements in Malaysia and China before the full adoption of Basel III, such as the IRB approach. While Malaysia required banks to choose between PD, LGD, and EAD, China specified when LGD or PD could be used. India banks had the choice between the foundation IRB and the advanced IRB approaches.

Moreover, another innovation was in credit risk mitigation. For instance, before India enacted a bankruptcy law, the regulator had three different frameworks for managing bankruptcy events. Moreover, in India, credit rating agencies were classified into two: credit rating companies licensed by the regulator and a government-owned rating agency for large credits. Changes were also realised in terminology. For instance, in Saudi Arabia, a version of Moratorium was referred to as a standstill agreement.

Although credit risk mitigation techniques were largely similar to those used in conventional banking, such as the use of derivatives, guarantees and collateral for credit protection, we noticed some innovations to help Islamic banks achieve compliance. The need for modification of credit risk mitigation mechanisms is supported in the literature. Jarbou and Niyama (2020), for instance, explained that the Shariah law does not permit banks to apply fines or penalties against customers in default. This makes it difficult for Islamic banks to apply credit discipline to their customers. Some of the innovative credit protection used included the application of waad. In Malaysia specifically, Musharakah Mutanaqisah could be undertaken with or without waad, which is binding and can be executed instead of the default. Secondly, credit insurance in Malaysia was conducted through the credit trade Takaful or Re-Takaful. Further, in Malaysia, Islamic banks were permitted to hold non-financial collateral. For Saudi Arabia, Sukkuk was viewed as a good means of credit protection.

2.5.7.2. Liquidity risk

In the analysis conducted, we established that Saudi is one unique country as it has fully implemented the Basel III requirements and surpassed most of the metrics, including requirements for liquidity, as other countries struggled to meet the minimum requirements and opted for phased implementations. The report by Islamic Development Bank indicates, “*Saudi banks already meet the Basel III capital, liquidity and leverage standards that international banks are expected to meet by 2019*.” (IsDB, 2020, p19)

This could be due to the country's excess liquidity status. As observed in the literature, excess liquidity has two possible concerns: that funds are not being invested and thus, banks have lower profitability than their peers, and second, that in pursuit of higher earnings (where such incentives exist), bank managers take excessive risks during booms, triggering a financial crisis (Harun et al., 2021; Sajjad Hussain, Muhaizam Bin Musa, and Omran, 2018). Additionally, high liquidity as an aftermath of Basel III implementation has been linked with high levels of gross non-performing loans, which is indicative of higher credit risks (Rizvi, Kashiramka, and Singh, 2018). Thus, in a situation such as in Saudi Arabia, it becomes important for the regulator to permit reasonable investments to allow for profitability while taming risk engagement.

So far, Saudi Arabia has responded to this need by establishing a highly controlled credit risk management environment where banks have limitations as it pertains to their lending decisions and loan recovery options. These have so far enabled the country to maintain very low NPAs compared to other countries. The country has also set up a national fund that should help with handling possible liquidity crises. Thus, given that the 2008 financial crisis was not curtailed with liquidity support, the multiple initiatives to control credit risk should help maintain the stability of the Saudi banking system (El-Massah et al., 2019).

Moreover, full compliance only helps to ensure stability but without a sure guarantee. This means that regulators must take appropriate contextual-based actions following the close observance of the economy and the banking system. We observed that India, which had set higher than the minimum standards, struggled to reach the minimum regulatory standards. However, the regulator conducted pilot studies with the regulations to examine their suitability before system-wide application. This enabled the regulator to determine the after-effects of compliance to determine whether additional time or policies were needed to ensure compliance and to maintain the stability of the banking system. This was followed by bi-annual stability monitoring.

2.5.8. Differential treatment of state-owned commercial banks

We did not find preferential treatment as it pertains to whether banks were state-owned or privately owned. In China, the regulations are impartially applied to all the banks, as evidenced in the statement on the rules on liquidity. However, notes by financial asset managers for acquiring state-owned banks were considered as collateral.

In India, we established an open acknowledgement of the lower performance of public sector banks, including an acknowledgement of rampant fraud (92.9% of all cases in 2017-18), and an acknowledgement that they were largely stressed.

> "*During 2017-18, PSBs accounted for 92.9 per cent of the amount involved in frauds of more than `0.1 million, as reported to the Reserve Bank, while the private sector banks accounted for 6 per cent*." (RBI, 2018, p128)

This is in line with literature that indicates that public sector (state-owned) banks are inefficient. The regulator reacted to this through the consolidation of the public sector bank. Consolidation is a different strategy that increases the size of the banks (the opposite of restraining the asset growth of privately owned banks).

2.6. Conclusion

In this chapter, we sought to answer two sub-questions: (a) how do standardised capital and liquidity regulations mitigate risks faced by banks? (b) what country-specific regulatory frameworks are in place to cater for additional risks that banks may face while operating within emerging markets? We used document analysis in which regulatory documents, national laws, and annual reports from the regulatory authorities were analysed. The findings reveal that countries are at different stages of implementing Basel III: while some have fully implemented it, some are still in the implementation stage. The findings also reveal countries that have set higher than Basel III required capital adequacy and liquidity ratios recognise the unique challenges they face and the inability of the standard regulation to mitigate additional risks within their banking system. However, the reports and documents analysed do not provide evidence that the additional regulations helped reduce the build-up of systemic risk or increased the stability of the banking system. This is the same between conventional and Islamic banks.

Regarding the second sub-question, we found that regulators in the different countries did not engineer any novel rules beyond the Basel III Framework, only requiring banks to have higher than standard ratios. Even for Islamic banks, we determined that BCBS frameworks were only adapted to Islamic contexts. Since nothing new was engineered, it presents a need to establish statistical proof of whether credit risk and liquidity risk influence stability and systemic risk and the influence of lower liquidity risk on credit risk. These gaps are further addressed in the empirical studies in chapters three and four.

Chapter 3 - Basel III: Implications of Capital and Liquidity Regulations on Financial Stability During Economic Depression

In this chapter, we attempt to answer our research question by investigating the effect of Basel III's new capital and liquidity requirements on systemic risk in the financial system within emerging markets. We do this by exploring the relationship between the capital and liquidity regulations, evaluating NSFR for banks and their probability of default risk, and analysing the marginal contribution of banks towards systemic risk. Section 3.1 aims to provide some background context into emerging markets as part of the introduction. Section 3.2 provides a theoretical framework by discussing key theories relevant to our research question. Section 3.3 of this chapter explores the existing literature and discusses different approaches used to study capital and liquidity regulation in relation to systemic risk and the assessment of results from existing literature. Section 3.4 investigates both standards (original and revised) of calculating NSFR under Basel III using historical data. Additionally, this section also lays out our use of the default risk model after reviewing the existing literature and presents empirical findings. This section further extends to investigate the systemic risk models used in the literature and our methodology to measure systemic risk along with its findings. Section 3.5 provides a discussion and concluding remarks based on the results from the preceding section.

3.1. Introduction:

The rationale for studying emerging market economies and policymaking processes is that they have a distinct set of features that distinguish them from both developed and frontier markets. The first crucial attribute of emerging markets pertinent to this study is their increased degree of volatility, which has been backed by both researchers and data. The essential question in judging emerging market volatility is whether it is the outcome of uncontrolled causes or the effect of the policy framework within which countries operate. The difference between these two causes of volatility is not easy because natural disaster shocks can be minimised if preventative and disaster management mechanisms are in place. Kaminsky et al. (2004) differentiate the policy framework in the case of developed economies, where policy frameworks function as a stabilising force within the economy, unlike emerging market economies where policy frameworks tend to be more procyclical in nature, encouraging economic booms and exacerbating recessions. Such arbitrariness in policymaking diminishes investor confidence and reduces long-term investments into productive assets. These uncertain policies are also thought to be a significant drag on GDP within emerging markets (Fatas and Mihov, 2003).

The second significant attribute in the transitory element in emerging markets. Emerging markets are increasingly transitioning to various fonts. These fonts cover essential demographic characteristics such as fertility rates, life expectancy, literacy rates, and the important artefacts pertinent to this study, the shift within economic and political institutions. These shifts are primarily characterised by repeated regime swaps resulting in dramatic reversals in fiscal, monetary and trade policies. These reversals are a predominant source of volatility in these markets and lead to shocks in economic growth (Aguiar et al., 2007). Finally, and perhaps most important transition to increasing interaction with international capital markets is frequently drawn out and, at times, disruptive. Ranciere et al. (2006) argue that pressing countries to push transitions may occasionally embrace measures that boost the rate of progress within the economy primarily by soothing borrowing constraints, leading to higher investments and higher economic growth while at the same also increasing the chances of crises due to stimulating risk-taking behaviour, leading to financial fragility and amplified probability of a financial crisis. Which often have dire recessionary consequences for emerging market economies.

This mixture of high volatility and transitional characteristics present within emerging markets poses a real dispute in policymaking. In established parlance, the challenge is to strike the right balance between commitment and flexibility or between rules and discretion. To demonstrate good faith in policy initiatives, perseverance is desirable; thus, methods that ensure such pledges will be valued by investors and will assist in economic success. As such, a continuous promise displays a resolution to remain on course despite the numerous continuing transformations. That promise is a pledge that, notwithstanding the country's volatility, policymakers will not behave in a way that aggravates or magnifies the volatility; rather, volatility will be mitigated to the greatest extent possible through policy actions. Likewise, Nguyen et al. (2022) add that uncertainty in policymaking and illiquid domestic markets are the major drivers of corporate default risk within emerging markets. As firms engage in risk-taking behaviour, they reduce their cash holding, resulting in an increased cost of financing and deteriorating financial performance (Ahsan and Qureshi, 2020; Tran, 2021).

Regulatory developments in the financial services industry within emerging markets are slow and diverse but are moving towards a similar trend as prescribed by the international regulatory regime. For instance, the People's Bank of China introduced Deposit Insurance Scheme in 2015 to protect depositors' confidence in the banking and Financial system (Gang, 2018). Likewise, the Chinese Government in 2017 also enacted Financial Stability and Development Committee assigning it regulatory powers under the state council to oversee the systemic risk within the Chinese economy as well as liaise with international regulatory bodies in relation to international market developments (Gang, 2018). On the other hand, China's Banking and Insurance Regulatory Commission (CBIRC) introduced a new liquidity risk measurement framework in 2018 which includes liquidity risk measures such as Net Stable Funding (NSFR) and Liquidity Coverage Ratio (LCR) as prescribed in Basel III along with LMR and HQLAAR with both measures aimed at meeting additional short-term liquidity demands under stressed conditions and helping banks' strategically place HQLA to meet their long term demands based on their maturity structure (CBIRC, 2018). The latter two measures will come into effect in 2020. Similarly, in addition to Basel III's liquidity requirements, Indian banks are also required to meet two additional liquidity measures under Sections 24, 42, and 56 of the Banking Regulations (Amended) Act 2017 (RBI, 2019). Indian Banks' are required to hold a Cash Reserve Requirement (CRR) of 4% of their Net Demand and Time Liabilities (NDTL) along with a Statuary Liquidity Requirement (SLR) of 18% of NDTL by 2020 (RBI, 2019).

The main objective of capital regulations is to limit banks' probability to default by increasing banks' loss-absorbing capacity. In contrast, the introduction of liquidity regulation is intended to mitigate the maturity mismatch between assets and liabilities as a preventive measure to funding risk and market liquidity risk. However, in theoretical terms, more liquid and enhanced capital should enable banks to absorb losses. In practice, the requirements proposed by Basel III would prompt changes in risk management in terms of evaluating risk and decrease bank profitability and ultimately encourage banks to pursue more risky investments in an effort of profit maximization. Although there is substantial literature on the effectiveness of capital regulation and its role in predicting banks' probability of default, research on the impact of new liquidity standards introduced by Basel III on banks remains scarce (Chiaramonte and Casu, 2017). Likewise, there is a difference between evaluating capital and liquidity requirements. For instance, capital requirements are calculated based on the total Risk Weighted Assets (RWA) that a bank may hold and is a measure of solvency risk, but it does not address asset liquidity risk. In contrast, liquidity requirements are a function of the funding mix of the bank that does not depend on other banking fundamentals such as capital adequacy and asset risk (Pierret, 2015). Liquidity requirements are computed based on a specific mix of HQLA rather than RWA and address funding and market liquidity risks (Chiaramonte and Casu, 2017). Equally, there is a consensus amongst academics and policy analysts on how to calculate capital requirements and the need for capital regulations, but there is limited consensus beyond the identification the liquidity is hard to measure (Allen, 2014; Diamond and Kashyap, 2016; Chiaramonte and Casu, 2017; Bai et al., 2018). Furthermore, empirical evidence on how the combination of capital requirement and liquidity measures impacts the bank's stability and the financial stability of the system is limited (Chiaramonte and Casu, 2017; Bai et al., 2018).

3.2. Theoretical Framework

This section investigates traditional theories on Bank Capital and liquidity in relation to systemic risk relevant to our fundamental research question discussed earlier in this study.

3.2.1 Theory of Bank Capital

Diamond and Rajan's (2000) theory of bank capital explains why banks need capital requirements by arguing that banks' capital structure and operations differ from those of other industrial businesses. The theory first explains the core functions of a bank by describing borrowers as entrepreneurs seeking funding for specific projects. Hence, every borrower has specific skills to maximise their cash flows from their project better than any other, given that they are well aware of their abilities. However, a borrower can not commit his human capital to the project, with the exception of when the payment comes due. A bank looking to extract repayment can only do so by threatening to liquidate the loan by taking the loan away and selling it to the next best user, in this case, other investors. At the same time, borrowers can threaten to withhold payments in future, triggering a loss for the bank. This would lead the bank to only extract a fraction of the total loan amount. Thus, loans are illiquid in nature as they cannot be refinanced to the full extent of the loan repayments due.

Because human capital cannot be easily committed to these assets, they are illiquid. A tool that may link human capital to a bank's assets would result in the production of liquidity. As a result, a bank that finances its lending activities through demand deposits is a type of instrument that can link human capital to a bank's assets. Demand deposits are deposits with fixed claims in the sequential service order, in which the depositor receives their money until the bank runs out of money or assets to sell. The dilemma for the bank in this fragile capital structure is that it cannot threaten to hold up depositors since this would result in collective action by all of its depositors anytime they believe their claim is in jeopardy. Any attempt by a bank to bargain with depositors or threaten to stop this service will result in a bank run. This effectively disintermediates the bank by crushing its profits to zero. As a result, the bank will honour all collections made by depositors. In a stable economic environment, banks maximise the amount of credit they can give by rigidly screening borrowers and employing a weak all-deposit capital structure.

Although uncertainty can be assessed but not verified, hence such a metric cannot be used exclusively to limit the amount of credit available to borrowers. Similarly, any decrease in real asset value could lead to a run on the bank due to panic among depositors. As a result, a bank must trade-off between the cost of bank runs against the cost of expanding credit and liquidity creation. As a result, it is preferable for banks to partially finance themselves with softer claims that may be renegotiated during uncertainty. These softer claims are known as capital, and they are long-term claims with no first-come, first-served right to banks' cashflows, unlike depositors. This capital can be obtained in the form of equity, in which investors always have the right to replace bankers. Given the fact that equity is a loan that is long-term in nature, the right to claim long-term debt emerges only in the case of a bank's default; thus, capital holders, unlike depositors, are not subject to the collective action problem. A capital requirement fulfils three essential roles. It boasts a bank's ability to absorb loan losses, acts as a buffer against asset price shocks, and allows the bank to modify the amount that can be collected from borrowers. The theory also claims that such higher capital requirements come at the cost of direct reduction in banks' liquidity and transaction services and higher agency costs resulting in lower credit and liquidity creation by banks.

Nevertheless, earlier works by Holmstrom and Tirole (1997) dispute the costs associated with imposing a higher capital requirement on banks, as mentioned in Diamond and Rajan's (2000) work, highlighting that the higher capital requirement, in fact, incentivises banks to make efficient asset portfolio choices and reinforces these incentives to monitor borrowers through monitoring channels. From a similar standpoint, the higher capital requirement also improves lending, liquidity creation and higher market share for banks (Mehran and Thakor, 2011). A theoretical model developed by Allen et al. (2011) adds that increased capital requirement does not have to be financed solely by equity holders and depositors. Banks can charge higher rates to borrowers to make up for the capital required, as this incentivises banks to monitor for borrowers that can pay off their loans. The only cost associated with such a measure would negatively affect the borrowers, particularly lower investment returns due to higher bank charges. Evidence Berger and Bowman (2013) and Thakor (2014) suggest that banks with higher capital levels have a significantly higher probability of sustaining a financial crisis, gaining a competitive edge in deposit and loan markets, and higher liquidity creation among large banks. However, evidence of higher liquidity creation is based on the sample of large banks from the US. In terms of financial stability, Thakor (2014) further adds that higher capital requirements improve not only the stability of the banks but also the wider financial system as an effective remedy for reducing contagion risk.

3.2.2. Theory of Bank Liquidity Requirements

The seminal work on liquidity risk by Diamond and Dybvig (1983) highlights that banks face liquidity risk during the financial intermediation of turning liquid liabilities into illiquid assets. They also add that deregulation increases competition among banks' and is a good sign of a free market economy, but they also state that during dire market conditions banks' face liquidity risk due to bank runs. They propose that banks' can mitigate liquidity risk by introducing a Deposit Insurance Scheme, due to which depositors would have no incentives to rush to move their deposits. However, Diamond and Dybvig's (1983) deposit insurance scheme proposition is not effective reasoning as evident during GFC, although banks' had deposit insurance schemes in place that did not stop bank runs. Furthermore, Diamond and Dybvig (1983) also mention that the deregulation of banks' encourages competition; however, the underlying issue of financial deregulation is that it creates a moral hazard problem when banks may invest in risky assets building systemic risk and thereafter creating a "too big to fail" effect within the financial system as mentioned by Repullo (2005).

Additionally, Diamond and Dybvig (1983) address only liquidity risk arising from depositors on the liabilities side of the balance but do not take into account banks' other obligations, such as investors' flight to quality and banks' short- and long-term liabilities. More importantly, they do not address the need for capital buffers to idiosyncratic liquidity risk arising from changing macroeconomic conditions. Diamond and Rajan (2005) agree that banks' face contagion risk, and this can affect the pool of liquidity when banks collapse. However, their work does not address the role of capital regulations and macroprudential policy in mitigating liquidity risk. Malherbe (2014) argues in light of new Basel III liquidity requirements that imposing limits on liquidity would lead banks' to hoard liquidity and would lead to lemon problems as they argue the more HQLAs banks' hoard, the less likely they are to trade in interbank markets to raise new cash limiting other banks' to borrow from interbank markets. Allen and Gu (2018) add in the context of financial stability that banks face multiple risks, such as panics, crises due to a decline in asset prices, contagion risks, foreign exchange risks, and Behavioural effects which cannot be prevented without the need of macroprudential regulations. Allen and Gu (2018) further argue that Diamond and Dybvig (1983) do not highlight the cost of implementing insurance schemes. Moreover, what could be the result if bank runs are reduced by insurance schemes in a world where the crisis would have been caused due to fundamentals? They dismiss the work of Diamond and Dybvig (1983), highlighting that the model is very simple and excludes other systemic risks referring to the financial crisis in Ireland.

Calomiris et al. (2015) developed a theory on bank liquidity requirements by extending the previous work conducted by Diamond and Dybvig (1983) by looking at both the asset and liabilities sides of a bank in light of new Basel III requirements. Their theoretical model highlights that the value of liquidity held at central banks is observable at all times, unlike the value of capital, which is dependent on the value of risky assets. Given that High-Quality Liquidity Assets (HQLA) are risk-free assets hence when banks hold such assets, they are committing to removing a portion of default risk from their portfolios. Because Liquidity is observable in value and risk-free, this can be used to pay senior bank claim-holders, in this case, a depositor, in the event of bank liquidation. They further highlight that the high cost associated with raising equity pre and post-crisis makes it challenging for banks to effectively respond to bank runs despite the deposit protection schemes in place. The incentive for banks to implement liquidity requirements is that even though it is difficult for banks to raise equity to shore up their capital in times of crisis. Banks can recourse to making use of liquidity buffers to avoid fire sales to incur losses in order to address collective action problems by depositors in times of crisis.

Nonetheless, empirical evidence by Hong et al. (2014) concludes that there is a negative relationship between NSFR and banks' probability of failing. Furthermore, they find that effect of LCR is insignificant in relation to preventing bank failure. The effect of LCR can be argued on the basis that LCR only covers 30 calendar days and does not address the maturity over the longer-term horizon. In contrast, Chiaramonte and Casu (2017) provide empirical evidence that the final version of NSFR (October 2014) has a higher predictive power compared to the earlier standards of NSFR (December 2010). They also find that NSFR has a positive effect on improving bank stability and supporting regulatory efforts to curb systemic risk. Hugonnier and Morellec (2017) reach a different conclusion stating that although the introduction of liquidity requirements decreases the magnitude of losses in default, it increases the likelihood of bank defaults. However, their work is focused from a Micro-prudential perspective rather than a macro-prudential perspective. Their work primarily relies on liquidity and leverage requirements but does not take the capital requirement of banks, and most importantly, their results are based on unregulated financial institutions.

Our study stems from several contributions to the literature. Primarily, studies conducted by Chiaramonte and Casu (2017), Hong et al. (2014), and King (2013) examine the effect of NSFR and LCR in predicting bank failures but fail to address the effect on mitigating systemic risk within the financial system taking all instruments of capital requirements into consideration. Our study is the first, to the best of our knowledge, which examines the effect of NSFR in a systemic liquidity risk context considering capital requirements such as Tier 1 to total assets ratio, Capital Adequacy Ratio (CAR) and using liquidity risk measures introduced post-financial crisis. Secondly, this is the first study to our knowledge that explores the effect of NSFR within the geographical sample of nine major EMEs as per the MSCI EM index based on Nominal GDP. Furthermore, the study also examines the effect of new capital and liquidity requirements on EMEs financial institutions in the context of systemic risk.

3.3. Literature Review:

The aim of this section is to review existing literature regarding capital and liquidity regulations from various standpoints. Additionally, In this section, we review three important themes. Firstly, the relationship between capital and liquidity regulations under the new liquidity standards, namely NSFR and its role in mitigating systemic risk from banks' perspective. Secondly, what role do central banks' play in alleviating the systemic risk via Macroprudential policies and LOLR functions? Thirdly, the role of liquidity within interbank markets and the contagion risk arising from short-term lending and borrowing activities within interbank markets. The study briefly highlights the issues of systemic risk, liquidity risk and capital regulations before going into a more in-depth discussion on the three themes explained above.

Capital requirements have been a long regulatory tool for assessing the safety and soundness of banks (Chiaramonte and Casu, 2017). Similarly, the interactions between capital and liquidity regulations are appropriate in the macroprudential context (BCBS, 2015; BCBS, 2016). But regulators prior to GFC relied heavily on capital regulations to maintain the safety and soundness of the financial system. The focus on capital requirements was based on the view that capital and liquidity are substitutes (ECB, 2018). However, the GFC has proved that capital and liquidity regulations are complementary and that capital requirements alone are insufficient to ensure the safety and soundness of financial institutions and minimize systemic liquidity risk.

Multiple studies on the financial crisis have highlighted the importance of liquidity risk. For instance, Diamond and Dybvig (2007) discuss the role of banks in liquidity creation. Banks grant loans which are illiquid and cannot be sold immediately at a higher price margin. While at the same time, banks supply on-demand deposits, which allows depositors to make withdrawals at any time. This causes liquidity mismatch when bank liabilities are more liquid than their assets during times when numerous demand deposits are withdrawn all at once (Diamond and Dybvig, 2007). Diamond and Rajan (2005) explain the reasons that Banks' assets are illiquid because they cannot be put as collateral or sold for the full value of the loan granted because human capital is not able to generate full value committed to the asset hence there is a contagion risk that affects the bank's assets if sold prior to maturity. Helbik (2017) adds that failures do not only occur because of bank runs and interconnectedness between financial institutions but also due to the fact that a bank failure from one bank can wipe out a large pool of liquidity from the market, causing systemic liquidity shortages during periods of stress.

3.3.1. The relationship between capital and liquidity requirements under Basel III

By definition, liquidity is a measure of cash, as well as any other assets that banks have and can use them to quickly meet short-term financial obligations and bills Saleh and Abu Afifa (2020), while capital is defined as a measure of resources that a bank has to absorb losses. In this section, the debate or argument is based on the premise that since capital is a loss-absorbing buffer, banks that have high capital ratios are expected to be less vulnerable to runs from short-term wholesale funding, as well as from deposits. Studies such as Dahir et al. (2019) support this premise by stating that these lower run risk enables or allows banks that are highly capitalized to take on greater liquidity risk.

Thakor (2018) claims that recent regulatory reforms with the twin objective of curtailing systemic risk and promoting economic growth do not serve as a valuable economic resolution in countering the root cause of the GFC. They add that the root cause of the GFC was insolvency risk rather than liquidity risk. Although recent regulatory reforms address the need to strengthen capital requirements, Basel III's liquidity requirement serves no benefit and should be abolished or relaxed. Similarly, Smith et al. (2019) justify the role of both capital and liquidity based on using confidential data of UK Banks from the Bank of England's database between 1989 to 2013 on a quarterly basis using variables such as actual regulatory capital, changes to individual capital guidance, RWA density, ROA, NPLs, liquid assets, derivatives to total assets ratio, wholesale debt to total assets and off-balance sheet commitments to total assets using fixed effect model. Their findings indicate that when banks have low capital, this implies that banks are highly leveraged, resulting in amplified insolvency risk; in such instances, the probability of failure is higher due to liquidity problems. In contrast, when capital requirements are raised, although the probability of failure and insolvency risk declines, banks shift excess liquidity into high-return illiquid assets as capital requirements are increased. Banks' view excess liquidity as an opportunity to grow their balance sheet and generate economic value for their stakeholders. However, shifting from liquid to illiquid assets does not protect banks from bank runs which arise when market conditions are uncertain or when banks are exposed to higher insolvency risk.

DeYoung et al. (2018) support the work of Smith et al. (2018) by claiming that if a decrease in equity capital causes uncertainty among uninsured bank creditors, in such a scenario, banks might treat capital and liquidity as substitutes. In the scenario of a potential bank run, banks may increase the liquidity of their assets by transferring illiquid loans to liquid securities or by increasing the maturity of their liabilities. Conversely, if the negative equity capital shock decreases the value of the bank, it makes the bank less risk-averse. It will lead to banks' treating capital and liquidity as compliments. In the latter scenario, a bank may increase its credit risk, interest rate risk and liquidity risk by shifting from high-rated stable liquid securities towards risky and illiquid loans or alternatively by decreasing the duration of its liability by shifting from stable long-term deposits to less stable short term brokered deposits and commercial paper issuance. A study by Carletti et al. (2019) also contributes to this. The researchers inspected the link between solvency and liquidity in relation to systemic risk. They explained that a bank with a larger share of short-term funding and illiquid assets is exposed to a rollover risk as compared to banks with high equity and more HQL assets. Additionally, raising equity while keeping the bank's asset side stationary has a similar effect on a bank's stability as increasing the stock of HQLAs while keeping the liabilities side of the balance sheet stationery.

DeYoung et al. (2018) argued otherwise. The researchers claimed that this does not apply to community banks in the U.S. as smaller banks pose little threat towards systemic risk. Furthermore, even after considering negative capital shocks, smaller banks tend to hold much higher liquidity as compared to their larger counterparts, given that they do not have access to multiple sources of funding. Hence their findings support the idea of excluding smaller banks from Basel III liquidity requirements because imposing NSFR and LCR requirements is likely to be redundant in practice and expensive. On the contrary, their study also finds no evidence of any linkage between capital shocks and liquidity management among larger banks advocating for two separate sets of capital and liquidity requirements alike to Basel III efforts to mitigate liquidity risk. However, their work is based on US banks only with assets of less than $ 1 Billion which essentially does not cover G-SIBs. The methodology used in their study to generate exogenous shocks to capital ratios does not take into account macroeconomic variables as these shocks are purely accounting-driven using balance sheet variables. The study also lacks evidence of the wider implications of these new regulations, for example, credit supply, interest rates on loans and changes to the balance sheet of banks.

Distinguin et al. (2013) also examined regulatory capital and liquidity measures proposed in Basel III for both US and European banks using NSFR. Their study found that the capital ratio of large banks tends to decrease as large banks become more illiquid and treat capital and liquidity as compliments. Whereas in the case of small banks, an increased relationship is found between capital ratios and illiquidity because small banks treat capital and liquidity as substitutes. However, their study relied only on the original version of NSFR weighting and revised NSFR weighting has not been studied in their research. On the other hand, Birn el al. (2017) investigated banks' response to Basel III's joint regulatory constraints using confidential data. They take risk-based capital, leverage capital, NSFR and LCR as their joint regulatory constraints and conclude that banks cannot manage their liquidity positions under joint constraints by increasing stable deposit funding, but banks can effectively manage their liquidity positions by increasing their liquid asset investments.

King (2013) offered insightful information on accommodating NSFR requirements by using data on banks based in both developed and emerging markets. They use banks' balance sheets and income statements by taking the weighted average of each country's banks' total assets to compare across other countries. Their macroeconomic variables include deposit, lending, policy rates, 1-month interbank offered rate and risk-free rates. Firstly, they calculate NSFR and the portion cost of wholesale funding with a maturity of one year or less. Secondly, they calculate the interest expense that a bank will incur on its retail deposits & wholesale funding, including interbank borrowing with a maturity of 1 year or less and on long-term debt. On the asset side, they calculate other income generated via investments and securities as compared to the risk-free rate offered on sovereign bonds.

The findings indicated that banks could meet NSFR by either increasing ASF, increasing the stakes of stable deposits against less stable deposits, extending maturities of wholesale debt beyond a one-year timeframe, or increasing the proportion of tier 1 capital. Alternatively, banks can reduce the RSF by shrinking the balance sheet loan portfolios, shifting the compositions of investments by selling a low-rated investment for cash holding or replacing it with high-rated investments by changing the composition of loans from retail to corporate loans and mortgages to reduce the maturity to less than a year. Despite these findings exhibiting a certain motivation, they fail to consider an instance where a bank is likely to face numerous defaults on its loan portfolio, where loan maturity is beyond a year, or alternatively, experience bank runs. The findings of Gobat et al. (2014) coincide with the above, that loan exposures beyond one year are not accounted for in the NSFR requirement. They also address additional shortcomings of the NSFR requirement stating that NSFR restricts banks' traditional role as liquidity providers and maturity transformers and may lead to liquidity shortages over the long term with real consequences towards the financial stability of the banking sector. It may also make deposits less stable while banks compete for funding sources.

Classical banking theories by Bryant (1980) and Diamond & Dybvig (1983) have acknowledged that assets and liabilities of financial institutions are jointly related in producing financial services and the creation of both default and liquidity risk. Calomiris et al. (2012) provide a theoretical explanation of liquidity requirements under Basel III by extending classical theories on liquidity risk. They demonstrate this by relaxing the assumption made in Black Scholes-Merton Framework; the effect of liquidity assets and illiquid assets is not the same on banks’ default risk. As per Diamond and Dybvig (1983), early liquidation of assets is costly and increases liquidity risk, which motivates banks to hold higher accounts of liquid assets. Early liquidation sends investors and depositors signals that a bank may be holding a risky portfolio and is illiquid, resulting in large outflows. Hence, banks holding liquid assets can isolate them from misinformed early withdrawals as well as mitigate default risk should they not meet their obligations. They further add that capital alone cannot mitigate risks faced in the banking industry. For instance, during the peak of the GFC in 2008, Citibank was bailed out by the U.S. government even after its capital to risk-weighted assets exceeded 11% during the crisis period.

A study by Covas & Driscoll (2014) refutes the above, claiming that forcing financial institutions to hold HQLAs, might lead to a decrease in the number of assets that banks hold. This will, however, raise the interest rate on bank loans. They argue that new liquidity regulations interact with the existing regulations on capital requirements. They develop a nonlinear dynamic general equilibrium model to study the macroeconomic impact of new liquidity requirements in relation to existing capital adequacy requirements. Their findings conclude that liquidity requirement in a baseline scenario would see a 3 per cent decrease in the number of loans granted, whereas banks holding more HQLAs over 6 per cent results in an aggregate output decline by 0.3 per cent and consumption drop by 0.1 per cent, preventing banks from profit maximization. Similarly, an increase in capital requirement from 6 per cent to 12 per cent would lead to the stock of loan portfolios declining by 1 per cent; at the same time, increasing the HQLAs by 9 per cent during the transition will have a higher effect on loan rates being increased by 15 basis points and stock of loans declining by 4 per cent. The study, however, fails to consider the dynamic nature of risk ratings among consumers and corporates, which is fundamental in evaluating the creditworthiness of borrowers. Additionally, the risk rating applied in the study relies on Basel I risk weights rather than sovereign credit ratings of government securities such as AAA or AA-. This makes it difficult to capture banks' cross-border exposures in other governmental securities aside from the U.S. T-bills. Moreover, this study does not reflect the exposures of banks' lending to other banks and the underlying systemic risk that arises from interbank lending activities.

Conversely, Dietrich et al. (2014) examine 921 banks in Western Europe with data samples ranging from 1996 to 2010 to calculate NSFR and Basel III implications on financial institutions. They calculate ASF and RSF to compute values for NSFR and then conduct GMM regression using banks specific variables. They also include two macroeconomic variables, GDP growth and a 10-year yield curve calculated by Organisation for Economic Co-operation and Development (OECD) with a dummy variable to reflect the GFC period. The empirical evidence indicates that the introduction of NSFR is likely to have a slight impact on bank performance based on bank-specific variables. However, Dietrich et al. (2014) do not address the link between capital and liquidity in terms of crisis. Chiaramonte and Casu (2017) believe that despite the cost associated with the implementation of Basel III, the primary aim of a new set of financial regulations is to make banks' stable to absorb shock and mitigate the spill-over effect into the economy. Both capital and liquidity holdings are equally important in promoting the safety and soundness of the financial system; however, according to Van den Heuvel (2018) and Chiaramonte and Casu (2017), little is known about the newly introduced liquidity standards and their interaction with a broader set of capital requirements. Carletti et al. (2019) further add that the introduction of liquidity requirements, specifically LCR and NSFR, complements capital requirements which have led to discussions about the interactions of these regulatory tools and their potential benefits and shortcomings towards promoting financial stability.

Carletti et al. (2019) explain that during the crisis, banks experience large outflows of funds, a process well explained in the academic literature of liquidity risk both from the view of depositors and investors such as Diamond and Dybvig (1983), Diamond and Dybvig (2007) and Dimond and Rajan (2005). The key difference between the role of capital and liquidity is that capital appears alongside liabilities as a source of funding. However, capital can absorb losses, but that does not mean that the capital is stored for a crisis period. Whilst liquid assets, for instance, cash, central bank reserves and governmental securities, appear on the other side of the balance sheet to be used as funding together with a liquidity buffer of HQLAs to alleviate the risk of a liquidity crisis (Frang et al., 2013). The term source of funding, as explained by the researchers, is the capital raised by banks through various activities such as investors and customer deposits, which would appear as liabilities on banks' balance sheets, whereas the term source of funding refers to covering losses arising from loan portfolios which is an asset on the balance sheet but if the borrower defaults these losses are covered by liquidity buffers explained above.

To put this into theory, the value of liquid assets, unlike capital requirements, is always observable. In contrast, the value of capital which co-depends on the value of risky assets. HQLAs are mainly risk-free assets, so when banks hold HQLAs, they are committing to reducing default risk partially as well as limiting liquidity risk (Calomiris et al., 2012). Hong et al. (2014) elaborate on the key difference between LCR and NSFR and categorise liquidity funding risk in two separate categories: asset liquidity and funding stability and link this with new liquidity requirements. They indicate that asset liquidity comprises of net liquid asset ratio, current ratio and government securities ratio, whereas funding stability comprises of brokered deposit ratio, core deposit ratio and non-core funding ratio. Based on the above categorises, LCR measures asset liquidity risk, whilst NSFR measures funding stability risk.

Vazquez and Federico (2015) and Chiaramonte and Casu (2017) both use data from American and European banks' and further add that smaller banks are more likely to collapse due to liquidity shortfalls, whereas large banks are more vulnerable to solvency issues due to inadequate capital buffers. Moreover, a single regulatory model of capital requirement cannot be used to promote financial stability as well as facilitate economic growth, as suggested by Thakor (2018). Even if banks were to hold liquid assets as part of higher capital requirements, it does not necessarily solve the issue of asset bubbles. Bank liquidity increases during uncertain market conditions or when banks are exposed to increased macroeconomic risk as investors adjust from direct investments in the market to saving deposits (Acharya and Naqvi, 2012). Investors' flight to safety behaviour leaves banks with excess liquidity from their liability side of the balance sheet due to higher saving deposits. This results in banks relaxing their lending standards, fuelling asset price bubbles and credit booms or alternatively sowing the seeds for the next crisis.

3.3.2. The role of Central Banks in liquidity provisions

The central argument in this section is premised on the claim that the LOLR policy by Central Banks significantly inflates systemic risk within the financial system. Studies such as Bagehot (1873) recommend that central banks should lend freely at high-interest rates during the pre-crisis periods, but they should do this only to banks that are solvent and illiquid, with good collateral, assets should be valued between during and pre-crisis prices, and that banks without collateral should be allowed to fail.

Literature on the role of central banks dates to the seminal work by Henry Thornton (1760 – 1815) and Walter Bagehot (1826 – 1877) on BoE's role as the LOLR. It has been known that central banks' play an important role in maintaining financial stability and preventing and managing the financial crisis (Allen, 2014). In an influential book written by Bagehot, "*Lombard Street*", Bagehot (1873) highlights important principals under which central banks' should lend to financial institutions during a crisis period: i) central banks' should lend freely at a high-interest rate during the pre-crisis period but only to solvent but illiquid banks' with good collateral ii) these assets should be valued between crisis and pre-crisis prices iii) Financial institutions without collateral should be allowed to fail. Rochet and Vives (2004) examine Bagehot's principal of central banks' lending to banks' which are illiquid but solvent in the context of the 21st-century of modern banking. They construct an equilibrium model to understand the rationale between investors and bank runs, and their findings conclude that the systemic risk can be avoided by adequate solvency and liquidity requirements, although the cost associated with this is large in terms of foregone returns that financial institutions would have generated. In other words, this interpretation shows that prudential regulations should be complemented by the LOLR policy.

Freixas et al. (2011) studied the role of central banks' as LOLR and the role of quantitative easing using aggerate liquidity risk in the context of GFC. Their research is similar to Allen et al. (2009) as they include idiosyncratic liquidity shocks to banks. They develop various models, including Federal reserve rates and Taylor rule to capture the effects on three banks' during the financial crisis, namely BNP Paribas, Bear Sterns and Lehman Brothers. Taylor Rule is a measure of the output gap and inflation rate (CPI), as this is the primary benchmark for setting interest rate policy. They use single and multiple effects of liquidity shocks on banks' and analyse central banks' role in setting interest rates. The interbank interest rate plays two important roles; firstly, from an ex-ante perspective, the expected rate of return from holding additional liquidity impacts banks' decision-making for holding short-term liquid assets against long-term illiquid assets, and secondly, ex-post rate controls the conditions at which banks can borrow liquid assets in response to distribution liquidity shocks (Freixas et al., 2011). Despite the role of interbank interest rates, they criticise that the primary role of financial institutions in an incomplete market is to share the risk and liquidity. However, banks' themselves face significant ambiguity regarding their own idiosyncratic liquidity needs during financial instability and hence will have larger borrowing needs than usual. They conclude that banks can achieve optimal allocation provided that the risk is shared among consumers and the insurance industry, but interbank interest rates should be kept low in conditions of financial instability.

Similarly, Drechsler et al. (2016) explore the role of LOLR in the context of the recent European debt crisis. They provide insights into the costs and benefits of central banks' interventions as LOLR considering classical theories by Thornton (1802), Bagehot (1873), and Diamond and Dybvig (1983). Their findings do not support the classical LOLR theory reasoning that despite LOLR stopping bank runs and allowing financial institutions to continue financing existing assets while limiting the fire sale phenomenon by banks, the LOLR theory does not address banks with weak capital. In support of the above, Bagehot (1873) states that banks with no collateral should be allowed to fail but fails to address the weak collateral. However, the ECB acted as the LOLR during the European debt crisis by providing loans to financial institutions through repo agreements. The criteria for the amount of funding is given based on the marked-to-market value of the collateral used minus the haircut. Banks with risky collateral are penalised with higher haircuts; however, the collateral needs to meet the criteria of ECB-eligible collateral. After September 2008, ECB began to offer subsidised haircuts that were below the private market haircuts value; for instance, in 2010, a Portuguese bond had a haircut of 4 per cent, and a German bond had a haircut of 3 per cent, whereas the same collateral had a haircut of 10 per cent and 2 per cent at London Clearing House exchange (Eberl et al., 2014; Drechsler et al., 2016). However, Drechsler et al. (2016) claimed that banks with weak capital structures borrowed more from LOLR and pledged riskier collateral as compared to highly capitalized banks. They also highlighted that banks with weak capital borrowed to buy part of risky sovereign debt and pledged a third of European sovereign debt as collateral. Hence, they argue that their findings point towards an alternative path of LOLR theories as weak banks have the incentive to take on more risk and borrow more from LOLR because they are close to being at default (Drechsler et al., 2016). In support, Acharya et al. (2017) argue that during the financial crisis, the Federal Reserve acted as a LOLR using two facilities – the Term Securities Lending Facility (TSLF) and Primary Dealer Credit Facility (PDCF) to address funding pressures during the recent financial crisis. They observe that TSLF allowed banks to exchange less liquid collateral for highly liquid Treasury collateral based on the fee set via auctions. Their findings also suggest that the demand for liquidity by banks as compared to the participants in the facilities, the bid rate and the amount borrowed was far higher on TSLF for banks with weak capital. Despite these, Bernanke (2013) strongly defends these arguments by stating that it was the Federal Reserve's LOLR facilities that prevented the credit crunch. However, Central banks lacked a full understanding of liquidity risk implications that resulted from banks' complex financial instruments such as derivatives, securitizations, and SPVs and their overwhelming dependence on short-term wholesale funding (Gobat et al., 2014).

Looking into EMEs, the role of Central Banks' LOLR function slightly differs as compared to developed economies. Rochet and Vives (2004) mentioned that financial crisis, along with currency crises, is common in EMEs in Asia, Latin America and Turkey. Since financial globalization, financial markets have been linked to the increased flow of capital in cross-border banking activities with a surge in foreign currency short-term debt, and Vives (2006) claimed that a crisis in EMEs has been blamed due to foreign currency (FX) exposures. Chuliá et al. (2018) argued that volatility spillover in the FX market creates its own risk for any given country, either facing depreciation or appreciation pressures. In a scenario of currency appreciation, central banks may lean against the wind to the degree that they are willing to do so. In contrast, the response of the central bank is much more restricted in a scenario of currency depreciation and, in the worst case leading to reducing the limit of FX reserves.

The study conducted by Chuliá et al. (2018) analysed currency downside risk in light of liquidity and financial stability risks taking 20 different currencies both from developed markets and emerging markets, a study similar to Diebold and Yilmaz (2015). Chuliá et al. (2018) discovered that currency appreciation and depreciation are tied to sovereign debt issues. Moreover, their findings suggest that the more liquid a set of currencies are, the more affect these liquid currencies have on other non-liquid currencies during periods of shock. They add that for emerging marketing, depreciation pressures are a real cause of concern for central bankers, which can lead to the destabilisation of their balance of payments. On the other hand, for mature economies, with more liquid currencies, appreciation or depreciation is more related to portfolio diversification with little consequences for the real economy. Hence, they argue that emerging market currencies are net transmitters of volatility, whereas developed market currencies are net receivers of volatility.

Tucker (2014) points out the issue of how central banks manage the crisis if the liquidity crisis is not in a local currency. The U.S. is bound to be the final lender of last resort of the dollar to the world as long as the key reserve currency is U.S. dollars (Lawrence, 2012). Even if the shortage is in Euro or Yen, the issuing central bank does not take exposures of the beneficiaries of LOLR functions (Tucker, 2014). The domestic central bank may decide to extend the LOLR operation to a bank but takes collateral to mitigate the risk. The central bank may then borrow money from the issuing central bank, holding its own currency as collateral.

The issuing central bank holds its foreign currency as collateral against the deposit of the domestic central bank. The bigger issue for issuing central banks' is credit exposure to the counterparty central bank and how valuable its currency is (Tucker, 2014). The author also argues that due to the recent GFC, issuing central banks are cautious about the moral hazard issue and are often left with a difficult choice between lending to the counterparty country to maintain financial stability or allowing a crisis to erupt that could be driven home. The latter choice becomes more difficult for larger EMEs. Dobler et al. (2016) dismissed the idea that the commercial banks' management ought to manage FX risks with relatively high dollarization in the EMEs, as this was evident in the GFC, where some banking sectors held a large FX exposure and were constrained due to global FX liquidity required.

3.3.3. Liquidity Provisions and Systemic Liquidity Risk

The main argument in this section revolves around the idea that when liquidity risks or problems are systemic, they are likely to have adverse effects on the stability of the entire financial system, as well as the economy. This is a situation that is characterized by banks taking excessive liquidity risk, which is often through relying too much on short-term wholesale funding.

In the era of modern banking, the concept of interbank markets has significantly played a role in financing banks' assets. The role of these markets is to ensure adequate liquidity is transferred from banks with surplus liquidity to banks in need of liquidity. According to Allen (2014), these markets are key to central banks' monetary policy and are crucial in sustaining the stability of the overall financial system. The financial regulations of central banks had a primary focus on ensuring that banks' have enough funds to protect themselves from the risks arising from their loan portfolios, such as credit risk or risks from the liabilities side. Ladley (2013) argues that GFC demonstrated serious shortcomings attached to this approach. Ladley (2013) further adds that problems with few banks easily spread throughout the financial system, where many financial institutions were adequately capitalized according to the regulatory capital requirements. The author critiques that the concept of interbank lending is to provide stability, but instead, it is also a mechanism by which contagion risks of one bank could spread between other financial institutions.

The study conducted by Allen and Gale (2004) shows the interactions between financial institutions and markets can lead to financial fragility. It, however, remains the role of the central banks to ensure that markets have adequate liquidity. Allen and Gale (2004) also add that financial institutions should have an incentive to provide liquidity in the market based on the volatility in the market, the type of asset they invest in and the risk of default. Additionally, if the interaction between the financial institution and markets is incomplete, there appear to be explanations for the systemic-wide crisis. Allen and Gale (2004) developed a model to explain the contagion risk that interbank markets pose. They argue that Diamond and Dybvig's (1983) theories do not address the underlying risk that arises from multiple financial institutions during a bank run. A study conducted by Berger & Bouwman (2009) investigates ways of calculating the liquidity within the US banking system by all US banks using data from 1993 -2003. They develop a model in three steps; firstly, they consider all of the banks‘ assets, liabilities, equity and off-balance sheet exposures into three different liquid classes; liquid, semi-liquid and illiquid. Secondly, they assign weights to calculate three categories of liquidity. In their third step, they construct liquidity measures based on loan maturity and on and off-balance sheet assets and liabilities. Their findings show that U.S. banks' liquidity creation exceeded $2.8 trillion in 2013. However, their findings do not show any empirical evidence of addressing the contagion risk within interbank markets and its interlinkage between financial institutions from a systemic liquidity risk perspective.

Acharya et al. (2012) addressed liquidity issues within the U.S. interbank market. They construct a model based on three assumptions. Firstly, they assume that some assets are bank-specific and are worth more than trading in interbank markets. Secondly, they assume that there are frictions in the interbank lending markets which act as the moral hazard in the interbank market, such are the contagion risk arising from the borrowing financial institution. They argue that the borrowing bank would need to have a claim large enough for other financial institutions to monitor its assets. Thirdly, they assume that liquidity is concentrated within a few banks' giving them market power. However, Goodfriend and King (1988) believe otherwise, as they argued that in an efficient interbank market, central banks should not lend to individual banks but instead provide liquidity via OMOs, as this would reduce liquidity concentration problems. Freixas and Jorge (2007) argue that the interbank market would fail to allocate liquidity adequately due to frictions such as asymmetric information of banks' assets.

Jobst (2014) constructs a Systemic Risk-adjusted Liquidity (SRL) model taking into account the new Basel III liquidity requirements, such as the NSFR, using data on the US Banking sector. First, they calculate the market implied value for both RSF and ASF to capture market interactions using option prices. Secondly, they adjust market risk using RSF as a strike price modelled based on daily options prices. This allows for expected loss from liquidity risk to be evaluated. Thirdly, they determine the expected joint losses from liquidity risk within the financial system. However, their study does not show any evidence of considering other elements of Basel III, such as CCyB and Capital Conservation Buffer (CCoB), as these instruments are equally important in capturing the systemic liquidity risk as both buffers carry HQLAs. Adrian and Boyarchenko (2013) highlight that both liquidity and capital requirements impact the risk-taking nature of banks. They analyse the systemic risk in the US banking sector using BHCs data. They include variables such as LCR and NSFR measures, Haircuts on weak collateral and then use the Dynamic Stochastic General Equilibrium (DSGE) model. Their findings suggest that prudential capital and liquidity requirements affect the systemic risk and return trade-off.

3.3.4. Research Hypotheses

After reviewing both theoretical and empirical literature, we develop the following hypothesis:

H_{1a}: New Capital and Liquidity Regulations, such as the Net stable funding ratio (NSFR), significantly and positively affect bank stability.

H_{1b}: NSFR complaint banks reduce their individual contributions towards systemic risk.

In this study, capital and liquidity regulations will be operationalized by Net stable funding ratio (NSFR), while bank stability by Z score and contributions towards systemic risk by CoVaR

3.4. Research Methodology

3.4.1. Data Requirements

The data sample for this study includes 550 observations from 55 banks listed on the MSCI Emerging Market Financials Index covering nine emerging market economies from Bankscope, spanning ten years of data from 2009 to 2019. The data contains banks' balance sheet information covering both asset liability as well as off-balance sheet items on consolidated bases reported in USD. The 10-year time span will enable us to consider the transition phase post-GFC, particularly the changes to capital and liquidity regulations. Additionally, this will also evaluate banks in emerging markets that meet NSFR liquidity measures and banks that do not meet the NSFR threshold and their contribution towards systemic risk.

In order to avoid sample selection bias, we followed the recommendation by Saleh and Abu Afifa (2020) on minimizing selection bias, where the authors emphasized the importance of correctly restating and revisiting the main goal of the research, then define the inclusion criteria from the target population, and then use random sampling to select the units to include in the study. Using random sampling ensures that every sampling unit has an equal chance of being included in the final sample. After taking into account the inclusion criteria, the emerging economies and banks therein were selected using random sampling.

3.4.2. NSFR Calculation

NSFR is calculated using the Basel III NSFR framework (BCBS, 2014) as done in studies conducted on European and American Markets (see Chiaramonte and Casu, 2017; DeYoung and Jang, 2016). The BCBS defines NSFR as the ratio of Banks ASF to its RSF (BCBS, 2014). This can be calculated as

$$\mathrm{NSFR} = \frac{\mathrm{ASF}}{\mathrm{RSF}} \qquad (3.1)$$

ASF represents the weighted average of a bank's liabilities and capital with higher weights assigned to stable sources of funding such as equity, subordinated debt, core and savings deposits and lower weights assigned to less stable sources of funding such as other deposits and short-term borrowing. ASF can be calculated as

$$ASF = Equity + Total\ LT\ Funding + (Customer\ Saving\ Deposits) * 0.95 + (Customer\ Current\ Deposits) * 0.90 + (Other\ deposits\ and\ ST\ Borrowing) * 0.5 \quad (3.2)$$

Likewise, RSF is a weighted average of the bank's assets and OBS items with higher weights assigned to long-term, illiquid and volatile assets such as trading securities, assets pledges as collateral, investments in subsidiaries, corporate loans and loans to SMEs and consumers. This can be represented mathematically as

$$\begin{aligned} RSF = {} & Other\ Assets + At.Investments\ in\ associates \\ & + Reserves\ for\ impaired\ Loans \\ & + (Governoment\ Securities + OBS\ items) * 0.05 \\ & + (Other\ Securities + Loans\ and\ Advances\ to\ Banks) * 0.5 \\ & + (Mortgage\ Loans) * 0.65 + (Retail\ and\ Corporate\ Loans) \\ & * 0.85 \quad (3.3) \end{aligned}$$

The full criteria of weights for each RSF and ASF instrument are shown in *Appendix B*. In the following step of this study, we measure the default risk of the banks which meet and breach the NSFR threshold to examine which categories of banks exhibit lower and higher default risk.

3.4.3. Default Risk Models

Research Scholars from the fields of finance and accounting have extensively studied bankruptcy prediction models since the works of Altman (1968) and Ohlson (1980) on Z-score and O-score. However, there has been a revitalised interest in default risk prediction models, particularly post-financial crisis capital and liquidity reforms under Basel III. For example, Lallour and Mio (2016) analyse NSFR's predicting power for bank failures and solvency issues against traditional accounting default risk measures. They use the multivariate logit model to examine the predictive power using variables such as capital adequacy ratio, leverage ratio, core funding ratio, loan-to-deposit ratio, an asset-to-deposit ratio, NSFR and liquid asset ratio with macroeconomic variables such as gross government debt-to-GDP ratio and current account deficit of the home country of the bank. Their findings suggest that the NSFR, core funding ratio and deposit-to-asset ratio were statically significant predictors of financial distress in firms. Nonetheless, their model relies purely on balance sheet information and does not incorporate market information. Hillegeist et al. (2004) add that accounting data is by nature historical and is prepared on a going concern principal hence using that data to predict the future, especially one that violates the "going concern" principal itself, is fundamentally flawed. Accounting-based measures relay on financial statements, which are effectively designed to measure the past performance of the bank and are not a good indicator of future performance.

Nevertheless, the Z-score model was established more than 50 years ago using multivariate discriminant analysis, and numerous market-based default risk prediction models exist. However, the Z-source model continues to be used globally as a primary or secondary tool for bankruptcy prediction and analysis both in research and practice (Altman et al., 2017). The use of the Z-score measure is beneficial for businesses that do not have market data or are not listed in their respective stock markets (Altman et al., 2017). Additionally, from a regulator's perspective, the current Basel requirement needs banks to validate their distress prediction models and record their results. Henceforth accounting-based models play a crucial role in an international context. Accounting-based models also compliment recent accounting regulations on IFRS 9, where default is recognized at initial recognition as compared to once a default materializes. However, Agarwal and Taffler (2008) acknowledge that accounting numbers are subject to reporting standards (such as cost accounting) which may hinder the true representation of the economic value of cost.

Market-Based models such as Black and Scholes (1973) and Merton (1974) using contingent claims approach overcomes most of the criticisms faced by accounting-based models such as sound theoretical model, stock price reflects the information contained in accounting statements, market variables are not influenced by accounting policies, and market prices reflect future performance of the company. However, market-based models have assumptions which are unpractical in real-world financial markets, as these models assume the stock returns would be normal, do not differentiate between types of debt issued by the company and only assumes that the firm only has one zero coupon loan. More importantly, it assumes that markets are perfectly liquid and market trading is continuing; however, during the GFC, this was not the case. Market-based models fail to address some of the basic empirical questions regarding the correlation between corporate failures and deteriorating investment opportunities (Campbell et al., 2008). Nevertheless, the default risk prediction power between market-based models and accounting-based models is statistically not significant (Agarwal and Taffler, 2008). Their study compares both the Black Scholes Merton options-based model and Z-score using variables such as 1-month risk-free rates, the market value of equity, daily stock price information, return on assets, and return on risk-weighted assets using the ROC curve. They conclude that neither the market-based model nor accounting-based models are statistically significant is failure prediction, although both models carry unique data for firm failure. However, market-based models are theoretically well-founded, but empirically, their lack of superior performance is not to be taken by surprise. Empirical superiority of the market-based model is hindered due to the restrictive assumptions of the model itself (Hillegeist et al. 2004). Despite criticism of traditional accounting-based models and theoretically appealing framework for market-based models, practically accounting-based models are robust and not dominated by market-based models such as Black Scholes Distance to default model and KMV model (Agarwal and Taffler, 2008).

3.4.4. Default risk Measurement

In this study, we employ the Z-score model to measure default risk for two main reasons. Firstly, the measurement of Basel III's NSFR requirement is measured based on financial statements rather than market information hence using the Z-score model naturality compliments components of NSFR measurements, mainly ASF and RSF. Secondly, despite the drawbacks of the Z-score model as well as market-based models, neither of them is statistically superior to one other in predicting default risk (Agarwal and Taffler, 2008). The Z-Score model has been the dominant model since its existence more than 45 years ago; it is still used as a main supporting tool for default prediction or financial distress analysis both in research and practice (Altman et al., 2017). This study uses a similar approach used by Giordana and Schumacher (2017), but the scope of research here is to measure the impact of Basel III liquidity standards on emerging markets. Furthermore, the set of variables used is slightly different to the one applied in their paper. This essentially will cover a diverse nature of risks that emerging markets are exposed to as compared to developed markets.

The data input for Z-Score can be derived from the balance sheet information of the banks and is calculated as follows:

$$\text{Z - Score} = \frac{E_{it}/A_{it} + ROA_{it}}{\sigma(ROA_{it})} \quad (3.4)$$

Where E_{it} is the Tier 1 Capital of a Bank i at the time t, A_{it} are the total assets of the bank i at the time t. Hence E_{it}/A_{it} is derived into Capital to Assets Ratio (CAR), likewise ROA_{it} is the return on assets calculated as profits after tax divided by the total assets on a yearly basis. σ is the standard deviation of ROA_{it} as a measure of default risk as the square of its inverse is the probability of losses that would exceed equity in a normally distributed return. Hence equation 3.4 can be rewritten as

$$Z\text{ - Score} = \frac{CAR_{it} + ROA_{it}}{\sigma(ROA_{it})} \quad (3.5)$$

The Z-Score indicator relies on a few assumptions in this study. Firstly, the data reported in the financial statements are accurate and transparent and decisively linked to the respecting bank's fundamental performance. Due diligence on the accuracy of the data reported has been cross-examined from other data-providing vendors to avoid any error in reporting from data-providing vendors. Secondly, the banks selected in the sample are listed in the MSCI index and are assumed to be domestically systemic important banks in the listed country.

The relationship between CAR and ROA has been studied both in developing and developed economies. One may conclude that financial institutions with higher leverage would be penalized since these institutions have a small portion of the equity that could be used to absorb losses given the case of emerging markets; likewise, a higher ROA leads to lower default risk and standard deviation of ROA decreases the Z-score since it increases the probability that equity may fall short to cover the losses that may originate (Giordana and Schumacher, 2017). Equally, if a bank was to improve its ROA by increasing leverage, it is also possible that an increment in leverage can bring that bank closer to default. This is because high leverage is associated with higher ROA under the condition that a bank is able to generate enough profits to service its debt. On the other hand, if such a bank fails to generate enough profits, it will have a lower ROA.

Feng et al. (2020) studied the relationship between capital adequacy and growth in lending in emerging market dynamics. They argue that capital adequacy and ROA are heterogeneously related to each other and are primarily dependent on bank-specific characteristics and economic conditions. Their results indicate higher capital requirements and ROA are negatively associated with each other during staggering economic growth. Their study employs an OLS estimation model using variables such as CAR, change in CAR, ROA, RWA and Liquid assets. In general regression model for panel data can be written as follows:

$$\log\left(ZScore_{i,t}\right) = \beta_0 + \beta_1 X_{it}^{1} + \beta_2 X_{it}^{2} + \cdots + \beta_k X_{it}^{k} + u_{it}$$

where i denotes cross sections and t denotes time-periods with $i = 1,2,\cdots,n$, and $t = 1,2,\cdots T$. $\log\left(ZScore_{i,t}\right)$ is the dependent variable, Xs are independent variables. βs represents relevant intercept and slope coefficients, and u_{it} is the error term.

The three most common estimation techniques used to estimate the model are pooled regression, random effects, and fixed effects models. The simplest way of estimating the model is ignoring the space and time dimensions of the panel data and simply estimating the model by pooling the panel data. A pooled regression model corresponds to running ordinary least squares (OLS) on the observations pooled across i and t.

In practice, the assumptions underlying ordinary least squares estimation of the pooled model are unlikely to be met. First, if there is individual heterogeneity, then omitting unit-specific factors that might affect the dependent variable contributes to the inconsistency of the least squares estimator. Furthermore, the assumptions of homoskedasticity and uncorrelated errors for the same individual are unrealistic, and autocorrelation and heteroscedasticity are two common specification issues that arise in panel data models. Finally, the OLS method ignores the time series aspect of panel data, and there will be potential bias caused by this inconsistency.

When individual heterogeneity is assumed to be important, unobserved effects models, estimated with fixed and random effects approach, become crucial. The general specification of these type of models can be presented as follows:

$$\log\left(ZScore_{i,t}\right) = \beta_0 + \beta_1 X_{it}^{1} + \beta_2 X_{it}^{2} + \cdots + \beta_k X_{it}^{k} + c_{it} + u_{it}$$

where c_i is an unobserved effect (unobserved component, latent variable, or unobserved heterogeneity) and u_{it} is the idiosyncratic errors or idiosyncratic disturbances.

The unobserved component is called a “random effect” when it is treated as a random variable, and it is assumed that the individual specific effects are uncorrelated with the independent variables. For the estimation procedure, the random effects approach puts c_i into the error term and then accounts for the implied serial correlation in the composite error, using a generalized least squares analysis. By contrast, unobserved effects are called a “fixed effect” when it is treated as a parameter to be estimated for each cross-section observation i, and the fixed effect assumption is that the individual specific effects are correlated with the independent variables. If some of the regressors are endogenous, but the endogeneity can be modelled as a dependence between the regressors and an unobserved component that is fixed over time, we can apply a fixed effects estimator, which may result in consistent estimation. The main drawback of fixed effects estimators is the inability to estimate the impacts of time-invariant explanatory variables.

To choose between fixed effects and random effects, generally, a formal test developed by Hausman (1978) is run during our empirical analysis, as shown in table 8. To understand the essence of the test, first note that the random effect estimator is at least as efficient as the fixed effect estimator and identifies all the parameters, unlike the fixed effect estimator omits the estimation of time-invariant variables. However, the fixed effect model is more robust as it does not require mean independence between the individual-specific effects and the observed regressors. The Hausman test is implemented under the null hypothesis that the fixed effects and random effects estimators do not result in systematically different outcomes. Therefore, the random effect estimator is consistent and efficient under the null hypothesis but inconsistent under the alternative hypothesis. In comparison, the fixed effect estimator is consistent under both hypotheses but less efficient than the random effect under the null hypothesis. If the null hypothesis is rejected, the conclusion is that random effect is not appropriate, so a fixed effects model should be used.

In table 7, as a robustness check, we also hypothesize the possibility of lag impacts for the dependent variable, assuming the existence of dynamic panel data effects. This modifies the main regression specification as follows:

$$\log(ZScore_{i,t}) = \beta_0 + \rho \log(ZScore_{i,t-1}) + \beta_1 X_{it}^1 + \beta_2 X_{it}^2 + \cdots + \beta_k X_{it}^k + c_{it} + u_{it}$$

By construction, the unobserved panel-level individual effects are correlated with the lagged dependent variables, which makes the standard estimators discussed above inconsistent. Both fixed and random effect models are estimated with the underlying assumption of strict exogeneity, meaning that the controlled regressors are not correlated with the error terms. The strict exogeneity assumption is often violated in economic problems, especially when there is a dynamic adjustment process that creates inertia. Therefore, in the specification with the lagged dependent variable, strict exogeneity assumption is violated and should be relaxed with the assumption that the regressors are weakly exogenous or sequentially exogenous or predetermined. This assumption is more natural than the strict exogeneity assumption and does not require the future values of the regressors to be uncorrelated with the error terms. In this last specification, when the lag of the dependent variable is one of the explanatory factors, pooled OLS is obviously inconsistent, as the disturbance in pooled regression is surely correlated with the lag of the dependent variable. Similarly, the fixed effects and random effects are also inconsistent.

A simple approach for consistent estimation of a dynamic panel data model was first proposed by Anderson and Hsiao (1982), who suggested an instrumental variable estimator with a generalized method of moments (GMM) approach, where after the first differencing of the model specification, a natural candidate as an instrumental variable for the lag term of the change in the dependent variable is taken the second lag term of the dependent variable. This is a proper instrument since it is correlated with the endogenous right-hand side variable, a change in the lag of the dependent variable but not correlated with the error term of the regression. A more efficient and consistent estimation approach for dynamic panel data models was proposed by Arellano and Bond (1991), who further developed the idea proposed by Anderson and Hsiao (1982), by noting that, in general, there are many more instruments available, and identify that not only all lagged values of the dependent variable but also all values of the regressors are available as instruments. Therefore, this estimator is more efficient, as it uses all the information, combining all the restrictions together in a GMM estimator.

Nevertheless, we chose fixed effects as our baseline specification, as the lag term in Arellano & Bond model is not significant. The Hausman test shown in table 8 suggests that FE is preferred over RE, and F-test for individual heterogeneity suggests that POLS is not preferred.

Hence, the model specification for this study is implemented under three different specifications. In the baseline specification, we regress the log value of Z-Score on NSFR only, as shown in equation 3.6, similar to the work conducted by Giordana and Schumacher (2017) and Ali et al. (2022). Then the model is extended with the period dummy and its interaction with NSFR, as shown in equation 3.7. Finally, a full model with control variables is examined, as shown in equation 3.8. In all the cases, we employed fixed effects estimator to control for bank-specific individual heterogeneity, as well as country-specific fixed effects are considered. As a robustness check, alternatively, as shown in Table 7, we also present the full model estimated with pooled OLS (POLS), Random Effects (RE) and Arellano-Bond linear dynamic panel-data (AB) estimators.

$$\log(\mathrm{ZScore}_{i,t}) = \alpha_i + \beta_1 \mathrm{NSFR}_{i,t} + \gamma \cdot \mathrm{Country}_i + \varepsilon_{i,t} \qquad (3.6)$$

$$\log(\mathrm{ZScore}_{i,t}) = \alpha_i + \beta_1 \mathrm{NSFR}_{i,t} + \beta_2 \mathrm{Period}_t + \beta_3 \mathrm{NSFR}_{i,t} * \mathrm{Period}_t + \gamma \cdot \mathrm{Country}_i + \varepsilon_{i,t} \qquad (3.7)$$

$$\log(\mathrm{ZScore}_{i,t}) = \alpha_i + \beta_1 \mathrm{NSFR}_{i,t} + \beta_2 \mathrm{Period}_t + \beta_3 \mathrm{NSFR}_{i,t} * \mathrm{Period}_t + \beta_x \,\mathrm{Bank\ Specific}_{i,t} + \gamma \cdot \mathrm{Country}_i + \varepsilon_{i,t} \qquad (3.8)$$

$$\log(\mathrm{ZScore}_{i,t}) = \alpha_i + \beta_1 \mathrm{NSFR}_{i,t} + \beta_2 \mathrm{Period}_t + \beta_3 \mathrm{NSFR}_{i,t} * \mathrm{Period}_t + \beta_4 \left(\frac{\mathrm{ROA}}{\sigma_{\mathrm{ROA}}}\right)_{i,t} + \beta_5 \left(\frac{\mathrm{CAR}}{\sigma_{\mathrm{ROA}}}\right)_{i,t} + \beta_6 \left(\frac{\mathrm{LLP}}{\mathrm{Gross\ Loans}}\right)_{i,t} + \beta_7 \left(\frac{\mathrm{LT\ debt}}{\mathrm{TA}}\right)_{i,t} + + \beta_8 \log(\mathrm{Total\ Assets})_{i,t} + \beta_9 \mathrm{EFF}_{i,t} + \gamma\, \mathrm{Country}_i + \varepsilon_{i,t} \qquad (3.8a)$$

Where $\log(\mathrm{ZScore}_{i,t})$ is the log value of Z-Score, $\mathrm{NSFR}_{i,t}$ is NSFR calculated as per equation 3.1. We introduce a period dummy Period_t which takes the value of 1 for $\mathrm{Year} \geq 2018$ and 0 otherwise. The rationale behind using a period dummy is to observe the effect of NSFR before and after NSFR became a mandatory requirement for banks to uphold. $NSFR_{i,t} * Period_t$ is the interaction term highlighting the effect of NSFR post-2018 on banks' default risk. $Bank\ Specific_{i,t}$ is the vector of control variables that includes normalized Return on Asset (ROA) $\left(\frac{ROA}{\sigma_{ROA}}\right)_{i,t}$ and normalized Capital adequacy ratio (CAR) $\left(\frac{CAR}{\sigma_{ROA}}\right)_{i,t}$, $\left(\frac{LLP}{Gross\ Loans}\right)_{i,t}$ is Loan Loss Provision (LLP) against Gross Loans as a measure of banks' credit risk. $\left(\frac{LT\ debt}{TA}\right)_{i,t-1}$ is the banks long-term debt against the total assets ratio and represents the banks debt structure. $\log(Total\ Assets)_{i,t}$ denotes to the size of the banks' balance sheet, $EFF_{i,t-1}$ is an Efficiency ratio calculated as a non-interest expense by net income; this variable measures if a bank has effective resource allocation systems in place. $Country_i$ is country fixed effects. , $\varepsilon_{i,t}$ is the standard error term, and α_i, β_n, and γ_t are the estimated individual specific constant terms and slope parameters.

Banks' assets have always been considered illiquid and one of the main sources of fragility within the banking sector (Wagner, 2007). Therefore, national regulators levy all banks to place liquid assets to defend against liquidity shocks. Liquid assets held by financial institutions are considered a net defensive position against liquidity shocks that a bank may face (Davis, 2008). Hence, a bank with a higher liquid asset has the capability to fund liquidity scarcity in times of distress or while facing liquidity shocks (Gatev and Strahan, 2006). An increase in liquidity in normal economic conditions has no effect on the stability of the bank. However, the initial impact on the banks allows banks to transfer risks out of their balance sheet at the same time, and this also triggers banks to engage in risk-taking activities to it optimize returns which ultimately offsets the initial impact of stability that a bank had. Similarly, in times of economic distress, though, an increase in liquid assets makes banks less vulnerable to bank runs due to reduced losses. However, banks' offset this through increased risk-taking to sustain both the asset and liquidity side of the balance sheet during economic stress while also considering profit maximization targets to maintain investor confidence. This effectively offsets the initial impact on bank's stability.

3.4.5. Z-Source Empirical Results

Figures 9 illustrate the average log values of Z-Score by year and country, as well as the developments for the examined period. We observed that, on average, the highest value of Z-Score is observed for Indonesian banks and the lowest value for Hungarian banks. These findings are consistent with the findings of Achsani and Kassim (2021), who argued that Islamic banking in Indonesia showed more stability when compared to conventional banking, especially in facing macro and microeconomic shocks. For the examined period, the average Z-score is mainly decreasing till 2013-2015, after which a sharp increase was observed for almost all the examined countries. An important turning point is also 2018, after which the slope of the Z-Score development line changed for most of the examined countries. The obvious turning point in 2018 is also seen in the development of NSFR, figure 10

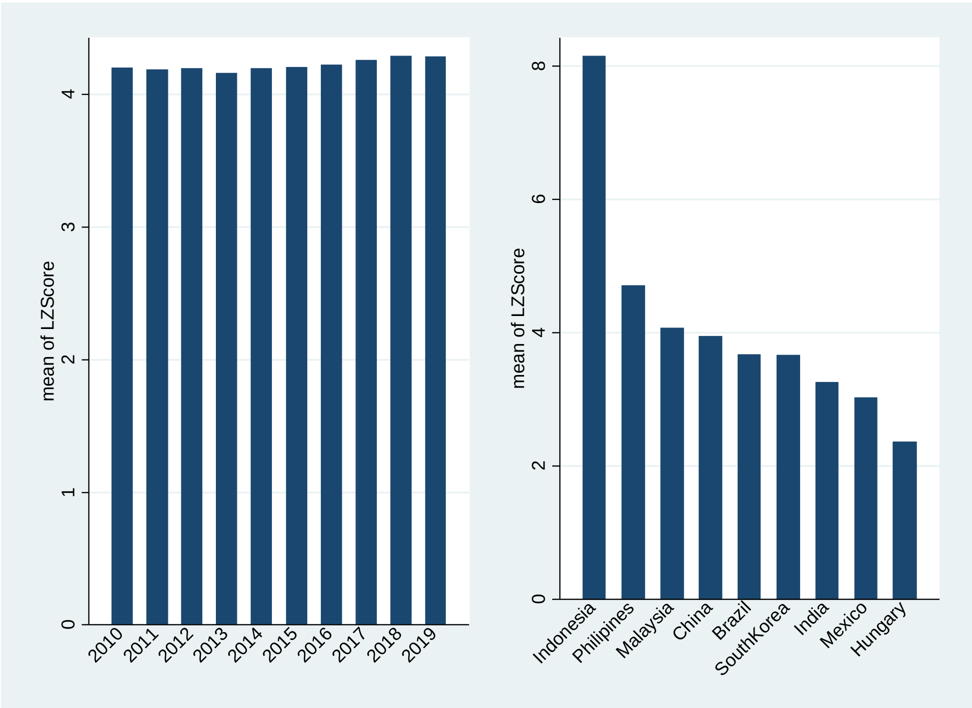

Figure 9: Mean of Log Z-score based on year and country (Source: authors analysis)

The main descriptive statistics for Z-Score and the considered explanatory factors by period are summarized in Table 3. The pair-wise correlation matrix is given in Table 5. On average log of Z-Score value for the examined sample of banks is about 4.22 units, with 1.04 as the lowest value (Indian AXSBIN bank, 2013) and 9.25 as the highest value (Indonesian BBCAJK bank, 2019). These findings are consistent with the findings of Sharma, Talanand Jain (2020) and Achsani and Kassim (2021), who studied the Indian and Indonesian banks, respectively. Sharma, Talanand Jain (2020) concluded that asset quality is one of the biggest risks in Indian banks. The authors further indicated that the lower z score is a result of the rise of bad loans in Indian banks. Achsani and Kassim (2021) attribute the high z score of Indonesian banks to the stability of Islamic banking in the country. The average value of the log Z-Score increased for the post-2018 period from 4.20 to 4.29. In contrast, the average value of NSFR slightly decreased after 2018, from 1.13 to 1.10.

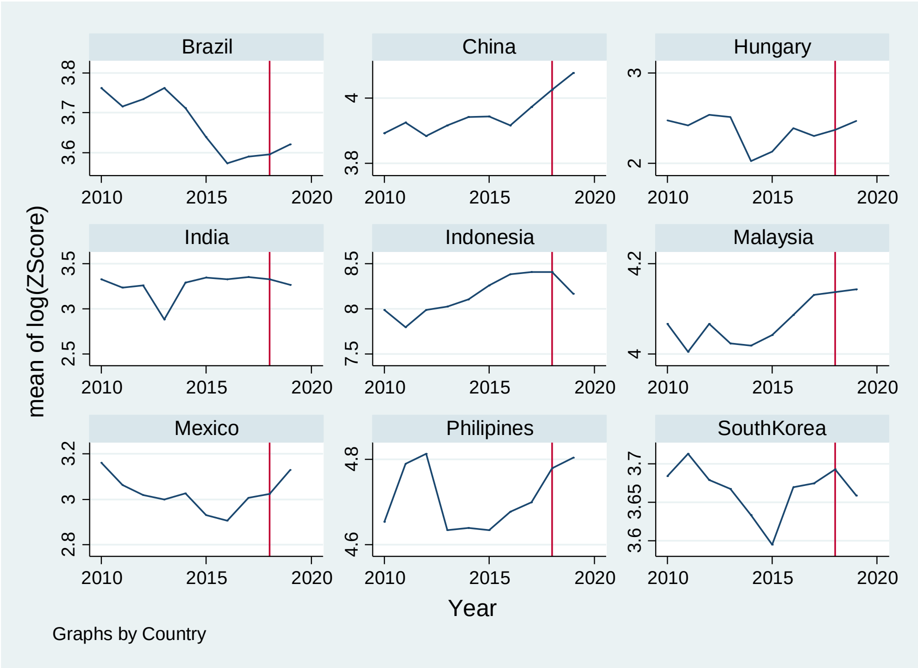

Figure 10: Mean Z-Score of Countries pre and post-2018 (Source: authors analysis)

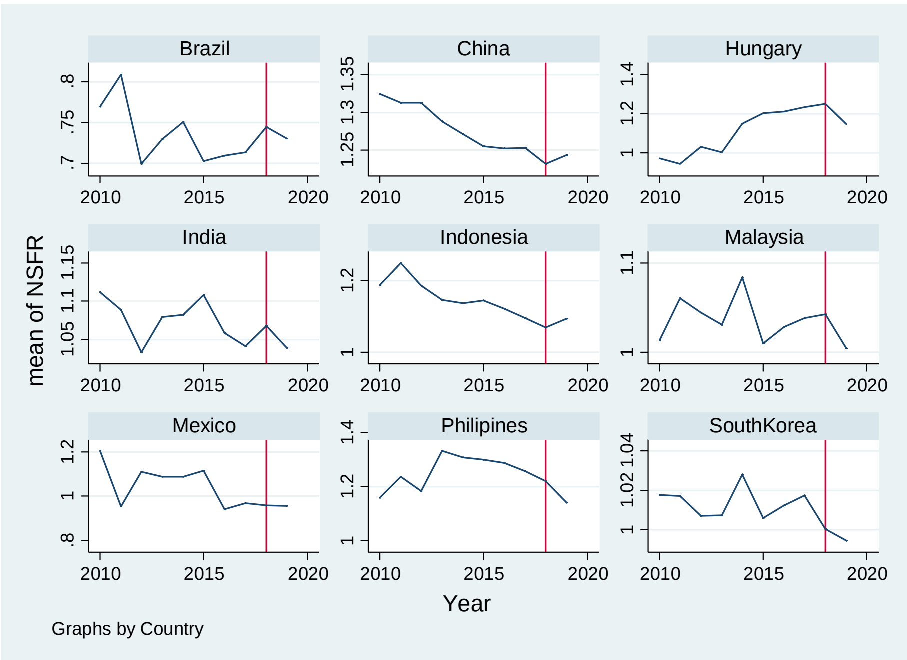

Figure 11: Mean of NSFR by Countries pre and post-2018 (Source: authors analysis)

Variable	Mean	Median	Min	Max	Sd	N
	Pre-2018					
Log(Z Score)	4.20	3.92	1.04	9.12	1.48	440
NSFR	1.13	1.16	0.53	1.67	0.20	440
ROA/sigma ROA	6.66	6.18	-0.92	23.87	4.01	440
CAR/sigma CAR	9.04	7.30	0.00	26.29	5.39	440
LLP/Gross loans	0.03	0.02	0.00	0.17	0.02	440
LT debt/TA	0.06	0.03	0.00	0.37	0.07	440
Log(Total Assets)	11.79	11.63	8.25	15.20	1.41	440
EFF	0.37	0.41	0.00	0.78	0.21	440
	Post-2018					
Log(Z Score)	4.29	4.01	2.37	9.25	1.54	110
NSFR	1.10	1.13	0.64	1.62	0.18	110
ROA/sigma ROA	6.00	5.50	-0.33	21.20	4.00	110
CAR/sigma CAR	9.70	8.38	2.38	25.16	4.98	110
LLP/Gross loans	0.03	0.03	0.01	0.08	0.02	110
LT debt/TA	0.07	0.04	0.00	0.39	0.07	110
Log(Total Assets)	12.18	12.12	9.48	15.28	1.37	110
EFF	0.36	0.36	0.00	0.80	0.22	110
	Total					
Log(Z Score)	4.22	3.92	1.04	9.25	1.49	550
NSFR	1.13	1.15	0.53	1.67	0.20	550
ROA/sigma ROA	6.53	5.97	-0.92	23.87	4.01	550
CAR/sigma CAR	9.17	7.58	0.00	26.29	5.31	550
LLP/Gross loans	0.03	0.03	0.00	0.17	0.02	550
LT debt/TA	0.06	0.04	0.00	0.39	0.07	550
Log(Total Assets)	11.87	11.75	8.25	15.28	1.41	550
EFF	0.37	0.40	0.00	0.80	0.21	550

Table 3: Summary Statistics

	Pre2018	Post2018	pval
LZScore	*4.2*	*4.29*	*0.60*
NSFR	*1.13*	*1.1*	*0.08*
ROA	*6.66*	*6*	*0.12*
CAR	*9.04*	*9.7*	*0.24*
LLPtoGrossLoansRatio	*.03*	*.03*	*0.70*
LTDebtTotalAsset	*.06*	*.07*	*0.19*
L_TotalAssets	*11.79*	*12.18*	*0.01*
EfficienyRatio	*.37*	*.36*	*0.56*

Table 4: *Mean difference between the two periods*

As can be seen in Table 4, we only reject (with 95 % confidence) the null hypothesis (under the null hypothesis, the average value of the examined variables is equal across the two periods) only for L_TotalAssets, meaning that the average values of the other variables are statistically not different across the two periods.

		1	2	3	4	5	6	7	8
		Pre-2018							
Log(Z Score)	1	1							
NSFR	2	0.0999*	1						
ROA/sigma ROA	3	0.4159*	0.1709*	1					
CAR/sigma CAR	4	-0.3191*	-0.4278*	-0.2745*	1				
LLP/Gross loans	5	-0.0497	-0.1684*	-0.1255*	-0.0339	1			
LT debt/TA	6	-0.3517*	-0.5058*	-0.3100*	0.5052*	0.0334	1		
Log(Total Assets)	7	-0.2207*	0.0953*	0.1229*	0.2060*	0.0412	0.1230*	1	
EFF	8	-0.6095*	-0.1427*	-0.2389*	0.3431*	-0.1106*	0.3811*	0.2486*	1
		Post-2018							
Log(Z Score)	1	1							
NSFR	2	0.0331	1						
ROA/sigma ROA	3	0.4525*	0.13	1					
CAR/sigma CAR	4	-0.3421*	-0.3184*	-0.2281*	1				
LLP/Gross loans	5	-0.0491	-0.125	-0.0487	0.0381	1			
LT debt/TA	6	-0.4058*	-0.3128*	-0.2598*	0.3504*	0.0851	1		
Log(Total Assets)	7	-0.2467*	0.2130*	0.0807	0.2198*	0.2080*	0.1137	1	

EFF	8	-0.5836*	-0.2025*	-0.2586*	0.4199*	-0.2426*	0.4646*	0.1788	1
		Total							
Log(Z Score)	1	1							
NSFR	2	0.0851*	1						
ROA/sigma ROA	3	0.4208*	0.1674*	1					
CAR/sigma CAR	4	-0.3216*	-0.4108*	-0.2681*	1				
LLP/Gross loans	5	-0.049	-0.1621*	-0.1130*	-0.0215	1			
LT debt/TA	6	-0.3609*	-0.4716*	-0.3026*	0.4773*	0.043	1		
Log(Total Assets)	7	-0.2220*	0.1074*	0.1064*	0.2124*	0.0703	0.1263*	1	
EFF	8	-0.6042*	-0.1516*	-0.2406*	0.3557*	-0.1336*	0.3962*	0.2302*	1

Table 5: Correlation Matrix

	(1)	(2)	(3)
VARIABLES	FE	FE	FE
NSFR	-0.409**	-0.358**	-0.113*
	(0.167)	(0.164)	(0.0630)
Period		-0.188**	0.0967*
		(0.0867)	(0.0570)
Period*NSFR		0.234***	-0.0833
		(0.0783)	(0.0542)
ROA/sigma ROA			0.0237***
			(0.00744)
CAR/sigma CAR			0.133***
			(0.0127)
LLP/Gross loans			0.249
			(0.886)
LT debt/TA			-0.204
			(0.175)
Log(Total Assets)			0.00623
			(0.0207)
EFF			-0.0619
			(0.127)
Constant	4.682***	4.611***	2.928***
	(0.188)	(0.185)	(0.286)
Observations	550	550	550
R-squared	0.037	0.081	0.682
Number of ID	55	55	55
The dependent variable in all the models is log of Z-Score. All the models are estimated through fixed effect (FE) estimator. Robust standard errors in parentheses.			
***** p<0.01, ** p<0.05, * p<0.1**			

Table 6: Empirical Estimation Models

The results are summarized in Table 6. In all the models, NSFR is a significant and negative factor in explaining the changes in Z-Score. However, we can clearly observe that the estimates in models (1) and (2) are much higher than the ones in the full model, which can be the result of omitting the important control variables. According to the full model (3), a unit increase in NSFR decreases Z-Score by about 11.3%. Period dummy is significant both in the model (2) and (3), but with different signs. After the inclusion of the important control variables, we can state that Z-Score is about 9.67% higher after 2018. The coefficient of the interaction term in model (3) is not significant and indicates that there is no change in the impact of NSFR on Z-Score after 2018. From the control variables, the significance is only observed for ROA and CAR.

	(1)	(2)	(3)	(4)
VARIABLES	POLS	FE	RE	AB
Period	0.106	0.0967*	0.0861	0.102
	(0.279)	(0.0570)	(0.0570)	(0.0907)
NSFR	-0.696**	-0.113*	-0.126*	-0.137
	(0.267)	(0.0630)	(0.0651)	(0.0854)
Period*NSFR	0.0111	-0.0833	-0.0689	-0.0980
	(0.256)	(0.0542)	(0.0537)	(0.0819)
ROA/sigma ROA	0.119***	0.0237***	0.0271***	0.0158**
	(0.0176)	(0.00744)	(0.00742)	(0.00697)
CAR/sigma CAR	-0.00124	0.133***	0.127***	0.135***
	(0.00649)	(0.0127)	(0.0125)	(0.00671)
LLP/Gross loans	1.100	0.249	0.318	-0.579
	(1.968)	(0.886)	(0.861)	(0.837)
LT debt/TA	0.360	-0.204	-0.186	-0.222
	(0.322)	(0.175)	(0.179)	(0.251)
Log(Total Assets)	0.0382	0.00623	0.00649	0.0223
	(0.0400)	(0.0207)	(0.0206)	(0.0283)
EFF	0.0838	-0.0619	-0.0884	-0.282*
	(0.196)	(0.127)	(0.129)	(0.157)
Lag of Log(ZScore)				0.00508
				(0.0526)
Constant	2.754***	2.928***	1.754***	2.886***
	(0.658)	(0.286)	(0.532)	(0.440)
Observations	550	550	550	440
R-squared	0.845	0.682		
Number of ID		55	55	55

The dependent variable in all the models is the log of Z-Score.
POLS is pooled OLS, FE is fixed effect,
RE is a random effect, and AB is Arellano-Bond linear dynamic panel-data estimator.
Robust standard errors in parentheses. As can be observed from table 8 of the Hausman test,
we reject the null hypothesis and should conclude that among the FE and RE, only fixed effects model
is consistent. Also, POLS is not consistent as we find significant unobserved individual heterogeneity in
F-test, presented in table 9. Finally, FE is preferred over AB in this case as we lose significance for
Important variables.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Alternative estimators for the empirical models

The FE model, in this case, is appropriate because it helps to avoid omitted variable bias. The fixed effects model ensures that the analysis can control for all the time-invariant omitted variables. The Hausman test is also performed in order to differentiate between the fixed effects model and the random effects model. In the case of Table 8 below, fixed effects (FE) is preferred under the null hypothesis.

	Coefficients			
	(b)	(B)	(b - B)	$\sqrt{diag(V_b - V_B)}$
	FE	RE	Difference	S.E.
Period	0.09667	0.0861	0.0106	0.0022
NSFR	-0.11315	-0.1255	0.0124	0.0044
NSFR*Period	-0.08332	-0.0689	-0.0144	0.0029
ROA/sigma ROA	0.02367	0.0271	-0.0034	0.0010
CAR/sigma CAR	0.13303	0.1268	0.0062	0.0010
LLP/Gross loans	0.24943	0.3183	-0.0689	0.0295
LT debt/TA	-0.20369	-0.1857	-0.0180	0.0148
Log(Total Assets)	0.00623	0.0065	-0.0003	0.0033
EFF	-0.06187	-0.0884	0.0266	0.0124
b **= consistent under Ho and Ha;**				
B **= inconsistent under Ha, efficient under Ho;**				
Test: Ho: difference in coefficients not systematic				
$\chi^2(8) = (b - B)'[(V_b - V_B)^{-1}](b - B) = 54.45$				
Prob > χ^2 = 0.0000				

Table 8: Hausman Test

F(54, 486)	1358.02
Prob > F	0.000
H_0: All $u_i = 0$: **where** u_i **is individual unobserved heterogeneity.**	

Table 9 – F-Test for Individual Heterogeneity

3.4.6. Systemic Risk Models

Post-GFC, there has been a growing range of comparable systemic risk methodologies that has been proposed by researchers in the existing literature that focuses on different features as part of their systemic risk measurement. However, there are two approaches based on the existing literature to measure systemic risk. The first approach looks at the failure of one financial institution, whose impact on the system causes marginal distress on the financial system due to the nature, scope, size, concentration, and connectedness of its financial activities with other financial institutions. In other words, this approach measures the systemic resilience due to individual failure of one bank or other banks within the financial system due to the contagion risk. The main objective of such an approach is to mitigate the contagion effect by containing systemic impact and avoiding moral hazard. This approach is also called the contribution approach.

In contrast, the second approach, known as the participation approach, looks at losses experienced due to single as well as multiple shocks to a firm due to substantial exposures to an affected industry, country, or currency. More specifically, the participation approach studies the resilience of an individual bank against single or multiple common shocks within the industry, a country or from a particular currency exposure. The policy objective of this approach is to maintain the overall functioning of the system and maximise banks' survivorship along with sustaining the mechanism of collective burden sharing. The variable used in the participation approach includes credit exposures to other financial institutions, market exposures to interest rates, credit spreads and currency, the bank's risk absorption capacity based on capital and liquidity requirements as well as confidential information accessible to banking regulators. We have summarised some of the key models used for systemic risk measurement using the contribution approach in Table 10 and the advantages and drawbacks for each model in Table 11.

	Conditional Value at Risk (CoVaR)	SRISK	Systemic Expected Shortfall (SES)	Distress Insurance Premium (DIP)	Systemic Contingent Claims Analysis (CCA)
Systemic Risk Measure	Value at Risk	Expected Shortfall	Expected Shortfall	Expected Shortfall	Expected Shortfall
Conditionality	percentile of individual return	threshold of capital adequacy	threshold of capital adequacy	percentage threshold of system return	various (individual or joint expected losses)
Dimensionality	multivariate	bivariate	bivariate	bivariate	multivariate
Dependence Measure	linear, parametric	parametric	empirical	parametric	non-linear, nonparametric
Method	panel quantile regression, multivariate dynamic conditional correlation (DCC GARCH)	dynamic conditional correlation (DCC GARCH) and Monte Carlo simulation	empirical sampling and scaling; Gaussian and power law	dynamic conditional correlation (DCC GARCH) and Monte Carlo simulation	empirical copula
Data Source	equity prices and balance sheet information	equity prices and balance sheet information	equity prices and balance sheet information	equity prices and CDS spreads	equity prices and balance sheet information
Data Input	quasi-asset returns	quasi-asset returns	quasi-asset returns	equity returns and CDS implied default probabilities	expected losses ("implicit put option")
Reference	Adrian and Brunnermeier (2016)	Brownlees and Engle (2017)	Acharya et al. (2017)	Huang et al. (2010)	Gray and Jobst (2011)

Table 10: Systemic Risk Models

	Advantages	Drawbacks
Conditional Value at Risk (CoVaR)	• Highlights the contribution of each firm to overall system risk • General enough to study the risk spill overs from banks to banks throughout the entire financial system • Have out-of-sample predictive power for realised correlation in tail events, so can oversee the build-up of systemic risk in a forward-looking mode and potentially be used in macroprudential policy applications • Reduces the effect of the arbitrary selection of a single level of confidence on expected losses	• Only provides individual measures that do not sum up to the total risk measure • CoVaR is over-susceptible to estimation errors than VaR; as the accuracy of CoVaR relies broadly upon the tail modelling accuracy • CoVaR model cannot be back-tested because the expected shortfall predictions cannot be validated via comparison with historical statistics
SRISK	• SRISK model delivers useful rankings of systemically risky firms at various stages of the financial crisis • This model was a significant predictor of the capital injections performed by the Fed during the crisis • The predictive ability of aggregate SRISK is stronger over longer horizons covering data from 15 to 20 years onwards	• SRISK presumes that the liabilities of a bank would remain constant around times of crisis • This model also fails to measure the marginal contribution of a bank to simultaneous changes of both the harshness of systemic risk and the dependence system over any combination of sample banks for any degree of statistical confidence and at any point in time because it does not employ

		multivariate density estimation
Systemic Expected Shortfall (SES)	• Easy to calculate and implement as relied on observable market data and statistical techniques • It can be used as a fundamental for a systemic tax because the measurement of MES is logically consistent, expressed in natural units • A good predictor of a firm's contribution to systemic risk • This measure scales naturally with the size of the firm	• Does not capture the true tails of the return distribution as it is computed from the moderately bad days of the market and not the worst performance of the market during an actual financial crisis • The data for this method is based on share returns only and exclude reference to a bank's size or its capital and liquidity requirements, which are considered essential elements of systemic risk
Distress Insurance Premium (DIP)	• The stress testing can be updated regularly • Robust and additional forecasting ability in anticipating the changes in correlations of asset return in relation to term structure variables and equity market • Strong power to identify systemic important financial institutions • Analyses the influence of general market changes on the performance of each bank and simultaneously integrates the feedback effect from the banking	• The accuracy of the model reduces when systemic losses are not sufficiently presented in the historical statistics • is not a very useful early warning indicator of systemic risk because it underestimates systemic risk during a period of market growth and boom

	scheme to the rest of the economy	
Systemic Contingent Claims Analysis (CCA)	• The model integrates market-implied expected losses (and endogenizes loss given default (LGD)) in the multivariate specification for joint default risk • This model can be used to quantify an individual institution's time-varying contribution to systemic solvency risk under normal and stressed conditions • This model can also serve as a macroprudential tool to price a commensurate systemic risk charge.	• Assumptions are required regarding the specification of the option pricing model (for the determination of implied asset and asset volatility of firms) because this model is driven by Black Scholes Option Pricing theory • Some of the assumption used includes a constant risk-free rate and normal distribution of asset return which do not reflect the reality in times of market stress • technique is complex and requires complete market data

Table 11: Systemic Risk Models Advantages and Drawbacks

We use the contribution approach in this chapter due to two main reasons. Conducting systemic risk analysis using a participation approach would not be possible due to the lack of access to confidential information only accessible to regulators. Secondly, the participation approach investigates the effect on individual firms when the system is already in crisis. Our definition of systemic risk is the failure of one firm and its contagion effect on the financial system. Hence, we consider the contribution approach to be best suited to address this issue. Additionally, after reviewing all the models, we use the CoVaR model as the main basis of this study to calculate systemic risk. The conclusion to use this CoVaR model is driven by a number of factors, including the availability of required high-frequency data to successfully compute systemic risk. Additionally, the ability of the model to capture spill over effects from institution to institution within the entire financial system and its out-of-sample predictive ability. A comparative study conducted by Sedunov (2016) reviews the institutional-level systemic exposures using the CoVaR model and SES model and finds that CoVaR has superior predicting power for within crisis performance during two systemic crisis periods witnessing the collapse of Long-Term Capital Management in 1998 and Lehman Brothers in 2008. Their findings also indicate that SES and Granger Causality does not accurately forecast the performance of the firms reliably during a crisis period as compared to the CoVaR model.

3.4.7. Systemic Risk Measurement

$CoVaR^{i|j}_{q,t}$ is the VaR[1] of bank i conditional on the event of bank j being in financial distress. Thus, $CoVaR^{i|j}_{q}$ is implicitly defined by the q-quantile of the conditional probability distribution, Adrian & Brunnermeier (2008):

$$\Pr\left(R^i_t \leq CoVaR^{i|j}_{q,t} \middle| R^j_t \leq VaR^j_{q,t}\right) = q \quad (3.9)$$

Bank j's systemic risk contribution is defined as the percentage difference of the VaR of the banking system conditional on the distressed state of bank j, that is $R^j_t \leq VaR^j_{q,t}$, and the VaR of the banking system is conditional on the benchmark state of the institution j (b^j), which is considered as one standard deviation around the returns.

$$\Delta CoVaR^{s|j}_{q,t} = \frac{100\left(CoVaR^{s|j}_{q,t} - CoVaR^{s|b^j}_{q,t}\right)}{CoVaR^{s|b^j}_{q,t}} \quad (3.10)$$

The CoVaR estimation is implemented through a three-step procedure.

1. First, the VaR of each institution j is computed by estimating the following univariate model, with conditional variance (σ) defined through a GARCH(1,1) specification:

$$R^j_t = \alpha_0 + \alpha_1 R^j_{t-1} + \varepsilon_{j,t}$$
$$\text{where } \varepsilon_{j,t} = z_{j,t}\sigma_{j,t}, \text{ with } \quad z_{j,t} \sim i.i.d(0,1)$$
$$\sigma^2_{j,t} = \beta^j_0 + \beta^j_1 \varepsilon^2_{j,t-1} + \beta^j_2 \sigma^2_{j,t-1}$$

   Considering the q-quantile of the given distribution for z, we can obtain the VaR of each institution j at each time period.

[1] $VaR^i_{q,t}$ is defined as the q-quantile of individual bank's return distribution, such that: $\Pr\left(R^i_t \leq VaR^i_{q,t}\right) = q$.

2. With the next step, a bivariate GARCH model with Engle's (2002) DCC specification is applied for the returns of each bank j and the banking system, $R_t = \left(R_t^j, R_t^S\right)'$, with joint dynamics

$$R_t = \mu_t + \varepsilon_t$$
$$\varepsilon_t = \Sigma_t^{1/2} z_t$$

Where Σ_t the 2 by 2 conditional covariance matrix of the error term ε_t and μ_t is the 2 by 1 vector of conditional means, and $z_t = \Sigma_t^{-1/2} (R_t - \mu_t) \sim$ i.i.d.(0, I_2). The conditional variances are modelled as GARCH (1,1)

$$\sigma_{j,t}^2 = \theta_0^j + \theta_1^j \varepsilon_{j,t-1}^2 + \theta_2^j \sigma_{j,t-1}^2$$
$$\sigma_{s,t}^2 = \theta_0^s + \theta_1^s \varepsilon_{s,t-1}^2 + \theta_2^s \sigma_{s,t-1}^2$$

And the conditional covariance $\sigma_{js,t} = \rho_{js,t}\sqrt{\sigma_{j,t}^2 \sigma_{s,t}^2}$

3. Based on the estimated the bivariate density of $\left(R_t^j, R_t^S\right)$ for each bank j $\mathrm{CoVaR}_{q,t}^{s|j}$ is obtained as follows:

$$\Pr\left(R_t^s \leq \mathrm{CoVaR}_{q,t}^{s|j} \,\middle|\, R_t^j \leq \mathrm{VaR}_{q,t}^j\right) = q \qquad (3.11)$$

Finally, a similar procedure is followed to obtain $\mathrm{CoVaR}_{q,t}^{s|b^j}$, with the only difference of conditional events being now the benchmark state mentioned earlier.

3.4.8. Data and Empirical Results

3.4.8.1 Data Collection

The analysis is implemented based on the USD returns from 14 banks in 4 different emerging market economies for the ten years period between 15 January 2010 and 3 January 2020. Table 12 lists the sample of banks used in the systemic risk analyses. Data is sourced from Bloomberg Terminals and Thomson Reuters DataStream on a weekly basis. The main descriptive statistics of the examined sample of returns are presented in the table13. VaR and CoVaR measures are computed at the 95% confidence level. The quantile regressions are estimated using state variables along with the local market index returns for each respective country (Budapest Index, Jakarta Composite Index, FTSE Bursa Malaysia KLCI Index, and SPB mvIpc). The summary statistics for the market index returns are displayed in Table 14. As can be observed, mostly the average returns by banks and market index returns are close to 0, with a standard deviation close to 1%; the return series are also non-normally distributed with excess kurtosis and skewedness. The main state variables used in the analysis are changes in 3 months T-Bill rates, the Yield spread between 10-year local government bonds and 3-month T-bill rate, and Liquidity spread as a difference in 3-month T-bill rate and 3-month interbank rate. Bank-specific variable includes bank returns, market-index returns and market volatility.

Banks	Country
OTPB	Hungary
BBCA.JK	Indonesia
BDMN.JK	Indonesia
BBNI.JK	Indonesia
BBRI.JK	Indonesia
BMRI.JK	Indonesia
ALLI.KL	Malaysia
AMMB.KL	Malaysia
HLBB.KL	Malaysia
MBBM.KL	Malaysia
PUBM.KL	Malaysia
RHBC.KL	Malaysia
BSMXB.MX	Mexico
GFNORTEO.MX	Mexico

Table 12 – Sample of banks based on ticker code

Country	Bank	mean	Sd	min	max	Skewness	kurtosis
Hungary	OTPB	0.08%	1.88%	-12.60%	6.48%	-0.96	8.96
Indonesia	BBCAJK	0.16%	1.37%	-4.76%	5.33%	-0.10	4.63
	BDMNJK	-0.01%	2.50%	-17.37%	14.68%	-0.28	10.91
	BBNIJK	0.12%	1.95%	-7.81%	10.15%	0.30	6.39
	BBRIJK	0.15%	1.80%	-6.93%	8.50%	0.01	4.87
	BMRIJK	0.10%	1.81%	-7.46%	10.33%	0.25	6.10

Malaysia	ALLIKL	0.01%	1.21%	-4.66%	3.70%	-0.10	3.93
	AMMBKL	-0.02%	1.11%	-4.14%	3.75%	-0.12	4.72
	HLBBKL	0.07%	0.88%	-4.43%	7.61%	1.14	15.13
	MBBMKL	0.02%	0.75%	-3.38%	2.60%	-0.34	5.82
	PUBMKL	0.05%	0.65%	-2.36%	3.57%	0.42	7.60
	RHBCKL	0.03%	1.19%	-4.70%	5.17%	-0.20	5.35
Mexico	BSMXBMX	0.06%	2.06%	-5.50%	30.48%	6.24	93.93
	GFNORTEOMX	0.07%	1.67%	-8.19%	6.16%	-0.06	4.75

Table 13 - Summary statistics of the bank returns

	mean	sd	min	max	skewness	kurtosis
Budapest Index	0.06%	1.10%	-6.29%	3.60%	-0.73	6.67
Jakarta Composite Index	0.08%	0.93%	-4.90%	3.77%	-0.68	6.65
FTSE Bursa Malaysia KLCI Index	0.02%	0.56%	-2.30%	2.00%	-0.19	4.68
SPB mvlpc	0.03%	0.86%	-3.33%	2.91%	-0.09	3.86

Table 14 - Summary statistics of market index returns

3.4.8.2 Empirical results

The CoVaR analyses results are summarized in Table 15, which displays the summary statistics of the estimated $\Delta CoVaR_{q,t}^{s|i}$ measure. Mean(std) measure is a proxy for the volatility of systemic risk contributions over time, while the Std(Mean)is a proxy for the dispersion of average systemic risk contributions. Finally, along with the summary statistics of the estimated $\Delta CoVaR_{q,t}^{s|i}$ measures, figures 12 to 15 illustrate the historical developments systematic risk measures on a country-to-country basis, whereas figure 16 plots the banks based on the change in delta CoVaR. Idiosyncratic averages and correlation matrix can be found in *Appendix C* on a country-specific basis.

Correspondingly for Hungary, Indonesia, Malaysia and Mexico, the financial distress of a bank, on average, increases the 5% VaR of the banking system by about 165.9%, 99.7%, 55.9% and 37.7% over its VaR when the financial institution is in its benchmark state. The average standard deviations of the $\Delta CoVaR_{q,t}^{s|i}$ Time series are correspondingly 67.6%, 22.2%, 13.7% and 9.1%, while the standard deviation across averages is NA (for Hungary due to only one bank in the sample), 30.3%, 14.4% and 47.3%.

	Hungary	Indonesia	Malaysia	Mexico
Mean	165.9%	99.7%	55.9%	37.7%
Mean(std)	67.6%	22.2%	13.7%	9.1%
Std(Mean)	NA	30.3%	14.4%	47.3%
Min	96.9%	36.3%	18.4%	2.9%
Max	520.2%	243.7%	177.9%	179.3%

Table 15 - Estimation Results of CoVaR and ΔCoVaR

Mean is the average $\Delta CoVaR_{q,t}^{s|i}$ for the examined period for the given country, Mean(std) is the average of the individual bank historical standard deviation measure of $\Delta CoVaR_{q,t}^{s|i}$, Std(Mean) is the standard deviation of historical averages for individual banks of the country, min and max are correspondingly minimum and maximum values for $\Delta CoVaR_{q,t}^{s|i}$ measures

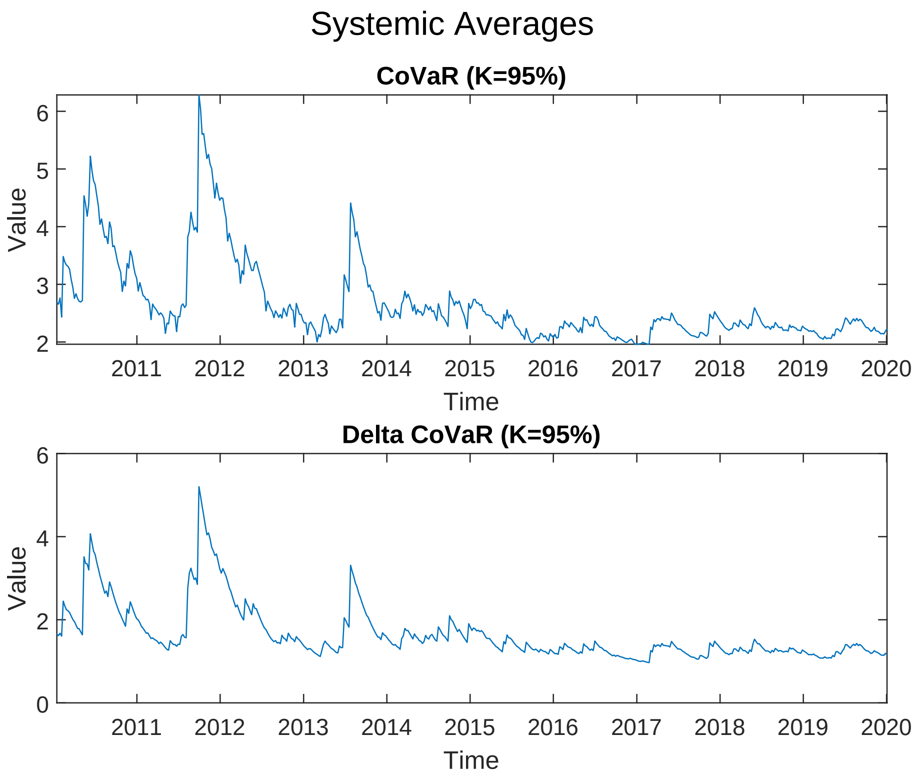

Figure 12 - Hungarian Banking System Systemic Risk Averages (Source: authors analysis)

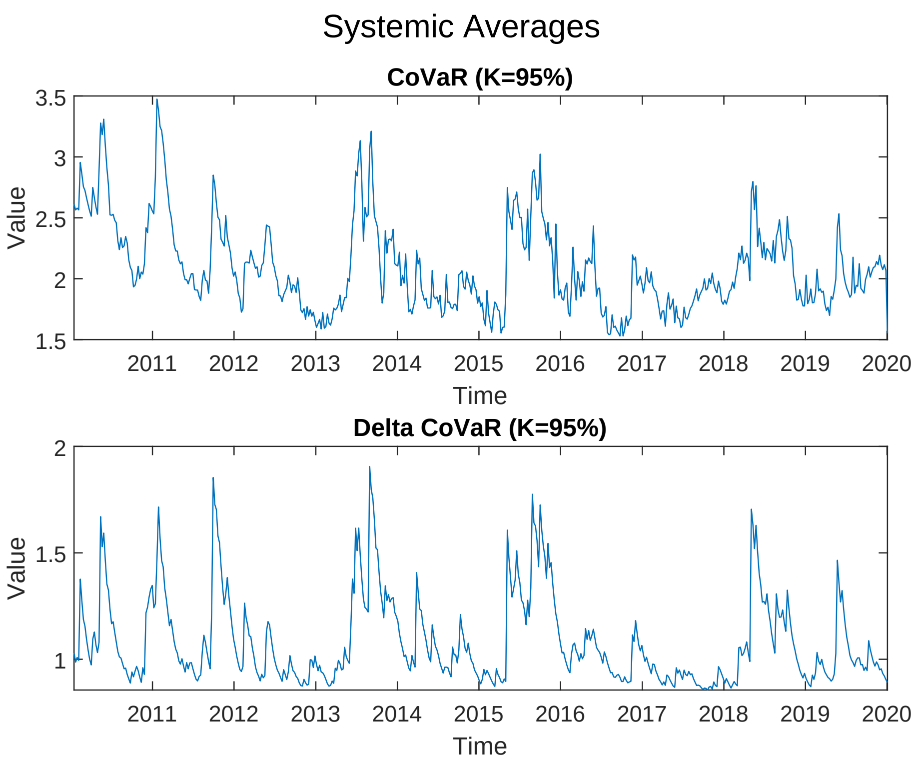

Figure 13 – Indonesian Banking System Systemic Risk Averages (Source: authors analysis)

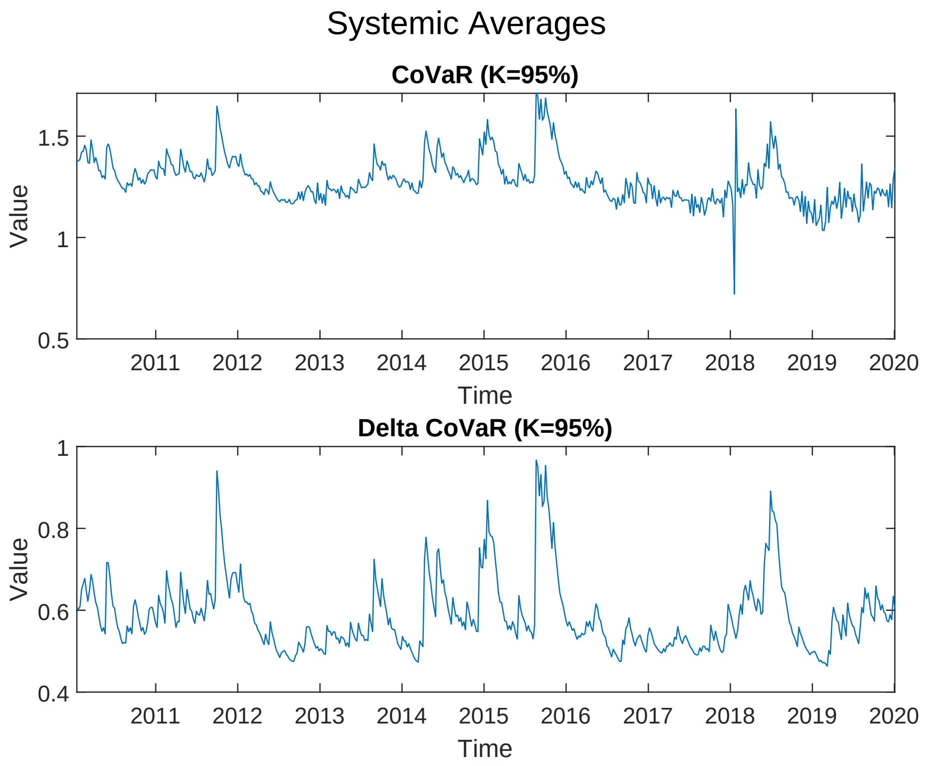

Figure 14 - Malaysian Banking System Systemic Risk Averages (Source: authors analysis)

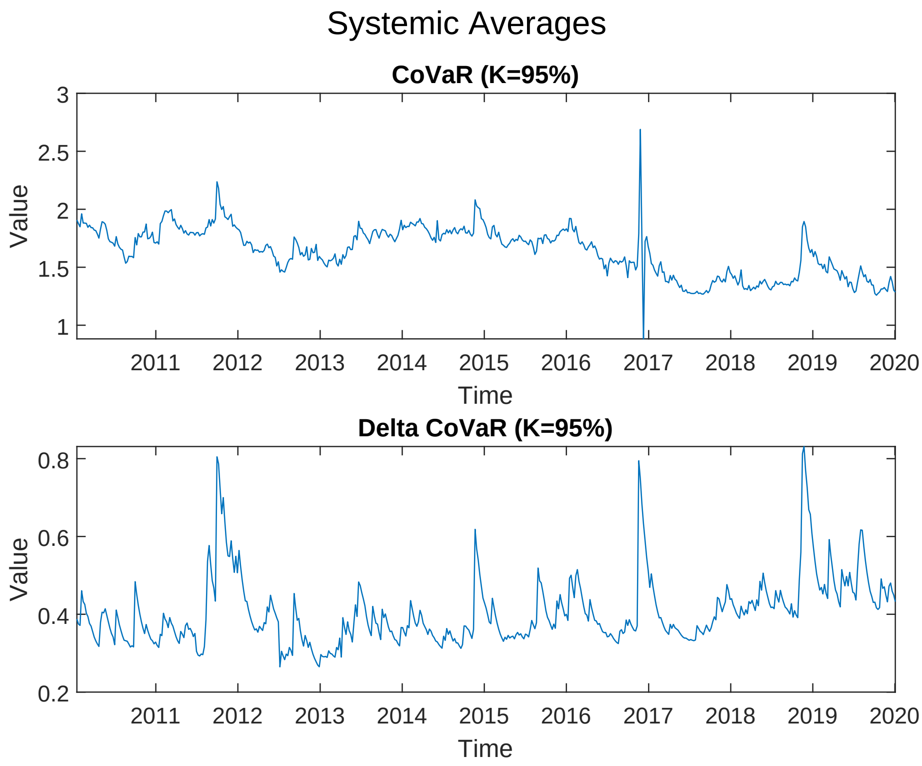

Figure 15 – Mexican Banking System Systemic Risk Averages (Source: authors analysis)

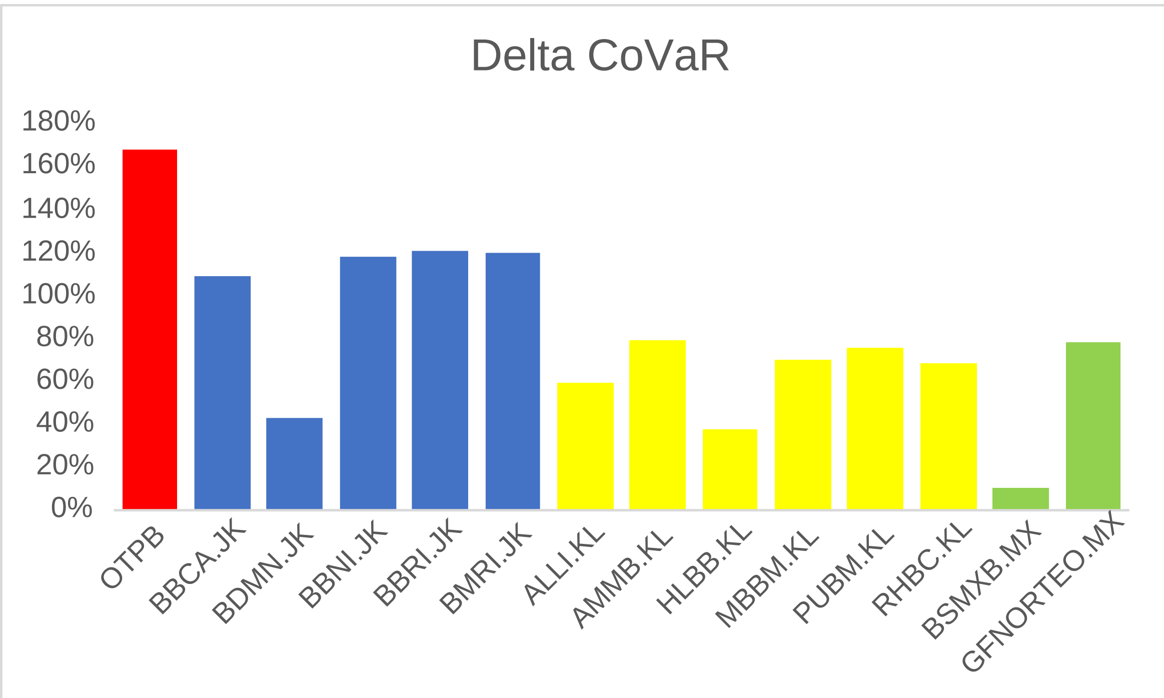

Figure 16 - Delta CoVaR based on banks (Source: authors analysis)

3.5. Discussions & Conclusion

The findings fail to fully support the hypothesis that new Capital and Liquidity Regulations, such as the Net stable funding ratio (NSFR), significantly and positively affect bank stability. The relationship between capital and liquidity requirement seems to be negatively based on the correlation matrix but not significant. This empirically shows that large banks, even in emerging markets, do not hold enough liquid assets as they have access to international markets and can raise funding relatively easily than their smaller counterparts as they have the advantage of attracting foreign investors and are more likely to meet international benchmarks to be listed on international markets despite illiquid local markets. However, this makes these banks equally exposed to changes in international markets as well as developments in their local markets. Similarly, holding higher liquid assets increases the default risk and decreases the stability of the banks as banks' are more prone to risk-taking activities to maximise profits.

These findings are inconsistent with most of the literature reviewed. For example, Boyarchenko (2013) found that both liquidity and capital requirement impact the risk-taking nature of banks by analysing the systemic risk in the US banking sector using BHCs data and established that prudential capital and liquidity requirement affect the systemic risk and return trade-off. A plethora of other literature, such as Marozva and Makina (2020) and Spinassou and Wardhana (2021), among others, indicated that liquidity requirements help control the risk of maturity transformation, where banks short-term deposits for long-term finance. They add that strengthening capital buffers requires the improvement of the quantity, quality, as well as reliability of capital adequacy.

However, if a bank has a stable balance between higher liquid and illiquid assets, it can sustain its stability. Looking into the role of NSFR requirements banks' with stronger ASF sources of funding can decrease default risk and, at the same time, improve stability. ASF includes Tier 1 capital, stable retail deposits, savings deposits and other sources of funding. Whereas on the other hand, banks with stronger RSF requirements face heightened default risk and diminish the banks' stability. RSF includes assets like securities, lines of credit and loans both residential and commercial. The reason RSF increases default risk is that though these assets strengthen the size of the balance sheet, at the same time, these assets are more illiquid and harder to utilize in times of uncertain economic conditions.

Previous research by King (2013) indicated that banks could meet NSFR by i) increasing ASF, ii) increasing the stakes of stable deposits against less stable deposits, iii) extending maturities of wholesale debt beyond a one-year timeframe, or iv) increasing the proportion of tier 1 capital. Consistent with the findings of the current study, King (2013) also argued that banks could reduce the RSF by shrinking the balance sheet loan portfolios and shifting the compositions of investments by selling low-rated investments for cash holding. They could also do this by replacing RSF with high-rated investments by changing the composition of loans from retail to corporate loans and mortgages to reduce the maturity to less than a year.

Likewise, as established from the literature review, systemic Risk Analysis implications are not homogeneous in every country; however, they comparatively reach a similar conclusion to the Z-source model. The Hungarian banking system is more exposed to systemic risk. Similarly, the Mexican banking sector is highly illiquid as a collapse of one bank increases the risk within the banking system by 47.3%. One factor to take into consideration in that all local indices had a return an average return of close to zero, and this is the same for the banking across all the countries analysed. Though, the extent of illiquid varies based on local market conditions and has been taken into consideration. However, to conclude, the effect of new liquidity requirements has no effect on systemic risk. One reason may be that market liquidity plays a bigger role in countering systemic risk.

Chapter 4 - Credit Risk, Liquidity Risk, Bank Liquidity Creation, and their joint implications on Systemic Risk

In this empirical chapter, we aim to examine the joint implications of credit and liquidity risk on bank stability and explore the effect of bank liquidity creation on systemic risk, given that there have been no other studies conducted which investigate this issue from conventional, hybrid and Islamic banking standpoints as mentioned in Chapter 1. The next section contextualizes our research by providing some important attributes of emerging markets linking these to conventional, hybrid and Islamic banking systems operating within these economies.

4.1. Introduction:

Emerging Markets offer the greatest opportunities since most of them are transitioning from the agricultural age to the industrial age, thus, shifting from non-user to users. Similarly, compared to developed economy banks, banks in an emerging market operate under a monopolistic competitive market structure (Godspower-Akpomiemie and Ojah, 2021), with banks in emerging markets being generally simpler businesses than same-sized institutions across the globe. These banks tend to have a strong deposit franchise, and their funding is generally dominated by deposits and equity with little use of volatile wholesale funding. Most marketers, as numerous studies show, are relatively consolidated where few banks have large deposit shares, offering sustainable scale advantages and marketing stability for bigger banks. It is imperative to note that emerging markets banks have come under intense pressure amidst the Covid-19 pandemic and its effect on the global economy (Rebucci et al., 2022). A careful review of previous crises shows that such banks are operating in a healthier macroeconomic environment and presenting much stronger balance sheets than in the past. At current valuations, these banks present a compelling asymmetric investment opportunity.

According to Khediri et al. (2015), Islamic banking emerged as an alternative financial institution which responded to the demand to have alternative solutions that were in compliance with the principles of Islamic law (Shari'ah). Like other banks, in terms of functions, these banks are assumed to play a significant intermediary role in transforming savings from the public. This is aimed at reinvesting in the economy by channelling accumulated funds to financial activities and entrepreneurs who are expected to make several contributions to the real economy by abiding by religious sensitivities. By conducting their financial operations within the parameters of Islamic finance and Islamic norms, Islamic banking ensures each financial contract refers to an identifiable and tangible underlying asset, as stated by Cox and Thomas (2005). Research has also highlighted the unique nature of Islamic financial principles, operations and products and has theoretically perceived Islamic banking to be a key contributor to the promotion of economic growth, making it suitable for this study. Moreover, as a result of its distinctive features, Islamic banks are exposed to more complexities in managing both their liabilities and assets, and this implies that these banks are expected to face a wider financing gap, therefore, presenting the need to discover whether they (Islamic banks) are exposed to greater capital and liquidity risks than their counterparts.

The role of credit and liquidity risk is of paramount importance in maintaining the stability of banks, making it a crucial and actively researched area within the fields of financial risk and banking stability. Researchers have made significant contributions by recognizing the significance of these risks and their impact on preserving the stability of financial institutions. Through their efforts, they have advanced the knowledge and understanding of these risks, which is essential for developing robust risk management frameworks and ensuring the resilience of banks. Molyneux and Nguyen (2017) have conducted extensive investigations into the intricate relationship between risk and bank stability, underscoring the paramount importance of comprehending and effectively managing credit and liquidity risk within the banking sector. It is essential to recognize that emerging markets possess distinctive characteristics and encounter specific challenges that differentiate them from developed markets. These challenges encompass heightened economic volatility, increased credit risk, and constrained access to stable funding sources. In this context, Athanasoglou, Daniilidis, and Delis (2014) have devoted their efforts to exploring the concept of credit risk procyclicality within emerging markets. Their valuable insights shed light on the particular obstacles faced by banks operating in these economies in managing credit risk effectively. Consequently, their research underscores the necessity of devising and implementing efficient strategies to safeguard bank stability. Another relevant aspect of research focuses on the relationship between bank concentration, competition, and crises, particularly in emerging markets. Beck, Demirgüç-Kunt, and Levine (2006) have conducted a comprehensive analysis in this area, demonstrating the elevated credit and liquidity risk associated with concentrated banking sectors in emerging markets. Their work highlights the implications of these risks for overall banking stability and underscores the importance of implementing appropriate measures to mitigate such risks.

When considering different banking models, including conventional, hybrid, and Islamic banking, researchers have identified distinct risk characteristics that warrant attention. For instance, Hassan and Lewis (2007) delve into the unique features and risk characteristics of Islamic banking, highlighting the differences between Islamic and conventional banking models. Their study sheds light on the impact of credit and liquidity risk on the stability of Islamic banks, contributing to a deeper understanding of risk management in this specific banking framework. In the case of hybrid banks, which combine traditional banking activities with nontraditional activities, DeYoung and Rice (2004) examine the associated risk characteristics. Their research analyzes the implications of such risk characteristics for bank stability, providing valuable insights into the management of credit and liquidity risk within hybrid banking models.

The rest of this chapter is organised as follows: Section 4.2 explores fundamental theories underpinning our research question. Section 4.3 of this chapter explores the relevant literature on bank credit and liquidity risk in relation to bank stability as well as bank liquidity creation and its impact on systemic risk leading to generating a research hypothesis. Section 4.5 provides a model specification to study the interaction between credit and liquidity risks, its implications for bank stability and model specification for measuring liquidity creation and its impact on systemic risk. Section 4.6 illustrates the data analysis and results of the methodology applied in section 4.5. Section 4.7 covers a discussion and conclusion based on existing literature and our findings.

4.2. Theoretical Framework

4.2.1. Theory of Financial Intermediation

The traditional Arrow-Debreu model (Arrow and Debreu, 1954) of resource allocation discourages the role of financial intermediaries by giving justification that firms or households can connect through the market themselves, and no role of financial intermediaries is inevitable. However, it fails to encompass actual practices and the significance of these intermediaries. For instance, these institutions are in a better position to manage and diversify idiosyncratic risk but are largely ignored by these conventional theories. Allen and Santomero (1997) argue that traditional theories of financial intermediation primarily set the context in terms of transaction cost and asymmetric information, which are becoming less relevant due to technical advancement and financial innovation. Their study discusses the two roles of financial intermediaries that are more relevant. First, they manage sophisticated financial instruments as well as markets and assist entities in transferring their risks. Second, banks reduce participation costs, that is, learning and participating effectively in the markets.

The idea of Pareto efficiency negates the need for intermediaries when markets are perfect (Allen and Santomero, 1997). Subsequently, the Modigliani-Miller theorem (Modigliani and Miller, 1958) also criticises the role of intermediaries and argues that households can themselves take any financial position and that intermediaries do not add value. But these extreme views and critiques are at odds when the adopted practices are observed. For ages, banks and insurance companies have been playing a vital role in the economy. As far as the financial markets are concerned, the financial intermediaries are the source of the development of financial markets.

Financial intermediation had historical ties with the concept of direct financing when there was no such intermediary to facilitate both the lenders and borrowers. The theory of financial intermediary relates to the need for such a body which aid in connecting the surplus units to the deficit units so that direct financing can be avoided (Bongomin et al., 2017). In addition, these institutions could overcome the limitations, risks, and challenges associated with the direct financing system (Rampini and Viswanathan, 2019). A financial intermediary can be said as a middleman who minimises or transforms risk in the economy. Financial intermediation does not only revolve around the concept of 'middle-man', but it also leaves a profound and positive effect on the economy and growth rate (Gretta, 2017). The study of Adediran et al. (2017) supported the role of financial intermediation in economic growth and tested their argument in the context of a developing country, that is, Nigeria, for the period of 1980 to 2014. Their study identifies a long-term relationship between financial intermediation and economic growth. It is found that the deficiency of production funds in the market in

Nigeria is primarily due to ineffective financial intermediation. The information-based theory of financial intermediation developed by Bethune, Sultanum, and Trachter (2019) emphasises the significance of the financial intermediary due to a large amount of information. Investors mobilising their funds through these institutions have more information as opposed to an asymmetric information base available to otherwise individual investors, which helps avoid disparaging mechanisms. There are many other theories of intermediation (such as Arrow and Debreu, 1954; Ramakrishnan and Thakor, 1984) that support the accumulation of common knowledge, but this particular theory, that is, information-based theory, is distinguished in the form of information heterogeneity.

Recently, the theory of FinTech for financial intermediaries has revolutionised the concept of financial intermediation by introducing modern technologies in financial management systems. Huebner et al. (2019) have demonstrated how the contemporary definition of financial intermediation is superimposed on the functions of the traditional one. FinTech models have decreased the level of the traditional financial intermediary to some extent but offer improved user experience and more effective prices. FinTech indeed has diminished the basic notion of the financial intermediary through automation, but still, the concept of the middleman can be seen in peer-to-peer payment and crowdfunding business models (Bavoso, 2019). Nevertheless, contextually, universal banking permits financial intermediaries to become more diverse and grow larger, and this enables them to benefit from more efficient portfolio diversification to take even larger risks. However, permitting diversification is likely to increase the similarity of the portfolio of the banks, thereby decreasing the diversification of its system and increasing systemic risk.

4.2.2. Liquidity Creation Theory

The central function of banks in liquidity creation and enhancing economic growth can be traced back to the seminal work of Adam Smith (1776). The reincarnation of conventional ideas of liquidity theories affirms the primary role of banks in liquidity creation, but they argue on its creation, on and off-balance sheets (Bryant, 1980; Diamond and Dybvig, 1983; Holmström and Tirole, 1998; Kashyap, Rajan and Stein, 2002). Even in some cases, both these functions collapse with each other, for example, the issuance of riskless liquid from the bank to provide risky illiquid loans. In addition, banks' roles in mitigating risks are also addressed and have grabbed the attention of many researchers. For instance, Niepmanm and Schmidt-Eisenlohr (2017) discuss the bank’s role in managing risk in international trade. It is found that bank instruments such as letters of credit are popular enough that around 15 per cent of world exports are being settled through them.

The contemporary theories of financial intermediaries have also clearly marked two fundamental roles of banks in the economy, firstly, they transform the risk, and the other is the creation of liquidity. According to the basic liquidity creation theory, banks usually liquefy the illiquid assets; it can also be said banks finance their illiquid assets through liquid liabilities to create liquidity. Similarly, liquidity is also created through off-balance sheet activities (Sahyouni and Wang, 2019). There are some risks also associated with liquidity creation, but these vulnerabilities do not stop banks from creating liquidity. This argument is well explained in the study of Diaz and Huang (2017); excessive liquidity can cause to initiate an asset bubble in the banking sector as well as increase the vulnerability and the probability of a financial crisis. Burger and Bouwman (2015) discuss excessive liquidity as the predicate of future crises. The study of Tran et al. (2016) identifies that high liquidity-containing banks are more prone to liquidity risk, and they generally have low profitability. The theory of liquidity creation in the context of capital is also demonstrated by Tran et al. (2016), who argue that a well-capitalised bank is in a better position to create more liquidity. Hence, there is a positive and bidirectional interrelationship between capital and liquidity creation. Another relevant study by Ghenimi et al. (2017) sheds light on the relationship between liquidity risk, credit risk, and bank instability. Although no meaningful relationship between liquidity and credit risk is found, however, both risks individually as well as interactively affect bank stability. On the contrary, Calomiris et al. (2015) establish a theory on the requirement of liquidity; it is suggested that the banks' assets should be regulated instead of capital. The need to hold more liquid assets is expressed to withstand the liquidity risks. Thus, simultaneously credit and liquidity risks affect the stability of banks. Sahvouni and Wang (2019) also explain the relationship between the number of liquid assets, funding cost, and net income. They found that the higher the number of liquid assets a bank holds, it will enjoy the high net income and bear lower funding costs.

4.2.3. Profit and Loss sharing theory

PLS theory usually demonstrates the basic structure of Islamic finance, which prohibits interest. It contends the idea of partnership instead of a traditional agent-client relationship where banks share both profit and loss with their customers and act as business partners (Farihana and Rahman, 2020). Theoretically, it is explained as a strong approach to strengthening Islamic banks by increasing their resilience against crisis (Fakir et al., 2019). Its meaning expands with the concept of the contractual agreement between two or more enterprises or people, which allows them to invest in a project and equally share the profit and losses associated with the project (Dar and Presley, 2000). In the banking business, the PLS theory can be extended to the relationship among the three participants, namely the user of capital, the bank (financial intermediary or the partial user of capital), and the depositor of funds in the bank. During the cycle, there are two kinds of partnerships or interactions that prevail; one is between the depositor and the bank, and the other is between the user and the bank. Under the influence of PLS theory, the financial intermediary (bank) does not receive any fixed interest; rather, banks and depositors share the profit and loss of the business linked with the user of capital (Hamza, 2016). In the case of capital loss, banks are subjected to bear all the financial losses while the entrepreneur or customers are exposed to labour and time costs (Farihana and Rahman, 2020). Also, Shariah forbids such banks from investing in prohibited businesses such as selling alcohol, pork, gambling, and others. In addition, the study of Abdul-Rahman et al. (2014) explains that during the financing of customers, PLS-based banking prohibits banks from demanding collateral assets. It is argued that some problems which are embedded in conventional banking, such as moral hazards and asymmetric information, are filtered out by PLS-based banks, and the whole project in which the banks are anticipated to invest is transparently monitored and supervised by these banks resulting in the increase of return and reduction of credit risk. Islamic financial system is free from debt as transactions based on interest or debt are prohibited in Islam. By leveraging the concept of interest-free financing in Islam, Shaukat and Alhabshi (2018) point out the widespread failure of interest-based debt financing regime and argue that ongoing episodes of exchange rate crisis or banking crisis are primarily stimulated by debt financing, the sub-prime mortgage crisis and financial contagion consequently, i.e., the GFC is the evidence to the shortcoming of debt financing. Their study advocates risk sharing-based financing as opposed to debt-based financing due to the greater financial instability attached to debt-based financing. The debate between PLS-based financial institutions and non-PLS-based has been a going concern, and in a similar context, Al-Amine (2015) argues that the equity and participatory investments models based on PLS theory are the best way to enhance the use of PLS products and limits the use of debt-based models. Their study endeavours to adopt product arrangements based on PLS major instruments like Mudaraba and Musharaka structures.

Two key instruments of PLS theory, *Mudaraba* and *Musharaka*, are based on the same principle of PLS in a financial transaction. These two instruments have the working mechanism of “rate of return”, in which not only profit but also the risk (produced by the investment) is shared by both the financer and entrepreneur (Ibrahim, 2018). The fundamental notion of Mudaraba is that when two partners set up a business, profit and loss sharing is carried out in pre-arranged fashion. The partner who solely provides capital is known as “rab-al-maal”, and he is only subjected to finance, while the other partner or entrepreneur who bears the responsibility of all the labour, managerial and physical work is known as “mudarib”. The loss-sharing mechanism of Mudaraba is somewhat different, the partner who is obligated to provide finance will bear all the financial losses, and the other will bear the loss of his efforts and time. The second instrument of the PLS framework is Musharaka, in which both the partners mutually share their capitals in the mixed pool, thus, are mutually responsible for finance and management. Subsequently, both share the loss to the extent of their ratio of investment (Aburime, 2008). Thus, these instruments, under the influence of PLS theory, reflect the Islamic view of participatory, where the profit, as well as risk, are divided commensurate to their ratio of investment. Therefore, it appears viable in building a balanced distribution of income and discouraging monopolisation (Dar and Presley, 2000). Afkar et al. (2020) use the agency theory to find the relationship between mudarib, or fund manager and rab-al-maal or fund owner, in the mechanism of PLS. This theory was developed by Jensen and Meckling (1976), and explains the role of agents in managing the company or funds and generating profits according to the will of the fund owner. The funds provided by the owner must give some return to the fund manager as a management fee. This kind of tied investment is limited by the fund owner in terms of the type of business or management of funds. Although the ratio of profit and loss must be set in the beginning, thus, the whole structure remains compliant with the sharia (Al-Nasser Mohammed and Muhammed, 2017).

Al-Arabi (1966) suggests the idea of a two-tier Mudaraba, in which the savings would be mobilised and allocated by the banks on the Mudaraba basis or the banks would play the role of an entrepreneur (mudarib) for depositors and financers for borrowers. Islamic banks are subjected to sharing the profits with the depositors and the borrowers. The reason for this is the fact that depositors are the real owners of the capital used by banks (as mudarib) to generate profits, and since no fixed rate on capital is committed; therefore, banks are motivated to maximize the overall profit in order to enhance their absolute returns (Mehri et al., 2017).

Mansour et al. (2015) extend the concept of a two-tier partnership and introduces the role of financing under a three-tier partnership based on PLS theory. The new financial product is added with a risk moderator as the third participant with the function of absorbing risks of revenue sharing and premature default. The study proposes an alternative option to connect the Islamic financial principle's basic objective with the prevailing practices under the influence of the PLS principle. The novel financing structure advocates a dynamic mechanism for sharing profit and loss by participants recursively over the investment horizon.

4.2.4. Islamic Finance Theory

Islamic financial system is solely based on the pure equity and Profit and Loss Sharing (PLS) concepts. These frameworks are constructed upon moral and ethical principles according to the fundamentals and teachings of Islam. For instance, the Holy Quran (the sacred book of Muslims) prohibits all kinds of debts or debt-based contracts. Blitz and Long (1965) explain that the Islamic financial system pertains to the historical theory of usury condemnation. Therefore, forbidding and discouraging interest has been the nucleus of the system. Islamic financial system is misunderstood with only interest-free banking; however, it also covers intriguing aspects like the rights and duties of individuals, risk-sharing, the sanctity of contracts, profit and loss sharing models, equitable distribution, capitalisation, and financial intermediaries (Iqbal, 1997; Moisseron et al., 2015). Explicitly, Farooq and Zaheer (2015) explain the theory of Islamic finance and call it 'more resilient to shocks". The primary reason to withstand these shocks is its stress on risk-sharing and limitation on excessive risks. Expanding the theories of Islamic finance, it governs three fundamental principles, namely, the principle of equity, the principle of participation, and the principle of ownership. The principle of equity acts as a rationale for the prohibition of usury (riba) in a financial contract to defend the weaker party, that is, the borrower. Furthermore, this principle forbids the excessive uncertainty (gharar) involved in the covenant, thus, reducing the chance of asymmetric information. It also advocates the existence of an alms-giving or charity (zakat) system in the Shari'ah that is obligatory on every Muslim who meets the requisite criteria (Hassan et al., 2019). The second principle depicts the true picture of profit that is associated with risk. As Shari'ah key role quoted that "reward (profit) comes with risk-taking," thus, it implicitly prohibits the advancement of riba, bridges the gap between financial activities and real activities, and ensures that whether a profit is generated with productive activity or with the mere passage of time (Ahmed et al., 2015). The third principle, which is the principle of ownership, is based on the prohibition of short selling. It mandates the complete ownership of the assets for selling or transacting and clearly warns that "do not sell anything until you don't have its ownership" (Hussain et al. 2016).

Islamic financing system offers key instruments for the ease of users in several ways. First, there is the term 'loan', which is theoretically explained as benevolent financing or (qard al hasan) it is basically financial assistance for needy people; no fee is charged against it. Ebrahim and Sheikh (2016) put stress on the incorporation of a benevolent loan in the Islamic financial system to minimise financial exclusion. In addition, there are other instruments of Islamic finance that come under the category of PLS, non-PLS, and fee-based products (Song and Oosthuizen, 2014). The fundamental instruments, including mudaraba (profit-loss sharing), musharaka (participation), murabaha (cost-plus financing), ijara (leasing), and salam (forward sale), act as the building blocks for deriving the complex financial instruments (Iqbal, 1997).

The rate of interest is the primary regime of the conventional financial system, which is demoralised in Islamic finance. There are several studies that have both theoretical and empirical explanations of the relationship between interest and favourable outcomes. Askari (2012) highlights that debt and leverages are the two major driving factors that are responsible for creating instability in the financial system. Unlike the Islamic financing system, these two features are involved in the form of "interest" in the conventional financial system. While explaining the effect of diminishing interest from the system, Al-Jarhi (2017) claims that the reduction of interest to zero will readily decrease the system of substituting the real resources for money; hence, the optimal output is maintained. Similarly, Samuelson’s (1958) work illustrates the relationship between the rate of interest and resource allocation and explains that a zero level of interest rate yields the best possible results for the allocation of resources. The involvement of interest in the financial system for attaining allocative efficiency has also been discouraged by Friedman (1970). Another feature of the Islamic financial system is the risk-sharing which is based on the Profit and Loss sharing (PLS) model, in which all the partners share both the profits and risks. Sorensen et al. (2000) find that the risk-sharing concept is not only enhancing the integration of capital markets but also increases the efficiency of the whole economy. In contrast, the conventional financial system has a gap for risk-sharing, and the resources are mobilised based on the conventional loan contract. Belouafi et al. (2015) suggest that the financial system needs to be more focused on risk-sharing rather than risk-shifting, and active steps should be taken to bring equity finance against debt financing. Thus, a financial system could be constructed that can grow vigorously and encounter instabilities.

Money in the conventional financial system is considered a commodity that has a price, usually in terms of interest, and it has the same function as the commodity. Also, its price depends upon the balance maintained between the supply and demand of capital. While in Islam, money is not seen as a commodity having a price; consequently, its hoarding is prevented by the practice of zakat (alms) (Jouti, 2020). Thus, the velocity of money circulation is maintained by the implication of zakat. Further, the importance of Islamic finance is enlightened by Triki and BoujelbÃ (2017) in the context of humanitarian considerations through the advancement of zakat. Thus, the ultimate goal of this system is to make people happy and strengthen the whole culture through the distribution of wealth, and it implicitly brings social justice and equality to society. To summarise, the Islamic financial system provides an option for prosperity, fair wealth distribution, a way of moral and ethical investment, promotes resource mobilisation, a risk-sharing model, the concept of participation, a complete and pious system of Islamic banking, and bridges the gap between real activities and financial system (Mukhtar et al., 2018).

Contextually, the association between the actual economy and the financial sector has been cited in the literature as another factor that contributes to the stability of Islamic finances and indeed, the Islamic banking theory argues that Islamic banking can establish a link between the actual economy and the financial sphere, thanks to the Shari'ah obligation which requires all financial transactions to be backed by a tangible asset. Due to this, Njima and Zouari (2012) claimed that financial flows could meet the financing requirements of the real movements of services and goods. Banking stability can then begin with this theory that seeks to explain Islamic finance elements, which can make it stable finance.

4.3. Literature Review

4.3.1. Credit & Liquidity Risks and their Influence on bank stability

Bank stability refers to a bank's capacity to preserve its financial robustness and endure unfavourable circumstances or disruptions within the banking system. It encompasses the bank's ability to withstand credit losses and fulfil its obligations, including honouring deposit withdrawals and meeting payment commitments. Basel III regulations evaluate bank stability by assessing their capital adequacy, which represents the extent of capital banks possess to absorb losses and sustain solvency. At the same time, banks are inherently exposed to many risks, such as operational risk, credit risk, market risk, interest rate risk, liquidity risk and country risk, to name a few. Though some of these risks cannot be fully measured empirically, such as operational risk, and some risks can only be managed by the banks' given the indirect exposure of these risks, for instance, interest rate risk and market risk. However, the role of bank credit and liquidity risks have long been debated by many scholars and researchers in the context of the financial intermediation function of banks. During the GFC, these two risks also took the attention of policymakers and regulators as the banking sector suffered from enormous losses, bankruptcies and bank runs due to rapid growth in subprime lending prior to the GFC. For instance, Gefang et al. (2011) studied the role of both credit and liquidity risk during the GFC that brought many banks on the brink of collapse using Credit Default Swaps (CDS) rates on 12 global banks and LIBOR-OIS spreads with daily data from the beginning of January 2007 until mid-December 2009. They explain that between August 2007 and December 2008, credit risk had risen steadily. Before reaching heightened levels of credit risk during the GFC, there were two dips in levels of credit risk in December 2007 mainly because banks were forced to write down their loans along with Federal Reserve intervention with term auction facility. Though it helped banks to sustain low levels of credit risk for a month before the downward trend was inverted until early summer 2008, where there was a second but smaller dip in levels of credit risk, nonetheless, by late summer gradual increase in credit risk resumed as Lehman collapsed and AIG disclosed of liquidity shortages issues.

Liquidity risk was more volatile and abrupt during the GFC with three major peaks, for instance during the bank run on Northern Rock, liquidity risk was at its first peak in August 2007; this led to liquidity easing by central banks, for instance, ECB injecting EUR 95 billion overnight and Federal Reserve injecting USD 24 billion. Their empirical analysis using LIBOR-OIS Spread on three major currencies reveals that in late August 2007, liquidity risk dropped much more rapidly in American markets as compared to European markets. Likewise, the second peak in liquidity risk was before the federal reserve introduced the term auction facility in December 2007. However, during the peak of GFC (late 2008), liquidity risk spiked dramatically after the collapse of Lehman's; moreover, the liquidity risk was higher in US markets, followed by British markets and the European markets. It can be argued that importance of liquidity risk is more important as compared to credit risk during the GFC (Gefang et al., 2011). However, there are significant concerns regarding the key variables used to indicate the level of credit and liquidity risk. However, the CDS market has grown significantly since 2004 but has been unregulated until 2014 with no centralised clearing. Hence, given the over-the-counter market structure, transparency and availability of the data used remain questionable. Additionally, CDS rates do not fully explain the events that took place during the GFC, as the information regarding CDS was largely private, making it harder for the market to make corrections (Chiaramonte and Casu, 2013). Nonetheless, CDS spreads are a good proxy for bank risk as they can mute the impact of credit rating downgrades on banks' debt as they capture information from bank balance sheet ratios, particularly Tier 1 ratio and leverage being the main determinants of CDS Spreads (Chava et al., 2018; Chiaramonte and Casu, 2013).

Secondly, Gefang et al. (2011) do not provide enough information regarding the role of LIBOR within financial institutions. This has been highlighted in the work of Fouquau and Spieser (2015), who focused on the importance of LIBOR by defining LIBOR as the benchmark for the interest rate paid on loans between one private or public bank to another. LIBOR also serves as a main reference point in multiple currencies for many inter-banking credit transactions, interest rate derivative contracts, exchange-traded contracts, bonds, and household credit. The extent of the use of LIBOR can be demonstrated by the total value of outstanding contracts. For instance, by mid-2011, the notional value of interest derivatives was 554 trillion USD; meanwhile, short-term interest rate contracts volumes traded in London's future and options amounted to 477 trillion euro (Fouquau and Spieser, 2015). They further investigate whether LIBOR was manipulated by the cartel referring to 12 main banks during the GFC using information from British Bankers' Association (BBA) on 1-,3-, and 6-month LIBOR rates, Repo rates and CDS rates between 2005 and 2008. Using factorial analysis, they report that LIBOR had been manipulated particularly during mid-October 2008; likewise, they also report a pattern of irregularities between LIBOR and historical interest rate benchmarks, which was also reported by King and Lewis (2015) and Chen (2020). Given the importance of LIBOR within money markets, these findings indicate that the conclusion reported by Gefang et al. (2011) may be flawed given that the study does not account for irregularities and manipulations in LIBOR, which has resulted in abolishing LIBOR and triggered inter-banking interest rate reforms (Chen, 2020).

King and Lewis (2015) also address the issue of LIBOR misreporting during the GFC when conducting their study on the role of credit and liquidity risk during the GFC. They use similar variables used in the Gefang et al. (2011) for 17 banks, five different maturities and control for misreporting using Jenson's Inequality. They report that both credit and liquidity risk was equally important for their role during the GFC. For instance, liquidity conditions within the inter-banking market are an important driver of a bank's funding costs. When the Fed Reserve launched a term auction facility and extended it during the GFC, the cost of short-term liquidity dropped by 100 bps, but the cost of long-term liquidity remained unchanged (King and Lewis, 2015). The rationale behind the higher cost of long-term funding is provided by Garcia-de-Andoain et al. (2016), who discovered that it was uncertainly attached to the future condition as compared to reduced short-term liquidity premium, which was mainly due to central bank intervention. This resulted in ample liquidity supply within the interbank markets in response to GFC.

Another interesting finding is that fluctuation in credit risk was largely responsible for the volatility within the interbank market, shoring up the funding cost for banks. For instance, King and Lewis (2015) claimed that one bps change in CDS spread increased the funding cost of banks by 4.3 bps during the GFC; such changes accounted for nearly a fifth of the LIBOR-OIS spreads. In other words, as the credit risk increased during the GFC, so did the cost of funding liabilities for banks increased until the central banks intervened. This effectively means that the liquidity premium within the interbank market is more sensitive to changes in credit risk. Despite interesting findings, their study lacks to address the role of these two risks originating from balance sheet activities. Furthermore, the role of abrupt changes in monetary policy base rates in the aftermath of the GFC; its impact on both the asset and liability side of the balance sheet has not been explored in their study. There is no doubt that banks' profitability and risk profile are exposed to changes in policy rates. To address this claim, Gomez et al. (2021) illustrate the impact of changes in interest rates on both the asset and liability side of the bank, referring to as the income gap, a standard measure for measuring changes in income from asset and liability sides due to changes in interest rate. Their study uses information from FR Y-9C on BHC in the US using variables such as a change in interest and non-interest income, change in equity, change in commercial and industrial loans, total loans, liquidity ratio and income gaps along with other variables. Their findings suggest that the income gap has a significant ability to predict banks' profit. For instance, when the Federal Reserve increases interest rate by 100 bps, banks with an income gap of the 75th percentile in a distribution curve reduce lending by 0.27 percentage points less than banks at the 25th percentile (Gomez et al., 2021). In other words, new banks or smaller banks have higher income gaps and tend to engage more in lending as compared to larger banks with lower income gaps during the interest rate raise. Nonetheless, these findings only indicate that the profitability of a bank is correlated to changes in interest rates but do not highlight the effect of changes in monetary policy rates on a bank’s credit risk and liquidity risk. Moreover, the variables included in their research are questionable as no justification was provided as to why only changes in commercial and industrial loans were given specific attention as compared to other categories of loans on the bank’s balance sheet, such as a change in residential loans or commercial real estate loans which were one of the main drivers of rising credit risk during the recent GFC. Furthermore, though the study includes liquidity ratio but does not include government securities as part of the calculation for liquidity ratio, which has been classified as HQLAs under the Basel III Liquidity Framework, their study also makes no mention of capital requirement. More broadly, the study is conducted only using US banks, which do not provide any indication of how banks in emerging markets are affected by changes in policy rates.

Morais et al. (2019) report that changes in core countries' monetary policy referring to changes in interest rates of the US, UK, and Euro area have a spillover effect into emerging economies that can affect the credit and liquidity risk dynamics of an emerging market economy. Using the Mexican banking sector, they measure the impact of changes in foreign monetary policy rates on credit behaviour by foreign banks operating in the Mexican banking system. They argue that a change in foreign policy rate is correlated with the credit supply to Mexican firms by respective countries' foreign banks. For instance, one standard deviation of decline in foreign monetary policy rate expands credit supplied through foreign banks by 2.1%, the loan maturity rises by 6.7%, and the probability of future loan default (credit risk) over a one-year time horizon also surges by 9.8%; in contrast, one standard deviation decrease in Mexican policy rate only increases loan supply on average by 0.6% for both national and foreign banks (Morais et al., 2019). One reason for lower credit supply by changes in the Mexican policy rate in comparison to changes in foreign monetary policy rate could be due to the exchange rate factor of USD against the Mexican Peso, which has not been controlled for or explored in their study. Moreover, the study is only based on the Mexican banking system, which is relatively small compared to other leading emerging market economies and does not explore the impact of foreign monetary policy rates on national banks.

Despite these shortcomings, Bräuning and Ivashina (2020) explore the role of US monetary policy in a wider context using a sample size between 1990 and 2016 covering 119 EMEs located in Africa, the Americas, Asia, and Europe. They use the DealScan database to extract reports of individual syndicate loan issuance to borrowers by home country lenders. They agree that outstanding dollar credit by foreign banks towards African, American, and Asian Emerging markets accounts for over 90 per cent of the credit and for Emerging Europe, this number is at 60 per cent indicating the influencing role of US monetary policy on EMEs credit cycle. Moreover, they agree that changes in US monetary policy disproportionately affect EME borrowers as compared to borrowers in developed markets for two main reasons. Firstly, a typical monetary policy easing in which the Federal Reserve cuts its policy rates by about four percentage points amplifies the loan volume towards emerging market borrowers exceeding the flow of loan volume into the developed markets by 32 per cent. In contrast, a monetary policy tightening has a pull-out effect by banks sharply contracting foreign credit into emerging market economies. This effect holds true for non-US banks, for banks with very small exposure to the US markets in their portfolio, borrowers in emerging markets which are highly reliant on US dollar-denominated credit and have limited trade links with the US, and for emerging market borrowing firms operating in non-tradeable sectors such as construction, finance & insurance, retail, and services to name a few. Secondly, the researchers claimed that given the differential effect between EMEs and developed markets; banks are often faced with few channels that drive banks risk-taking in response to changes in monetary policy. The prudent risk-taking channel is often consistent with traditional risk management models and productive risk-taking channels, often leading to riskier investments becoming more attractive in response to monetary policy easing and low yield in the home markets. Their findings indicate that foreign banks increase credit into emerging markets due to reaching for the yield effect. In other words, banks generate higher returns in emerging markets as compared to home markets which offer low yields and returns due to the easing of monetary policy, naturally making riskier investments in emerging markets an attractive choice for foreign banks. According to Bruno and Shin (2015), it is well to reason that banks' lower monetary policy rate reduces that Value at Risk (VaR) constraint, making banks increase their risk-bearing capacity.

One reason for such risk-taking behaviour by banks is that when the monetary policy rate is reduced banks’ have access to more capital at a lower cost but also face lower profit margins in their home country due to lower policy rates which drive banks to invest in high yield high-risk assets in EMEs to maintain its profit margins. Nonetheless, such volatile markets and the risk associated with asset holdings also increase bank credit risk and leverage. However, this effect is more evident when the home country’s monetary policy begins to be tightened, and the materialisation of non-performing loans becomes more common. This is because the cost of credit increases, thereby reducing the availability of foreign credit in EMEs, banks with existing credit contracts do not extend credit contracts to their EMEs borrowers due to higher credit costs associated with tightening of home monetary policy, which offsets the higher yields offered by EMEs borrowers. However, studies conducted by Bräuning &

Ivashina (2020) and Morais et al. (2019) only shed light on the correlation between credit risk and change in foreign monetary policy rates on foreign banks or banks with exposure to dollar credit; these findings do not highlight the impact of change in the monetary policy of home countries on national banks. Additionally, the role of liquidity risk in changes in monetary policy is somewhat limited in these studies.

The role of liquidity and bank stability in changes in the central bank's monetary policy rate has been comprehensively studied using the dynamic asset pricing model (Drechsler et al., 2017). Their model has two types of agents in the markets that differ from each other based on their risk profiles. One agent is risk averse, seeking certainty and stability over uncertainty, while in contrast, the risk-tolerant agent is mainly interested in pooling its net worth, for instance, banks and other financial institutions. The rationale for banks being risk tolerant is that banks take risky leveraged positions using short-term risk-free rates. It is well known that banks use funding from their liabilities side to expand the asset side of the balance sheet, which also exposes banks to funding liquidity risk, also known as rollover risk (Diamond,1984; Allen and Gale, 1994). To overcome such a risk, banks usually hold two types of liquid securities: central bank reserve and government securities as part of their liquidity buffers. In turn, banks demand liquidity premiums as an opportunity cost for holding these assets in reserves. However, the liquidity premium is dependent on the central bank interest rate; therefore, by changing the interest rate, the central banks not only change the cost of holding liquid assets but also influence the banks' risk-taking. For instance, an increase in the policy base rate increases the liquidity premium but also increases the cost of taking leverage, thereby deterring banks from risk-taking. However, the aggregate decline in risk-taking also increases risk aversion resulting in increased risk premia. In contrast, a lower policy rate leads to cheaper liquidity and higher volatility over the long term. One reason for increased volatility is driven due to banks taking on greater leverage and engaging in increased risk-taking activities. This results in low returns and depressed assets, as witnessed during the recent GFC. However, cheaper liquidity eases liquidity risk concerns with the banking system but, at the same time, also increases credit risk and vice versa in an environment of tightening interest rates. These claims also echo some of the arguments raised in numerous studies highlighting ample access to liquidity and costly liquidity; both pose detrimental consequences for banks (Acharya et al., 2020; Acharya and Thakor, 2016; Bruno and Shin, 2015).

On the other hand, Armas (2020) explores the role of monetary policy in bank credit and liquidity through the lens of the Philippines' banking system, indicating that the local banking system remains the primary source of credit to various sectors accounting for 59 per cent of credit to GDP. However, since the Asian financial crisis, banks in the Philippines have been conservative when entering new lending contracts, given their ability to lend has been somewhat weakened, as reflected in the central banks' monetary policy stance. Their study focuses on the impact of monetary policy rate on three bank-specific features, namely liquidity, capital, and size, using the GMM estimator, highlighting three findings consistent with other theoretical and empirical findings and one novel finding. Firstly, liquidity is the main indicator of banks' ability to lend; secondly, banks' loan supply is dependent upon the monetary policy rate, where tighter monetary policy reduces lending activities; thirdly, the type of bank does not affect the lending responses to changes in monetary policy. However, their key finding suggests that the banks' lending channel in relation to changes in monetary policy rate does not exist in the Philippines' banking system. Further explaining that highly liquid banks responded more firmly than financial institutions with less liquid assets in the event of tightening monetary policy as liquid banks used these assets to bump up their liquidity buffers to insulate themselves against any financial crisis or large deposit withdrawal as well as to sustain their conservative lending activities.

Another reason for this is also the need to insulate from rising levels of credit risk; as the cost of borrowing for banks increases, likewise borrower also finds it difficult to pay back their outstanding loan during the period of tightening monetary policy (Armas 2020; Guinigundo, 2017). Similarly, using panel data from emerging market and employing the VAR model, it is evident that changes to monetary policy affect various asset types as well; for instance, changes in base interest rate plays an important role in the oscillations of stock prices and bank credit shocks also the impact housing prices (Singh and Nadkarni, 2017). Elaborating on this further, a lower policy rate declines both the stock prices and house prices but under a tightening policy rate, the effect is larger and more persistent on stock prices due to the rising cost of borrowing and reduced opportunity of lending. The relationship between Monetary Policy rates and credit risk among MENA banks is positive (Mahrous et al., 2020). Using 21 years of data on 15 countries located in the MENA region shows monetary policy rates above 6.3 per cent, which amplifies the level of credit risk and non-performing loans as the rising cost of paying outstanding loans makes it harder for borrowers to repay, making materialisation of NPLs increasing, likely endangering the financial stability of the banking system (Mahrous et al., 2020). If the monetary policy rate is above 6.3 per cent, the impact on credit risk is 1.9 per cent, but in the event of the monetary policy rate being lower than 6.3 per cent, the effect on credit risk remains positive, but the impact is dramatically reduced to around 0.27 per cent (Mahrous et al., 2020). Though their analysis takes inflation into account, the sample size of banks used in the study is small. Additionally, the majority of the countries in their analysis are dominated by Islamic banking, which are exposed to different risks as per Profit and Loss Sharing (PLS) theory and Islamic financing theory, which underpins Islamic banking system prohibiting riba (interest) based transactions which are not addressed nor explored in previous studies conducted. Nonetheless, the research carried out by Kabir et al. (2015) on credit risk in Islamic banks and conventional banks provides a puzzling picture. They employ both the market-based Distance-to-Default (DD) model as well as the accounting-based Z-score model to measure credit risk on banks located in both the MENA region and other emerging economies which have large Islamic banking footprints. They argue that credit risk among Islamic banks using the DD model is significantly lower in comparison to traditional banking counterparts; however, using the Z-score model and NPL ratio indicates elevated credit risk in comparison to conventional banking. Though it can be agreed that Islamic banking is not completely immune from credit risk, their study makes no attempt to explore the impact on Islamic banking in a wider context, particularly regarding the relationship between liquidity risk and financial stability. One reason for higher credit risk is because of the risks attached to Musharakah and Mudarabah contracts which are primarily based on partnership making it practically impossible to demand collateral for Islamic banks to hedge for credit risk from borrowers (Ashraf et al., 2016).

Another study explores the interaction between credit & liquidity risk and its impact on bank stability, using 8 MENA countries and 49 banks with a sample size of 7 years between 2006 – 2013 (Ghenimi et al., 2017). The main variables used include capital-to-asset ratio, NPL as a measure of credit risk, Return on Equity (ROE), ROA, net interest incomes, liquid asset to total asset ratio as a measure of liquidity risk, loan growth, net loans to total assets, Z-score to measure bank stability along with other macroeconomic variables such as inflation and GDP. By employing the GMM model, they reach the conclusion that bank stability has no correlation with the interaction between credit and liquidity risk (Ghenimi et al., 2017). However, it is important to note that they do highlight that these risks do amplify other underlying risks as they increase or decrease. For instance, credit risk increases the default risk of the bank, whereas banks' inability to secure liquid assets at a low cost could also drive banks towards bankruptcy, as evidenced during the recent GFC. Nonetheless, it is worth noting that their research does not address the changes in monetary policy base rate on both liquidity and credit risk; in addition, their analysis does not include LCR or NSFR ratios as liquidity measures under Basel III and does not distinguish the findings between Islamic and traditional banks.

Despite these shortcomings, one of the recent studies by Hassan et al. (2019) shows that interactions between both credit and liquidity risk on bank stability from both traditional and Islamic banking perspectives. However, their analysis does not incorporate any macroeconomic variables nor any new liquidity measure introduced under Basel III. The analysis relies upon Z score and DD models using data from 8 years between 2007 – 2015 on a balanced dataset of 26 banks for each category (i.e., Islamic and traditional banking) (Hassan et al., 2019). Their findings are consistent with the work done by Ghenimi et al. (2017), highlighting a negative relationship between credit risk and liquidity risk within Islamic banks. Further adding that the negative relationship is consistent during the financial crisis for Islamic banks, but post-GFC, the negative relationship is also evident among traditional banks (Hassan et al., 2019). This could be due to changes in credit and liquidity risk pre-GFC amongst traditional banks. Moreover, the relationship between liquidity risk and bank stability among Islamic banks is also found to be negative (Hassan et al., 2019). One reason for such a difference could be due to a multi-governance system imposed on Islamic banks, for instance, Sharia supervisory board, as well as the national regulator assessing banks' compliance and exposure to risks indicating a better risk management approach towards mitigating risks as compared to their counterparts. However, little has been explored in these studies about the role of liquidity creation within banks and how they differ between traditional and Islamic banks.

4.3.2. The Role of liquidity creation in Banks

Liquidity creation is the prime motivation for the existence of banks. It is well known that banks create liquidity from both on and off-balance-sheet activities by financing illiquid assets such as credit cards, personal loans, corporate credit lines, mortgages, and business loans with relatively liquid liabilities, for instance, using various retail and business deposits as per the theory of financial intermediation (Bryant, 1980; Diamond and Dybvig, 1983). Though it is also understood that having liquidity is important for banks to fulfilling their obligation in a timely manner, it is also well evidenced in previous studies reviewed that having too much liquidity leads banks to engage in more risk-taking activities. However, this section explores the implications of banks' ability to create liquidity from balance sheet activities on the risk profile of the banks. Do bigger banks have the capacity to create more liquidity in comparison to their smaller counterparts. Additionally, how does banks' ability to create change during a crisis period and change monetary policy. For instance, Berger and Bouwman (2009) argue that though the classical theories of financial intermediation portray banks as turning liquid liabilities into illiquid assets and generating liquidity out of these illiquid assets, there exist no measures to measure such liquidity creation by financial institutions. They introduced a liquidity creation measure dividing both assets and liabilities of the balance sheet into three groups liquid, semi-liquid and illiquid, with the respective weightings of -½, 0, ½ depending upon balance sheet items based on asset or liabilities side (Berger and Bouwman, 2009). The asset and liability classes for each group are shown in *Appendix D,* along with the weightings.

They employ BBLC measure on all US commercial banks using data between 1993 and 2003 from Federal Reserve call reports excluding banks whose assets are below USD 25 million and with no exposure to real estate mortgages. Their categorisation of bank size is based on total gross assets, with banks having assets exceeding USD 3 billion classified as large, banks with assets between USD 1 - 3 billion classified as medium, and banks with assets up to USD 1 billion classified as small. Findings indicate that the US banking sector created liquidity of more than USD 2.8 trillion until 2003 (Berger and Bouwman, 2009). Moreover, empirical evidence also points out that large banks created as much as 81 per cent of overall liquidity though these banks only account for 2 per cent of all banks (Berger and Bouwman, 2009). Additionally, the relationship between liquidity creation and the value of the bank is positive, but the relationship between bank capital requirements and bank liquidity creation differs based on the balance sheet size of the banks. For instance, higher capital requirements are imposed by the regulator to improve the safety and soundness of banks, but such requirements harm liquidity creation among smaller banks and, on the contrary, enhances liquidity creation among large financial institutions (Berger and Bouwman, 2009). The reason smaller banks are disadvantaged when it comes to liquidity creation is that the balance sheet size of these banks is relatively small compared to their counterparts. Additionally, smaller banks have limited sources of attracting liquidity as they hold a very small market share within the interbank market as a net lender. It is also worth noting that these banks do not operate in international markets as compared to large banks. Despite these findings, this study does not address some important questions regarding the effect of changes in monetary policy on liquidity creation, is having more liquidity creation good for the economy and banking stability, and how banks' liquidity creation behaves during the crisis period. Moreover, these conclusions are made using data from one country in isolation, potentially leading to a lack of understanding as to whether similar conclusions can be made for banks operating in other countries.

However, some of the subsequent research conducted by Allen Berger and Christa Bouwman attempts to address some of the gaps identified in their previous research. For instance, Berger and Bouwman (2017) investigate the changes in banks' liquidity creation during financial crises and changes in monetary policy. The data used covers between 1986 - 2008, comprising different financial crises ranging from the 1987 stock market crash, the credit crunch of the early 1990s, the Russian debt crisis, and the dot com bubble to the GFC of 2008. The calculation of liquidity creation of banks' on and off-balance sheets and the size classification used for banks is the same as defined in Berger and Bouwman (2009). Their analysis explores whether the measure of liquidity creation could predict a looming financial crisis by detrending BBLC measure and GDP while accounting for monetary policy and market return. Their findings indicate that off-balance liquidity creation is a better indicator of a financial crisis in comparison to on-balance liquidity creation and total liquidity creation. The rationale for this conclusion is that during the last five crises studied, banks' off-balance detrend increased above the odds of 1, indicating an increased risk-taking in off-balance sheet transactions followed by a crisis in subsequent quarters. Moreover, prior to two quarters of the GFC, both total liquidity and off-balance sheet liquidity creation measures had a probability of 90% for an impending crisis. However, the former dropped due to changes in GDP, whereas the latter remained consistent in both quarters before the GFC hit the banks (Berger and Bouwman, 2017).

These findings reflect the off-balance sheet exposures held by banks during the GFC; for instance, by the end of 2007, J.P Morgan and Citi both had USD 1 trillion assets each on their off-balance sheet in the form of Structured Investment Vehicles (SIVs), but for Citi, these off-balance sheet SIVs represented about half of the bank's total assets (Crotty, 2009). The purpose of SIVs is supposed to be a standalone vehicle used for paying fees originating from banks with no obligations or commitments. However, banks used SIVs to borrow from short terms markets and use these funds to buy long-term illiquid but high-yield securities such as collateralised debt obligations and MBS (Crotty, 2009). This did increase banks off-balance sheet liquidity creation even after deducting the cost of short-term borrowing, but what drove these banks into crisis was a sharp collapse in demand for collateralised debt obligations and MBS due to increasing defaults among borrowers accompanied by housing pricing declines making these SIVs worthless (Berger and Bouwman, 2017; Crotty, 2009).

Nonetheless, Liquidity creation, both on and off-balance sheet, differs from a monetary policy rate perspective based on the bank size and economic conditions. For instance, a one percentage point change in policy rate increases liquidity creation among small banks by about 2.3 to 2.0 per cent, in monetary terms, equivalent to USD 333 Billion in the following two quarters (Berger and Bouwman, 2017). However, results for medium and large banks are weak and rather mixed. One reason for higher liquidity creation among smaller banks could be due to higher engagement by small banks towards SME segments as compared to their larger counterparts which mostly view SME lending as a risky business, something which has not been factored in their study. Likewise, during the crisis period, change in monetary policy slightly reduces liquidity creation among small banks but remains steady as compared to large banks, which may hoard liquidity during the crisis period and avoid taking lending positions in the interbank market.

Regardless of insightful results, Berger and Bouwman (2017) agree that these results are based on one standalone country. Additional cross-country research is required to further enhance understanding of bank liquidity creation during times of stress and changes to monetary policy. Furthermore, the pattern of bank liquidity creation might also differ based on the magnitude of stress felt by one economy. To illustrate this argument, during the Asian financial crisis of 1997, banks in Europe or the Middle East were not severely impacted by the crisis as compared to financial institutions based in Indonesia, South Korea and Thailand. Similarly, Berger et al. (2016) also studied to determine if the regulatory interventions seen during the GFC reduced or increased banks' liquidity creation. They utilise confidential data on the German banking sector between 1999 – 2009 and use ratios of asset side, liabilities side and off-balance sheet liquidity creation to total assets, loan to asset ratio, Z-score, and Risk-weighted assets to total asset as explanatory variables; they also use instrumental variables to address endogeneity concerns such as regulatory intervention and capital support dummies, the state vote share of a pro-business political party, a distance of banker to its insurer along with control variables such as total asset, return on equity, NPL ratio, tier 1 capital ratio, fees income to total income and loan portfolio concentration. Based on previous studies conducted, it is understood that both regulatory interventions and capital support are used to limit banks risk-taking activities and to promote safety and soundness within the banking system. Nonetheless, Berger et al. (2016) find that such actions also come with unintended consequences of a reduction in bank liquidity creation. It has been underlined in their conclusions that, on the one hand, regulatory interventions reduce liquidity creation, and on the other hand, capital support has no effect on bank liquidity creation.

One possible explanation behind a negative relationship between regulatory interventions and liquidity creation is that regulators might impose restrictions on affected bank's operations, such as limiting their balance sheet size or curbing banks' ability to grant new loans or deposits to contain spillover effects towards the wider banking system. These limitations, indeed would naturally curtail bank's ability to create liquidity. However, the most interesting debate is around the belief that capital support has no effect on liquidity creation is doubtful as that has not been the case during the recent GFC, where banks were engaging in risk-taking activities, Berger et al. (2016) argues that these results are different as German banking data falls short of a sufficient explanation. During the GFC, well-known German banks were engaging in risky activities and were at the centre of the GFC too. Perhaps a more reasonable explanation is that liquidity creation on the asset side of the balance sheet had declined due to bad loans and continued risky exposures to illiquid securities as banks sought to create new liquidity, whilst liquidity creation on the liabilities side of the balance sheet was somewhat higher but unstable as banks lured its customers with higher deposits rates to keep the bank liquid despite capital support to meet regulatory capital requirement effectively cancelling liquidity creation from liabilities side against asset side (Fecht et al.,2019; Berger et al., 2016; Acharya and Mora, 2015).

Likewise, Kapoor and Peia (2021) study the effect of quantitative easing on bank liquidity creation using US banks which took part in US Federal Reserve's large-scale asset purchase programs during the GFC by using the BBLC measure and employing the difference in difference estimation method. They explore whether three rounds of quantitative easing during the GFC by the federal reserve enhanced liquidity creation among banks. Banks' that were most affected by the quantitative easing policy continued to engage in risky lending practices in resemblance to their counterparts in all three rounds of quantitative easing (Chakraborty et al., 2020; Rodnyansky and Darmouni, 2017). Additionally, Kapoor and Peia (2021) add that predominantly first and third rounds of Fed's quantitative easing observed increased loan origination from banks when liquid assets were injected as part of quantitative easing. However, astonishingly bank liquidity creation did not increase until the third round of quantitative easing, which took place in 2012; the main cause for weak bank liquidity creation is primarily driven because banks continued to turn liquid assets received as part of quantitative easing into illiquid assets by taking lending positions within interbank markets as well as purchasing MBS (Kapoor and Peia, 2021). One of the factors not considered by previous studies reviewed the influence of senior executives in banks' pursuit of liquidity creation. According to Huang et. (2018), who studies the role of CEO optimism and bank liquidity creation covering normal as well as times of crisis highlights that CEO optimism influences how much liquidity a bank creates. They use the BBLC measure along with three key variable dummies such as the CEOs Optimism dummy being one if the post holder delays exercising 100 per cent or more in the money options during his tenure and 0 otherwise, Holder 67 dummy being one if the post holder delays exercising 67 per cent or more in the money options during tenure and 0 otherwise, and a dummy variable with the value being one if the post holder has been a net buyer of stock during the first five years of his tenure and 0 otherwise. They concluded by emphasising CEOs who are optimistically created more bank liquidity as compared to less optimistic CEOs; nevertheless, this positive link was stronger during the GFC, highlighting that liquidity creation was higher among optimistic CEOs (Huang et., 2018). However, their study has a few things which are not considered, for instance, the size of these banks, the ownership composition, the terms of loans, and loan composition. More importantly, Huang et. (2018) does not indicate if these banks were part of regulatory bail-out programs during the GFC because Kapoor and Peia (2021) argue that post-GFC bank liquidity creation increased due to quantitative easing by central banks rather than just CEO optimism.

Studies conducted in emerging markets relating to bank liquidity creation are rather limited as compared to an intense debate around bank liquidity creation within developed markets. Gupta and Kashiramka (2020) study the link between bank liquidity creation and bank stability in the aftermath of the GFC in conjunction with a recent significant rise in NPLs within the Indian banking sector. Using data sourced from the Reserve Bank of India (RBI) database ranging from 2007 -2019 comprising 91 commercial banks (28 public sector banks, 21 private sector banks, and 42 foreign banks) and including variables such as Z-Score to measure bank stability along with variables relevant to CAMELS framework. Additionally, they also use four different categories of BBLC measures covering on and off-balance sheet items as well as the maturity of assets and liabilities. After examining the results using OLS and GMM regression models they report three key findings. Firstly, a statistically significant positive relationship between bank liquidity creation and bank stability using on balance sheet items; secondly, when evaluating this relationship based on bank size the impact of liquidity creation on bank stability is negative unlike medium sized banks and finally the Z-score for public sector banks show higher instability as compared to private sector banks (Gupta and Kashiramka, 2020). Despite these findings it is worth pointing out that positive correlation between bank liquidity creation and bank stability contradicts findings of previous studies which report liquidity creation increases banking instability and can be used to predict an impending crisis within the banking industry (see Berger et al., 2019; Berger and Bouwman, 2017; Fungáčová et al., 2015). However, it can be argued that the basis on which previous findings has been concluded is based upon the dataset used to evaluate the relationship within developed markets where the nature and development of the banking system differ from the banking system within emerging markets.

Additionally, it should also be noted that banks within the developed market have higher bank liquidity creation as compared to emerging markets. For instance, US banks created average liquidity of 20% in 2003 (Berger and Bouwman, 2009); Russian banks created 28.60% of liquidity in 2007 (Fungáčová et al., 2015); and banks' from Western Europe created 28% of liquidity between 2014 and 2018 (Yeddou and Pourroy, 2020); in contrast, Indian banks only created 1.11% liquidity between 2007 - 2019 when factoring in off-balance sheet activities (Gupta and Kashiramka, 2020). It should also be noted that different timeframes can influence varying results; however, based on previous studies, it is evident that banks within developed markets create more liquidity and are more prone to illiquidity and thus exposed to liquidity risk compared to banks with lower levels of liquidity creation within emerging markets. Additionally, the difference in conclusion based on bank size can be supported using the competition fragility hypothesis, which explains that in a competitive atmosphere, banks are implored to take on undue risk to stay afloat, effectively creating more fragility as a result (Keeley, 1990; Allen and Gale, 2004). In other words, smaller banks are more cost-sensitive as compared to their larger counterparts due lack of economies of scale often enjoyed by large financial institutions; to mitigate this risk and compete effectively, smaller banks' employ higher risk controls which leaves these banks incurring additional costs one such example is the cost of holding higher liquidity on its balance sheet. In contrast, the reduction in stability of large banks is driven by amplified liquidity creation, leading these banks to engage in excessive risk-taking activities creating a moral hazard problem with the stigma of being too big to fail (Gupta and Kashiramka, 2020).

Looking from a Malaysian banking perspective, Toh (2019) implements the Lerner index developed by Lerner (1934) to examine whether bank capital affects liquidity creation and bank diversification. They provide evidence using data from 28 commercial banks between 2001 - 2017, arguing that an increase in bank capital drove banks away from traditional banking services into more fee-based services such as underwriting and securities trading. Moreover, banks with higher capital ratios create less liquidity from on-balance-sheet activities such as deposit-taking and lending and instead, branch out and divert their assets into more niche markets to improve profitability. Liquidity creation from the on-balance sheet is reduced for all banks regardless of their size as capital ratios increase; nonetheless, off-balance sheet liquidity creation only declines for larger, listed domestic banks giving smaller, unlisted, and foreign banks a competitive advantage for providing more tailored off-balance sheet facilities needed for liquidity creation (Toh, 2019).

Likewise, using the same sample, their subsequent study investigates the impact of stock market liquidity on bank liquidity creation in the Malaysian banking sector (Toh et al., 2019). They employ various measures to gauge stock market liquidity, such as quoted bid-ask spread, Amihud Illiquidity ratio (Amihud, 2002), and Frequency of zero return days (Lesmond et al., 1999) along with other control variables, including Z-score and BBLC measure to quantify bank-level liquidity creation. Their finding points towards evidence of a positive link between liquid stock market and enhanced bank liquidity creation both on and off-balance sheet (Toh et al., 2019). Despite interesting findings, both studies do not consider how higher capital requirements and stock market liquidity would affect Islamic banks since the Malaysian banking sector also has numerous Islamic banks operating with sperate set of regulatory rules governing these banks. Additionally, study conducted on higher capital requirement by Toh (2019) has no variable addressing the financial crisis or accounting for liquidity requirement imposed under Basel III in post-GFC environment.

It can, perhaps, be defensible that more liquid capital markets lead to enhanced bank liquidity creation because banks can not only borrow liquidity via interbank markets but also use cheaper equity finance to raise fresh liquidity to partake in additional lending activities both on and off-balance sheet. Dang (2020) presents his case using 28 Vietnamese commercial banks whilst studying if fee based non-traditional banking services prevents banks from liquidity creation. To explain bank liquidity creation behaviour, they employ fixed effect and OLS models using variables such as size, income diversification, non-interest income, on and off-balance sheet BBLC measures and return of assets along with variables such as GDP and inflation. Based on their empirical findings they present a statistically robust case arguing that non-traditional banking activities reduces bank liquidity creation as it diverges banks away from its core function of financial intermediation (lending business) a main determinant of liquidity creation into a fee-based model where income is based on pushing services to generate liquidity by weakening banks core function (Dang, 2020). These findings refute previous work conducted by Toh (2019) in Malaysian banking context they argue that small banks are at advantage of creating liquidity by offering off-balance sheet services. Nevertheless, it should be noted that Dang (2020) work do not address the issue based on banks size, furthermore their work has acknowledged that Vietnamese banking sector suffered during the recent GFC but no regulatory variables including bank capital and liquidity ratios are included in their empirical analysis to address the liquidity creation behaviour during crisis period or post-GFC under Basel III environment.

Another relevant study by Hsieh and Lee (2020) explores the role of liquidity creation with credit risk in a wider cross-country context using 27 emerging Asian economies. They argue that banks with higher illiquid asset tend to increase their liquid assets, loans and credit, however, banks with higher level of core deposits increase their liquidity creation. They further add that banks that are more exposed to higher credit risk based on Ted spread decrease their liquid assets and increase loans and credit more rapidly (Hsieh and Lee, 2020). However, a few things to note that has not been addressed in their work more precisely there is not an actual measure for liquidity creation but rather a liquid asset variable based on balance sheet which is not exactly a measure of liquidity creation. Additionally, their work uses Ted spread to credit risk but given the bank level data used it would have more reason to draw on this risk using non-performing loans ratio which would portray a more accurate picture of credit risk for each bank. Additionally, they do not address the issue regarding countries which operate under dual supervision regime particularly Islamic and conventional banking systems. It is no doubt that based on the studies review there seems to be very limited evidence of research on liquidity creation within emerging markets and more specifically within the Islamic banking sector.

One of the few studies found exploring liquidity creation in Islamic banking context relates to Berger et al. (2019), they conduct a cross country study on 24 countries predominantly from Middle East and Asia using panel data of 690 banks both conventional and Islamic between 2000-2014. Their outcomes reveal that though conventional banks create more liquidity overall nonetheless liquidity creation within Islamic bank is much higher when compared based on liquidity created per asset (Berger et al., 2019). Similarly, when looking from the financial stability front conventional banks liquidity creation affects financial stability more adversely among high-income countries as compared to low-income countries where the effect is not noticeable (Berger et al., 2019). In contrast Islamic Banks' liquidity creation has no effect on financial stability within high-income countries and interestingly promotes stability within low-income economies (Berger et al., 2019). One reason for higher liquidity creation per asset is since Islamic banks engage more in on-balance sheet transection such as loans as compared to off-balance sheet activities and other financial instruments such derivatives, options and swaps which are mostly prohibited (Berger et al., 2019).

4.3.3. Financial stability and systemic risk

The financial stability of the system encompasses the overall well-being and resilience of the financial system during an economic depression. The amalgamation of banks, financial markets, and non-bank financial institutions plays a crucial role in mitigating systemic risks and unexpected disturbances. The implementation of Basel III regulations, which include liquidity requirements, ensures that banks maintain sufficient liquidity reserves to meet their obligations even in times of financial strain. The stability of financial systems has long been an important concern and remain in the limelight more so post-GFC. The crisis was primarily embarked on systemic risk as capital shortages rarely limited to one bank leaned to amplify as a financial contagion (Buch et al. 2019). Davydov, Vahamaa and Yasar (2020) examine how liquidity creation at the individual bank level helps mitigate systemic risk. It is found that the bank's liquidity creation contributes to strengthening the systemic linkage of individual banks however banks riskiness is negatively linked with liquidity creation. Laeven et al. (2016) discuss the relationship between bank size and the systemic risk as it is a hot topic since the most recent financial crisis and, thus, whether the bank capacity is a function of systemic risk or not. The study highlights several potential factors such as bank size and large banks are typically considered the centre of crisis. Moreover, systemic risk is also significantly associated with unstable funding and practice of more risky activities. Their study also advocates inverse relationship of bank capital and systemic risk. Thus, the combining effect of these factors are contributing more towards systemic risk and hence more predictive in assessing the bank performance, as compared to individual factor. Therefore, the simultaneous effects of these influencing measures are considered during study.

The empirical study by Ozsuca and Akbostanci (2016) evaluate the risk-taking nature of the banks over the decade of 2002-2012, specifically for Turkish banking system, and confirms the presence of risk-taking network of monetary policy. Their study concludes that large banks which have characteristics such as large size, more liquid and are well-capitalised are generally less risky and therefore add less to the systemic risk as compared to the smaller more volatile banks. The theoretical study of Calomiris et al. (2015) on liquidity risks of banks illustrate the need of liquid assets so that the risk of liquidity can be mitigated. The theory also identified that the stability of banks is the function of liquidity risk and credit. Roberts et at. (2019) find that banks that have implemented liquidity requirement such as LCR are more resilient than non-LCR complaint banks. Although LCR has a negative effect on liquidity creation, however, lower systemic risk consequently would allow greater bank lending in the long run. In an attempt to explore systemic risk exposures in the Chinese financial system, Fang et al (2018) advocate that the interconnectedness of financial institutions explains the systemic risk and is the major driver of the Chinese stock market crash of June 2015. They further argue that commercial banks appear less risky in turmoil periods whereas relatively riskier in tranquil periods when compared with other financial markets.

Another study in the same market by Wang et al. (2018) contends that, in a stress period, interconnectedness and systemic risk among the financial institutions is at their peak. To bring systemic risk at a prudent level, Acharya and Thakor (2017) discuss the role of macroprudential regulations in mitigating systemic risk that banks may be significantly prone to collective failure. The macroprudential assessment focuses on the systemic shortage of liquidity and capital with an aim to promote stability of the financial system. Their study finds that excessive leverage relative to the optimal level at individual bank level puts the financial system at greater systemic risk. Moreover, the likelihood of a bank run for liquidity reasons is higher not only for banks with a higher level of leverage but also when other bank portfolios are highly levered. Chen et al. (2018) distinguishes between bank-based and market-based financial systems to figure out the relationship between liquidity risk and bank performance. Based on a sample of commercial banks from advanced economies; macroeconomic, supervisory, and regulatory factors along with the availability of liquid assets and external funding are key forces that explain idiosyncratic liquidity risk. It further indicates the negative relationship between liquidity risk and bank performance in the case of a market-based system whereas no meaningful relationship in a bank-based system.

The transmission of liquidity into systemic risk through the balance sheet channel has been discussed in the literature. For instance, Zeldea (2020) demonstrates that cash, available for sale securities, and brokered deposits are statistically crucial in driving systemic risk. Their study set up a novel framework by first computing marginal expected shortfall for banks and embed it within a random forecast modelling setup. Zheng et al. (2019) discuss the relationship between liquidity creation in banks with failure risks conditional on bank capital for the U.S banks. It is argued that the relationship is significantly negative for small banks and the role of bank capital is highly pronounced during the GFC. Evidence of causes of bank fragility in the MENA region is documented by Ghemine et al. (2017). It is observed in their study that individual, as well as interactive effects of credit and liquidity risk, contribute significantly to bank stability however no time-lagged, as well as the contemporaneous relationship, exists between the liquidity and credit risks of the bank which is contrary to what is predicted by classic theories of the microeconomics of banking.

Andreou et al. (2016) argue that the managerial capacity of the banks is instrumental in the bank's liquidity creation and risk-taking behaviour. It is found that managers with higher skills typically create more liquidity and add more risk however de-leveraging balance sheets through liquidity reduction has been a common practice in periods of financial turmoil. Similarly, the effect of governance in liquidity creation has been observed by Diaz and Huang (2017). Bank liquidity is found to be the function of CEO education, compensation structure, ownership, and progressive practices. Acemoglu et al. (2015) explain the financial contagion in terms of transition phases. It is found the interconnectedness of financial institutions appear as a buffer for adverse but smaller shocks, however, after crossing certain threshold dense interconnectedness tends to amplify the negative shock and are appeared as the major force driving systemic risk.

Studies have also distinguished liquidity risk exposures between conventional and Islamic banking systems. The study of Jaara et al. (2017) emphasizes on the exposure of persuading factors of liquidity risks related to Islamic and conventional banks. Further, it aims on creating such a mechanism by which the liquidity risk could be mitigated, and a sound system could be developed in favour of aggressive risk management. The nature of Islamic banking is found as more prone to liquidity risk than conventional banks. This is because Islamic banks exhibit a distinct reliance on alternative financing modes, which, coupled with limited availability of short-term instruments, necessitates the use of specific liquidity management tools. These banks have established mechanisms and frameworks to effectively manage and mitigate liquidity risk, such as profit equalization reserves and Sharia-compliant liquidity management techniques. However, their susceptibility to liquidity risk is often perceived to be greater compared to conventional banks due to the unique features and adherence to Shariah principles in Islamic finance. The prohibition of interest-based transactions obliges Islamic banks to adopt alternative financial structures, including profit-sharing arrangements and trade-based transactions. This fundamental distinction curtails their access to conventional liquidity management tools, consequently amplifying liquidity risk (Ayub, 2009).

However, Zaheer and Farooq (2014) had contrasting findings. According to the researchers, Islamic banking branches are less prone to withdrawal risks in the face of liquidity stress and this impact remains constant after the introduction of an array of controls. Furthermore, Islamic operations appeared to attract more deposits than their conventional counterparts and this implied that religious branding was likely playing a role in this phenomenon. The authors additionally highlighted that Islamic banks were more likely to grant new loans when faced with liquidity crisis and that in some instances, their lending decisions are likely to be less sensitive to changes in deposits. The findings of these researchers suggested that a greater financial inclusion of faith-based cohorts via Islamic banking, for instance, might not only increase economic stability but banking stability. For drawing results, 204 banks of Middle East and North Africa region are selected for research and the approaches such as univariate and panel regression analysis are adopted. Moreover, the substantial differences of both the type of banking are addressed in the context of liquidity risk, and 92% of liquidity risk is due to financial crises, GDP, securities detained by banks, off-balance sheet items, banks' gearing and some others.

Boukhatem and Djelassi (2020) also examine the liquidity risks in the Saudi Banking system by using three specific indicators and compares its impact on Islamic and conventional banks over the period of 2008 to 2018. The methodology adopted for this study is least square dummy variable corrected. The study finds that the liquidity risks inherent somewhat different features across Islamic and traditional banking systems as well as across large and small banks. For instance, the financing-to-deposits indicator reveal that the funding gap is narrower for larger Islamic banks than smaller Islamic banks. Similarly, the funding structure of larger conventional banks are more fragile and unstable than that of larger Islamic banks. In addition, interbank ratio indicator identifies that Islamic bank are more dependent upon the interbank funding and net borrowing. While the last indicator i.e., liquidity-ratio indicator draws a fine line between Islamic and conventional banking in the context of capital. Thus, a contrary behaviour of both the banks are highlighted in the study. Louati, Abida, and Boujelbene (2015) inspect the nature of conventional and Islamic banking with respect to capital adequacy. The study is conducted over the period of 2005-2012, and on several countries of Middle East North Africa and South Asia. The study also reveals the inverse relationship of two main factors of conventional banks that are liquidity and credit risk.

Sukmana and Suryaningtyas (2016) explore the determinants of liquidity in the context of Indonesian traditional and Islamic banks. Mahdi and Abbes (2017) compare the relationship between capital, risk, and liquidity in the context of Islamic and conventional banking systems in the MENA region. It demonstrates the riskier nature of Islamic banks due to their involvement in relatively risky transactions such as Musharaka and Moudharaba as opposed to commercial operations. A similar study, carried out by Incekara and Cetinkaya (2019), brings Turkish evidence by comparing liquidity risk in conventional as well as in Islamic banks. It is found that non-performing loans, liquid assets, gross domestic product, and inflation are statistically meaningful in explaining the level of liquidity risk for Islamic banks whereas only non-performing loans and liquid assets are found significant for predicting liquidity risk as far as conventional banks are concerned.

On the contrary, Chakron and Gallali (2017) document relatively higher systemic risk for conventional banking system when compared with Islamic counterparts reflecting conventional banking system a real threat for the financial stability. However, Islamic banks tend to contribute significantly to systemic risk during financial turmoil. Market risk and size of the bank are primary factors that induce systemic risk that stem from Islamic banks particularly in the context of Middle Eastern countries. An interesting study by Shahzab et al. (2018) models the systemic, tail risk, and both upside as well as downside contagion effects of global Islamic indices including Dow Jones Islamic, Dow Jones Islamic Financial indices, Islamic indices from the USA, Japan, and the UK. It is observed that DJ Islamic World and US-based Islamic indices possess robust downside contagion effect and systemic risk exposure whereas DJ World financials and Japanese Islamic indices exhibit larger upside spillover effect.

Ongoing episodes of the financial crisis have highlighted the shortcomings of risk models. The literature has also been expanding in utilising a range of empirical methodologies for modelling systemic risk. A recent breakthrough is brought by Adrian and Brunnermeier (2016) by introducing the delta Conditional Value at Risk (CoVaR) approach to segregate systemic risk components. It takes differential between the value at risks of the financial institutions in two different states: in a state of financial distress and in a normal state. The advantage of the delta CoVaR approach is that it is the forward-looking systemic risk measure conditional on the balance sheet and macroeconomic variables. Other studies such as Sedunor (2016) endorses the outperformance of delta CoVaR methodology and assert that the measure is better than traditional systemic risk measures such as expected shortfall and Granger causality. Liu (2017) uses the CoVaR approach to model non-linearities of systemic risk and introduce regime-switching by means of Markov-switching quantile autoregression for the U.S large bank holding companies.

Karimalis and Nomikos (2017) introduce the copula based VaR and CoVaR to model systemic risk for portfolios of large European banks. Their study brings important conclusions. Firstly, liquidity risk is identified as the important determinant of systemic risk. Secondly, leverage and size contribute significantly to the systemic risk. Thirdly, macroeconomic variables such as industrial production, unemployment, stock market index, and GDP provide linkage between systemic risk and macroeconomy. Other notable studies that use CoVaR for modelling systemic risk in the context of China and the US are those conducted by Xu et al. (2018) and Teply and Kvapilikova (2017) respectively. The intricated interdependencies among the sources of systemic risk are also modelled by Pourkhanali et al. (2016). Probability of defaults are obtained to assign credit ratings to the financial institutions and correlation structure among these rating classes are examined using canonical and D-vine copula. Their study concludes that second-tier financial institutions contribute the most to systemic risk. Dahir et al. (2017), using a two-step system GMM model, explores the relationship between liquidity risk, bank risk-taking, banking activities and funding liquidity risk for BRICS countries. It is found that the liquidity risk alters bank risk-taking behaviour and encourages more conservative holdings of the liquid asset as compared to the past.

Bai et al. (2018) construct a liquidity mismatch indicator to measure the gap between the liquidity of assets and liabilities that need to be funded to proxy the bank's liquidity risk. The results reveal that banks with higher liquidity mismatch have a more negative stock return as well as more positive stock return in subsequent crisis and non-crisis periods. Similarly, stocks of such banks earn a more negative return as well as more positive returns in the case of liquidity run. Shen et al. (2018) employ panel data instrumental regression approach to model liquidity risk and find that liquidity risk is negatively related to bank performance. Canadian evidence is brought by Li and Saiz (2016) which evaluate systemic risk in the network of financial market infrastructures by using extreme value methods. The methodology is to measure the probability of the tail event that two or more financial market infrastructures (FMI) have significant risk exposure to the same individual. The interdependence between FMIs is modelled by means of conditional probabilities that FMI has significant risk exposure to the entity given that other FMIs have a similar risk exposure on the same entity. Kleinow et al. (2017) compare four different methodologies to model systemic risk namely delta CoVaR, marginal expected shortfall, co-dependence risk and lower tail dependence. Results of their study conclude that different approaches lead to very different estimates of systemic risk which also vary with time however marginal expected shortfall appears most appealing.

Another strand of literature focuses on sophisticated data science approach to model risks as well as optimise predicting accuracy. The advantage of these approaches is that these approaches allow non-linearity, complexity, and spill over effects associated with various sorts of risks. Tavana et al. (2018) use artificial neural networks (ANN) and Bayesian networks (BN) to model liquidity risk. Using liquidity ratios, the two-phase ANN-BN approach is found self-confirming. Wang et al. (2021) use a machine-learning-based system to model systemic risk. In comparison to econometric and other machine learning approaches, the random forest classifier appears to be the most efficient classifier for simulating the expert voting process. Leo et al. (2019) reviews a growing literature pertaining to the application of machine learning approaches in banking risk management. It is concluded that there exists a huge gap and many aspects of risk management have remained unexplored with respect to machine learning applications. A similar study by Kou et al. (2019) also surveys existing methodologies as well as machine learning approaches such as big data analysis, sentiment, and network analysis for modelling systemic risk. Guijarro et al. (2019) uses sentiment analysis to assess liquidity risk. A natural language processing algorithm is used to extract sentiment from the Twitter microblogging service. It is found that investor's mood has little impact on the spread of the S&P 500 index. Bid-ask spread is among the most popular measures of liquidity risk.

The linkage between liquidity risk and credit cannot be neglected as far as systemic risk is concerned. As identified, both models of banking such as the financial intermediation perspective in Diamond and Dybvig (1983) or Bryant (1980), and the Monti-Klein framework suggest that the asset and liability structure of a bank are closely associated and especially with regard to fund withdrawals and borrower defaults. When financial institutions face liquidity constraints, their ability to extend credit or fulfill existing credit obligations may be impaired. Likewise, a decline in credit quality and an increase in default rates can diminish the value of assets held by financial institutions, thereby reducing their capacity to generate liquidity. Thus, understanding the intricate interconnections between liquidity risk and credit risk is imperative in effectively managing systemic risk. The recognition of the vital need to explore the relationship between liquidity risk and credit risk was significantly emphasized during the Global Financial Crisis (GFC) in 2008, where the inherent interdependence between these two risks became evident. The crisis vividly demonstrated how liquidity challenges and credit defaults originating from specific sectors of the financial system could swiftly spread, leading to extensive repercussions on overall financial stability.

One notable study emphasizing the connection between liquidity risk and credit risk is by Duffie and Zhu (2011). The authors analyze the feedback effects between liquidity risk and credit risk, emphasizing the importance of considering these risks jointly to understand systemic risk dynamics. Their research highlights the role of liquidity in amplifying the effects of credit shocks and the subsequent impact on overall financial stability. Furthermore, Acharya and Pedersen (2005) provide insights into the relationship between liquidity risk and credit risk. Their study highlights how liquidity shortages can lead to fire sales of illiquid assets, which further exacerbate credit risk and contagion effects within the financial system. The works of Brunnermeier and Pedersen (2009) and Adrian and Shin (2010) also contribute to the understanding of the intricate association between liquidity risk and credit risk. These studies investigate how liquidity constraints can lead to adverse feedback loops and systemic risk amplification, particularly during periods of financial stress.

By comparing systemic risk and bank size, Varotto and Zhao (2018) analyse common systemic risk indicators and introduce new superior systemic risk measures for the US and European banks. The new measure provides potential value addition to the Basel III framework. Khan et al. (2020) compare sophisticated risk models including dynamic panel probit model, hybrid artificial neural network, and Merton-KMV approaches to model credit risk in the non-financial sector of Pakistan. The hybrid neural network outperforms the other competing model. Using the hybrid neural network, Khan and Iqbal (2021) construct default risk factors to test its efficacy in Fama and French's (2015) five-factor model. O'Halloran and Nowacyzk (2019) use an artificial intelligence approach to model the effects of financial market regulation on systemic risk. It uses simulation technology accompanied by advances in graph and machine learning approaches to develop entire financial systems derived from the realistic distribution of bank data. In exploring machine learning's application in assessing credit risk, Bazarbash et al. (2019) discuss the strengths and weaknesses of machine learning tools. It brings at least four novel aspects firstly explaining common machine learning techniques in the non-technical language, secondly discuss challenges in credit risk modelling, thirdly income prospect prediction, and last but not least forecast modification in general conditions.

4.3.4. Research Hypotheses

Based on the existing theories and literature reviewed above, the following testable hypotheses have been formulated.

H_{1a}: *There is a reciprocal relationship between liquidity risk and credit risk, that is, liquidity risks influence credit risks and vice versa.*

H_{1b}: *Liquidity risk and credit risk jointly and individually contribute to bank stability.*

H_{1c}: *The overall bank liquidity creation reduces systemic risks for Islamic, Conventional and Hybrid banks.*

These hypotheses propose that credit and liquidity risk play a significant role in determining the stability of banks. Additionally, it is posited that the level of bank liquidity creation has a notable influence on the level of systemic risk present in the financial system. These hypotheses have been empirically tested to assess the extent to which credit and liquidity risk affect bank stability and how bank liquidity creation contributes to systemic risk

4.5. Research Methodology

4.5.1. Data Sample

For all banks, balance sheet information was obtained on a quarterly basis from FQ1 2015 until FQ1 2021, reported in USD using both Bloomberg Terminal as well as Refinitiv Eikon. The criteria for selection of the countries were chosen based on the Refinitiv Eikon Islamic Finance Development Indicator (IFDI) 2020, which measures Islamic finance development in various countries based on quantitative development, knowledge, governance, awareness, and corporate social responsibility activities within each country. The idea behind using IFDI as a criterion was to ensure the study captures all key countries within the Islamic finance market as well as provide a rich sample of Islamic banks and conventional banks operating within these markets. The ten countries used in this study include Malaysia, Indonesia, Bahrain, United Arab Emirates, Saudi Arabia, Jordan, Pakistan, Oman, Kuwait, and Qatar. This gave an initial panel data sample of 164 banks which was reduced to 134 banks and 3,350 observations after removing banks due to not serving within the commercial banking segment, either a wholesale bank or did not have consistent data for the required time frame. The data analysis is conducted using Stata software.

Countries	Conventional Banks	Conventional Hybrid Banks	Islamic Banks
Malaysia	0	7	2
Indonesia	19	15	1
Bahrain	3	0	5
United Arab Emirates	2	10	5
Saudi Arabia	1	3	6
Jordan	13	0	2
Pakistan	1	13	1
Oman	4	2	1
Kuwait	5	0	5
Qatar	4	1	3
Total	52	51	31

Table 16: Breakdown of Conventional, Conventional Hybrid and Islamic Banks based on countries

To avoid bias against both Conventional and Islamic banks. Bank type has been divided into three bank categories, namely Conventional Banks, Conventional Hybrid Banks and Islamic Banks. For a bank to be classified as Conventional Hybrid, one of the following criteria should be met. Firstly, the bank holds both Conventional and Islamic banking licenses from their national regulator to operate in both segments. Second, the Bank has an Islamic Banking unit or owns a subsidiary which provides Islamic Banking services. Thirdly, banks which have reported on their balance sheet owning Islamic banking assets and deposits, which also includes financing or investing in Musharaka, Mudaraba, Sukuk, Ijarah and Wakala Islamic Financing instruments. Using this criterion gives us 52 conventional banks, 51 conventional hybrid banks and 31 Islamic banks. Table 16 lists country by country breakdown of all three bank categories. The key variables used for this study are listed in Table 17 and are elaborated further in the subsequent sections.

Variables	Measures	Frequency

Bank Returns	$\frac{\text{Last bank stock price}_{t-1} - \text{Current bank stock price}_{t}}{\text{current bank stock price}_{t}}$	Daily
Market Returns	$\frac{\text{Last market price}_{t-1} - \text{Current market price}_{t}}{\text{current market price}_{t}} \text{ X } 100$	Daily
Credit Risk	Non-performing loans/ Total Loans	Quarterly
Liquidity Risk	[(Demand Deposits + Federal Funds Sold and Repo purchases+ Other inter-banking assets)-(Trading securities at FV+ Available for sale securities+ Cash due from other banks+ Federal Funds Sold under Repo agreement)]/Total Assets	Quarterly
Capital Adequacy Ratio (CAR)	Total regulatory capital to asset ratio	Quarterly
Loan Growth	Loan to asset Ratio	Quarterly
Net Interest Margin (NIM)	Net interest income to earning assets	Quarterly
Size	Log (Total Assets)	Quarterly
Liquidity	Deposit to Asset Ratio	Quarterly
Efficiency Ratio	Cost to income ratio	Quarterly
Financial Leverage	Debt to equity ratio	Quarterly
Return on Asset (ROA)	Net income/ Total assets	Quarterly
Return on Equity (ROA)	Net Income to equity ratio	Quarterly
Income Diversity	$(1 - \frac{\text{Net interest income - other operating income}}{\text{Total operating Income}})$	Quarterly
Inflation	Consumer Price Index	Quarterly
GDP	Real GDP Growth	Quarterly

Table 17 - Key variables used in this study

4.5.2. Measurement for credit, liquidity risk and bank stability

To test the first hypothesis **H_{1a}**, we empirically examine the relationship between credit and liquidity risk as shown in equations 4.1 and 4.2 to first identify the general relationship between the two and identify whether a reciprocal relationship exists before measuring their individual and joint effects on bank default risk as shown in equation 4.4. Equation 4.1 seeks to investigate the relationship between credit risk and bank-specific variables and the macroeconomic variables of the country from which the bank is based. Equation 4.2, on the other hand, seeks to investigate the relationship between liquidity risk and bank-specific variables and the macroeconomic variables of the country from which the bank is based.

The empirical model used in this study to evaluate the relationship between credit and liquidity risk closely relates to studies conducted by Imbierowicz and Rauch (2014) and Ghenimi et al. (2017). Imbierowicz and Rauch (2014) observe the relationship between credit and liquidity risk using various proxy variables for credit and liquidity risk and employs a generalised structural equations approach to address concerns around potential endogeneity. To elaborate, endogeneity arises when an independent variable is correlated to the model's error term instead of being zero; this violation of the Gauss- Markov Theorem results in making the OLS regression estimation biased due to the reverse causality issue. To address this concern, we employ Panel Vector Auto-regressive (PVAR) model and GMM-style instrumental variables similar to Ghenimi et al. (2017).

*G*enerally, in VAR models, we consider the system of equations where the endogenous variables depend on their own and the lags of the other endogenous variables (in our case LR and CR), and then we can also include exogenous variables. In the panel VaR model, we also specify lag orders of dependent variables to be used as instruments. In our case, we have used lags of 1,2,3, and 4 for CR and LR as instruments. The lag number was chosen based on lag selection criteria*.*

$$CR_{i,t} = \beta_0 + \beta_1 CR_{i,t-1} + \beta_2 LR_{i,t-1} + \sum_{j=1}^{J} \beta_j Bank_{i,t}^{j} + \sum_{l=1}^{L} \beta_l Macro_t^{l} + \varepsilon_{i,t} \quad (4.1)$$

$$LR_{i,t} = \beta_0 + \beta_1 LR_{i,t-1} + \beta_2 CR_{i,t-1} + \sum_{P=1}^{P} \beta_P Bank_{i,t}^{P} + \sum_{Q=1}^{Q} \beta_Q Macro_t^{Q} + \varepsilon_{i,t} \quad (4.2)$$

Where i indicates for bank $i = 1\ldots., N$, t stand for the time in quarters $t = 1\ldots., T$. β_0 is the intercept. $CR_{i,t}$ and $LR_{i,t}$ represents credit risk and liquidity risk at bank i at time t. $Bank_{i,t}^{j}$ and $Bank_{i,t}^{P}$ is a vector of bank-specific variables consisting of ROA representing a measure of profitability based on banks assets, ROE representative profitability from the Investors' viewpoint, CAR signifying the total capacity of regulatory buffer a bank holds for risk management and mitigation purposes, log of total assets represents the size of a bank, Net Interest Margin (NIM) highlighting net income generating by banks' just from interest charges, Financial Leverage (Lever) demonstrating banks' risk appetite, Loan assets growth representing riskiness, Efficiency Ratio for the propose of gauging the management ability to utilize assets efficiently, Income diversity for accessing the banks income stability from other activities. Likewise, $Macro_t^{l}$ and $Macro_t^{Q}$ is a vector of macroeconomic variables such as GDP and Inflation. The selection of these variables has been well established on previous studies conducted in the spheres of both credit and liquidity risks by Bonfim (2009); Munteanu (2012); Imbierowicz and Rauch (2014): Kabir et al. (2015); Ghenimi et al. (2017); Lassoued (2018); Hassan et al. (2019); Mohammad et al. (2020); Gupta and Kashiramka (2020); Pham (2021).

$$Z\text{ - }Score_{it} = \frac{CAR_{it} + ROA_{it}}{\sigma ROA_{it}} \quad (4.3)$$

To gauge banking stability, numerous models have been used in previous studies which rely on market-based information as well as accounting-based information. For instance, Kabir et al. (2015) studied both models Merton DD which uses market-based information and Z-score, using accounting-based information. However, it should be noted that the Merton DD uses bank stock price as a main input and relies on certain assumptions which are not practical in nature (Kabir et al., 2015). For instance, the assumption that the market remains liquid and trades continuously was not true during the GFC. Moreover, the stock price does not accurately reflect all the accounting information within an illiquid market. An alternative common measure used to measure the safety and soundness of a bank is using Z score using balance sheet information.

Multiple studies use Z-score to measure bank stability, including studies conducted by Imbierowicz and Rauch (2014), and Ghenimi et al. (2017). Likewise, Chiaramonte et al. (2016) compare both DD and Z-score measures, highlighting that Z-score can accurately predict 74% of bank failures and is the main underlying determinant for the DD model. Moreover, the prediction power of the Z-score model remains stable for the three-year ahead window. To measure the stability of banks, this study also employs Altman Z-score (Altman, 1968) as a predictor of bank stability. Z-score is measured using CAR and ROA divided by the standard deviation of ROA of bank i at the time t as shown in equation 4.3. The higher the value of the z-score, the more stable the bank is said to be; similarly, the closer the z-score value to zero, the riskier and more unstable a bank is deemed to be.

$$\text{Z - Score} = \beta_0 + \beta_1 \text{Z - Score}_{it-1} + \beta_2 \text{Liquidity Risk}_{it} + \beta_3 \text{Credit Risk}_{it} + \beta_4 \text{Liquidity Risk * Credit risk}_{it} + \beta_5 \text{Size}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{CAR}_{it} + \beta_8 \text{Loan Growth}_{it} + \beta_9 \text{efficency}_{it} + \beta_{10} \text{Income Diversity}_{it} + \beta_{11} \text{Inf}_t + \beta_{12} \text{GDP}_t + \varepsilon_{it} \quad (4.4)$$

After measuring the bank stability using Z-score to assess the impact of credit and liquidity risk independently as well as jointly on bank stability, the study employs the Z-score as the dependent variable to test our second Hypothesis $\mathbf{H_{1b}}$. This model seeks to address the aim and second objective of this study, where β_0 is the intercept, which is to be estimated, Z - Score_{it-1} is lagged by one to ensure it captures the stability of bank consistently over time. $\text{Liquidity Risk}_{it}$ and Credit Risk_{it} is the gauges independent impacts of liquidity and credit risk on bank stability. The interaction term of Liquidity and credit risk asses the joint impact of both risks on bank stability. Size_{it} is log of total assets, ROA_{it} is the return on asset calculated as net income divided by total assets, CAR_{it} is Capital adequacy ratio, Loan Growth_{it} is loan growth calculated as growth on a quarterly basis to annual growth in the prior year, efficency_{it} is the efficiency ratio, $\text{Income Diversity}_{it}$ is income diversity. Inf represents changes in consumer price index, GDP is the GDP growth, $\varepsilon_{it}$is standard error term. $\beta_1,\ldots\ldots,\beta_{14}$are parameters to estimated using the dynamic general method of moments (GMM) estimator by Blundell and Bond (1998). The variables used in this regression have been established in the strand of previous literature on bank credit risk, bank liquidity risk and Bank stability, for instance Cole and Gunther (1995), Acharya and Viswanathan (2011), Cole and White (2012), He and Xiong (2012b), and

Liu et al. (2021) for balance sheet related variables; Thomson (1992) and Aubuchon and Wheelock (2010) for the macroeconomic variables.

4.5.3. Measuring Bank Liquidity Creation

To answer the second research question of this study, it is important to measure bank liquidity creation before measuring systemic risk impact on bank liquidity creation. Hence, to measure bank Liquidity creation of banks, we use pioneering work conducted by Berger and Bouwman (2009) BBLC measure, as shown in *Appendix D,* as our main foundation to measure bank liquidity creation. However, one key challenge around implementing such a measure within our study was that the work of Berger and Bouwman (2009) does not necessarily address concerns about the different risk exposures around conventional and Islamic banking systems, given that certain financial instruments are prohibited underpinned by Islamic Finance theory and the concept of riba (interest) does not exist as per PLS theory. Additionally, Berger and Bouwman (2009) are based on US banks rather than a wider cross-country study. Nonetheless, these concerns have been addressed in their subsequent study, which measures liquidity creation among conventional and Islamic banks by slightly modifying the previous classification of balance sheet items (Berger et al., 2019). Though, their estimation seems rather biased towards conventional banks as they do not study banks which operate in both conventional and Islamic banking segments and cannot be classified as either fully-fledged conventional or Islamic banks. Hence, we address this bias by studying banks which operate in both segments as conventional hybrid banks.

To compute bank liquidity creation for each quarter, we largely adhere to Berger and Bouwman's (2009) three steps cat-fat process. In the first step, we assign all on and off-balance sheet items into three categories liquid, semiliquid and illiquid, as shown in Table 18. For the assets side of the balance sheet, this categorization accounts for the ease, cost and time required to dispose of these assets to meet liquidity demand. For liabilities and equity, consideration is given to the ease, cost and time required for a customer to obtain their liquid funds. As for off-balance sheet items, these are classified as on-balance sheet items. However, given that our sample represents a mix of high- and low-income economies, we modify the classification of real estate loans and consumer loans as the classification differs within these countries between being illiquid assets for low-income countries and semi-liquid for high-income countries (Berger et al., 2019). Hence, we use World Bank Atlas Method for classifying low- and high-income economies. Based on their methodology, countries which are classified in the High-income group include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. Similarly, countries classified as low-income economies include Indonesia, Malaysia, Pakistan, and Jordan.

Assets		
Illiquid assets (weight=1/2)	**Semiliquid assets (weight=0)**	**Liquid assets (weight=-1/2)**
Residential real estate loans (Low-income countries)	Residential real estate loans (High-income countries)	Reserve Repos and Cash Collateral
Other Consumer/Retail Loans (Low-income Countries)	Other Consumer/Retail Loans (High-income Countries)	Trading Securities and at FV through Income
Other Mortgage Loans	Loans and Advances to Banks	Available for Sale Securities
Commercial real estate loans (Mudaraba, Musharaka, Murabaha)		Held to Maturity Securities
Other Loans		At-equity Investment in Associates
Investment in Property		Other Securities
Other Earning Assets		Cash and Due from other Banks
Fixed Assets (Ijara)		
Goodwill		
Other Intangibles		
Deferred Tax Assets		
Discontinued Operations		
Other Assets		
Liabilities and equity		
Liquid liabilities (weight=1/2)	**Semiliquid liabilities (weight=0)**	**Illiquid liabilities and equity (weight= -1/2)**
Customer Deposits (Amanah, Mudaraba and Musharaka)	Other Deposits and Short-Term Borrowing	Long term debt
Deposits from Banks		Credit Impairment Reserves

Repos and Cash Collateral		Reserves for Pension
Trading liabilities		Deferred Tax Liabilities
		Other Liabilities
		Pref. Shares and Hybrid Capital
		Common Equity
		Non-Controlling Interest
Off-balance sheet guarantees		
Illiquid guarantees (weight=1/2)	**Semiliquid guarantees (weight=0)**	**Liquid guarantees (weight= -1/2)**
Guarantees	Other Off-Balance Sheet Exposure to Securitizations	Prohibited by Gharar
Acceptances and Documentary Credits Reported Off-Balance Sheet		
Committed Credit Lines		
Other Contingent Liabilities		

Table 18 - Bank Liquidity Creation Measurement Construction

The second step of bank liquidity measurement encompasses assigning weights to all the balance sheet items classified in the first step consistent with liquidity creation theory which highlights that liquidity is created when a bank finance illiquid asset with liquid liabilities; hence positive weights of $^1/_2$ are allocated to both illiquid assets and liquid liabilities. To elaborate further, this effectively implies a transformation of $1 of illiquid assets in the form of commercial loans into $1 of liquid liabilities in the form of deposits (Amanah), generating $1 for the public. In contrast, banks destroy liquidity by using liquid assets (e.g., cash) and illiquid liabilities (e.g., Debt) to finance liquidity liabilities. Hence negative weights of $-\,^1/_2$ are placed on both liquid assets and illiquid liabilities categories. All items falling under the semiliquid category are kept neutral, assigning a weight of 0. Off-balance sheet items such as guarantees and credit lines act similarly on balance sheet items but are allocated a positive weighting as they provide customer access to liquid funds similar to deposits in the forms of Amanah or commercial real estate loans such as Murabaha.

$$\text{Catfat} = \Big[\frac{1}{2}(\text{illiquid assets} + \text{liquid liabilites} + \text{illiquid gurantees}) + 0(\text{semiliquid assets} + \text{semiliquid liabilites} + \text{semiliquid gurantees}) - \frac{1}{2}(\text{liquid assets} + \text{illiquid liabilites} + \text{equity} + \text{liquid gurantees})\Big]/\text{Total Assets} \quad (4.5)$$

In the third step, we construct liquidity creation measure by multiplying the weights allocated to liquid, semiliquid and illiquid classification to assets, liabilities, equities, and off-balance sheet items. The study conducted by Berger et al. (2019) also shows that bank liquidity creation can be further separated into total liquidity creation, asset side liquidity creation, liabilities side liquidity creation and off-balance sheet liquidity creation by summing up the weighted dollar term value in the respective categories. However, for the sake of simplicity, we illustrate the total cat-fat measure in equation 4.5 as computed by the studies conducted by Zhang et al. (2019). The compressed used by equation Zhang et al. (2019) provides total bank liquidity creation. However, we have modified the equation by removing liquid derivatives and guarantees as they are prohibited in Islamic banking, also specified by Berger et al. (2019) in their international bank liquidity creation construction. The final value of total bank liquidity creation is divided by total assets for normalization purposes to avoid the regression results being biased towards large banks.

4.5.4. Composition of systemic risk with bank liquidity creation

In order to examine the link between systemic risk and bank liquidity creation as per our third Hypothesis **H_{1c}.** We first have to estimate systemic risk, given that we have already estimated bank liquidity creation in the previous section. To gauge the sensitivity of banks' systemic risk towards financial shock within the market, naturally measuring the coefficients of a linear relationship between indicators of one bank and the financial system would have been a way forward. However, banking literature on systemic risk refers to large shocks within the financial system as compared to minor changes within the financial system; these events do not take place every day. They are often referred to as high severity low-frequency events or, alternatively, tail events

(Fahlenbrach et al., 2012). Hence to estimate extreme shock within the financial system, we follow Van Oordt and Zhou (2018) approach using daily bank stock data and market index data and regressing daily bank returns against market returns conditional to extreme shocks.

$$R_i = \beta_i^T R_m + \varepsilon_i, \text{ for } R_m < - VaR_\alpha \quad (4.6)$$

Where R_i denotes bank returns and R_m denotes to market returns on a daily basis within a financial system. Likewise, coefficient $\beta_i^T$is a measure of systemic risk bank i and T in the coefficient is an index of the relationship between bank i and the financial system in an event of extreme shock. VaR_α is Value at Risk, which is defined as the loss of dollar investment within the market exceeding the probability α. Given that β_i^T is regarded as systemic risk measure which means that banks with higher β_i^T coefficient are expected to suffer from higher capital losses in an extreme shock taking place within the market. Systemic risk is computed with α set at 5 per cent, which would naturally attract extreme events; however, this will result in a much smaller observation sample and using conventional OLS regression will not be an effective method. Hence, to address this issue, similar to Van Oordt and Zhou (2016); Van Oordt and Zhou (2018); Davydov et al.(2021), we use Extreme Value Theory to estimate systemic risk; as this approach also has a much smaller mean square error in comparison to OLS regression (Van Oordt and Zhou, 2018). Hence β_i^T can be rewritten as

$$\beta_i^T = \lim_{\alpha \to 0} \tau_i(\alpha)^{1/\xi_m} \frac{VaR_i(\alpha)}{VaR_m(\alpha)} \quad (4.7)$$

Where VaR_i and VaR_m is the value at risk of the bank R_i and market R_m with the probability of α. ξ_m is the market tail index and $\tau_i(\alpha)$ is the tail dependency between bank returns and market returns expressed as:

$$\tau_i(\alpha) = \Pr(R_i < - VaR_i(\alpha) \mid R_m < - VaR_m(\alpha) \quad (4.8)$$

To estimate the market tail index, we implement Hill's Estimator (Hill, 1975), which has been widely used for tail index estimation literature by Schmuki (2008); Jia (2014); Van Oordt and Zhou (2016); Davydov et al.(2021) to estimate market tail index ξ_m. Hill estimator is empirically expressed as

$$\frac{1}{\xi_m} = \left(\frac{1}{n}\sum_{i=1}^{n} \log\frac{R_{m,T}}{R_{m(n+1)}}\right)^{-1} \quad (4.9)$$

Where $R_{m,(1)} \geq R_{m,(2)} \geq R_{m,(3)} \geq \ldots\ldots \geq R_{m,(T)}$ is order of statistics of sample T of identically independent distributed realized non-negative market returns R_m. Likewise, n denotes upper-order statistics, often referred to as the number of threshold values representing extreme events counted in tail distribution. Studies conducted by Van Oordt and Zhou (2018) and Davydov et al.(2021) agree that all components of systemic risk can be estimated using existing estimators of EVT. Hence systemic risk β_i^T by combing all components where T is the total observations of bank and market returns and n as the worst stock returns expressed as

$$\beta_i^T = \tau_i\left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}} \frac{VaR_i(n/T)}{VaR_m(n/T)} \quad (4.10)$$

Where β_i^T is a measure of systemic risk, $\frac{1}{\xi_m}$ is the market tail index estimated using equation 4.10, $\tau_i(\frac{n}{T})$ is parameter of tail dependency estimated nonparametric approach essentially measuring $(n + 1)$ the highest loss on bank returns. In other words, this component measures the tail dependence between bank and the market (Van Oordt and Zhou, 2016). In other words, this component measures the concentration of links between the bank and the market during extreme shocks. Fluctuations in this component are primarily due to changes in banks i in computing tail dependencies. Likewise, $\frac{VaR_i(n/T)}{VaR_m(n/T)}$ is the ratio of VaR_i bank i and VaR_m market index m. VaR_m primarily remains consistent for all bank, changes to market VaR_m is based on the difference change in bank tail risk VaR_i. This computation essentially measures bank tail risk but does not consider whether bank tail risk can be associated to extreme shocks within the market m. A linear additive link is acquired by taking log of systemic risk β_i^T, systemic linkage $\tau_i\left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}}$, and bank tail risk $\frac{VaR_i(n/T)}{VaR_m(n/T)}$ similarly to Davydov et al. (2021) and is empirically stated as

$$\text{Ln}\left(\beta_i^T\right) = \text{Ln}\ \tau_i\left(\frac{n}{T}\right)^{\frac{1}{\varepsilon_m}} + \text{Ln}\frac{\text{VaR}_i\left({}^{n}/_{T}\right)}{\text{VaR}_m\left({}^{n}/_{T}\right)} \approx \log(\text{Systemic Linkage}) + \log(\text{Tail Risk}) \quad (4.11)$$

$$\text{Ln}(\text{Risk}_{i,t}) = \beta_0 + \beta_1\text{Catfat}_{i,t-1} + \gamma_s(\text{Bank - Specific Variables})_{i,t-1} + \phi\ \text{Country FE}_{i,t} + \omega\text{Time FE}_{i,t} + \varepsilon_{i,t} \quad (4.12)$$

To evaluate the association between systemic risk and bank liquidity, we use the panel fixed effect model for estimation. Where the dependent variable is $\text{Risk}_{i,t}$ is the log systemic risk, systemic risk and tail risk for bank i at time t. Like Van Oordt and Zhou (2018), we also ignore all observations of systemic risk, which equates to zero to preserve liner additive linear relationship. β_0 is the intercept, bank liquidity creation measure of Catfat is computed using equation 4.5. Bank-specific variables used in this model include CAR as measure of regulatory capital, ROA as a measure of profitability, deposit-to-asset ratio as a measure of liquidity, Non-interest income as a measure of income diversification, NPLs as a measure of credit risk and bank size; these variables has been in the existing literature on systemic risk and bank liquidity creation (Jia, 2014; Van Oordt and Zhou, 2016; Van Oordt and Zhou, 2018; Zhang et al.,2019; Davydov et al., 2021). Country-fixed effects were used to control for country-specific averages. We also include time-fixed effects in our model to address time-specific idiosyncratic factors that can influence systemic risk. Additionally, ε represents standard error for bank i at time t. The above approach discussed aims to answer the second research question, research aim and third research objective of this study.

4.6. Data analysis and results

4.6.1. Interactions between Credit and Liquidity risks and its impact on Bank stability

Variable	Obs.	Mean	Std. Dev.	Min	Max
CR	3,300	4.27	3.76	-9.51	37.87
LR	3,276	0.05	0.18	-0.65	0.78
CR*LR	3,246	0.13	0.94	-8.80	4.91
Z-Score	3,305	76.62	72.47	-208.15	865.52
ROA	3,330	1.04	1.11	-11.18	4.32

ROE	3,330	8.64	10.24	-132.53	37.37
CAR	3,305	18.77	6.55	-30.22	73.40
LnTA	3,330	9.11	1.54	4.79	12.55
NIM	3,330	3.50	1.68	-1.48	14.09
Lever	3,330	10.03	23.39	-2.09	867.09

Table 19: Descriptive Statistics

Table 19 above highlights descriptive statistics for all the variables used in equation first four equations of this chapter. A few data points which were missing were estimated using linear interpolation. Banks with no data at all were excluded from our analysis. Like Ghenimi et al. (2017) we also employ panel vector auto-regression (PVAR) developed by Love and Ziccchino (2006) since we are not sure whether credit risk influences liquidity risk or vice versa. Hence to gauge this influence between credit and liquidity risk, PVAR is implemented. We begin with choosing the appropriate lag order in the PVAR models by employing different moments and model selection criteria (MMSC) developed by Andrews and Lu (2001), particularly, Bayesian information criterion (MBIC), Akaike's information criterion (MAIC), and Hannan and Quinn information criterion (MQIC) are applied. Based on the three model-selection criteria, the lag order is preferred when it has the smallest MBIC, MAIC, and MQIC. The results reveal that the three statistics suggest different lag orders. Considering that for the first 2 lag orders, panel VAR models reject Hansen's over-identification restriction at the 5% alpha level, indicating possible misspecification in the model; thus, we chose lag 4 according to MAIC criteria.

lag	*CD*	*J*	*J p-value*	*MBIC*	*MAIC*	*MQIC*
1	0.98	46.50	0.00	-73.99*	14.50	-18.10
2	0.97	21.19	0.05	-69.19	-2.81	-27.27*
3	0.93	10.70	0.22	-49.54	-5.30	-21.60
4	0.91	1.37	0.85	-28.76	-6.63*	-14.78
No. of Obs = 1,865; No. of panels = 132						

Table 20: Lag selection criteria for PVAR

After checking the stability of the models and ensuring that all inverse roots of the companion matrix lie inside the unit circle so that the models are stable, as shown in Figure 17, we conduct impulse response analysis of the total sample as well as based on the type of bank type. The estimation output is in Table 21 (column 1), and the impulse response analyses are displayed in Figures 18 to 21. The results reveal that although credit and liquidity risks respond positively to the other's shock, still the response is not significant. Thus, there is no significant cross-relationship between liquidity risk and credit risk. Therefore, the causal relationship between liquidity risk and credit risk do not indicate any considerable co-movement. The results are mainly robust to the changes in bank types (see the columns (2)-(4) of table 21), although for hybrid and Islamic banks, we further lose significance, the general conclusion of no causal association between the two risk measures is observed. The same conclusions are also achieved with the Granger causality test (table 22), where we fail to reject the null hypothesis that CR and LR do not Granger cause each other.

VARIABLES	(1) Full		(2) Conventional		(3) Hybrid		(4) Islamic	
	CR	LR	CR	LR	CR	LR	CR	LR
L.CR	0.554***	0.00639	0.584***	0.00957	0.295	0.00449	1.335	-0.147
	(0.143)	(0.00616)	(0.176)	(0.0107)	(0.221)	(0.00897)	(3.684)	(0.674)
L2.CR	0.189*	0.00153	0.141	-0.00199	0.150	0.00741	0.122	-0.0104
	(0.106)	(0.00321)	(0.0991)	(0.00650)	(0.168)	(0.00723)	(0.332)	(0.0444)
L3.CR	0.00132	-0.00183	-0.000608	-0.00611	0.0473	0.00429	0.125	0.00734
	(0.0998)	(0.00246)	(0.0848)	(0.00615)	(0.155)	(0.00764)	(0.227)	(0.0300)
L4.CR	0.140*	0.00154	0.166	0.00809	0.337**	-0.00111	-0.365	0.0619
	(0.0849)	(0.00234)	(0.194)	(0.0129)	(0.139)	(0.00511)	(1.522)	(0.274)
L.LR	0.917	0.414***	4.613	0.327	0.456	0.463***	-0.512	0.466
	(0.655)	(0.0628)	(4.984)	(0.363)	(1.200)	(0.132)	(3.406)	(0.626)
L2.LR	0.178	0.266***	1.735	0.311*	-0.180	0.200**	1.051	-0.0122
	(0.455)	(0.0514)	(2.560)	(0.183)	(0.623)	(0.0909)	(3.846)	(0.676)
L3.LR	0.0664	-0.0962**	1.124	-0.239***	-0.444	0.0147	-0.0454	-0.0616
	(0.513)	(0.0439)	(0.918)	(0.0898)	(0.804)	(0.0812)	(1.235)	(0.195)
L4.LR	0.189	0.239***	1.395	0.189	-0.886	0.225***	-0.125	0.419
	(0.581)	(0.0429)	(1.729)	(0.126)	(0.765)	(0.0795)	(3.785)	(0.660)
ROA	0.0773	-0.00400	-1.636	-0.0150	-1.136	-0.0638	0.0880	0.0198
	(0.372)	(0.0194)	(1.424)	(0.100)	(0.980)	(0.0728)	(0.427)	(0.0656)
ROE	-0.0553	0.000135	0.140	0.00302	0.0959	0.00874	-0.00978	-0.00560
	(0.0496)	(0.00288)	(0.131)	(0.00927)	(0.132)	(0.00941)	(0.121)	(0.0218)

CAR	0.0284	-0.00141	0.0762	-0.00226	0.00853	-0.00201	-0.00523	0.00350
	(0.0245)	(0.00159)	(0.0650)	(0.00404)	(0.0391)	(0.00572)	(0.0736)	(0.0135)
LnTA	-1.021	-0.0193	-1.578	0.0587	0.128	0.0587	-1.116	0.317
	(1.337)	(0.0812)	(3.694)	(0.238)	(1.090)	(0.115)	(8.128)	(1.495)
NIM	-0.00777	-0.00718	0.314	0.00296	0.250	0.0340	-0.233	0.0398
	(0.185)	(0.0107)	(0.370)	(0.0235)	(0.622)	(0.0453)	(1.004)	(0.183)
Lever	-0.00384	-0.000666	0.697	0.000868	0.538	0.0973	0.0189	-0.00149
	(0.0713)	(0.00348)	(0.724)	(0.0531)	(1.733)	(0.123)	(0.0448)	(0.00834)
Loan	0.106	-0.0102	0.0349	-0.0337	-1.373	-0.000976	-0.254	0.0931
	(0.132)	(0.00785)	(1.012)	(0.0661)	(0.990)	(0.0968)	(2.523)	(0.457)
EffRatio	0.000641	-5.84e-06	0.000375**	-9.75e-06	0.00143	-0.000127	-0.00139	-0.000172
	(0.000390)	(1.26e-05)	(0.000148)	(1.26e-05)	(0.00178)	(0.000200)	(0.00305)	(0.000575)
IncomeDiv	-0.000549	2.36e-05**	-0.00133***	1.19e-06	-0.00258**	5.58e-05	0.000298	1.40e-05
	(0.000513)	(1.06e-05)	(0.000137)	(7.84e-06)	(0.00113)	(0.000125)	(0.000232)	(4.48e-05)
GDP	-0.0208*	0.000127	0.0119	0.000713	-0.0197	-0.000753	0.0151	-0.00303
	(0.0119)	(0.000722)	(0.0276)	(0.00208)	(0.0177)	(0.00142)	(0.0650)	(0.0111)
Inflation	-0.0519	0.000955	0.0655	0.00338	-0.112	-0.00643	-0.0260	0.000577
	(0.0467)	(0.00355)	(0.0613)	(0.00536)	(0.0711)	(0.00955)	(0.150)	(0.0252)
Observations	2,217	2,217	868	868	917	917	432	432
Standard errors in parentheses								
***** p<0.01, ** p<0.05, * p<0.1**								

Table 21 : PVAR Estimation Results for interactions between credit and liquidity risks

Equation	*Excluded*	*chi2*	*df*	*Prob>chi2*
CR	LR	2.342	4	0.673
	ALL	2.342	4	0.673
LR	CR	2.359	4	0.67
	ALL	2.359	4	0.67

Ho: excluded variable does not granger cause equation variable, H1: excluded variable causes granger-cause equation variable

Table 22: PVAR Granger causality Wald Test

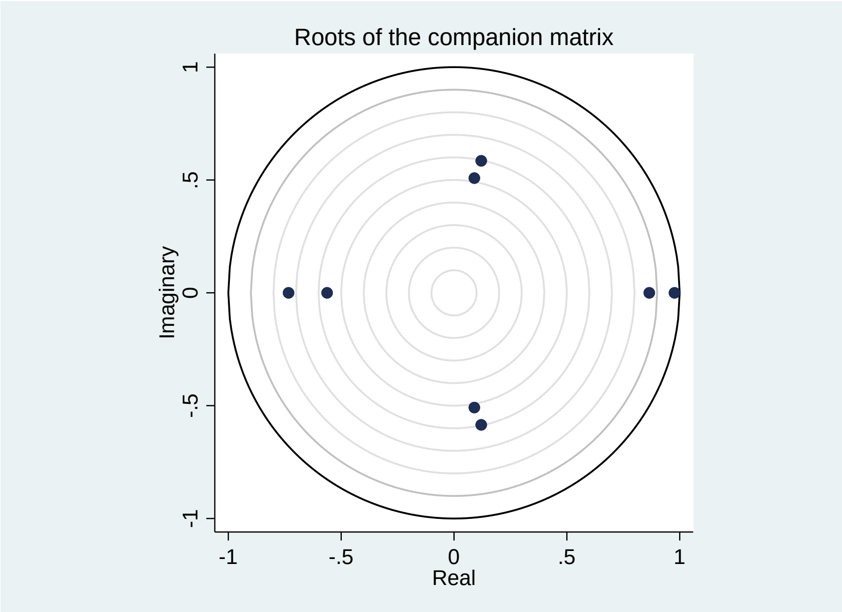

Figure 17: VAR stability test (Source: authors analysis)

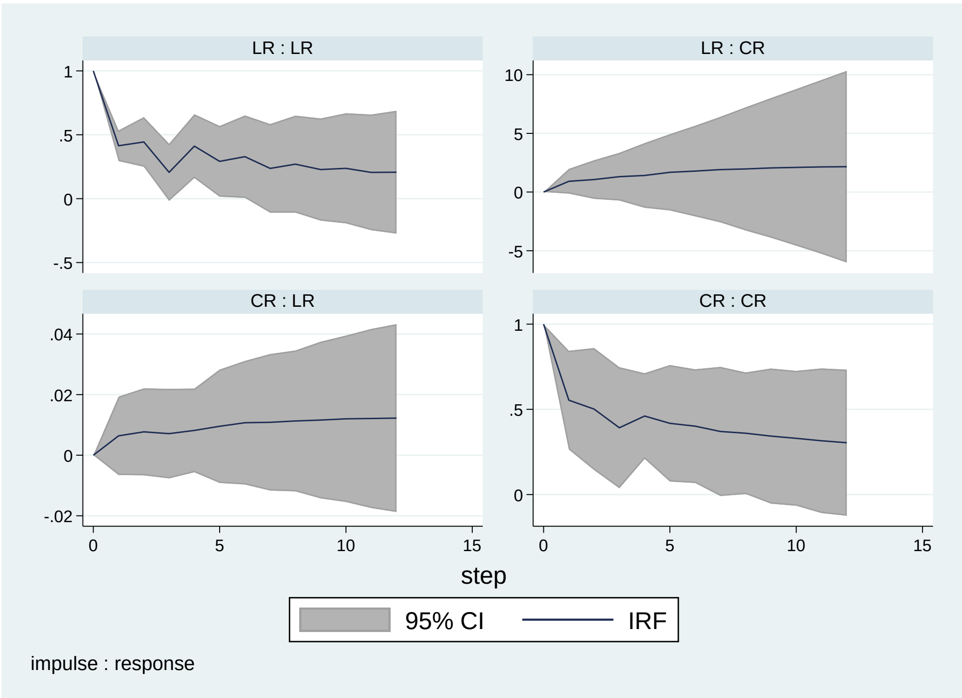

Figure 18: Impulse response function between credit risk and liquidity risk for all banks (Source: authors analysis)

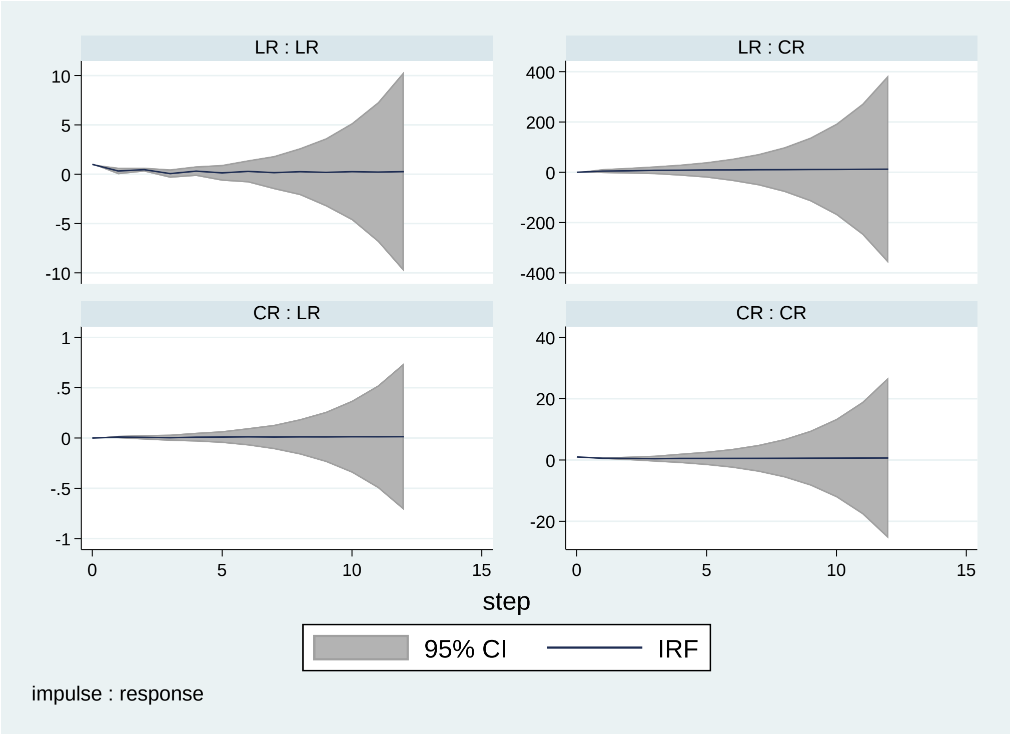

Figure 19: Impulse response function between credit risk and liquidity risk for conventional banks (Source: authors analysis)

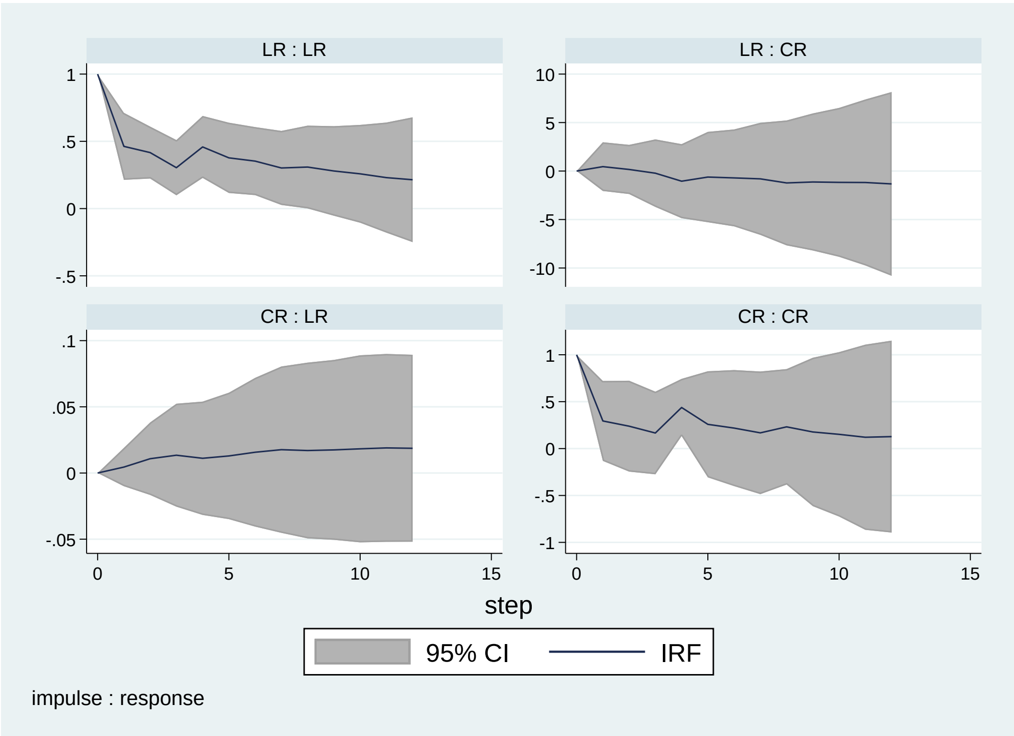

Figure 20: Impulse response function between credit risk and liquidity risk for hybrid banks (Source: authors analysis)

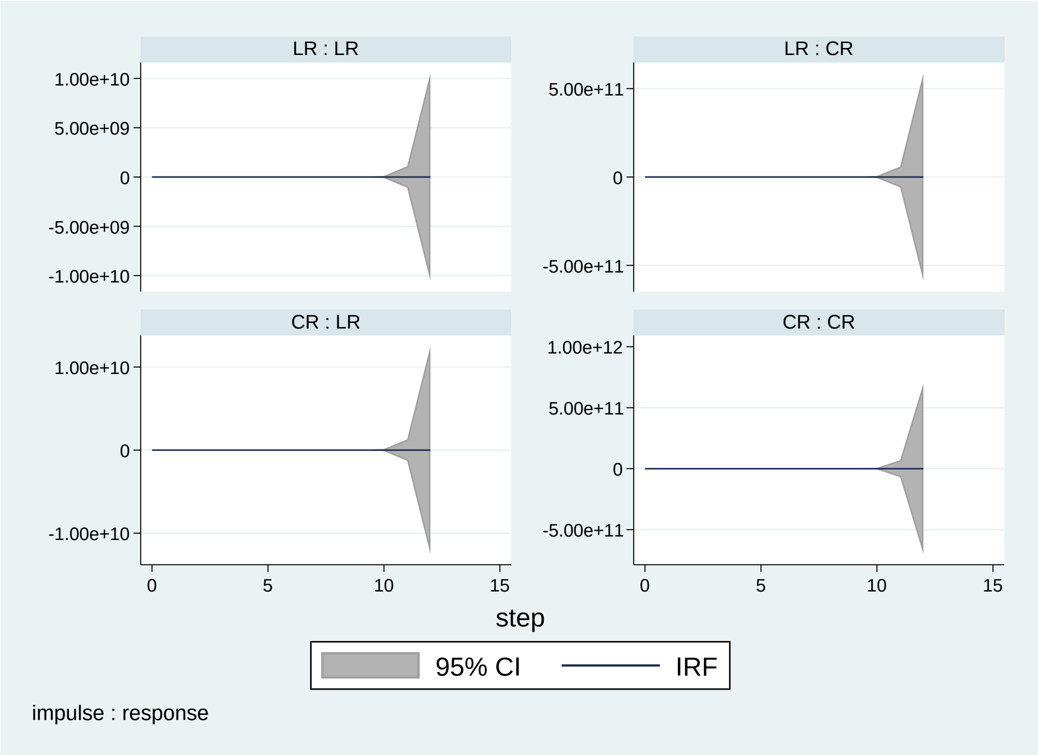

Figure 21: Impulse response function between credit risk and liquidity risk for Islamic banks (Source: authors analysis)

Table 23 summarizes the results for the Z Score model from equation 4.4. First, the results of the full model (column (1)) show that for the specification test of AR (2) we fail to reject the null hypothesis, which implies that the empirical model has been correctly specified because there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments used in the models are valid. In addition, in Hansen J-statistic test we again fail to reject the null hypothesis that over-identifying restrictions are valid, and hence the model specification is correct. The lagged dependent variable Z-score is highly significant and positive, showing that about 71% of the movement in ZScore has a dynamic character.

We also observe a significant impact of credit risk and liquidity risk. Higher credit risk and higher liquidity risk (inverse of liquidity ratio) significantly increase the possibility of bankruptcy. The coefficient of the interaction term for the two is also significant and negative, suggesting that there is a joint and negative influence of the interaction between liquidity risk and credit risk on banking stability.

For the other control variables, loan growth, size and efficiency have a significant negative effect on banking stability. Therefore, it may be interpreted as the ability of banks to attract new deposits, good managerial qualities and, a fortiori, a low probability of default. Also, small banks and those with lower managerial efficiency are more exposed to it. Positive coefficients are found for ROA and CAR, which means that more profitable banks with more capital are less exposed to risk. The income diversity is not significant. The results are robust among the sample of different bank types (columns (2) – (4)).

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
L.ZScore	0.710***	0.788***	0.513***	0.713***
	(0.00138)	(0.00500)	(0.0163)	(0.0842)
CR	-0.498***	-0.432*	0.123	-1.121
	(0.0302)	(0.254)	(0.152)	(0.757)
LR	4.139***	23.64***	-5.218**	-7.330
	(0.305)	(3.703)	(2.359)	(13.07)
CR_LR	-0.540***	-3.009***	0.924**	-0.303
	(0.0538)	(0.445)	(0.374)	(1.921)
LnTA	-6.633***	0.275	-0.478	2.521***
	(0.209)	(1.305)	(1.677)	(0.495)
ROA	0.285***	-0.833	2.005**	1.214
	(0.0621)	(0.694)	(0.805)	(1.484)
CAR	2.272***	1.614***	2.495***	1.945***
	(0.0154)	(0.120)	(0.0804)	(0.561)
Loan	-0.582***	14.17***	-5.278***	-0.616
	(0.145)	(1.031)	(1.484)	(0.959)
EffRatio	-0.000186***	-0.000387	0.00491	0.00477
	(5.34e-05)	(0.000556)	(0.00359)	(0.00465)
IncomeDiv	6.44e-05	-0.00142***	6.34e-06	0.000221
	(0.000190)	(0.000219)	(0.00105)	(0.000394)
GDP	-0.116***	-0.128***	-0.0341***	-0.0264
	(0.00414)	(0.0193)	(0.00850)	(0.0502)
Inflation	-0.299***	-0.245**	0.185***	0.154
	(0.0171)	(0.101)	(0.0662)	(0.252)
AR(1)	-3.8433	-2.7825	-2.664	-1.7226
	(0.0001)	(0.0054)	(0.0077)	(0.0850)
AR(2)	-.1238	-.1054	-.1291	1.1764
	(0.9015)	(0.9161)	(0.8973)	(0.2395)
Hansen test	105.54	29.09	36.20	16.70
	(0.99)	(0.99)	(0.99)	(0.99)
Observations	2,734	1,076	1,114	544
Number of ID	116	46	47	23

Hansen J-test refers to the over-identification test for the restrictions in GMM estimation. The AR1 and AR2 are the Arellano Bond test for the existence of the first- and second-order autocorrelation in first differences. Country-fixed effects are controlled for. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 23: Empirical results of bank stability based on bank type

4.6.2. Bank Liquidity Creation and Systemic Risk Results

Tables 24 and 25 are the analyses for two components of systemic risk measure as the dependent variable. Table 24 summarizes the results of the models with Systemic Linkage (L) as the dependent variable, while Table 25 illustrates the results with Bank Tail Risk (Tail) as the dependent variable. According to the results, bank liquidity creation is negatively associated with systemic linkages. Particularly, using the full sample results, we can conclude that a 1% increase in liquidity creation is associated with a 1.35% decrease in systemic linkage measures at the individual bank level, holding all the other effects fixed. The estimated coefficient remains negative also for the three different sub-samples for Conventional, Hybrid and Islamic banks, but the significance is only observed for the model of the Islamic bank sub-sample but with smaller economic significance. For Islamic banks 1% increase in liquidity creation is associated with a 0.43% decrease in systemic linkage measure at the individual bank level, holding all the other effects fixed. The negative association is also observed for bank tail measure, but the significance of the estimated coefficients is not proved in any sample. For the included control variables in the full sample, we can state that systemic linkage is significantly associated with ROA (negative effect) and size (positive effect); in the different subsamples, significance is only observed for deposit to assets in the Hybrid banks sub-sample. Credit risk, deposits to assets and ROA are among the control variables that have a significant causal association with bank tail risk.

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-1.347***	-1.944	-0.879	-0.427*
	(0.349)	(1.870)	(0.489)	(0.193)
CAR	-0.0568	-0.0889	-0.0404	0.0385
	(0.0384)	(0.0714)	(0.0895)	(0.0446)
ROA	-0.527***	-0.121	-0.720	-1.332
	(0.0978)	(0.153)	(0.588)	(0.707)

IncomeDiv	-0.00640	0.00219	0.00736	-0.0268
	(0.0283)	(0.0116)	(0.0179)	(0.0636)
CR	-0.0693	-0.0535	-0.135	0.139
	(0.0995)	(0.138)	(0.0829)	(0.0756)
Ln(Total assets)	0.823**	1.848	-0.0341	0.604
	(0.348)	(1.770)	(0.884)	(0.702)
Deposit/Assets	-0.00676	-0.0271	-0.0889**	0.0309
	(0.0128)	(0.0200)	(0.0269)	(0.0227)
Constant	8.419***	3.933	17.64***	-3.121
	(2.231)	(3.748)	(3.060)	(7.191)
Observations	2,223	1,039	785	399
R-squared	0.509	0.704	0.442	0.246
Dependent variable is Systemic Linkage, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Table 24: Empirical Results for Systemic Linkage Model and Bank Liquidity Creation

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-0.0379	-0.117	-0.0194	-0.0801
	(0.0342)	(0.0734)	(0.0103)	(0.0576)
CAR	-0.00491	0.00145	-0.00364	-0.0184
	(0.00612)	(0.00277)	(0.00588)	(0.0140)
ROA	0.00378	0.00558	-0.0663*	-0.179***
	(0.0116)	(0.0126)	(0.0283)	(0.0481)
IncomeDiv	-0.00236	-0.00357	-0.000586	0.00446
	(0.00178)	(0.00286)	(0.00267)	(0.00494)
CR	0.0248**	-0.0183*	0.0300**	0.0367***
	(0.00936)	(0.00756)	(0.00735)	(0.00645)
Ln(Total assets)	-0.0685	0.00908	-0.0537	-0.0984
	(0.0592)	(0.0562)	(0.0310)	(0.108)
Deposit/Assets	-0.00675	-0.00257	-0.00660***	0.00550
	(0.00387)	(0.00398)	(0.00109)	(0.00433)
Constant	2.615***	2.029***	1.890***	1.174*
	(0.549)	(0.224)	(0.175)	(0.583)
Observations	2,223	1,039	785	399
R-squared	0.285	0.203	0.364	0.677

Dependent variable is Bank tail risk, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 25 : Empirical Results for bank tail risk model and Bank Liquidity Creation

The results of the models with Systemic Risk (beta) measure are summarized in Table 26. Table 26 reveal that bank liquidity creation is negatively associated with systemic risk measure. Particularly, using the full sample results, we can conclude that 1% increase in liquidity creation is associated with a 1.38% decrease in systemic risk measures at the individual bank level, holding all the other effects fixed. The estimated coefficient can also be considered economically significant and consistent with the literature by Zheng et al. (2019), according to whom liquidity creation decreases stand-alone risk and the likelihood of bank failure. The estimated coefficient remains negative also for the three different sub-samples for Conventional, Hybrid and Islamic banks. Nevertheless, the significance is only observed for the model of the Islamic bank sub-sample, but with smaller economic significance. For Islamic banks 1% increase in liquidity creation is associated with a 0.51% decrease in systemic risk measure at the individual bank level, holding all the other effects fixed. For the included control variables in the full sample, we can state that systemic risk is significantly associated with the size, capital adequacy and profitability of a bank. Particularly, the causal effect of the size is positive, and for the capital adequacy and profitability is negative, meaning that according to the full sample, small banks with higher adequate capital and more profitability are less prone to risks. For the Islamic bank sub-sample, ROA is also negatively and credit risk positively associated with systemic risk measure. For the Hybrid sub-sample, significance is observed for the deposits to assets ratio, which negatively affects systemic risk measure.

	(1)	(2)	(3)	(4)
VARIABLES	Full	Conventional	Hybrid	Islamic
Ln(Catfat)	-1.380***	-2.037	-0.900	-0.508**
	(0.362)	(1.806)	(0.488)	(0.190)
CAR	-0.0616*	-0.0864	-0.0443	0.0196
	(0.0322)	(0.0713)	(0.0938)	(0.0575)
ROA	-0.526***	-0.118	-0.786	-1.515*
	(0.103)	(0.156)	(0.611)	(0.734)
IncomeDiv	-0.00863	-0.00123	0.00667	-0.0221
	(0.0273)	(0.0123)	(0.0203)	(0.0661)

CR	-0.0446	-0.0727	-0.107	0.177**
	(0.107)	(0.135)	(0.0874)	(0.0747)
Ln(Total assets)	0.754*	1.838	-0.0838	0.508
	(0.390)	(1.692)	(0.903)	(0.607)
Deposit/Assets	-0.0133	-0.0290	-0.0951**	0.0366
	(0.0144)	(0.0204)	(0.0259)	(0.0253)
Constant	11.02***	5.893	19.49***	-1.934
	(2.464)	(3.767)	(3.070)	(7.085)
Observations	2,223	1,039	785	399
R-squared	0.507	0.701	0.443	0.265
Dependent variable is Systemic Risk, in all the models country and period fixed effects are controlled for. Country level clustered robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1				

Table 26: Empirical Results for Systemic Risk Model and Bank Liquidity Creation

4.7. Discussion & Conclusion

The relationship between credit and liquidity is not significant across all conventional, hybrid and Islamic banks. Though there exists a relationship between credit and liquidity risk that is rather causal with no meaningful economic impact on banks. Based on the findings, it can be deduced that although there is a statistically significant relationship between credit and liquidity risk and bank stability, the practical significance or magnitude of this effect appears to be relatively small or insignificant. This implies that variations in credit and liquidity risk levels may not exert a substantial influence on the overall stability of banks in real-world situations. These results are consistent with the study conducted by Ghenimi et al. (2017), which also reached a similar conclusion. However, both credit and liquidity risk significantly impact bank stability, similar to Imbierowicz and Rauch (2014). Although when breaking these results based on bank type, there is a negative effect of credit and liquidity risk on bank stability for conventional banks, the joint relationship of credit and liquidity risk is also negative for Islamic banks but not statistically significant for Islamic banks. Additionally, Hybrid banks operating in both Islamic as well as conventional segments are more exposed to liquidity risk as compared to credit risk. The joint impact of credit and liquidity risk positively affects bank stability.

One reason for this finding is that Hybrid banks' credit risk has no impact on their bank stability, based on our findings, which potentially offsets the effect of liquidity risk.

When looking into Islamic banks, the main determinants of bank stability for these banks are the size and capital adequacy ratio, which positively affect bank default risk. Whereas for Hybrid and Islamic banks, another factor negatively influencing their banking stability is loan growth; this is due to the fact the more these banks issue loans, the more illiquid these banks become, affecting their liquidity risk position. However, it should be noted that though loan growth among Islamic banks is negative, it is not statistically significant to affect bank stability. These findings contrast those of Bilgin et al. (2021), who discovered that banks with higher loan shares and growth are less riskier, and the ones with higher income diversifications are riskier. This also exhibited consistency with the view that conventional banking activities such as lending become more stable over time, making it more difficult to walk away from such an association.

Another factor which affects both conventional and hybrid banks is GDP growth and Inflation. This is because both banks are more exposed to interest rate fluctuation, given their large exposure to changes in interest rates. When looking at the overall sample, we find that credit risk, joint credit and liquidity risk, size, efficiency ratio, GDP and inflation all negatively affect bank stability. These findings support those of Mahrous et al. (2020), using data from 15 countries in the MENA region, who discovered that monetary policy rates above 6.3% amplified the level of non-performing loans and credit risk. This made it more difficult for borrowers to repay, making the materialization of NPLs increase, and this is likely to endanger the financial stability of the Islamic banking system.

From a bank liquidity creation and systemic risk standpoint, this study finds that Islamic banks bank liquidity creation decreases systemic linkage risk as compared to their counterparts, a finding contradicting the work of Alaoui Mdaghri (2022) who, through a regression analysis, discovered that liquidity creation diminishes both the NPLs of Conventional and Islamic banks and in equal measure, their system linkage risks. On the other hand, the greater the liquidity position among hybrid banks, the systemic linkage these banks would face. Examining from an overall sample, we can conclude that 1% liquidity creation decreases systemic linkage risk by 1.35%, whereas an increase of size by 1% increases systemic linkage risk by 0.82%. However, when looking at bank tail risk, a 1% increase in ROA for Islamic banks decreases bank tail risk by 0.18% and 0.06% for hybrid banks. In the contrary, 1% increase in credit risk also increase bank tails risk for Islamic and hybrid banks by 0.04% and 0.03% but decreases bank tail risk for conventional banks by 0.02%. When evaluating the link of systemic risk with bank liquidity creation, we find that overall bank liquidity creation actually reduces systemic risk, and this result is statistically significant for Islamic banks as well. For conventional and Hybrid banks, a similar relationship is seen but not statically significant. Additionally, we also find a positive link between credit risk and systemic risk for Islamic banks but find no link between credit risk and systemic among conventional and hybrid banks. In comparison, there is a negative link between ROA and systemic risk among Islamic banks. However, for hybrid banks, an increase in liquidity decreases systemic risk.

We conclude by stating that there was no relationship found between credit and liquidity risk. For Conventional banks, credit risk, liquidity risk and joint credit liquidity risks affect their banks' stability. Likewise, there was no link found between bank liquidity creation and systemic risk. Although. It should be noted that credit risk does negatively influences bank tail risk among conventional banks. Whilst for Hybrid banks, liquidity risk and joint credit liquidity risks influence their bank stability. No association between bank liquidity creation and systemic risk is found, but if these banks increase their liquid deposits, they will see a decline in systemic linkage, bank tail risk and overall systemic risk. For Islamic banks, no significant relationship was found for credit and liquidity risk. Factors affecting these banks include the size of the bank and their capital adequacy ratio. On the other hand, Bank liquidity creation by Islamic banks does reduce systemic linkage risk as well as systemic risk. However, it should also be taken into consideration that an increase in credit risk among Islamic banks affects both bank tail risk and systemic risk positively.

Existing studies have considered the effect of either credit or liquidity risk; however, few studies have focused on the association between the two. Bank liquidity creation is likely to decrease rather than increase NPLs, although the liquidity creation process is considered risky through the rendering of banks more illiquid. As a result, policymakers ought to encourage bank liquidity creation to grow the economy, including that of emerging markets. In a vast economy, borrowers are more inclined to repay their debts, consequently reducing the NPLs of banks. The findings of this chapter also provide various recommendations for bank supervisors and bank management, especially on risk. The Global Financial Crisis disclosed distrust between banks, to a further extent, driven by large credit risks in their portfolios, which are likely to freeze the market from liquidity. Central banks and regulators were forced to intervene to prevent the collapse of the financial system. Nonetheless, the findings of this chapter suggest joint management of credit and liquidity risk, which could reduce uncertainties and, to a larger extent, increase bank stability. Therefore, the findings of this chapter underpin regulatory efforts such as the ones by the Dodd-Frank Act and the Basel III framework that have placed a strong emphasis on the significance of liquidity risk management together with the credit risk and asset quality of a bank.

Chapter 5 – Conclusion

This chapter presents a short conclusion to the thesis. In addition, we also outline the research limitations encountered during the study. Moreover, we highlight avenues for future research based on identified gaps within our analysis. We start by providing a generic conclusion, followed by a discussion of research limitations. The chapter closes with future research recommendations.

5.1. Conclusion

The GFC revealed the numerous vulnerabilities, risks, and challenges in the global and national financial systems. Despite this, the evolving regulations in the banking sector have proved ineffective in addressing the inherent issues that could impact the 2008 GFC. The Basel Committee advances these regulations on Banking Supervision and national regulators. The complexities experienced in the dynamic financial systems raise concerns over the effectiveness of the regulations offered by the different institutions. Therefore, understanding and effectively managing various risks is paramount in ensuring financial stability and sustainable growth at the national and international levels. The current study focused on the banks' major risks, including credit and liquidity risks, and how they stand out as critical factors with substantial impact on stability and overall systemic risk. In this light, the liquidity creation by banks and the regulatory frameworks that govern risk management help develop resilience and soundness in Islamic and Conventional banking. Chapters 2, 3 and 4 offer a comprehensive account of the interplay between credit risk, liquidity risk, systematic risk, liquidity creation, and regulatory frameworks. Examining the findings in these chapters and the multiple case studies, some insights reflect on the theoretical and practical aspects that can be adopted by policymakers, regulators, and practitioners to develop a robust regulatory framework.

The insights from the three analytical chapters highlight the need for the effectiveness of financial regulations in addressing systemic risk within the global financial system. The first study examines the international and national regulatory frameworks in the conventional, hybrid, and Islamic banking contexts. The research compares the guidance between the BCBS and the IFSB. The findings demonstrate that the IFSB converts BCBS guidance to make it Sharia-compliant for Islamic banks. Also, the investigation focuses on addressing credit, liquidity, and systemic risk in four countries:

China, India, Malaysia, and Saudi Arabia. The variations in liquidity requirements and capital requirements across the countries are identified, highlighting that higher requirements are imposed on Indian banks than in other countries. The study also demonstrated an absence of a systemic risk framework in Saudi Arabia's banking system, and a weak mechanism has been adopted in the Malaysian banking sector. The second study focuses on Basel III's capital and liquidity regulations, specifically the stable net funding and higher capital adequacy ratios. The study utilised data from banks in emerging market economies in the past decade to investigate whether these requirements help mitigate default and systemic risks, considering the dynamic economic conditions. The findings indicate that the impact of these regulations on default risk and systemic risk is not conclusive, raising questions about their effectiveness. The third study explored the relationship between credit, liquidity, and bank default risks. Subsequently, the study established the effects of bank liquidity creation on systemic risk across different types of banks. The findings show a positive relationship between credit and liquidity risks but not a significant causal relationship. However, credit and liquidity risks statistically impact bank default risk, particularly for conventional and hybrid banks. The study also reveals that bank liquidity creation reduces the systemic risk for Islamic banks but increases bank tail risk for Islamic and hybrid banks. These findings suggest that substantial differences in national regulations are necessary for how the specific risks faced by banks in emerging markets are implemented. Furthermore, there is substantial evidence that a one-size-fits-all approach would be inadequate. This implies a need for a tailored regulatory strategy to manage risks in each country's banking industry effectively.

Integrating the findings from the three studies offers key insights that help address the research questions and objectives. The study shows no significant relationship between credit and liquidity risks across conventional, hybrid, and Islamic banks. However, both credit risk and liquidity risk were found to impact bank stability significantly. This implies that movements in credit risk do not necessarily correspond to liquidity risk but independently affect banks' stability. Bank stability is negatively affected by the collective impact of credit and liquidity risks. The key impacts on bank stability for Islamic banks include size and capital adequacy ratio. The hybrid banks' stability is largely exposed to liquidity risk, while bank liquidity creation has positive impacts. In addressing systematic risk, the study shows that bank liquidity creation decreases systemic linkage risk for Islamic banks. Suggestively, liquidity creation activities in Islamic banks reduce the interconnections between the institutions, which lowers the risk of a systemic crisis. Conversely, the hybrid banks' systematic linkage risk increases because of a greater liquidity position. Therefore, the findings implied that a combination of credit and liquidity risk could have different impacts on stability, depending on the type of bank. Fundamentally, the findings show that bank liquidity creation was linked to reducing systemic risk across the sample, especially for Islamic banks.

The study demonstrates that most countries adhere to Basel II or III requirements with different achievements having been made. For instance, Saudi Arabia is compliant with Basel III, while India seeks to meet minimum requirements. Nevertheless, different nations have additional regulatory provisions beyond Basel III. There are variations in regulations for public and private sector banks. Across all sectors, a risk-based approach has been adopted by practitioners in the banking industry. These considerations are important for the banks and regulators who optimise the banking system's stability. For instance, some nations implemented stress tests and administered surveys that seek information that can guide in ensuring stability. With such insights, there has been increased adoption of Basel III in response to changing macroeconomic factors such as the COVID-19 pandemic. These findings further support that effective risk management considers country-specific factors when designing regulatory frameworks and tailored solutions for the public and private sectors.

The insights emerging in the current study offer an enhanced understanding of risk interactions by highlighting the relationship between credit risk and liquidity risk and how systematic risk emerges and can be addressed. Fundamentally, the theoretical contribution of the study is that the credit and liquidity risks do not necessarily exhibit significant co-movement. Subsequently, the findings challenge the traditional conceptualisation that the banking industry should have a nuanced understanding of risk interactions. The study also demonstrates the importance of bank-specific factors, including size, capital adequacy ratio, and loan growth, in planning for bank stability and limiting systemic risk. Suggestively, increased efficiency at the national and international levels requires considering the heterogeneity of the various banks and assessing their risk profiles.

The Basel III and regulatory reforms investigated in this study show that adopting an effective guiding framework is critical in strengthening the banks' capital and liquidity requirements that can enhance financial stability. Adopting the regulatory frameworks and specific provisions requires risk management practices that effectively manage credit and liquidity risks to ensure stability. For instance, practitioners and regulators can adopt robust risk assessment frameworks, stress testing, and liquidity management strategies. The findings show increased potential for success when regulators adopt a risk-based approach and tailor regulatory provisions to address specific risks faced by banks in different market segments. In this context, the implementation of Basel III and other international standards enhances risk management when they are aligned with macroeconomic factors and issues emerging in the context of specific countries.

Liquidity requirements such as the NSFR are important considerations for practitioners in addressing the probability of a bank default by shaping how an institution can manage liquidity and mitigate the default risk. This is demonstrated by findings that show it is important to encourage bank liquidity creation. Therefore, there is evidence that policymakers and regulators can consider incentivising banks to engage in sound liquidity creation practices with the adoption of an appropriate regulatory framework that promotes the creation of liquid assets and ensure the institutions build the capability to meet their obligations in the financial system, which can reduce the potential for systemic risk. However, the study does not fully support the notion that new capital and liquidity regulations, such as the NSFR, significantly and positively affects bank stability. This implies that additional measures are required to pursue such objectives. Furthermore, stress tests, surveys, and monitoring demonstrated that the information gathered could be valuable in determining the banks' risk profiles. The stress tests can help the regulators to assess the resilience of the banking sector and specific institutions to demonstrate the impact of certain scenarios and promptly identify potential vulnerabilities. Resultantly, regulators can enhance the effectiveness of risk mitigation and the financial system's stability.

5.1.1. Theoretical and Practical Implications

The theoretical and practical implications emerging from the study require strategic considerations to transform the banking sector, focusing on country-specific contexts.

Notably, various stakeholders should be involved in these practices, including bankers in the private and public sectors, regulators, and policymakers. The insights from the current study show the need to enhance the understanding of liquidity requirements for all stakeholders. Focusing on factors such as the NSFR and its impact on the probability of default can help enhance risk management and mitigation practices. These efforts align with the need to strengthen measures to mitigate systemic risks in the banking industry. Moreover, there is a consensus among researchers and the current study's findings that mitigating systemic risk has become an inherent consideration in the actions taken by policymakers and regulators. This includes improving measures such as NSFR, leveraging requirements, countercyclical buffers, and globally systemically important institution surcharges. However, there is a need to assess these measures' effectiveness in reducing systemic risk and promoting financial stability to ensure that the most effective practices are adopted premised on the macroeconomic factors and the bank's risk profiles.

The implications of the current findings demonstrate the importance of considering the interactions between credit and liquidity risks. The combined effect of credit risk and liquidity risk on the stability of the banks can be instrumental in developing appropriate risk management strategies. Therefore, all types of banks should implement integrated approaches that address both credit and liquidity risks, which can limit the interdependencies and potential magnification of their impacts. Similarly, considerations should be made in promoting liquidity creation and its role in managing the threats of systemic risk. Such undertakings require policymakers and regulators to recognise the importance of bank liquidity creation and its implications for systemic risk in line with the characteristics of the specific banks. Policymakers and regulators should also encourage banks in different market segments to implement sound liquidity creation practices that can contribute to financial stability premised on international and national frameworks that are appropriate for their operations. Moreover, the study demonstrates that tailoring the regulatory frameworks for emerging market economies is critical due to their potential impact on the global system. This implies that recognising emerging market economies' unique characteristics and challenges can help regulators develop and advocate for regulatory frameworks that align with their needs. For instance, the initiatives can consider the underdeveloped capital markets, high volatility of the economy, and liquidity constraints experienced in these countries.

A focus on Islamic and state-owned banks shows that regulatory challenges must be addressed. These institutions face distinct regulatory issues that need effective customisation of international frameworks such as Basel III. This is important to help address specific risks that emerge due to the unique characteristics of these banks. These strategies should be undertaken with adequate coordination and information sharing across the countries. Such an approach is critical given the global impact of systematic risks. Collaboration and knowledge sharing among policymakers and regulators across countries can harmonise the regulatory frameworks and create a level playing field. Additionally, the integration at a global scale can reduce the challenge of formulating and implementing regulations that are not aligned with the diverse interests of different countries and segments. Aligned with these developments is the need to foster transparency and disclosure concerning capital and liquidity. Such information is critical in how policymakers and regulators understand the risk profiles and their capacity to address financial crises. The information should also be standardised and consistent to ensure a comprehensive understanding at all times due to the dynamic nature of the banking sector. Stress testing, surveys, and scenario analyses can enhance the information used. Therefore, appropriate frameworks for continuous monitoring should be developed and implemented to enhance stress testing premised on the unique characteristics of the markets. Additionally, research on emerging market economies and evidence-based accounts can help to develop tailored regulatory frameworks and risk management solutions that are adequate for the unique experiences emerging in a particular country.

Based on the insights emerging from the current study, there is overwhelming evidence that the role of the different stakeholders and the specific needs emerging in each market requires strategies that promote a risk avoidance culture and professional development in the banking sector. Such actions should be established at all organisational levels, including training and education opportunities to enhance the company's risk management skills and knowledge. Such strategies should entail support from regulators and policymakers to ensure an industry-wide approach in adopting best practices and a risk avoidance culture.

Although the findings and implications of the current study show the potential for substantial improvements, some challenges might limit the achievements made. Focusing on emerging market economies, there are potential challenges to implementing constructive developments due to resistance to change, which might emerge from the banking institutions, regulators, policymakers, and other stakeholders. Subsequently, it is imperative to communicate the benefits and rationale behind the best practices that should be adopted to manage risks and achieve financial stability and profitability. The implementation of the regulations and frameworks can be limited in emerging economies due to resource constraints. This includes funding, technologies, and skilled personnel that can coordinate activities. There is a need for banks and regulators to foster talent development and invest in the necessary infrastructure to align national capabilities with those prevailing in the global context.

Another potential challenge is the regulatory complexity exemplified by limitations in implementing Basel III in some countries, such as India, and its modification for adoption in Islamic banking. The dynamic and evolving regulatory landscape can be challenging due to the different guidelines, standards, and requirements in standardising reporting from banking institutions on different market segments. This implies that regulations adopted should offer clear and consistent guidelines and a simplified framework that is understood and implemented across the industry. In this context, banks can engage with the regulators to ensure that the guidelines and frameworks adopted are understood and adequate depending on their risk profiles. The banks can contribute to developing the regulations and frameworks by ensuring that they voice their opinions and over quality data that can be used to describe the industry and establish the requirements that should be met. Regulators should implement adequate data infrastructure, governance frameworks, and analytical solutions in this context.

Challenges in international coordination and harmonisation can limit improvements in emerging economies. With the huge diversity and expansive nature of the global financial system, it can be challenging for the interests emerging across different jurisdictions. Furthermore, the diverse regulatory frameworks increase challenges in how regulators from different countries or representatives of different market segments achieve collaboration and cooperation. Further challenges from the insights gathered are balancing business objectives with risk management. Notably, the GFC was influenced by banks pursuing business objectives despite the potential risks associated with their actions. Therefore, when business objectives limit the focus on risk management, regulators must be proactive and advocate for strong governance, risk management frameworks, and performance monitoring strategies to align the banking practices with a risk avoidance culture. Given the long time taken to address the challenges faced following the 2018 GFC, it is evident that formulating and implementing appropriate frameworks and regulations can be time-consuming. Therefore, the regulators must offer adequate information about the roadmaps, frameworks, regulations, timelines, and implementation plans. It is important for the banks and other stakeholders to be prepared by allocating resources and sharing information based on their requirements and risk profiles.

5.1.2. Research Limitations

Similarly to other studies conducted on capital and liquidity regulation, our thesis has some research limitations. Therefore, we highlight some of these limitations to guide future avenues of research. First, the empirical nature of this thesis and its particular focus on emerging markets presents a limitation. We greatly depended on secondary databases and reports to conduct the empirical analysis. Hence, the lack of data availability and reporting within emerging markets affected our ability to conduct research at a broader scale and to study all the listed financial institutions within the MSCI EM index. In addition, to conduct systemic risk measurements, we needed high-frequency data to capture volatility within the country-specific financial markets. This was not available for all the countries within our initial sample size. This limited reporting is also attributable to the lack of activity within these financial markets and the lack of consistent reporting mechanisms.

This limitation was mitigated by comparing data availability from multiple databases, namely the Refinitiv Eikon and Bloomberg databases, to maximize our sample size. Moreover, we also faced significant challenges in gathering information for 3-month T-Bills, as this was required to calculate the change in the 3-month T-bill rate, the computation of yield spread, and the liquidity spread within these markets. One of the reasons for the lack of such information was that some of the countries in our initial sample either did not issue 3-month T-bills or had discontinued the issuing of 3-month

T-bills. For instance, China discontinued its 3-month T-bills rate in 2016. Therefore, given this limitation, countries with no state variable data were excluded from the systemic risk analysis owing to missing or unavailable state variable data during FY2010 – FY2020. Should data reporting mechanisms and data availability improve in the future, research could be conducted on countries that are not explored in this thesis.

Furthermore, our study was also affected by the Covid-19 pandemic and the resulting lockdown measures, which led to a reduced sample size for bank default risk measurement owing to a lack of access to secondary databases. However, post Covid-19, this limitation was mitigated by reviewing all the country-specific data and increasing our sample size. This decision was driven by the idea that a larger sample size would deliver better results when studying the impact of NSFR on bank stability.

In Chapter 3, the computation of NSFR was time-consuming as it required the identification of bank balance sheet items in accordance with Basel III NSFR standards. Weights also needed to be assigned to each item for each financial year. Likewise, in Chapter 4, the computation of the BBLC measure required a significant amount of time because certain balance sheets and off-balance exposures were assigned weights, as specified in the study conducted by Berger and Bouwman (2016). In Chapter 2, analysing regulatory documents and reports required an understanding of the challenges faced within our selected sample of countries and the regulatory measures that they had implemented. This was in addition to the understanding of international regulatory requirements imposed by BCBS.

Moreover, we employed the CoVaR model for systemic risk measurement in both Chapters 3 and 4. This model has some limitations. For instance, CoVaR provides individual risk measures rather than the sum of total systemic risk within the financial system. Furthermore, the CoVaR model is more susceptible to estimation error than VaR. Therefore, the accuracy of the model is broadly dependent on the accuracy of tail modelling. It should also be noted that CoVaR modelling cannot be back-tested because the expected shortfall predictions cannot be validated by comparison with historical data. We also employed the GARCH model to capture the volatility within market data. Owing to data limitations within emerging markets, we chose to measure volatility on rolling weekly data. This did not capture volatility during day-to-day trading but rather on weekly closing market prices. As volatility cannot be predicted using the GARCH approach for smooth time series data, weekly data were the only alternative option that could be used. This was because using monthly data would have risked eliminating the volatility factor because the data would have been much smoother in comparison to weekly data.

5.1.3. Future Research Directions

Based on our research and our review of existing literature, we have identified six avenues of research that could provide new insights into the existing literature on financial risk and regulations. Future studies should address the following gaps in knowledge:

- The insights emerging from the current study demonstrate a need for further investigations on the components of NSFR liquidity requirements and their impact on the probability of a bank defaulting. Such a focus can offer more insights into addressing default risk and increasing the capacity of the banks to contribute to financial stability.
- There is a need for a comparative analysis focusing on liquidity requirements and systemic risk. Comparing liquidity measures such as NSFR, countercyclical buffers, institution surcharges, and leverage requirements can enhance the mitigation of systemic risk and identify the most effective measures for enhancing financial stability.
- Since most literature has focused on developed nations, further studies must examine credit risk, liquidity risk, and bank stability in emerging market economies. Such insights can be instrumental in pursuing effective risk management strategies and adopting unique challenges in these economies.
- There is inadequate research addressing the role of bank liquidity creation in systematic risk. Examining the relationship between these factors can help address issues of financial stability at different levels, including organisational, national, and global.
- Future studies should address the most effective regulatory framework in emerging markets. Such investigations can contribute to risk management and financial stability in emerging markets by highlighting the challenges, regulatory requirements, and the framework's impact on the banking sector.

- Future studies should address the risk profiles of the different types of banks in emerging markets. The insights gathered can foster a better understanding of the regulatory requirements and risk management practices that are most effective for each bank.

References

Abdo, M.M. and Onour, I., 2020. Liquidity Risk Management in Full-Fledged Islamic Banking System. Management and Economics Research Journal, 6(2).

Abdul Ganiyy, A., Zainol, Z. and Ahmad, N.H., 2017. Determinants of liquidity risk in dual and fully Islamic banking systems: Evidence from Malaysia and Sudan. Asian Journal of Multidisciplinary Studies, 5(1), pp.90-99.

Abdul Ganiyy, A.F., Ogunbado, A.F. and Ahmad, N.H., 2017. Islamic perspectives on liquidity risk management practices of Islamic banks in Malaysia and Bahrain. Asian Journal of Multidisciplinary Studies, 5(1), pp.100-108.

Abdul-Rahman, A., Latif, R.A., Muda, R. and Abdullah, M.A., 2014. Failure and potential of profit-loss sharing contracts: A perspective of New Institutional, Economic (NIE) Theory. Pacific-Basin Finance Journal, 28, pp.136-151.

Abdul-Rahman, A., Said, N.L.H.M. and Sulaiman, A.A., 2017. Financing structure and liquidity risk: Lesson from Malaysian experience. Journal of Central Banking Theory and Practice, 6(2), pp.125-148.

Aburime, T., 2008. Islamic banking theories, practices and insights for Nigeria. International Review of Business Research Papers, 5(1), pp.321-339.

Acemoglu, D., Ozdaglar, A. and Tahbaz-Salehi, A., 2015. Systemic risk and stability in financial networks. American Economic Review, 105(2), pp.564-608.

Acharya, V. V. and Pedersen, L. H. (2005). Asset pricing with liquidity risk. Journal of Financial Economics, 77(2), pp.375-410.

Acharya, V. V., Qian, J., Su, Y., & Yang, Z. (2021). In the shadow of banks: Wealth management products and issuing banks' risk in China. NYU Stern School of Business.

Acharya, V., Davydenko, S.A. and Strebulaev, I.A. (2012). Cash Holdings and Credit Risk. Review of Financial Studies, 25 (12), 3572–3609. Available from https://doi.org/10.1093/rfs/hhs106 [Accessed 9 February 2021].

Acharya, V.V & Richardson, M (2009) CAUSES OF THE FINANCIAL CRISIS, Critical Review, 21:2-3, 195-210, DOI: https://doi.org/10.1080/08913810902952903

Acharya, V.V. and Steffen, S. (2020). The Risk of Being a Fallen Angel and the Corporate Dash for Cash in the Midst of COVID. The Review of Corporate Finance Studies, 9 (3), 430–471. Available from https://doi.org/10.1093/rcfs/cfaa013 [Accessed 2 February 2021].

Acharya, V.V. and Thakor, A.V. (2016). The dark side of liquidity creation: Leverage and systemic risk. Journal of Financial Intermediation, 28, 4–21. Available from https://doi.org/10.1016/j.jfi.2016.08.004 [Accessed 18 February 2021].

ACHARYA, V.V. and VISWANATHAN, S. (2011). Leverage, Moral Hazard, and Liquidity. The Journal of Finance, 66 (1), 99–138. Available from https://doi.org/10.1111/j.1540-6261.2010.01627.x [Accessed 11 June 2021].

Acharya, V.V. et al. (2019). Whatever It Takes: The Real Effects of Unconventional Monetary Policy. The Review of Financial Studies, 32 (9), 3366–3411. Available from https://doi.org/10.1093/rfs/hhz005 [Accessed 13 February 2021].

Acharya, V.V. et al. (2020). Does the lack of financial stability impair the transmission of monetary policy? Journal of Financial Economics, 138 (2), 342–365. Available from https://doi.org/10.1016/j.jfineco.2020.06.011 [Accessed 15 April 2021].

Acharya, V.V., and Merrouche, O. (2013) 'Precautionary Hoarding of Liquidity and Interbank Markets: Evidence from the Subprime Crisis', Review of Finance, 17(1), pp. 107–160.

Acharya, V.V., and Mora, N. (2015) 'A Crisis of Banks as Liquidity Providers', Journal of Finance, 70(1), pp. 1 -43.

Acharya, V.V., Gromb, D. and Yorulmazer, T. (2012) 'Imperfect Competition in the Interbank Market for Liquidity as a Rationale for Central Banking', American Economic Journal: Macroeconomics, 4(2), pp. 184-217.

Acharyaa, V.V.,Fleming, M.J., Hrung, W.B., Sarkar, A. (2017) 'Dealer financial conditions and lender-of-last-resort facilities', Journal of Financial Economics, 123(), pp. 81-107.

Achsani, M. N. F. F., & Kassim, S. (2021). The determinants of credit risk under dual banking system: indonesian experience based on bank specific variables. Al-Muzara'ah, 9(2), 215-229.

Adediran, O., Ekejiuba, C.P., Matthew, O. and Adegboye, F.B., (2017). Co-integration analysis of financial intermediation and economic growth in Nigeria. Journal of Internet Banking and Commerce, 22(8), pp.1-12.

Adesina, K.S. (2019) 'Basel III liquidity rules: The implications for bank lending growth in Africa', Economic Systems , 43(2), pp. 100688

Adrian, T. and Shin, H. S. (2010). Liquidity and leverage. Journal of Financial Intermediation, 19(3), pp.418-437.

Adrian, T., Boyarchenko, N. (2013) 'Liquidity Policies and Systemic Risk', Federal Reserve Bank of New York Staff Reports, no. 661, pp. 1-44.

Afkar, T., Utomo, S.P., Miradji, M.A. and Hariawan, F., (2020). The Role of Profit-Loss Sharing In Development of MSMEs. International Journal of Economics, Business and Accounting Research, 4(01).

Agarwal, V and Taffler, R (2008) 'Comparing the performance of market-based and accounting-based bankruptcy prediction models', Journal of Banking & Finance , 32(), pp. 1541–1551

Aguiar, Mark, and Gita Gopinath. 2007. Emerging market business cycles: The cycle is the trend. Journal of Political Economy 115(1): 69-102.

Ahmed, H., Mohieldin, M., Verbeek, J. and Aboulmagd, F., 2015. On the sustainable development goals and the role of Islamic finance. The World Bank.

Ahsan, T and Qureshi, M.A. (2020) 'The nexus between policy uncertainty, sustainability disclosure and firm performance', Applied Economics, 53(4), pp. 441-453.

Aikman, D., Bridges, J., Kashyap, A. and Siegert, C. (2018) 'Would macroprudential regulation have prevented the last crisis?', Bank of England Staff Working Paper No. 747, pp. 1 -53 [Online]. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2018/would-macroprudential-regulation-have-prevented-the-last-crisis.pdf (Accessed: 23rd Dec 2019)

Ajibo, K.I., 2015. Risk-based regulation: The future of Nigerian banking industry. International Journal of Law and Management, 57 (3) pp. 201 – 216.

Al-Amine, M.A.B., 2015. Product development and maqā id in Islamic finance: towards a balanced methodology. Islamic Economic Studies, 23(1).

Al-Arabi, M.A., 1966. Contemporary banking transactions and Islam's views thereon'. Islamic Review, 11(3), pp.10-43.

Al-Jarhi, M., 2017. An economic theory of Islamic finance. ISRA International Journal of Islamic Finance, 9(2), pp.117-132.

Al-Nasser Mohammed, S. and Muhammed, J., 2017. The relationship between agency theory, stakeholder theory and Shariah supervisory board in Islamic banking. Humanomics, 33(1), pp.75-83.

Alaoui Mdaghri, A., 2022. How does bank liquidity creation affect non-performing loans in the MENA region?. International Journal of Emerging Markets, 17(7), pp.1635-1658.

Aldasoro, I; Faia, E (2016) 'Systemic loops and liquidity regulation', Journal of Financial Stability, 27(), pp. 1-16.

Alessi, L. and Detken, C., 2018. Identifying excessive credit growth and leverage. Journal of Financial Stability, 35, pp.215-225.

Ali, K., Hongbing, H., Liew, C. Y., & Jianguo, D. (2022). Governance perspective and the effect of economic policy uncertainty on financial stability: Evidence from developed and developing economies. Economic Change and Restructuring, 56(3), 1971-2002. https://doi.org/10.1007/s10644-023-09497-6

Allen F, E Carletti and D Gale (2009), ‘Interbank Market Liquidity and Central Bank Intervention’, Journal of Monetary Economics 56, pp 639–652.

Allen, B; Chan, K.K; Milne, A; Thomas, S (2012) 'Basel III: Is the cure worse than the disease?', International Review of Financial Analysis, 15(), pp. 159–166.

Allen, F (2014). How should bank liquidity be regulated? Federal Reserve of Atlanta: Financial Markets Conference paper Atlanta: Georgia (April 2014).

Allen, F and Gale, D (2004), ‘Financial Intermediaries and Markets’, Econometrica 72(4), pp 1023–1061.

Allen, F and Gu, X. (2018) 'The Interplay between Regulations and Financial Stability', Journal of Financial Services Research, 52(), pp. 233–248.

Allen, F. and Douglas Gale, 2004, Financial Fragility, Liquidity, and Asset Prices, Journal of the European Economic Association vol. 3, pp. 533-546.

Allen, F. and Santomero, A.M., 1997. The theory of financial intermediation. Journal of banking & finance, 21(11-12), pp.1461-1485.

Allen, F., & Gu, X. (2021). Shadow banking in China compared to other countries. The Manchester School, 89(5), 407-419.

Allen, F., Carletti, E., and Marquez, R. (2011) 'Credit Market Competition and Capital Regulation', The Review of Financial Studies, 24(4), pp. 983–1018.

Allen, Franklin, and Douglas Gale, 1994, Limited market participation and volatility of asset prices, American Economic Review 84, 933–955.

Alqahtani, F. and Mayes, D.G., 2018. Financial stability of Islamic banking and the global financial crisis: Evidence from the Gulf Cooperation Council. Economic Systems, 42(2), pp.346-360.

Alsharif, M., Nassir, A.M., Kamarudin, F. and Zariyawati, M.A., 2016. BASEL III: MAIN ISSUES FOR GCC BANKS. International Journal of Economics, Commerce and Management, 4(11), pp.541-563.

Altavilla, C.; Pagano, M. and Simonelli, S. (2017) “Bank Exposures and Sovereign Stress Transmission” Review of Finance. Available at SSRN: https://ssrn.com/abstract=2640131 or http://dx.doi.org/10.2139/ssrn.2640131

Altman, E.I. (2020). COVID-19 And The Credit Cycle. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3604361 [Accessed 3 February 2021].

Altman, E.I., “Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy,” Journal of Finance 23 (1968), pp. 589–609.

Altman, E.I., Iwanicz-Drozdowska, M., Laitinen, E.K., and Suvas, A. (2017) 'Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman’s Z-Score Model', Journal of International Financial Management & Accounting, 28(2), pp. 131-171

Altunbas, Y., Gambacorta, L. and Marqués-Ibáñez, D. (2011). Does monetary policy affect bank risk-taking? Journal of Financial Intermediation, 20(2), pp.123-149.

Amihud, Y (2002) 'Illiquidity and stock returns: cross-section and time-series effects', Journal of Financial Markets , 5(1), pp. 31 - 56.

Amin, S.I.M., Ali, M.H., and Nor, S.M., 2018. Cost efficiency and liquidity risk in banking: New evidence from OIC countries. International Journal of Business & Management Science, 8(2), pp.255-276.

Amran, N.H. and Ahmad, W., 2021. Will the Sharia Regulatory Framework and Moral Hazard of Too-Big-to-Fail Stir Liquidity Risk? Evidence from Major Players of Islamic Banks. Global Business and Management Research: An International Journal, 13(4), pp. 194-204.

Anderson, T.W. and Hsiao, C. (1982) 'Formulation and estimation of dynamic models using panel data', Journal of Econometrics, 18(1), pp. 47-82.

Andreou, P.C., Philip, D. and Robejsek, P., 2016. Bank liquidity creation and risk‐taking: Does managerial ability matter?. Journal of Business Finance & Accounting, 43(1-2), pp.226-259.

Andrews, D.W.K. and Lu, B. (2001). Consistent model and moment selection procedures for GMM estimation with application to dynamic panel data models. Journal of Econometrics, 101 (1), 123–164. Available from https://doi.org/10.1016/s0304-4076(00)00077-4 [Accessed 27 June 2021].

Andriosopoulos, K., Chan, K.K., Dontis-Charitos, P., Staikouras, S.K. (2017) 'Wealth and risk implications of the Dodd-Frank Act on the U.S. financial intermediaries', Journal of Financial Stability, 33, pp. 366 - 379.

Anginer, D, Demirguc-Kunt, A and Zhu, M. (2014). How does competition affect bank systemic risk? 23 (1), 1–26. Available from https://doi.org/10.1016/j.jfi.2013.11.001 [Accessed 16 May 2023].

Arellano, M. and Bond, S. (1991) 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', The Review of Economic Studies, 58(2), pp. 277-297

Ariss, R.T., 2010. On the implications of market power in banking: Evidence from developing countries. Journal of banking & Finance, 34(4), pp.765-775.

Armas, J.C.A. (2020). BSP Working Paper Series Is bank lending channel of monetary policy evident in the Philippines? A dynamic panel data approach. Available from https://www.bsp.gov.ph/Media_And_Research/WPS/WPS202011.pdf [Accessed 16 April 2021].

Arora, R., 2021. Driving excellence in credit risk management practices in commercial lending-an empirical analysis of Indian public sector banks. International Journal of Business Continuity and Risk Management, 11(1), pp.1-24.

Arrow, K.J. and Debreu, G., 1954. Existence of an equilibrium for a competitive economy. Econometrica: Journal of the Econometric Society, pp.265-290.

Ashraf, D., Rizwan, M.S. and L'Huillier, B. (2016). A net stable funding ratio for Islamic banks and its impact on financial stability: An international investigation. Journal of Financial Stability, 25, 47–57. Available from https://doi.org/10.1016/j.jfs.2016.06.010 [Accessed 21 April 2021].

Askari, H., 2012. Islamic finance, risk-sharing, and international financial stability. Yale Journal of International Affairs., 7, p.1.

Athanasoglou, P. P., Daniilidis, I. and Delis, M. D. (2014). Bank procyclicality and output: Issues and policies. Journal of Economics and Business, 76(1), pp.97-113.

Aubuchon, C.P. and Wheelock, D.C., 2010. The geographic distribution and characteristics of US bank failures, 2007-2010: do bank failures still reflect local economic conditions?. Federal Reserve Bank of St. Louis Review, 92(5), pp.395-415.

Avdjiev, S., Gambacorta, L., & Schiaffi, S. (2020). The effects of prudential regulation, financial development and financial openness on banking stability. Journal of Financial Stability, 46, pp.100-745.

Avraham, D., Selvaggi, P. And Vickery, J. I. (2012), ‘A Structural View of U.S. Bank Holding Companies’ Economic Policy Review 18(2), pp 65-81. Available at SSRN: https://ssrn.com/abstract=2118036 or http://dx.doi.org/10.2139/ssrn.2118036

Ayadi, O. F., Arouri, M. H. and Rault, C. (2015). Bank size and systemic risk: International evidence. Journal of International Financial Markets, Institutions and Money, 35(1), pp.60-82.

Ayed, W.B., Lamouchi, R.A. and Alawi, S.M., 2021. Does the deposit structure affect Islamic bank’s maturity transformation activities? The implications of IFSB liquidity guidelines. International Journal of Islamic and Middle Eastern Finance and Management.

Ayub, M. (2009). Understanding Islamic Finance (2nd ed.). John Wiley & Sons.

Ba, S. (2022). China's Implementation of Basel III: Progress and Solutions. In The New Cycle and New Finance in China (pp. 313-319). Singapore: Springer Nature Singapore.

Bagehot W (1873), ‘Lombard Street: A Description of the Money Market, London: H. S. King’.

Bahago, K., Jelilov, G. and Celik, B., 2019. Impact of banking supervision on liquidity risk and credit risk: evidence from Nigeria. International Journal of Economics and Financial Issues, 9(3), p.200.

Bai, J;Krishnamurthy, A; Weymuller, C.H. (2018) 'Measuring Liquidity Mismatch in the Banking Sector', The Journal of Finance, 73(), pp. 51-93.

Baldwin, K., Alhalboni, M. and Helmi, M.H., 2019. A structural model of “alpha” for the capital adequacy ratios of Islamic banks. Journal of International Financial Markets, Institutions and Money, 60, pp.267-283.

Banco Central do Brasil. (2021). www.bcb.gov.br. Available from https://www.bcb.gov.br/en/about/covid-19-measures.

Bandyopadhyay, A. and Saxena, M., 2021. Linkage between Credit Risk and Liquidity Risk in Indian Banks: A Comparison of the Pre & Post Basel 3 Conditions.

Banerjee, R. N., Mio, H (2018) 'The impact of liquidity regulation on banks', Journal of Financial Intermediation, 14, pp. 30-44.

Bank Negara Malaysia. (2020). Press Release -2020 Bnm.gov.my. Available from https://www.bnm.gov.my/press-release-2020 [Accessed 30 January 2021].

Bank of England. (2021) Our response to coronavirus (Covid). Available from https://www.bankofengland.co.uk/coronavirus [Accessed 28 January 2021].

Barucci, E.; Colozza, T.; Milani, C. (2019) 'The effect of bank bail-outs in the EU', Journal of International Money and Finance, 95(), pp. 14-26.

Basah, M.Y.A., Mohamad, S.N.A., Aziz, M.R.A., Khairi, K.F., Laili, N.H., Sabri, H. and Yusuf, M.M., 2018. Risks in Islamic banks: challenges and management. Journal of Engineering and Applied Sciences.

Basel Committee on Banking Supervision (2015), “Making supervisory stress tests more macroprudential: Considering liquidity and solvency interactions and systemic risk”, BCBS Working Paper.

Basel Committee on Banking Supervision (2016), “Literature review on integration of regulatory capital and liquidity instruments”, Working Paper, No 30, March

Basel Committee on Banking Supervision (BCBS), 2021. The Basel Framework. Bank for International Settlements, pp.1-1626.

Basel Committee on Banking Supervision (BCBS). (2010). Basel III: International framework for liquidity risk measurement, standards and monitoring (December).

Basel Committee on Banking Supervision (BCBS). (2011). Basel III: A global regulatory framework for more resilient banks and banking systems (June 2011).

Basel Committee on Banking Supervision (BCBS). (2013). Basel III: The liquidity coverage ratio and liquidity risk monitoring tools (January).

Basel Committee on Banking Supervision (BCBS). (2014). Basel III: The net stable funding ratio (October).

Bauerle Danzman, S., Winecoff, W. K. and Oatley, T. (2017)‘All Crises areGlobal: Capital Cycles in an Imbalanced International PoliticalEconomy’,International Studies Quarterly, 61 (4), pp. 907–923

Bavoso, V., 2019. The promise and perils of alternative market-based finance: the case of P2P lending in the UK. Journal of Banking Regulation, pp.1-15.

Bayoumi, T., and Melander, O. “Credit matters: empirical evidence on U.S. macrofinancial linkages,” IMF Working Paper No. 08/169 (2008)

Bazarbash, M., 2019. FinTech in Financial Inclusion: Machine Learning Applications in Assessing Credit Risk. IMF Working Papers, 19(109), p.1.

BCBS (2013) Monitoring tools for intraday liquidity management, Available at: https://www.bis.org/publ/bcbs248.pdf (Accessed: 15th Dec 2019).

Bechtel, A.; Ranaldo, A. and Wrampelmeyer, J. Liquidity Risk and Funding Cost (2019). University of St.Gallen, School of Finance Research Paper No. 2019/03 .

Available at SSRN: https://ssrn.com/abstract=3391129 or http://dx.doi.org/10.2139/ssrn.3391129

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2006). Bank concentration, competition, and crises: First results. Journal of Banking & Finance, 30(5), pp.1581-1603.

Beck, T., Demirgüç-Kunt, A. and Levine, R. (2010). Financial institutions and markets across countries and over time: The updated financial development and structure database. World Bank Economic Review, 24(1), pp.77-92.

Beck, T., Demirgüç-Kunt, A. and Merrouche, O., 2013. Islamic vs. conventional banking: Business model, efficiency and stability. Journal of Banking & finance, 37(2), pp.433-447.

Belouafi, A., Bourakba, C.A. and Saci, K., 2015. Islamic finance and financial stability: A review of the literature. Journal of King Abdulaziz University: Islamic Economics, 28(2).

Berger, A & Bouwman, C (2009) 'Bank Liquidity Creation', The Review of Financial Studies, 22(9), pp. 3779-3837.

Berger, A.N. and Bouwman, C., 2015. Bank liquidity creation and financial crises. Academic Press.

Berger, A.N. and Bouwman, C.H.S. (2017). Bank liquidity creation, monetary policy, and financial crises. Journal of Financial Stability, 30, 139–155. Available from https://doi.org/10.1016/j.jfs.2017.05.001 [Accessed 30 April 2021].

Berger, A.N. et al. (2016). Bank liquidity creation following regulatory interventions and capital support. Journal of Financial Intermediation, 26, 115–141. Available from https://doi.org/10.1016/j.jfi.2016.01.001 [Accessed 5 May 2021].

Berger, A.N. et al. (2019). Liquidity creation performance and financial stability consequences of Islamic banking: Evidence from a multinational study. Journal of Financial Stability, 44, 100692. Available from https://doi.org/10.1016/j.jfs.2019.100692 [Accessed 19 May 2021].

Berger, D., Guerrieri, V., Lorenzoni, G., Vavra, J., 2017. House prices and consumer spending. The Review of Economic Studies 85, 1502–1542.

Bernanke, B., (2013) ‘The Federal Reserve and the Financial Crisis’ (Princeton University Press, Princeton, New Jersey).

Berrospide, J. (2012). Bank Liquidity Hoarding and the Financial Crisis: An Empirical Evaluation. Available from https://www.federalreserve.gov/pubs/feds/2013/201303/201303pap.pdf [Accessed 9 February 2021].

Berrospide, J.M., Edge, R.M., 2010. The effects of bank capital on lending: what do we know, and what does it mean? Int. J. Cent. Bank. 6 (4), 5–54.

Berrospide, Jose, Ralf Meisenzahl, and Briana Sullivan, 2012, Credit line use and availability in the financial crisis: The importance of hedging, Finance and Economics Discussion Series, Federal Reserve Board of Governors, 2012-27

Bethune, Z., Sultanum, B. and Trachter, N., 2019. An information-based theory of financial intermediation.

Bhansali, V., Gingrich, R. and Longstaff, F.A., 2008. Systemic credit risk: What is the market telling us?. Financial Analysts Journal, 64(4), pp.16-24.

Bhatt, S., 2021. ASSESS FORTE OF PUBLIC SECTOR BANKS IN INDIA. International Journal of Management (IJM), 12(6), pp.322-330.

Bianchi, J (2016) 'Efficient Bailouts?', American Economic Review, 16(12), pp. 3607–3659.

Bilgin, M.H., Danisman, G.O., Demir, E. and Tarazi, A., 2021. Economic uncertainty and bank stability: Conventional vs. Islamic banking. Journal of Financial Stability, 56, p.100911.

Birn, M., Dietsch, M., and Durant, D (2017) "How to reach all Basel requirements at the same time?," Débats économiques et financiers 28, Banque de France.

BIS (2010) Basel III: A global regulatory framework for more resilient banks and banking systems , Available at: https://www.bis.org/publ/bcbs189_dec2010.pdf (Accessed: 17th Oct 2019).

Bitar, M., Hassan, M.K., Pukthuanthong, K. and Walker, T., 2018. The performance of Islamic vs. conventional banks: Evidence on the suitability of the Basel capital ratios. Open Economies Review, 29(5), pp.1003-1038.

Black, F and Scholes, M (1973) 'The Pricing of Options and Corporate Liabilities', Journal of Political Economy, 81(3), pp. 637-654.

Blitz, R.C. and Long, M.F., 1965. The economics of usury regulation. Journal of Political Economy, 73(6), pp.608-619.

Blundell, R. and Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87 (1), 115–143. Available from https://doi.org/10.1016/s0304-4076(98)00009-8 [Accessed 11 June 2021].

Boateng, K. (2019). Credit risk management and performance of banks in Ghana: The ‘Camels’ rating model approach. Kwadwo Boateng (2018). Credit Risk Management and Performance of Banks in Ghana: the ‘Camels’ Rating Model Approach. International Journal of Business and Management Invention, 8(02).

Bonfim, D. (2009). Credit risk drivers: Evaluating the contribution of firm level information and of macroeconomic dynamics. Journal of Banking & Finance, 33 (2), 281–299. Available from https://doi.org/10.1016/j.jbankfin.2008.08.006 [Accessed 9 June 2021].

Bongomin, G.O.C., Ntayi, J.M., Munene, J.C. and Akol, C.M., 2017. Financial intermediation and financial inclusion of poor households: Mediating role of social networks in rural Uganda. Cogent Economics & Finance, 5(1), p.1362184.

Boora, K. and Jangra, K., 2019. Preparedness level of Indian public sector banks for implementation of Basel III: An empirical investigation. Managerial Finance, 45(2), pp. 172-189.

Boukhatem, J. and Djelassi, M., 2020. Liquidity risk in the Saudi banking system: Is there any Islamic banking specificity?. The Quarterly Review of Economics and Finance, 77, pp.206-219.

Bräuning, F. and Ivashina, V. (2020). U.S. monetary policy and emerging market credit cycles. Journal of Monetary Economics, 112, 57–76. Available from https://doi.org/10.1016/j.jmoneco.2019.02.005 [Accessed 26 March 2021].

Brei, M.; Gambacorta, L.; Peter, G.V. (2013) 'Rescue packages and bank lending', Journal of Banking and Finance, 37(2), pp. 490-505.

Brunetti, C., Harris, J.H., Mankad, S., Michailidis, G. (2019) 'Interconnectedness in the interbank market', Journal of Financial Economics, 133(), pp. 520-538.

Brunnermeier, M. K., and L. H. Pedersen, 2009, “Market liquidity and funding liquidity”, Review of Financial Studies, 22(6), 2201–2238.

Brunnermeier, M.K; Garicano, L.; Lane, P.R.; Pagano, M.; Reis, R.; Santos, T.; Thesmar, D.; Nieuwerburgh, S.V. and Vayanos. D. (2016) 'The Sovereign-Bank Diabolic Loop and ESBies', American Economic Review, 106(5), pp. 508 - 512.

Brunnermeier, M.K. and Sannikov, Y. (2015) 'International Credit Flows and Pecuniary Externalities', American Economic Journal: Macroeconomics, 7(1), pp. 297 - 338.

Bruno, V. and Shin, H.S. (2015). Capital flows and the risk-taking channel of monetary policy. Journal of Monetary Economics, 71, 119–132. Available from https://doi.org/10.1016/j.jmoneco.2014.11.011 [Accessed 9 April 2021].

Bryant, J (1980) 'A model of reserves, bank runs, and deposit insurance', Journal of Banking & Finance, 4(4), pp. 335 - 344.

Bryant, J., 1980. A model of reserves, bank runs, and deposit insurance. Journal of banking & finance, 4(4), pp.335-344.

Buch, C.M., Krause, T. and Tonzer, L., 2019. Drivers of systemic risk: Do national and European perspectives differ?. Journal of International Money and Finance, 91, pp.160-176.

Buch, M.C. and Goldberg, L.S. (2015) 'International Banking and Liquidity Risk Transmission: Lessons from Across Countries', IMF Economic Review , 63(), pp. 377 - 410.

Bülbül, D., Hakenes, H., & Lambert, C. (2019). What influences banks’ choice of credit risk management practices? Theory and evidence. Journal of Financial Stability, 40, 1-14.

Butzbach, O., 2016. Systemic risk, macro-prudential regulation and organizational diversity in banking. Policy and Society, 35(3), pp.239-251.

Calomiris, C.W., Heider, F. and Hoerova, M., 2015. A theory of bank liquidity requirements. Columbia Business School Research Paper, 2, p.10.

Calomiris, Charles W. and Heider, Florian and Hoerova, Marie, A Theory of Bank Liquidity Requirements (April 15, 2015). Columbia Business School Research Paper No. 14-39, Available at SSRN: https://ssrn.com/abstract=2477101 or http://dx.doi.org/10.2139/ssrn.2477101

Campbell, J.Y., Hilscher, J., and Szilagyi, J. (2008) 'In Search of Distress Risk', Journal of Finance, 63(6), pp. 2899 - 2939.

Cardno, C., 2018. Policy Document Analysis: A Practical Educational Leadership Tool and a Qualitative Research Method. Educational Administration: Theory & Practice, 24(4), pp.623-640.

Carletti, E., Goldstein, I., Leonello, A (2018) The interdependence of bank capital and liquidity, Available at: https://www.aeaweb.org/conference/2019/preliminary/paper/TirG3EKd (Accessed: 15th April 2019).

CBIRC (2018) Rules on Liquidity Risk Management of Commercial Banks, Available at: http://www.cbirc.gov.cn/chinese/files/2019/84B92E8736AC44B489C22A4399E00DFE.pdf (Accessed: 22nd Oct 2019).

Chakraborty, I., Goldstein, I. and MacKinlay, A. (2020). Monetary stimulus and bank lending. Journal of Financial Economics, 136 (1), 189–218. Available from https://doi.org/10.1016/j.jfineco.2019.09.007 [Accessed 12 May 2021].

Chakroun, M.A. and Gallali, M.I., 2017. Contribution of Islamic banks to systemic risk. International Journal of Banking, Accounting and Finance, 8(1), pp.52-92.

Chari, A., Jain, L. and Kulkarni, N. (2020). The Unholy Trinity: Regulatory Forbearance, Stressed Banks and Zombie Firms. Available from https://doi.org/10.3386/w28435 [Accessed 13 February 2021].

Chava, S., Ganduri, R. and Ornthanalai, C. (2018). Do Credit Default Swaps Mitigate the Impact of Credit Rating Downgrades?*. Review of Finance, 23 (3), 471–511. Available from https://doi.org/10.1093/rof/rfy033 [Accessed 12 March 2021].

Chen, H.K., Liao, Y.C., Lin, C.Y. and Yen, J.F., 2018. The effect of the political connections of government bank CEOs on bank performance during the financial crisis. Journal of Financial Stability, 36, pp.130-143.

Chen, J. (2020). LIBOR's poker. Journal of Financial Markets, 100586. Available from https://doi.org/10.1016/j.finmar.2020.100586 [Accessed 12 March 2021].

Chen, Y.K., Shen, C.H., Kao, L. and Yeh, C.Y., 2018. Bank liquidity risk and performance. Review of Pacific Basin Financial Markets and Policies, 21(01), p.1850007.

Cherry, S. et al. (2021). Government and Private Household Debt Relief during COVID-19. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3770124 [Accessed 22 January 2021].

Chiaramonte, L & Casu, B. (2013) The determinants of bank CDS spreads: evidence from the financial crisis, The European Journal of Finance, 19:9, 861-887, DOI: 10.1080/1351847X.2011.636832

Chiaramonte, L and Casu, B (2017) 'Capital and liquidity ratios and financial distress. Evidence from the European banking industry', The British Accounting Review, 49(), pp. 138-161.

Chiaramonte, L. et al. (2016). How Accurately Can Z-score Predict Bank Failure? Financial Markets, Institutions & Instruments, 25 (5), 333–360. Available from https://doi.org/10.1111/fmii.12077 [Accessed 9 June 2021].

Chopra, Y., Subramanian, K. and Tantri, P.L. (2020). Bank Cleanups, Capitalization, and Lending: Evidence from India. The Review of Financial Studies. Available from https://doi.org/10.1093/rfs/hhaa119 [Accessed 13 February 2021].

Chuliá, H., Fernández, J., and Uribe, J.M. (2018) 'Currency downside risk, liquidity, and financial stability', Journal of International Money and Finance, 89, pp. 83-102.

Claessens, S. (2017)‘Global Banking: Recent Developments and Insightsfrom Research’,Review of Finance, 21 (4), pp. 1513–1555

Claessens, S. and Neeltje van Horen. (2015). The Impact of the Global Financial Crisis on Banking Globalization. 63 (4), 868–918. Available from https://doi.org/10.1057/imfer.2015.38 [Accessed 15 May 2023].

Claessens, S. and Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. Emerging Markets Review, 15(1), pp.1-33.

CMA (2019) Prudential Rules, Available at: https://cma.org.sa/en/RulesRegulations/Regulations/Documents/Final%20Draft%20 Prudential%20Rules%20(English).pdf (Accessed: 22nd Oct 2019)

Cole, R.A. and Gunther, J.W. (1995). Separating the likelihood and timing of bank failure. Journal of Banking & Finance, 19 (6), 1073–1089. Available from https://doi.org/10.1016/0378-4266(95)98952-m [Accessed 11 June 2021].

Cole, R.A. and White, L.J. (2011). Déjà Vu All Over Again: The Causes of U.S. Commercial Bank Failures This Time Around. Journal of Financial Services Research, 42 (1-2), 5–29. Available from https://doi.org/10.1007/s10693-011-0116-9 [Accessed 11 June 2021].

Coleman, N. and Feler, L., 2015. Bank ownership, lending, and local economic performance during the 2008–2009 financial crisis. Journal of Monetary Economics, 71, pp.50-66.

Covas, F., & Driscoll, J. C. (2014). Bank liquidity and capital regulation in general equilibrium. In Finance and economics discussion series, 2014-85Washington, D.C: Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board.

Cox, S. and Thomas, A., 2005. Liquidity management: developing the Islamic capital market and creating liquidity. Abdukader Thomas, Stella Cox and B. Kraty, Structuring Islamic Finance Transactions. London: Euromoney Institution Investor PLC, pp.171-183.

Crotty, J. (2009). Structural causes of the global financial crisis: a critical assessment of the “new financial architecture.” Cambridge Journal of Economics, 33 (4), 563–580. Available from https://doi.org/10.1093/cje/bep023 [Accessed 5 May 2021].

Cucinelli, D., 2016. Can speed kill? The cyclical effect of rapid credit growth: evidence from bank lending behavior in Italy. The Journal of Risk Finance, 17 (5), pp. 562-584. https://doi.org/10.1108/JRF-03-2016-0035

Cuong-Ly, K; Chen, Z; Wang, S; Jiang, W (2017) 'The Basel III net stable funding ratio adjustment speed and systemic risk', Research in International Business and Finance, 39(), pp. 169-182.

Cuong-Ly, K.; Shimizu,K (2018) 'Funding liquidity risk and internal markets in multi-bank holding companies: Diversification or internalization?', International Review of Financial Analysis, 57(), pp. 77-89

D’Cruz, R.G. and Adnan Sundra & Low, 2021, May 4. The Banking Regulation Review: Malaysia. The Law Reviews, pp. 1-37. https://thelawreviews.co.uk/title/the-banking-regulation-review/malaysia

Dahir, A. M., Mahat, F., Razak, N. H. A., & Bany-Ariffin, A. N. (2019). Capital, funding liquidity, and bank lending in emerging economies: An application of the LSDVC approach. Borsa Istanbul Review, 19(2), 139-148.

Dahir, A.M., Mahat, F.B. and Ali, N.A.B., 2018. Funding liquidity risk and bank risk-taking in BRICS countries: An application of system GMM approach. International Journal of Emerging Markets.

Dalglish, S.L., Khalid, H. and McMahon, S.A., 2020. Document analysis in health policy research: the READ approach. Health policy and planning, 35(10), pp.1424-1431.

Dalhatu, S. S., & Sharofiddin, A. (2021). A Risk-Based Supervisory Framework for Islamic Banks in Nigeria. In The Importance of New Technologies and Entrepreneurship in Business Development: In the Context of Economic Diversity in Developing Countries: The Impact of New Technologies and Entrepreneurship on Business Development (pp. 1496-1520). Springer International Publishing.

Dalhatu, S.S. and Sharofiddin, A., 2020. Conceptual Framework on Risk-Based Supervision of Islamic Banks: A Proposed Risk-Based Supervisory Framework. International Research in Technology, Engineering, Science and Humanities (IJRTESH), 01(1), pp. 1-9.

Dang, V.D. (2020). Do non-traditional banking activities reduce bank liquidity creation? Evidence from Vietnam. Research in International Business and Finance, 54, 101257. Available from https://doi.org/10.1016/j.ribaf.2020.101257 [Accessed 19 May 2021].

Dar, H.A. and Presley, J.R., 2000. Lack of profit loss sharing in Islamic banking: management and control imbalances. International Journal of Islamic Financial Services, 2(2), pp.3-18.

Davies, H. and Green, D. (2008)Global Financial Regulation: The EssentialGuide. Cambridge: Polity

Davis, D.D, Korenok, O., Lightle, J.P (2019) 'Liquidity regulation, banking history and financial fragility: An experimental examination', Journal of Economic Behavior and Organization, [Online]. Available at: https://doi.org/10.1016/j.jebo.2019.09.005 (Accessed: 17th Oct 2019).

Davydov, D., Vähämaa, S. and Yasar, S. (2021). Bank liquidity creation and systemic risk. Journal of Banking & Finance, 123, 106031. Available from https://doi.org/10.1016/j.jbankfin.2020.106031 [Accessed 18 February 2021].

De Haas, R. and Van Horen, N. (2012). International shock transmission and bank lending: Evidence from the global financial crisis. Journal of International Economics, 89(2), pp.495-510.

De Larosière Report, 2009. Report of the High-level Group on Financial Supervision in the EU.

Degryse, H., Matthews, K. and Zhao, T. (2018). SMEs and access to bank credit: Evidence on the regional propagation of the financial crisis in the UK. Journal of Financial Stability, 38, 53–70. Available from https://doi.org/10.1016/j.jfs.2018.08.006 [Accessed 12 February 2021].

Deli, Y and Hasan, I (2017) 'Real effects of bank capital regulations: Global evidence', Journal of Banking and Finance, 82(1), pp. 217-228.

Demirgüç-Kunt, A. and Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. Journal of Financial Economics, 98(3), pp.626-650.

Demirgüç-Kunt, A. and Huizinga, H. (2013). Interest rates and bank risk-taking. Journal of Financial Economics, 109(3), pp.759-778.

Demirguc-Kunt, A., Pedraza, A. and Ruiz-Ortega, C. (2020). Banking Sector Performance during the COVID-19 Crisis. World Bank, Washington, DC. Available from https://doi.org/10.1596/1813-9450-9363 [Accessed 26 January 2021].

Dermine, J (2015) 'Basel III leverage ratio requirement and the probability of bank runs', Journal of Banking & Finance, 53(), pp. 266-277.

DeYoung, R. and Rice, T. (2004). Noninterest income and financial performance at US commercial banks. Financial Review, 39(1), pp.101-127.

DeYoung, R., Distinguin, I. and Tarazi, A. (2018). The Joint Regulation of Bank Liquidity and Bank Capital. Journal of Financial Intermediation, 34 (1), 32–46. Available from https://doi.org/10.1016/j.jfi.2018.01.006 [Accessed 14 January 2021].

DeYoung, R., Jang, K.Y. (2016) 'Do banks actively manage their liquidity?', Journal of Banking & Finance, 66(), pp. 143-161.

Dhiraj, N.S., Puneri, A. and Benraheem, H., 2019. A SUCCINCT ANALYSIS OF MITIGATING LIQUIDITY RISK IN ISLAMIC BANKS IN THE LIGHT OF LIQUIDITY AND RISK MANAGEMENT PRINCIPLES. International Journal of Islamic Business Ethics, 4(1), pp.527-539.

Diamond and Rajan (2000) 'A Theory of Bank Capital', The Journal of Finance, 55(6), pp. 2431-2465

Diamond, D and Dybvig, P (2007) 'Banks and Liquidity Creation: A Simple Exposition of the Diamond-Dybvig Model', Quarterly Journal of Economics, 93(2), pp. 189–200.

Diamond, D and Rajan, R (2005) 'Liquidity Shortages and Banking Crises', The Journal of Finance, 60(), pp. 615-647.

Diamond, D.W. (1984). Financial Intermediation and Delegated Monitoring. The Review of Economic Studies, 51 (3), 393–414. Available from https://doi.org/10.2307/2297430 [Accessed 8 February 2021].

Diamond, D.W. and Dybvig, P.H., 1983. Bank runs, deposit insurance, and liquidity. Journal of political economy, 91(3), pp.401-419.

Diamond, D.W., Hu, Y. and Rajan, R.G. (2021). Liquidity, Pledgeability, and the Nature of Lending. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3773076 [Accessed 17 February 2021].

Diamond, Douglas, and Anil Kashyap, 2016, Liquidity requirements, liquidity choice and financial stability, in John B. Taylor and Harald Uhlig, eds.: Handbook of Macroeconomics, Vol. 2. (North-Holland, Amsterdam).

Díaz, V. and Huang, Y., 2017. The role of governance on bank liquidity creation. Journal of Banking & Finance, 77, pp.137-156.

Diebold, F.X., Yilmaz, K., 2015. Financial and Macroeconomic Connectedness A Network Approach to Measurement and Monitoring. Oxford University Press, Oxford

Dietrich, A., Hess, K., &Wanzenried, G. (2014). The good and the bad news about the new liquidity rules of Basel III inWestern European countries. Journal of Banking & Finance, 44, 13-25.

Distinguin, I., Roulet, C., and Tarazi, A (2013) 'Bank regulatory capital and liquidity: Evidence from US and European publicly traded banks', Journal of Banking & Finance, 37(), pp. 3295 - 3317.

Dobler, M., Gray, S., Murphy, D., and Radzewicz-Bak, B. (2016) 'The Lender of Last Resort Function after the Global Financial Crisis', IMF Working Paper WP/16/10, pp. 1-63.

Dolfin, M., Knopoff, D., Limosani, M. and Xibilia, M.G., 2019. Credit risk contagion and systemic risk on networks. Mathematics, 7(8), p.713.

Dong, M. and Oberson, R., 2021. Moving toward the expected credit loss model under IFRS 9: capital transitional arrangement and bank systematic risk. Accounting and Business Research, pp.1-39.

Dow, S.C. (1996) 'Why should the Banking System be Regulated', The Economic Journal, 106(), pp. 698-707.

Drechsler, I., Drechsedl, T., Marques-Ibanez, D. and Schnabl, P. (2016) 'Who Borrows from the Lender of Last Resort?', The Journal of Finance, 71(5), pp. 1933-1974.

Drechsler, I., Savov, A. and Schnabl, P. (2017). A Model of Monetary Policy and Risk Premia. The Journal of Finance, 73 (1), 317–373. Available from https://doi.org/10.1111/jofi.12539 [Accessed 13 April 2021].

Drechsler, I., Savov, A. and Schnabl, P. (2017). The Deposits Channel of Monetary Policy*. The Quarterly Journal of Economics, 132 (4), 1819–1876. Available from https://doi.org/10.1093/qje/qjx019 [Accessed 12 February 2021].

Drehmann, M and Nikolaou, K (2013) 'Funding liquidity risk: Definition and measurement', Journal of Banking & Finance, 37(7), pp. 2173-2182.

Duc Khuong Nguyen, Canh Phuc Nguyen and Le Si Dang. (2022). Uncertainty and corporate default risk: Novel evidence from emerging markets. 101571–101571. Available from https://doi.org/10.1016/j.intfin.2022.101571 [Accessed 28 May 2023]

Duffie, D. and Zhu, H. (2011). Does a central clearing counterparty reduce counterparty risk? Review of Asset Pricing Studies, 1(1), pp.74-95.

EBA (2018) FINAL REPORT – GUIDELINES ON THE REVISED SREP AND SUPERVISORY STRESS TESTING, Available at: https://eba.europa.eu/sites/default/documents/files/documents/10180/2282666/6c2e3962-6b95-4753-a7dc-68070a5ba662/Revised%20Guidelines%20on%20SREP%20(EBA-GL-2018-03).pdf (Accessed: 22nd Oct 2019).

Eberl, Jakob, and Christopher Weber, 2014, ECB collateral criteria: A narrative database 2001–2013, IFO Working Paper Series No. 174.

Ebrahim, M. and Sheikh, M., 2016. Debt Instruments in Islamic Finance: A Critique. Arab Law Quarterly, 30(2), pp.185-198.

ECB (2018) Systemic liquidity concept, measurement and macroprudential instruments, Available at: https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op214.en.pdf (Accessed: 10th April 2019).

Edge, R. M., & Liangb, J. N. (2022). Financial Stability Committees and the Basel III Countercyclical Capital Buffer. International Journal of Central Banking, 76, 247-299.

Ekinci, R. and Poyraz, G., 2019. The effect of credit risk on financial performance of deposit banks in Turkey. Procedia Computer Science, 158, pp.979-987.

El-Gamal, M. A. (2006). Islamic Finance: Law, Economics, and Practice. Cambridge University Press.

El-Massah, S., Bacheer, S.M. and Al Sayed, O., 2019. Liquidity risk in the MENA region banking sector: does bank type make a difference?. The Journal of Developing Areas, 53(1).

Elayan, F.A., Aktas, R., Brown, K., Pacharn, P. (2018) 'The impact of the Volcker rule on targeted banks, systemic risk, liquidity, and financial reporting quality', Journal of Economics and Business, 96, pp. 69-89.

Elnahas, A.M., M. Kabir Hassan and Waheed, A. (2017). Religion and mergers and acquisitions contracting: The case of earnout agreements. 42, 221–246. Available from https://doi.org/10.1016/j.jcorpfin.2016.11.012 [Accessed 15 May 2023]

ELOUALI, J. and OUBDI, L., 2020. Liquidity Risk Determinants of Islamic Banks. IJBTSR International Journal of Business and Technology Studies and Research, 2(4), pp.7-pages.

Fahlenbrach, R., Prilmeier, R. and Stulz, R.M. (2012). This Time Is the Same: Using Bank Performance in 1998 to Explain Bank Performance during the Recent Financial Crisis. The Journal of Finance, 67 (6), 2139–2185. Available from https://doi.org/10.1111/j.1540-6261.2012.01783.x [Accessed 17 June 2021].

Fakir, A.E., Fairchild, R. and Tkiouat, M., 2019. A hybrid profit and loss sharing model using interest free-debt and equity financing: An application of game theory as a decision tool. The North American Journal of Economics and Finance, 49, pp.352-360.

Fang, L., Sun, B., Li, H. and Yu, H., 2018. Systemic risk network of Chinese financial institutions. Emerging Markets Review, 35, pp.190-206.

Fang, X., Jutrsa, D.; Peria , S.; Presbitero, A.; Ratnovski, L (2020) 'Bank capital requirements and lending in emerging markets: The role of bank characteristics and economic conditions', Journal of Banking and Finance, 105806(), pp. 1-19.

Farag, M., Harland, D., & Nixon, D. (2013). Bank capital and liquidity. Quarterly Bulletin, Bank of England.

Farhan, M., Alam, H.M., Sattar, A. and Khan, S., 2020. Credit Risk Management in Islamic Banking: A System Thinking Approach. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies, 11(16), pp.11A16J-1.

Farihana, S. and Rahman, M.S., 2020. Can profit and loss sharing (PLS) financing instruments reduce the credit risk of Islamic banks?. Empirical Economics, pp.1-18.

Farooq, M. and Zaheer, S., 2015. Are Islamic banks more resilient during financial panics?. Pacific Economic Review, 20(1), pp.101-124.

Fecht, F., Thum, S., Weber, P. (2019) 'Fear, Deposit Insurance Schemes, and Deposit Reallocation in the German Banking System', Journal of Banking & Finance, 105(), pp. 151 - 165.

Federal Reserve (2017) Liquidity Risk Management, Available at: https://www.federalreserve.gov/supervisionreg/topics/liquidity_risk.htm (Accessed: 22nd Dec 2019)

Ferguson, R. W. (2002). Should financial stability be an explicit central bank objective. Challenges to Central Banking from Globalized Financial Systems, 16-17.

Fiordelisi, F., Marques-Ibanez, D. and Molyneux, P. (2011). Efficiency and risk in European banking. Journal of Banking & Finance, 35(5), pp.1315-1326.

Fleckenstein, M. and Longstaff, F. (2020). The Market Risk Premium for Unsecured Consumer Credit Risk. Available from https://doi.org/10.3386/w28029 [Accessed 10 February 2021].

Foglia, A., 2018. Stress testing credit risk: a survey of authorities' approaches. Eighteenth issue (September 2009) of the International Journal of Central Banking, 5(3), pp.9-45.

Fouquau, J. and Spieser, P.K. (2015). Statistical evidence about LIBOR manipulation: A “Sherlock Holmes” investigation. Journal of Banking & Finance, 50, 632–643. Available from https://doi.org/10.1016/j.jbankfin.2014.03.039 [Accessed 12 March 2021].

Freixas X, A Martin and D Skeie (2011), ‘Bank Liquidity, Interbank Markets and Monetary Policy’, Review of Financial Studies 24(8), pp 2656–2692.

Freixas, X. and Jorge, J. (2007). “The Role of Interbank Markets in Monetary Policy: A Model with Rationing.” Department of Economics and Business, Universitat Pompeu Fabra, Working Paper 1027

Friedman, M., 1969. The optimum quantity of money. The Optimum Quantity of Money and Other Essays, pp.1-50.

Fungáčová, Z., Turk, R., Weill, L., 2015. High liquidity creation and bank failures. In: International Monetary Fund Working Paper No. 15/103, Retrieved 15 May 2021, from: https://www.imf.org/external/pubs/ft/wp/2015/wp15103.pdf

Galletta, S. and Mazzù, S., 2019. Liquidity risk drivers and bank business models. Risks, 7(3), p.89.

Gambacorta, L., Mistrulli, P.E., 2004. Does bank capital affect lending behavior? Journal of Financial Intermediation 13, 436–457

Gang, Y (2018) Deepen reform and opening-up comprehensively. Create new prospects for financial sector, Available at: https://www.bis.org/review/r181220h.pdf (Accessed: 22nd Oct 2019).

Gao, Y., Liao, S., Wang, X. (2018) 'Capital markets’ assessment of the economic impact of the Dodd–Frank Act on systemically important financial firms', Journal of Banking and Finance, 86, pp. 204-223.

Garcia-de-Andoain, C. et al. (2016). Lending-of-last-resort is as lending-of-last-resort does: Central bank liquidity provision and interbank market functioning in the euro area. Journal of Financial Intermediation, 28, 32–47. Available from https://doi.org/10.1016/j.jfi.2016.01.003 [Accessed 16 March 2021].

Gefang, D., Koop, G. and Potter, S.M. (2011). Understanding liquidity and credit risks in the financial crisis. Journal of Empirical Finance, 18 (5), 903–914. Available from https://doi.org/10.1016/j.jempfin.2011.07.006 [Accessed 11 March 2021].

Geske, R (1979) 'The valuation of compound options', Journal of Financial Economics , 7(1), pp. 63 - 81.

Ghenimi, A., Chaibi, H. and Omri, M.A.B. (2017). The effects of liquidity risk and credit risk on bank stability: Evidence from the MENA region. Borsa Istanbul Review, 17 (4), 238–248. Available from https://doi.org/10.1016/j.bir.2017.05.002 [Accessed 18 February 2021].

Ghenimi, A., Chaibi, H. and Omri, M.A.B., 2020. Liquidity risk determinants: Islamic vs conventional banks. International Journal of Law and Management.

Giordana, G and Schumacher, (2017) 'An Empirical Study on the Impact of Basel III Standards on Banks' Default Risk: The Case of Luxembourg', Journal of Risk and Financial Management, 10(8), pp. 2 -21.

Gobat, J; Yanase, M; Maloney, J (2014) 'The Net Stable Funding Ratio: Impact and Issues for Consideration', IMF Working Paper , WP/14/106(), pp. 1-43.

Godspower-Akpomiemie, E. and Ojah, K., 2021. Competition and Market Discipline in the Banking Industry of Emerging Market Economies. Review of Development Finance, 11(1), pp.1-25.

Golub, S., Kaya, A. and Reay, M., 2015. What were they thinking? The Federal Reserve in the run-up to the 2008 financial crisis. Review of International Political Economy, 22(4), pp.657-692.

Golubeva, O., Duljic, M. and Keminen, R., 2019. The impact of liquidity risk on bank profitability: some empirical evidence from the European banks following the introduction of Basel III regulations. Journal of Accounting and Management Information Systems, 18(4), pp.455-485.

Gomez, M. et al. (2021). Banks' exposure to interest rate risk and the transmission of monetary policy. Journal of Monetary Economics, 117, 543–570. Available from https://doi.org/10.1016/j.jmoneco.2020.03.011 [Accessed 18 March 2021].

Goodfriend M and R King (1988), 'Financial Deregulation, Monetary Policy and Central Banking', Federal Reserve Bank of Richmond Economic Review 74(3), pp 3–22.

Granja, J., Leuz, C. and Rajan, R. (2020). Revised: Going the Extra Mile: Distant Lending and Credit Cycles. Available from https://doi.org/10.3386/w25196 [Accessed 12 February 2021].

Gretta, S.A.A.B., 2017. Financial inclusion and growth. The Business & Management Review, 8(4), p.434.

Guijarro, F., Moya-Clemente, I. and Saleemi, J., 2019. Liquidity risk and investors' mood: Linking the financial market liquidity to sentiment analysis through Twitter in the S&P500 index. Sustainability, 11(24), p.7048.

Guinigundo, D.C. (2017). Macroprudential frameworks, implementation, and communication strategies – The Philippines. Available from https://www.bis.org/publ/bppdf/bispap94.pdf.

Gupta, J. and Kashiramka, S. (2020). Financial stability of banks in India: Does liquidity creation matter? Pacific-Basin Finance Journal, 64, 101439. Available from https://doi.org/10.1016/j.pacfin.2020.101439 [Accessed 18 February 2021].

Hadi, M.A. and José Closs, S., 2016. Ensuring rigour and trustworthiness of qualitative research in clinical pharmacy. International journal of clinical pharmacy, 38(3), pp.641-646.

Halling, M., Yu, J. and Zechner, J. (2020). The Dynamics of Corporate Debt Structure. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3488471 [Accessed 17 February 2021].

Hamza, H., 2016. Does investment deposit return in Islamic banks reflect PLS principle?. Borsa Istanbul Review, 16(1), pp.32-42.

Harun, T.W.R., Kamil, N.K.M., Haron, R. and Ramly, Z., 2021. Bank Liquidity Risk and Capital Structure: A Conceptual Review of Theoretical and Empirical Research on Islamic Banking Perspective. International Journal of Academic Research in Accounting Finance and Management Sciences, 11(3), pp. 539–553.

Hasan, Z. (2014). Islamic Banking and Financial Crisis: Reputation, Stability and Risks. Edward Elgar Publishing.

Hassan, M. K. and Lewis, M. K. (2007). Handbook of Islamic banking. Edward Elgar Publishing.

Hassan, M., Aliyu, S. and Hussain, M., 2019. A contemporary review of Islamic finance and accounting literature. The Singapore Economic Review, pp.1-38.

Hassan, M.K., Khan, A. and Paltrinieri, A. (2019). Liquidity risk, credit risk and stability in Islamic and conventional banks. Research in International Business and Finance, 48, 17–31. Available from https://doi.org/10.1016/j.ribaf.2018.10.006 [Accessed 27 April 2021].

Hausman. J. A. (1978) 'Specification Tests in Econometrics', Econometrica, 46(6), pp. 1251-1271.

He, Liang (2019) 'The seed of a crisis: Investor sentiment and bank liquidity', Finance Research Letters, 29(), pp. 152 - 155.

He, Z. and Xiong, W. (2012). Rollover Risk and Credit Risk. The Journal of Finance, 67 (2), 391–430. Available from https://doi.org/10.1111/j.1540-6261.2012.01721.x [Accessed 11 June 2021].

Hidayat, S.E., Nadeem, M.M., AlMadaifa, A.J. and Ali, Z., 2018. Impacts of Basel III on Islamic finance. Journal of Islamic Financial Studies, 4(02), pp.123-133.

Hill, B.M. (1975). A Simple General Approach to Inference About the Tail of a Distribution. The Annals of Statistics, 3 (5), 1163–1174. Available from https://www.jstor.org/stable/pdf/2958370.pdf?refreqid=excelsior%3Ac9eed4ab3aec009a9f081879653f357e [Accessed 18 June 2021].

Hillegeist, S., Keating, E., Cram, D., Lundstedt, K., 2004. Assessing theprobability of bankruptcy. Review of Accounting Studies 9, 5–34.

Hlebik, S (2017) 'Liquidity Risk under The New Basel Global Regulatory Framework', Applied Economics and Finance, 4(6), pp. 78-90.

Holmström, B. and Tirole, J., 1998. Private and Public Supply of Liquidity. Journal of Political Economy, 106(1), pp.1-40.

Holmstrom, B., Tirole, J. (1997) 'Financial Intermediation, Loanable Funds, and the Real Sector', The Quarterly Journal of Economics, 112(3), pp. 663-691.

Hong, H; Huang, J; Wu, D (2014) 'The information content of Basel III liquidity risk measures', Journal of Financial Stability, 15(), pp. 91-111

Hoque, H; Andriosopoulos, D; Andriosopoulos, K; Douady, R (2015) 'Bank regulation, risk and return: Evidence from the credit and sovereign debt crises', Journal of Banking & Finance, 50(1), pp.455-474.

Hosen, M. N. and Ashraf, D. (2021). Risk management practices of Islamic banks: A systematic review. Journal of Islamic Accounting and Business Research, 12(4), pp.775-794.

Hsieh, M. and Lee, C. (2020). Bank Liquidity Creation, Regulations, and Credit Risk. Asia-Pacific Journal of Financial Studies, 49 (3), 368–409. Available from https://doi.org/10.1111/ajfs.12295 [Accessed 19 May 2021].

Huang, S.-C., Chen, W.-D. and Chen, Y. (2018). Bank liquidity creation and CEO optimism. Journal of Financial Intermediation, 36, 101–117. Available from https://doi.org/10.1016/j.jfi.2018.03.004 [Accessed 12 May 2021].

Hübner, J., Vuckovac, D., Fleisch, E. and Ilic, A. 2019. Fintechs and the new wave of financial intermediaries. Available at: https://www.alexandria.unisg.ch/publications/259703.

Hugonnier, J. and Morellec, E (2017) 'Bank capital, liquid reserves, and insolvency risk', Journal of Financial Economics, 125(), pp. 266-285.

Hussain, M., Maheshwari, D. and Hamid, M., 2021. A Study Of The Impact Of Non-Performing Assets Of Indian Banking System On Selected Public Sector Banks. International Research Journal Of Modernization In Engineering Technology And Science, 3(3).

Hussain, M., Shahmoradi, A. and Turk, R., 2016. An overview of Islamic finance. Journal of International Commerce, Economics and Policy, 7(01), p.1650003.

Hussien, M.E., Alam, M.M., Murad, M.W. and Wahid, A.N., 2019. The performance of Islamic banks during the 2008 global financial crisis: evidence from the Gulf cooperation council countries. Journal of Islamic Accounting and Business Research, 10(3), pp. 407-420.

Ibrahim, M.H. and Alam, N., 2018. Islamic economics and Islamic finance in the world economy. The World Economy, 41(3), pp.668-673.

Ibrahim, W.H.W. and Ismail, A.G., 2015. Conventional bank and Islamic banking as institutions: similarities and differences. Humanomics, 29 (1), pp. 43-60.

ICMA. (2020) COVID-19 Market Updates: Monetary policy. Available from https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/covid-19-market-updates/monetary-policy/#Malaysia [Accessed 30 January 2021].

Imbierowicz, B. and Rauch, C. (2014). The relationship between liquidity risk and credit risk in banks. Journal of Banking & Finance, 40 (40), 242–256. Available from https://doi.org/10.1016/j.jbankfin.2013.11.030 [Accessed 10 September 2019].

IMF (2008), Global Financial Stability Report, April 2008

IMF (2017) SAUDI ARABIA FINANCIAL SYSTEM STABILITY ASSESSMENT, Available at: https://www.imf.org/~/media/Files/Publications/CR/2017/cr17318.ashx (Accessed: 22nd Oct 2019).

IMF (2017b, December). PEOPLE'S REPUBLIC OF CHINA FINANCIAL SECTOR ASSESSMENT PROGRAM. IMF Country Report No. 17/403. Available at https://www.imf.org/-/media/Files/Publications/CR/2017/cr17403.ashx (Accessed: 10th June 2022).

IMF. (2021) Policy Responses to COVID19. Available from https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#I [Accessed 28 January 2021].

İncekara, A. and Çetinkaya, H., 2019. Liquidity risk management: A comparative analysis of panel data between Islamic and conventional banking in Turkey. Procedia Computer Science, 158, pp.955-963.

Ippolito, F., Almeida, H., Perez Orive, A., Acharya, V. (2019) 'Bank lines of credit as contingent liquidity: Covenant violations and their implications', Journal of Financial Intermediation, https://doi.org/10.1016/j.jfi.2019.03.004

Ippolito, F., Peydró, J.L.,Poloc, A. ,Sette, E. (2016) 'Double bank runs and liquidity risk management', Journal of Financial Economics, 122(), pp. 135-154.

Iqbal, Z., 1997. Islamic financial systems. Finance and Development, 34, pp.42-45.

Isanzu, J.S., 2017. The impact of credit risk on financial performance of Chinese banks. Journal of International Business Research and Marketing, 2(3).

Islam, A., Farooq, M. and Ahmad, A., 2017. Factors affecting liquidity position of Islamic banks. City University Research Journal, pp.27-36.

Ismail, R., Rahman, R.A. and Ahmad, N., 2013. Risk management disclosure In Malaysian islamic financial institutions: Pre-and post-financial crisis. Journal of Applied Business Research (JABR), 29(2), pp.419-432.

Izzeldin, M. et al. (2021). The impact of Covid-19 on G7 stock markets volatility: Evidence from a ST-HAR model. International Review of Financial Analysis, 74, 101671. Available from https://doi.org/10.1016/j.irfa.2021.101671 [Accessed 26 January 2021].

Jaara, O.O., Jaara, B.O., Shamieh, J. and Fendi, U.A., 2017. Liquidity risk exposure in Islamic and Conventional banks. International Journal of Economics and Financial Issues, 7(6), p.16.

Jarbou, T. and Niyama, J.K., 2020. Country comparative assessment of Islamic banks' financial economic situation. REVISTA AMBIENTE CONTÁBIL-Universidade Federal do Rio Grande do Norte-ISSN 2176-9036, 12(2).

Jayawarsa, A.K., Wulandari, I.G.A.A., Saputra, K.A.K. and Saputri, N.M.M.D., 2021. Public financial deposits in state owned banks: from an inflation perspective and bank Indonesia interest rates. International Journal of Business, Economics and Law, 24(1), pp.105-112.

Jedidia, K.B. and Hamza, H., 2015. Determinants of liquidity risk in Islamic banks: A panel study. Islamic Management and Business, 2(2), pp.137-146.

Jensen, M.C. and Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), pp.305-360.

Jia, M. (2014). Doctoral Thesis: Heavy-Tailed Phenomena and Tail Index Inference. Available from https://core.ac.uk/download/pdf/35317427.pdf.

Jobst, A.A. (2014) 'Measuring Systemic Risk-Adjusted Liquidity (SRL) - A Model Approach', IMF Working Paper: Monetary and Capital Markets Department WP/12/209, pp. 1-69.

Jouti, A.T., 2020. The Fourth Market theory and interest rate benchmarking in the Islamic finance industry. ISRA International Journal of Islamic Finance.

Joyce, M., Miles, D., Scott, A., Vayanos, D. (2012) 'Quantitative Easing and Unconventional Monetary Policy – an Introduction', The Economic Journal, 122(564), pp. 271 – 288.

Jung H. and Kim, D. (2015) 'Bank funding structure and lending under liquidity shocks: Evidence from Korea', Pacific- Basin Finance Journal , 33(), pp. 62 - 80.

Kabir, Md.N., Worthington, A. and Gupta, R. (2015). Comparative credit risk in Islamic and conventional bank. Pacific-Basin Finance Journal, 34, 327–353. Available from https://doi.org/10.1016/j.pacfin.2015.06.001 [Accessed 21 April 2021].

Kapoor, S. and Peia, O. (2021). The impact of quantitative easing on liquidity creation. Journal of Banking & Finance, 122, 105998. Available from https://doi.org/10.1016/j.jbankfin.2020.105998 [Accessed 11 May 2021].

Karimalis, E.N. and Nomikos, N.K., 2018. Measuring systemic risk in the European banking sector: a copula CoVaR approach. The European Journal of Finance, 24(11), pp.944-975.

Karolyi, G., Lee, K.H., Van Dijk, M., (2012) Understanding commonality in liquidity around the world. Journal of Financial Economics 105 (1), 82–112

Kashyap, A., Tsomocos, D. and Vardoulakis, A. (2020). Optimal Bank Regulation In the Presence of Credit and Run-Risk. Available from https://doi.org/10.3386/w26689 [Accessed 10 February 2021].

Kashyap, A.K., Rajan, R. and Stein, J.C., 2002. Banks as liquidity providers: An explanation for the coexistence of lending and deposit‐taking. The Journal of finance, 57(1), pp.33-73.

Kayesa, N.K. and Shung-King, M., 2021. The role of document analysis in health policy analysis studies in low and middle-income countries: Lessons for HPA researchers from a qualitative systematic review. Health Policy OPEN, 2, p.100024.

Keeley, M.C. (1990). Deposit Insurance, Risk, and Market Power in Banking. The American Economic Review, 80 (5), 1183–1200. Available from https://www.jstor.org/stable/2006769?seq=1 [Accessed 17 May 2021].

Keister, T. (2016) 'Bailouts and Financial Fragility', The Review of Economic Studies, 83(2), pp. 704–736.

Khalid, M.S., Rashed, M. and Hossain, A., 2019. The Impact of Liquidity Risk on Banking Performance: Evidence from the Emerging Market. Global Journal of Management and Business Research.

Khan, U.E. and Iqbal, J., 2021. The Relationship between Default Risk and Asset Pricing: Empirical Evidence from Pakistan. The Journal of Asian Finance, Economics and Business, 8(3), pp.717-729.

Khediri, K.B., Charfeddine, L. and Youssef, S.B., 2015. Islamic versus conventional banks in the GCC countries: A comparative study using classification techniques. Research in International Business and Finance, 33, pp.75-98.

Khokher, Z. and Alhabshi, S., 2019. Determinants of capital structure decisions among publicly listed Islamic banks. Management Science Letters, 9(10), pp.1577-1598.

Kim, D; Sohn, W (2017) 'The effect of bank capital on lending: Does liquidity matter?', Journal of Banking and Finance, 77(1), pp.95-107.

King, M. R. (2013). The Basel III net stable funding ratio and bank net interest margins. Journal of Banking & Finance, 37, 4144-4156.

King, T.B. and Lewis, K.F. (2015). Credit Risk, Liquidity and Lies. Finanace and Economics Discussion Series, 2015 (2012), 1–41. Available from https://doi.org/10.17016/feds.2015.112 [Accessed 12 March 2021].

Klein, M.A. (1971). A Theory of the Banking Firm. Journal of Money, Credit and Banking, 3 (2), 205. Available from https://doi.org/10.2307/1991279.

Kleinow, J., Moreira, F., Strobl, S. and Vähämaa, S., 2017. Measuring systemic risk: A comparison of alternative market-based approaches. Finance Research Letters, 21, pp.40-46.

Konovalova, N., Kristovska, I. and Kudinska, M., 2016. Credit risk management in commercial banks. Polish Journal of Management Studies, 13.

Kou, G., Chao, X., Peng, Y., Alsaadi, F.E. and Herrera-Viedma, E., 2019. Machine learning methods for systemic risk analysis in financial sectors. Technological and Economic Development of Economy, 25(5), pp.716-742.

Ladley, D (2013) 'Contagion and risk-sharing on the inter-bank market', Journal of Economic Dynamics & Control, 37(), pp. 1384-1400.

Lallour, A and Mio, H (2016) 'Do we need a stable funding ratio? Banks' funding in the global financial crisis', Bank of England Staff Working Paper No. 602, (), pp. [Online]. Available at: https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/do-we-need-a-stable-funding-ratio-banks-funding-in-the-global-crisis.pdf?la=en&hash=925455009706E7D907FCF132D7F152AD2654CFC2 (Accessed: 08th March 2020)

Lassoued, M. (2018). Comparative study on credit risk in Islamic banking institutions: The case of Malaysia. The Quarterly Review of Economics and Finance, 70, 267–278. Available from https://doi.org/10.1016/j.qref.2018.05.009 [Accessed 9 June 2021].

Lawrence, B. (2012): "The Federal Reserve as global lender of last resort, 2007–2011", Winner: Best Paper Award, International Political Economy Society (IPES), University of Virginia, 9–10 November.

Leo, M., Sharma, S. and Maddulety, K., 2019. Machine learning in banking risk management: A literature review. Risks, 7(1), p.29.

Lerner, A.P. (1934). The Concept of Monopoly and the Measurement of Monopoly Power. The Review of Economic Studies, 1 (3), 157–175. Available from https://doi.org/10.2307/2967480 [Accessed 17 May 2021].

Lesmond, D. A., J. P. Ogden, and C. A. Trzcinka. 1999. A new estimate of transaction costs. The Review of Financial Studies 12 (5):1113–41. doi:10.2307/2645977.

Li, F. and Perez-Saiz, H., 2018. Measuring systemic risk across financial market infrastructures. Journal of Financial Stability, 34, pp.1-11.

Ling, D. X., Haron, R., & Hasan, A. (2022). BASEL III CAPITAL REGULATION FRAMEWORK AND ISLAMIC BANK'S RISK. IIUM Law Journal, 30(S2), 93-128.

Liu, X., 2017. Measuring systemic risk with regime switching in tails. Economic Modelling, 67, pp.55-72.

Liu, Y., Qiu, B. and Wang, T. (2021). Debt rollover risk, credit default swap spread and stock returns: Evidence from the COVID-19 crisis. Journal of Financial Stability, 53, 100855. Available from https://doi.org/10.1016/j.jfs.2021.100855 [Accessed 11 June 2021].

Louati, S., Abida, I.G. and Boujelbene, Y., 2015. Capital adequacy implications on Islamic and non-Islamic bank's behavior: Does market power matter?. Borsa Istanbul Review, 15(3), pp.192-204.

Love, I., & Zicchino, L. (2006). Financial development and dynamic investment behavior: Evidence from panel VAR. The Quarterly Review of Economics and Finance, 46, 190-210.

Lund, S., Daruvala, T., Dobbs, R., H€arle, P., Kwek, J.-H. and Falcon, R.(2013)‘Financial Globalization: Retreat or Reset?’. [online]. Availablefrom:http://www.mckinsey.com/global-themes/employment-and-growth/financial-globalization [Accessed 29 January 2019].

Maatoug, A.B., Ayed, W.B. and Ftiti, Z., 2019. Are MENA banks’ capital buffers countercyclical? Evidence from the Islamic and conventional banking systems. The Quarterly Review of Economics and Finance, 74, pp.109-118.

Mabrouk, A. and Farah, L., 2021. Liquidity Risk Management in the Islamic Banking: Portfolio of Ijara and Murabaha. European Journal of Islamic Finance, (18).

Mahdi, I.B.S. and Abbes, M.B., 2018. Relationship between capital, risk and liquidity: a comparative study between Islamic and conventional banks in MENA region. Research in International Business and Finance, 45, pp.588-596.

Mahmood, H., Gan, C., and Nguyen, C (2018) 'Maturity transformation risk factors in Islamic banking', Journal of Managerial Finance, 44(6), pp. 787-808.

Mahrous, S.N., Samak, N. and Abdelsalam, M.A.M. (2020). The effect of monetary policy on credit risk: evidence from the MENA region countries | Emerald Insight. Review of Economics and Political Science. Available from https://doi.org/10.1108\/REPS [Accessed 19 April 2021].

Malherbe, F. (2014) 'Self-Fulfilling Liquidity Dry-Ups', The Journal of Finance , 69(2), pp. 947 - 970.

Mansour, W., Ben Abdelhamid, M. and Heshmati, A., 2015. Recursive profit-and-loss sharing. Journal of Risk, 17(6), pp.21-50.

Marozva, G. and Makina, D., 2020. Liquidity risk and asset liability mismatches: evidence from South Africa. Studies in Economics and Econometrics, 44(1), pp.73-112.

Masood, O. and Javaria, K., 2017. Liquidity Risk Management and Financial Performance of Islamic Banks: Empirical Evidence from Global Islamic Banks. Journal of Islamic Financial Studies, 3(02), pp.62-70.

Matz, L.M., Neu, P., 2007. Liquidity Risk: Measurement and Management. Wiley Finance

Meegan, A., Corbet, S., Larkin, C. (2018) 'Financial market spillovers during the quantitative easing programmes of the global financial crisis (2007–2009) and the European debt crisis', Journal of International Financial Markets, Institutions & Money, 56(), pp. 128 -148.

Meh, C. “Bank balance sheets, deleveraging and the transmission mechanism,” Bank of Canada Review Summer (2011): 23–34.

Mehran, H. and Thakor, A. (2011) 'Bank Capital and Value in the Cross-Section', The Review of Financial Studies, 24(4), pp. 1019–1067.

Mehri, M., Jouaber-Snoussi, K. and Hassan, M.K., 2017. Profit-sharing ratio as a screening device in venture capital. In Handbook of empirical research on Islam and economic life. Edward Elgar Publishing.

Mennawi, A.N.A. and Ahmed, A.A., 2020. The Determinants of Liquidity Risk in Islamic Banks: A Case of Sudanese Banking Sector. International Journal of Islamic Banking and Finance Research, 4(1), pp.38-49.

Milojević, N. and Redzepagic, S., 2021. Effects expectation of the revised exposure to banks Basel credit risk weighted assets standard. Strategic Management-International Journal of Strategic Management and Decision Support Systems in Strategic Management, 26(3).

Mirakhor, A. and Iqbal, Z. (2011). Introduction to Islamic Finance: Theory and Practice. John Wiley & Sons.

Misman, F.N. and Bhatti, M.I., 2020. The determinants of credit risk: an evidence from ASEAN and GCC Islamic banks. Journal of Risk and Financial Management, 13(5), p.89.

Misman, F.N., Bhatti, I., Lou, W., Samsudin, S. and Abd Rahman, N.H., 2015. Islamic banks credit risk: a panel study. Procedia Economics and Finance, 31, pp.75-82.

Modigliani, F. and Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. The American economic review, 48(3), pp.261-297.

Mohammad, S. et al. (2020). Liquidity risk exposure and its determinants in the banking sector: A comparative analysis between Islamic, conventional and hybrid banks. Journal of International Financial Markets, Institutions and Money, 66, 101196. Available from https://doi.org/10.1016/j.intfin.2020.101196 [Accessed 9 June 2021].

Mohanty, S.K; Akhigbe, A; Basheikh, A; Khan, H.R (2018) 'The Dodd-Frank Act and Basel III:Market-based risk implications for global systemically important banks(G-SIBs)', Journal of Multinational Financial Management, 47-48(), pp. 91-109.

Mohd Amin, S.I. and Abdul-Rahman, A., 2020. The role of regulation in Banking: Liquidity risk perspective. Iranian Journal of Management Studies, 13(3), pp.391-412.

Moisseron, J.Y., Moschetto, B.L. and Teulon, F., 2015. Islamic finance: a review of the literature. International Business & Economics Research Journal (IBER), 14(5), pp.745-762.

Mollah, S. and Zaman, M., 2015. Shari'ah supervision, corporate governance and performance: Conventional vs. Islamic banks. Journal of Banking & Finance, 58, pp.418-435.

Molyneux, P. and Nguyen, L. H. (2017). Risk in banking and capital regulation. Journal of Banking & Finance, 82(1), pp.203-214.

Morais, B. et al. (2019). The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach‐for‐Yield, and Real Effects. The Journal of Finance, 74 (1), 55–90. Available from https://doi.org/10.1111/jofi.12735 [Accessed 24 March 2021].

Muhammad Natsir et al. (2019). Foreign penetration, competition, and credit risk in banking. 19 (3), 249–257. Available from https://doi.org/10.1016/j.bir.2019.05.003 [Accessed 16 May 2023].

Mukhtar, S., Zainol, Z. and Jusoh, S., 2018. Islamic Law and Sustainable Development Goals. Tazkia Islamic Finance and Business Review, 12(1).

Munteanu, I. (2012). Bank Liquidity and its Determinants in Romania. Procedia Economics and Finance, 3, 993–998. Available from https://doi.org/10.1016/s2212-5671(12)00263-8 [Accessed 9 June 2021].

Newbury, L.B. and Izaguirre, J.C., 2019. Risk-Based Supervision in Low-Capacity Environments: Considerations for Enabling Financial Inclusion.

Niepmann, F. and Schmidt-Eisenlohr, T., 2017. International trade, risk and the role of banks. Journal of International Economics, 107, pp.111-126.

Nijs, L., & Nijs, L. (2020). Shadow Banking in Asia. The Handbook of Global Shadow Banking, Volume II: The Future of Economic and Regulatory Dynamics, 341-426.

Nikolaou, K (2009) “Liquidity (Risk) Concepts: Definitions and Interactions” ECB Working Paper No. 1008. Available at SSRN: https://ssrn.com/abstract=1333568

Ningsih, P.K., 2020. Contribution of Sharia Supervisory Board (SB) and Sharia Compliance Levels to Performance Indonesian Sharia Banking. Jurnal Manajemen (Edisi Elektronik), 11(1), pp.114-125.

Njima, NEB and Zouari, SM, 2012. Challenges and opportunities for the development of Islamic Finance in Tunisia. Journal of Academic Finance , 3 (1).

Noman AHM, Gee CS, Isa CR (2017) Does competition improve financial stability of the banking sector in ASEAN countries? An empirical analysis. PLoS ONE 12(5): e0176546. https://doi.org/10.1371/journal.pone.0176546

O'Halloran, S. and Nowaczyk, N., 2019. An artificial intelligence approach to regulating systemic risk. Frontiers in Artificial Intelligence, 2, p.7.

Olson, D. and Zoubi, T., 2017. Convergence in bank performance for commercial and Islamic banks during and after the Global Financial Crisis. The Quarterly Review of Economics and Finance, 65, pp.71-87.

Onagun, A.I., 2019. Capital Regulatory Requirements for Islamic Banks in the UAE: A Comparative Analysis. In Islamic Finance, Risk-Sharing and Macroeconomic Stability (pp. 81-94). Palgrave Macmillan, Cham.

Özşuca, E.A. and Akbostancı, E., 2016. An empirical analysis of the risk-taking channel of monetary policy in Turkey. Emerging Markets Finance and Trade, 52(3), pp.589-609.

Pan, H., & Fan, H. (2020). Research on the stability of the banking system with shadow banking under macroeconomic fluctuation. Frontiers in Physics, 8, 338.

Parashar, S.P., 2010. How did Islamic banks do during global financial crisis?. Banks and Bank systems, 5(4), pp.54-62.

Perves, M.M., 2015. Legal and regulatory framework in Islamic banking system: Bangladesh perspective. European Journal of Business and Management, 7(21), pp.179-188.

Petrella, G., and Resti, A. (2017) 'What drives the liquidity of sovereign bonds when markets are under stress? An assessment of the new Basel 3 rules on bank liquid assets', Journal of Financial Stability, 33(), pp. 297 - 310.

Petrone, D. and Latora, V., 2018. A dynamic approach merging network theory and credit risk techniques to assess systemic risk in financial networks. Scientific reports, 8(1), pp.1-14.

Pham, Hai Nam. (2021). How Does Internal Control Affect Bank Credit Risk in Vietnam? A Bayesian Analysis. The Journal of Asian Finance, Economics and Business, 8 (1), 873–880. Available from https://doi.org/10.13106/jafeb.2021.vol8.no1.873 [Accessed 9 June 2021].

Pierret, D (2015) 'Systemic Risk and the Solvency-Liquidity Nexus of Banks', International Journal of Central Banking, 11(3), pp. 193-227.

Piskorski, T., Seru, A., 2018. Mortgage market design: Lessons from the Great Recession. Brookings Papers on Economic Activity. (Spring): 429–513

Podpiera, J. and Weill, L. (2008). Bad luck or bad management? Emerging banking market experience. Journal of Financial Stability, 4(2), pp.135-148.

Popov, A. and Udell, G. F. (2012). Cross-border banking, credit access, and the financial crisis. Journal of International Economics, 87(1), pp.147-161.

Popov, A.I. and Udell, G.F. (2012). Cross-border banking, credit access, and the financial crisis. 87 (1), 147–161. Available from https://doi.org/10.1016/j.jinteco.2012.01.008 [Accessed 16 May 2023].

Pourkhanali, A., Kim, J.M., Tafakori, L. and Fard, F.A., 2016. Measuring systemic risk using vine-copula. Economic modelling, 53, pp.63-74.

Pushkala, N., Mahamayi, J. and Venkatesh, K.A., 2017. Liquidity and off-balance sheet items: A comparative study of public and private sector banks in India. SDMIMD Journal of Management, 8(1), pp.47-54.

Qadiri, H. and Alsughayer, S. (2021). Credit Risk and Disclosure Behavior in the Bank Industry: Evidence From Saudi Arabia. International Journal of Accounting and Financial Reporting, 11(3), pp. 1-24.

QCB (2012) The Qatar Central Bank, QFC Regulatory Authority And Qatar Financial Markets Authority Welcome New Law Regulating Financial Institutions, Available at:

http://www.qcb.gov.qa/english/news/pages/newlawpressrelease.aspx (Accessed: 22nd Oct 2019).

Radzi, R.M. and Lonik, K.A.T., 2016. Islamic banks' risks: It's rating methodology and shariah assessment solutions. Journal of Islamic Banking and Finance, 4(2), pp.48-60.

Rafiq, M.S. and Siddiqui, D.A., 2018. Comparative Analysis of Credit Risk of Islamic and Conventional Banks:(A Case Study of Pakistan). Available at SSRN 3299515.

Rahaman, S.M. and Sur, D., 2021. Identifying Key Drivers of Non-Performing Assets in Indian Public Sector Banks: A Panel Data Analysis. IIM Kozhikode Society & Management Review, p.22779752211000146.

Ramakrishnan, R.T. and Thakor, A.V., 1984. Information reliability and a theory of financial intermediation. The Review of Economic Studies, 51(3), pp.415-432.

Ramaswamy, S (2017): Financial crisis and regulatory reforms. IngramSpark, Basel

Rampini, A.A. and Viswanathan, S., 2019. Financial intermediary capital. The Review of Economic Studies, 86(1), pp.413-455.

Rashid, U.S.A., Rahman, A.A. and Markom, R., 2018. THE REGULATORY FRAMEWORK ON LIQUIDITY RISK MANAGEMENT OF ISLAMIC BANKING IN MALAYSIA. International Journal of Business & Society, 19.

Rasli, S., Kassim, A.A.M. and Bhuiyan, A.B., 2020. Shariah Governance Characteristics and Risk-Taking of Local and Foreign Islamic Banks in Malaysia: A Conceptual Model. Journal of Accounting and Finance in Emerging Economies, 6(2), pp.441-451.

RBI - Notifications. (2011). Rbi.org.in. Available from https://www.rbi.org.in/scripts/NotificationUser.aspx?Id=5090&Mode=0 [Accessed 13 February 2021].

RBI (2019) Report of the Internal Working Group to review the Liquidity Management Framework, Available at: https://rbidocs.rbi.org.in/rdocs//PublicationReport/Pdfs/IWGREPORT17135173C7384084ACE10A75E8C35D93.PDF (Accessed: 22nd Oct 2019).

Repullo R (2005), 'Liquidity, Risk Taking, and the Lender of Last Resort', International Journal of Central Banking 1(2), pp 47–80.

Reserve Bank of India - Press Releases. (2021). Rbi.org.in. Available from https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx [Accessed 28 January 2021].

Risfandy, T., Trinarningsih, W., Harmadi, H. and Trinugroho, I., 2019. ISLAMIC BANKS'MARKET POWER, STATE-OWNED BANKS, AND RAMADAN: EVIDENCE FROM INDONESIA. The Singapore Economic Review, 64(02), pp.423-440.

Rizvi, N.U., Kashiramka, S. and Singh, S., 2018. Basel I to Basel III: Impact of credit risk and interest rate risk of banks in India. Journal of Emerging Market Finance, 17(1_suppl), pp.S83-S111.

Rizvi, N.U., Kashiramka, S. and Singh, S., 2021. Basel III in India: a double-edged sword. Qualitative Research in Financial Markets, 13(5), pp. 692-709.

Roberts, D., Sarkar, A. and Shachar, O., 2018. Bank liquidity creation, systemic risk, and basel liquidity regulations. FRB of New York Staff Report, (852).

Roberts, K., Dowell, A. and Nie, J.B., 2019. Attempting rigour and replicability in thematic analysis of qualitative research data; a case study of codebook development. BMC medical research methodology, 19(1), pp.1-8.

Rochet J-C and Vives X (2004), 'Coordination Failures and the Lender of Last Resort: Was Bagehot Right After All?', Journal of the European Economic Association 2(6), pp 1116–1147.

Rochet, J.C., 2018. Systemic risk: Changing the regulatory perspective. 23rd issue (December 2010) of the International Journal of Central Banking, pp.256-277.

Rodnyansky, A. and Darmouni, O.M. (2017). The Effects of Quantitative Easing on Bank Lending Behavior. The Review of Financial Studies, 30 (11), 3858–3887. Available from https://doi.org/10.1093/rfs/hhx063 [Accessed 12 May 2021].

Rosenkranz, P. and Lee, J. (2019). Nonperforming Loans in Asia: Determinants and Macrofinancial Linkages. SSRN Electronic Journal. Available from https://doi.org/10.2139/ssrn.3357289.

Saad Azmat et al. (2020). Conventional vs Islamic banking and macroeconomic risk: Impact on asset price bubbles. 62, 101351–101351. Available from https://doi.org/10.1016/j.pacfin.2020.101351 [Accessed 15 May 2023].

Safiullah, M. and Shamsuddin, A., 2018. Risk in Islamic banking and corporate governance. Pacific-Basin Finance Journal, 47, pp.129-149.

Sahyouni, A. and Wang, M., 2019. Liquidity creation and bank performance: evidence from MENA. ISRA International Journal of Islamic Finance.

Sajjad Hussain, M., Muhaizam Bin Musa, M. and Omran, A., 2018. The Impact of Private Ownership Structure on Risk Taking by Pakistani Banks: An Empirical Study. Pakistan Journal of Humanities and Social Sciences, 6(3), pp.325-337.

Saleh, I. and Abu Afifa, M., 2020. The effect of credit risk, liquidity risk and bank capital on bank profitability: Evidence from an emerging market. Cogent Economics & Finance, 8(1), p.1814509.

Saliba, C., Farmanesh, P., & Athari, S. A. (2023). Does country risk impact the banking sectors' non-performing loans? Evidence from BRICS emerging economies. Financial Innovation, 9(1), 1-30.

Salim, B.F., Mahmoud, M.H. and Atiatallah, S., 2015. Role of Capital Adequacy Standard of (IFSB) on Minimizing the Financial Crisis Impact for Financial Institutions:

Evidence from Middle East. European Journal of Economics, Finance and Administrative Sciences, (77).

Samanta, S., 2015. Basel III in India: Where are we heading?. MUDRA: Journal of Finance and Accounting, 2(1), pp.83-99.

Samuelson, P.A., 1958. An exact consumption-loan model of interest with or without the social contrivance of money. Journal of Political Economy, 66(6), pp.467-482.

Sarkar, S. and Sahoo, T.K., 2017. Analysis of capital requirements for public sector banks in India due to rising provision for NPAs and additional capital requirements under Basel-III. Indian Institute of Management Bangalore.

Sarker, N. and Bhowmik, P.K., 2021. Bank Liquidity Risk: Significance of Financial Disclosure and Governance Practice. Asian Economic and Financial Review, 11(9), pp.724-744.

Schmuki, S. (2008). Tail Dependence: Implementation, Analysis, and Study of the most recent concepts. Available from https://ethz.ch/content/dam/ethz/special-interest/mtec/chair-of-entrepreneurial-risks-dam/documents/dissertation/master%20thesis/masterthesis_sebastian_schmuki_final.pdf [Accessed 18 June 2021].

Sedunov, J., 2016. What is the systemic risk exposure of financial institutions?. Journal of Financial Stability, 24, pp.71-87.

Shaban, M., Hassan, M. K. and Al-Hares, O. M. (2019). Bank liquidity creation and systemic risk: A comparative analysis between Islamic and conventional banks. Journal of Financial Stability, 40(1), pp.77-91.

SHAH, S. M. R., Jianjun, L. I., & Qiang, F. U. (2020). What prompted shadow banking in China? Wealth management products and regulatory arbitrage. The Journal of Asian Finance, Economics and Business (JAFEB), 7(12), 63-72.

Shahzad, S.J.H., Arreola-Hernandez, J., Bekiros, S., Shahbaz, M. and Kayani, G.M., 2018. A systemic risk analysis of Islamic equity markets using vine copula and delta CoVaR modeling. Journal of International Financial Markets, Institutions and Money, 56, pp.104-127.

Sharma, G. D., Talan, G., & Jain, M. (2020). Policy response to the economic challenge from COVID‐19 in India: A qualitative enquiry. Journal of Public Affairs, 20(4), e2206.

Shaukat, M. and Alhabshi, D.O., 2015. Instability of interest-bearing debt finance and the Islamic finance alternative. Islamic Economic Studies, 23(2).

Sheikh, S.M., Sabri, P.S.U., Akram, M.W., bin Dost, M.K. and Luqman, M., 2018. Determinants of Depositors Behavior with Respect to Liquidity Risk Management in Islamic Banks of Pakistan. Abasyn University Journal of Social Sciences (AJSS), 11(Special Issue-IGCETMA).

Singh, B. and Nadkarni, A. (2017). How Asset Prices Interact with Bank Credit and Monetary Policy? Evidence from Emerging Market and Developing Economies.

Available from https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/WPS20171F862229BECC428DA690A301816EC05E.PDF.

Smith, A., 1776. An inquiry into the nature and causes of the wealth of nations: Volume One. London: printed for W. Strahan; and T. Cadell.

Song, M.I. and Oosthuizen, C., 2014. Islamic banking regulation and supervision: Survey results and challenges. International Monetary Fund.

Sorensen, B.E., Kalemli-Ozcan, S. and Yosha, O., 2000. Risk Sharing and Industrial Specialization: Regional and International Evidence. FRB of Kansas City Research Working Paper No. 00-06.

Spendzharova, A.B. (2016) 'Regulatory cascading: Limitations of policy design in European banking structural reforms', Journal of Policy and Society, 35(), pp. 227 - 237.

Spinassou, K. and Wardhana, L.I., 2018. Regulation of Islamic banks: Basel III capital framework and profit-sharing investment accounts (No. hal-01674376).

Spinassou, K. and Wardhana, L.I., 2021. Basel framework and profit-sharing contracts: Islamic banking through the lens of capital requirements.

Spuchľáková, E., Valašková, K. and Adamko, P. (2015). The Credit Risk and its Measurement, Hedging and Monitoring. Procedia Economics and Finance, 24, 675–681. Available from https://doi.org/10.1016/s2212-5671(15)00671-1 [Accessed 10 February 2021].

Stiglitz, J E (2010): “The financial crisis of 2007-8 and its macroeconomic consequences” in Griffith-Jones et al (2010)

Syamlan, Y.T. and Jannah, W., 2019. The determinant of credit risk in Indonesian Islamic commercial banks. Share: Jurnal Ekonomi dan Keuangan Islam, 8(2), pp.181-206.

Taiwo, J.N., Ucheaga, E.G., Achugamonu, B.U., Adetiloye, K. and Okoye, O., 2017. Credit risk management: Implications on bank performance and lending growth. Saudi Journal of Business and Management Studies, 2, pp.584-590.

Tavana, M., Abtahi, A.R., Di Caprio, D. and Poortarigh, M., 2018. An Artificial Neural Network and Bayesian Network model for liquidity risk assessment in banking. Neurocomputing, 275, pp.2525-2554.

Teply, P. and Kvapilikova, I., 2017. Measuring systemic risk of the US banking sector in time-frequency domain. The North American Journal of Economics and Finance, 42, pp.461-472.

Thakor, A.V. (2014) 'Bank Capital and Financial Stability: An Economic Trade-Off or a Faustian Bargain?', Annual Review of Financial Economics, 6(), pp. 185-223.

The Fed - Coronavirus Disease 2019 (COVID-19). (2021). Board of Governors of the Federal Reserve System. Available from https://www.federalreserve.gov/covid-19.htm [Accessed 27 January 2021].

Thomson, J.B. (1992). Modeling the bank regulator's closure option: A two-step logit regression approach. Journal of Financial Services Research, 6 (1), 5–23. Available from https://doi.org/10.1007/bf01046114 [Accessed 11 June 2021].

Thornton, H. (1802), An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (Nabu Press, London)

Tobias, A. and Brunnermeier, M.K., 2016. CoVaR. The American Economic Review, 106(7), p.1705.

Toh, M.Y. (2019). Effects of bank capital on liquidity creation and business diversification: Evidence from Malaysia. Journal of Asian Economics, 61, 1–19. Available from https://doi.org/10.1016/j.asieco.2018.12.001 [Accessed 17 May 2021].

Toh, M.Y., Gan, C. and Li, Z. (2019). Revisiting the Impact of Stock Market Liquidity on Bank Liquidity Creation: Evidence from Malaysia. Emerging Markets Finance and Trade, 55, 1176-1802. Available from https://doi.org/10.1080/1540496X.2018.1496420 [Accessed 17 May 2021].

Tran, Q.T. (2021) 'Economic policy uncertainty and cost of debt financing: International evidence ', North American Journal of Economics and Finance, 51(), pp. 101419.

Tran, T.T., Nguyen, Y.T. and Long, T., 2019. The determinants of liquidity risk of commercial banks in Vietnam. Banks and Bank Systems, 14(1), p.94.

Tran, V.T., Lin, C.T. and Nguyen, H., 2016. Liquidity creation, regulatory capital, and bank profitability. International Review of Financial Analysis, 48, pp.98-109.

Triki, M.W. and BoujelbÃ, Y., 2017. A Comprehensive Literature Review of Islamic Finance Theory from 2011 to 2016. Global Journal of Management and Business Research.

Tucker, P (2014) 'The lender of last resort and modern central banking: principles and reconstruction', BIS Working Paper 79, pp. 10-42.

Turner, P (2014) 'The exit from non-conventional monetary policy: what challenges? ', BIS Working Papers No 448, pp. 1 - 26 [Online]. Available at: https://www.bis.org/publ/work448.pdf (Accessed: 23rd December 2019).

Turner, P (2017) 'Did Central Banks Cause The Last Financial Crisis? Will They Cause The Next?', National Institute of Economic and Social Research Discussion Paper No. 484, pp. 1 -57 [Online]. Available at: https://www.niesr.ac.uk/sites/default/files/publications/DP484.pdf (Accessed: 23rd December 2019

Ullah, H., Wang, Z., Abbas, M. G., Zhang, F., SHAHZAD, U., & MAHMOOD, M. R. (2021). Association of financial distress and predicted bankruptcy: The case of Pakistani banking sector. The Journal of Asian Finance, Economics and Business, 8(1), 573-585.

Upadhyay, J.C., 2021. Profitability Analysis of the Nainital Bank Ltd., Uttarakhand (India). IJREM/5(1), pp. 35-40.

Van den Heuvel, S (2018). The Welfare Effects of Bank Liquidity and Capital Requirements Washington DC: Federal Reserve Board (June 2018).

Van den Heuvel, S., 2002. Does bank capital matter for monetary transmission? Federal Reserve Bank of New York Economic Policy Review 1–7.

Van Oordt, M. and Zhou, C. (2018). Systemic risk and bank business models. Journal of Applied Econometrics, 34 (3), 365–384. Available from https://doi.org/10.1002/jae.2666 [Accessed 17 June 2021].

Van Oordt, M.R.C. and Zhou, C. (2016). Systematic Tail Risk. The Journal of Financial and Quantitative Analysis, 51 (2), 685–705. Available from https://www.jstor.org/stable/pdf/43862331.pdf?refreqid=excelsior%3Aee5d314c0656989c5ec6f387a1446143 [Accessed 17 June 2021].

Varotto, S. and Zhao, L., 2018. Systemic risk and bank size. Journal of International Money and Finance, 82, pp.45-70.

Vazquez, F., & Federico, P. (2012). Bank Funding Structures and Risk: Evidence from the Global Financial Crisis; IMF working paper; European Department.

Vazquez, F., & Federico, P. (2015). Bank funding structures and risk: evidence from the global financial crisis. Journal of Banking and Finance, 61, 1-14.

Vein-Tran, D (2020). Funding liquidity and bank lending. Cogent Economics & Finance. Available from https://www.tandfonline.com/doi/full/10.1080/23322039.2020.1734324 [Accessed 17 February 2021].

Vives, X. (2006) “Banking and Regulation in Emerging Markets: The Role of External Discipline.” The World Bank Research Observer, 21 (2), pp 179–206.

Vodová, P. (2013). Determinants which affect liquid asset ratio of Czech and Slovak Commercial; Silesian University in Opava; School of Business Administration in Karvina.

Waemustafa, W. and Sukri, S., 2016. Systematic and unsystematic risk determinants of liquidity risk between Islamic and conventional banks. International Journal of Economics and Financial Issues, 6(4), pp.1321-1327.

Wagner, Wolf. 2007. The liquidity of bank assets and banking stability. Journal of Banking & Finance 31: 121–39.

Wang, G.J., Jiang, Z.Q., Lin, M., Xie, C. and Stanley, H.E., 2018. Interconnectedness and systemic risk of China's financial institutions. Emerging Markets Review, 35, pp.1-18.

Wang, T., Zhao, S., Zhu, G. and Zheng, H., 2021. A machine learning-based early warning system for systemic banking crises. Applied Economics, pp.1-19.

Wei, X; Gong, Y; and Wu, H.M. (2017) 'The impacts of Net Stable Funding Ratio requirement on Banks' choices of debt maturity', Journal of Banking & Finance, 82(), pp. 229 - 243.

Willem van den End, W. and Tabbae, M (2012) 'When liquidity risk becomes a systemic issue: Empirical evidence of bank behaviour', Journal of Financial Stability, 8(), pp. 107-120.

Williams, B., & Rajaguru, G. (2022). The evolution of bank revenue and risk in the Asia-Pacific Region. Pacific-Basin Finance Journal, 71, 101693.

Wood, L.M., Sebar, B. and Vecchio, N., 2020. Application of rigour and credibility in qualitative document analysis: Lessons learnt from a case study. The Qualitative Report, 25(2), pp.456-470.

Xi, C., 2016. Why has Basel III become hard law for China? The domestic political economy of international financial law. The Domestic Political Economy of International Financial Law, pp.91-104.

Xu, Q., Chen, L., Jiang, C. and Yuan, J., 2018. Measuring systemic risk of the banking industry in China: A DCC-MIDAS-t approach. Pacific-Basin Finance Journal, 51, pp.13-31.

Yaacob, S.F., Rahman, A.A. and Karim, Z.A., 2016. The determinants of liquidity risk: A panel study of Islamic banks in Malaysia. Journal of Contemporary Issues and Thought, 6, pp.73-82.

Yeddou, N. and Pourroy, M. (2020). Bank liquidity creation: Does ownership structure matter? The Quarterly Review of Economics and Finance, 78, 116–131. Available from https://doi.org/10.1016/j.qref.2020.01.003 [Accessed 14 May 2021].

Zaheer, S. and Farooq, M., 2014, January. Liquidity crisis: are Islamic banking institutions more resilient. In IMF conference on “Macroeconomic Challenges Facing Low-Income Countries,” Washington, DC.

Zainudin, S.M., Abdul Rasid, S.Z., Omar, R. and Hassan, R., 2019. The good and bad news about the new liquidity rules of Basel III in Islamic banking of Malaysia. Journal of Risk and Financial Management, 12(3), p.120.

Zedda, S. and Cannas, G (2020) 'Analysis of banks' systemic risk contribution and contagion determinants through the leave-one-out approach', Journal of Banking and Finance, 112(), pp. 105160.

Zeldea, C., 2020. Modeling the Connection between Bank Systemic Risk and Balance-Sheet Liquidity Proxies through Random Forest Regressions. Administrative Sciences, 10(3), p.52.

Zhang, D., Cai, J., Dickinson, D.G. and Kutan, A.M., 2016. Non-performing loans, moral hazard and regulation of the Chinese commercial banking system. Journal of Banking & finance, 63, pp.48-60.

Zhang, Q., & Wang, Z. (2023, May). Check for updates A Study of the Capital Replenishment Tools in Chinese Commercial Banks: Current State and Some

Suggestions for Countermeasures. In Proceedings of the International Conference on Education, Humanities, and Management (ICEHUM 2022) (Vol. 741, p. 364). Springer Nature.

Zhanga, J; He, L; An, Y (2020) 'Measuring banks' liquidity risk: An option-pricing approach', Journal of Banking and Finance , 111(), pp. 105703.

Zheng, C., Moudud-Ul-Huq, S., Rahman, M.M. and Ashraf, B.N., 2017. Does the ownership structure matter for banks' capital regulation and risk-taking behavior? Empirical evidence from a developing country. Research in International Business and Finance, 42, pp.404-421.

Zheng, C., Wai Kong) Cheung, A. and Cronje, T. (2019). The moderating role of capital on the relationship between bank liquidity creation and failure risk. Journal of Banking & Finance, 108, 105651. Available from https://doi.org/10.1016/j.jbankfin.2019.105651 [Accessed 17 February 2021].

Zolkifli, N.A., Samsudin, K.J. and Yusof, M.B., 2019. Determinants of liquidity and market risk and the effect on bank performance in Bahrain and Malaysia banking. International Journal of Trade, Economics and Finance, 10(1), pp.8-16.

Appendix A: List of all Documents Analysed

SN	Document Name
	Regulatory documents
1.	The Basel Framework
2.	Guidance Note in Connection with The IFSB Capital Adequacy Standard: The Determination of Alpha in The Capital Adequacy Ratio for Institutions (Other Than Insurance Institutions) Offering Only Islamic Financial Services
3.	Guidance Note on The Recognition of Ratings by External Credit Assessment Institutions (Ecais) On Takāful and Retakāful Undertakings
4.	Guidance Note on Quantitative Measures for Liquidity Risk Management in Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
5.	Guidance Note on Sharīʻah-Compliant Lender-Of-Last-Resort Facilities
6.	Core Principles for Effective Islamic Deposit Insurance Systems
7.	Guiding Principles on Sharī`Ah Governance Systems for Institutions Offering Islamic Financial Services
8.	Guiding Principles on Liquidity Risk Management for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
9.	Guiding Principles on Stress Testing for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions And Islamic Collective Investment Schemes]
10.	Revised Capital Adequacy Standard for Institutions Offering Islamic Financial Services [Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes]
11.	Revised Guidance on Key Elements in The Supervisory Review Process of Institutions Offering Islamic Financial Services (Excluding Islamic Insurance (Takāful) Institutions and Islamic Collective Investment Schemes)
12.	Core Principles for Islamic Finance Regulation (Banking Segment) (CPIFR)
13.	Guiding Principles on Disclosure Requirements for Islamic Capital Market Products (Ṣukūk And Islamic Collective Investment Schemes) IFSB-19
14.	Revised Standard on Disclosures to Promote Transparency and Market Discipline for Institutions Offering Islamic Financial Services (Banking Segment)
	China
1.	Measures for the Liquidity Risk Management of Wealth Management Products of Wealth Management Companies. Order of China Banking and Insurance Regulatory Commission (2021) No. 14
2.	Notice of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Regulatory Rating of Commercial Banks China Banking Regulatory Commission (2021) No. 39
3.	Notice of the General Office of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Quality Management of Commercial Banks' Liabilities

4.	Notice of the China Banking and Insurance Regulatory Commission on Issuing the Measures for the Supervision and Evaluation of financial Services for Small and Micro Enterprises of Commercial Banks (for Trial Implementation)
5.	China Banking and Insurance Regulatory Commission on Printing a Notice of the "Guiding Opinions on the Innovation of Commercial Banks (Revision)"China Banking Regulatory Commission [201 9] No. 42
6.	Notice on Enhancing Disclosure Requirements for Composition of Capital
7.	Supervisory Guidance on Capital Instruments Innovation for commercial Banks CBRC [2012] No.56
8.	Notice on Measurement Rules of Capital Requirements for Bank Exposures to Central Counterparties
9.	Capital rules for commercial banks
10.	Notice on Issuing the Guidelines on Internal Control of Commercial B Yin Jian Fa [2014] No. 40
11.	Notice on Policy Clarification of Capital Rules
12.	Rules on Large Exposure of Commercial Banks
13.	Decree of China Banking Regulatory Commission No. 3, 2011
14.	Rules on Liquidity Risk Management of Commercial Banks
India	
1.	2010: Regulation and Supervision of Financial Institutions
2.	2011: Regulation, Supervision and Financial Stability
3.	2012: Regulation, Supervision and Financial Stability
4.	2013: Regulation, Supervision and Financial Stability
5.	2014: Regulation, Supervision and Financial Stability
6.	2015: Regulation, Supervision and Financial Stability
7.	2016: Regulation, Supervision and Financial Stability
8.	2017: Regulation, Supervision and Financial Stability
9.	2018: Regulation, Supervision and Financial Stability
10.	2019: Regulation, Supervision and Financial Stability
11.	2020: Regulation, Supervision and Financial Stability
12.	2021: Regulation, Supervision and Financial Stability
Malaysia	
1.	Wa`d
2.	Application to be Approved as Financial Holding Company Pursuant to Sections 280(2) and 280(3) of the Financial Services Act 2013 and Section 290(1) of the Islamic Financial Services Act 2013
3.	Capital Adequacy Framework (Basel II – Risk-Weighted Assets)
4.	Capital Adequacy Framework for Islamic Banks (Capital Components)
5.	Capital Adequacy Framework for Islamic Banks (Risk-Weighted Assets)
6.	Capital Funds for Islamic Banks
7.	Capital Funds
8.	Central Bank of Malaysia Act 2009
9.	Compliance
10.	Credit Risk
11.	LAWS OF MALAYSIA Act 618 Development Financial Institutions Act 2002
12.	Domestic Systemically Important Banks Framework
13.	Credit Card-i
14.	Financial Reporting for Islamic Banking Institutions
15.	Financial Reporting

16.	LAWS OF MALAYSIA Act 758 Financial Services Act 2013
17.	Fit and Proper Criteria
18.	Guidelines on Credit Transactions and Exposures with Connected Parties
19.	Guidelines on Credit Transactions and Exposures with Connected Parties for Islamic Banks
20.	Introduction of New Products
21.	LAWS OF MALAYSIA Act 759 Islamic Financial Services Act 2013
22.	Leverage Ratio
23.	Liquidity Coverage Ratio
24.	Murabahah
25.	Net Stable Funding Ratio
26.	Stress Testing Policy Document
27.	Credit Card
28.	Ijarah
29.	Qard
30.	Capital Adequacy Framework (Capital Components)
31.	Corporate Governance
32.	Hibah
33.	Financial Technology Regulatory Sandbox Framework
34.	Wakalah
35.	Prudential Standards on Securitisation Transactions for Islamic Banks
36.	Rahn
37.	Recovery Planning
38.	RESOLUTIONS OF SHARIAH ADVISORY COUNCIL OF BANK NEGARA MALAYSIA
39.	Restricted Committed Liquidity Facility
40.	Risk Governance
41.	Risk-Informed Pricing
42.	Risk-Weighted Capital Adequacy Framework (Basel II) – Internal Capital Adequacy Assessment Process (Pillar 2)
43.	Shariah Governance Framework for Islamic Financial Institutions
44.	Shariah Governance
45.	Single Counterparty Exposure Limit for Islamic Banking Institutions
46.	Single Counterparty Exposure Limit
47.	Statutory Reserve Requirement
48.	Tawarruq
49.	The Banking Regulation Review: Malaysia
50.	Wadi`ah
Saudi Arabia	
1.	Rules for Bank Accounts Updated September 2021
2.	Shariah Governance Framework for Local Banks Operating in Saudi Arabia February 2020
3.	Rules on Management of Problem Loans January 2020
4.	Key Principles of Governance in Financial Institutions under the Controland Supervision of the Saudi Central Bank (3rd Edition – Dhul Qidah 1442H/June 2021)
5.	Guidelines on Management of Problem Loans January 2020

6.	CLARIFYING MEMO ON POWERS AND RESPONSIBILITIES OF MEMBERS OF THE BOARD OF DIRECTORS OF SAUDI COMMERCIAL BANKS CONTENTS
7.	MANAGEMENT OF OPERATIONAL RISk
8.	ISLAMIC FINANCE IN SAUDI ARABIA: Leading the Way to Vision 2030
9.	Saudi credit regulations
10.	Saudi credit information law
11.	Commercial bank accounting standards
12.	BANKING CONTROL LAW
13.	Rules On Compensation Practices
14.	Establishment of the Bilateral Complaint Handling Process (BCHP) on Compensation Practices
15.	Rules on Compensation Practices
16.	DETAILS OF COMPENSATION Paid-Annexure

Appendix B – NSFR Calculation Criteria

<table>
<tr><th colspan="3">NSFR calculation using NSFR standards 2010 and 2014 (BCBS, 2010; BCBS 2014)</th></tr>
<tr><td></td><td>2010</td><td>2014</td></tr>
<tr><td>Available stable funding (Sources)</td><td></td><td></td></tr>
<tr><td>Tier 1 capital</td><td rowspan="4">100 %</td><td rowspan="4">100 %</td></tr>
<tr><td>Tier 2 capital</td></tr>
<tr><td>Time deposits with a remaining maturity of one year or more</td></tr>
<tr><td>Other borrowed money with a remaining maturity of one year or more</td></tr>
<tr><td>Stable retail transaction deposits</td><td rowspan="3">90%</td><td rowspan="3">95%</td></tr>
<tr><td>Small time deposits with a remaining maturity of less than one year</td></tr>
<tr><td>Stable retail saving deposits</td></tr>
<tr><td>Less stable retail transaction deposits</td><td rowspan="2">80%</td><td rowspan="2">90%</td></tr>
<tr><td>Less stable retail saving deposits</td></tr>
<tr><td>Wholesale transaction deposits</td><td rowspan="8">50%</td><td rowspan="8">50%</td></tr>
<tr><td>Wholesale saving deposits</td></tr>
<tr><td>Large time deposits with a remaining maturity of less than one year</td></tr>
<tr><td>Foreign deposits</td></tr>
<tr><td>Other borrowed money with a remaining maturity of less than one year</td></tr>
<tr><td>Transaction deposits of U.S. government</td></tr>
<tr><td>Transaction deposits of states and political subdivisions in the United States</td></tr>
<tr><td>Transaction deposits of foreign governments and official institutions</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Required stable funding (Uses)</td><td></td><td></td></tr>
<tr><td>Unused commitments</td><td rowspan="3">5%</td><td rowspan="3">5%</td></tr>
<tr><td>Letter of credit</td></tr>
<tr><td>Securities in 0% risk weight category</td></tr>
<tr><td>Securities in 20% risk weight category 20% 20%</td><td>20%</td><td>20%</td></tr>
<tr><td>Securities in 50% risk weight category</td><td rowspan="4">50%</td><td rowspan="4">50%</td></tr>
<tr><td>Loans in 0% risk weight category</td></tr>
<tr><td>Trading securities in 0% risk weight category</td></tr>
<tr><td>Other assets in 0% risk weight category</td></tr>
<tr><td>Loans in 20% risk weight category</td><td rowspan="3">65%</td><td rowspan="3">65%</td></tr>
<tr><td>Trading securities in 20% risk weight category</td></tr>
<tr><td>Other assets in 20% risk weight category</td></tr>
<tr><td>Loans in 50% risk weight category</td><td rowspan="3">85%</td><td rowspan="3">85%</td></tr>
<tr><td>Trading securities in 50% risk weight category</td></tr>
<tr><td>Other assets in 50% risk weight category</td></tr>
<tr><td>Securities in 100% risk weight category and no risk weight</td><td rowspan="4">100 %</td><td rowspan="4">100 %</td></tr>
<tr><td>Loans in 100% risk weight category and no risk weight category</td></tr>
<tr><td>Trading securities in 100% risk weight category and no risk weight category</td></tr>
<tr><td>Other assets in 100% risk weight category and no risk weight category</td></tr>
</table>

Appendix C – Idiosyncratic Risks and Covariance Matrix Country Specific

Hungary

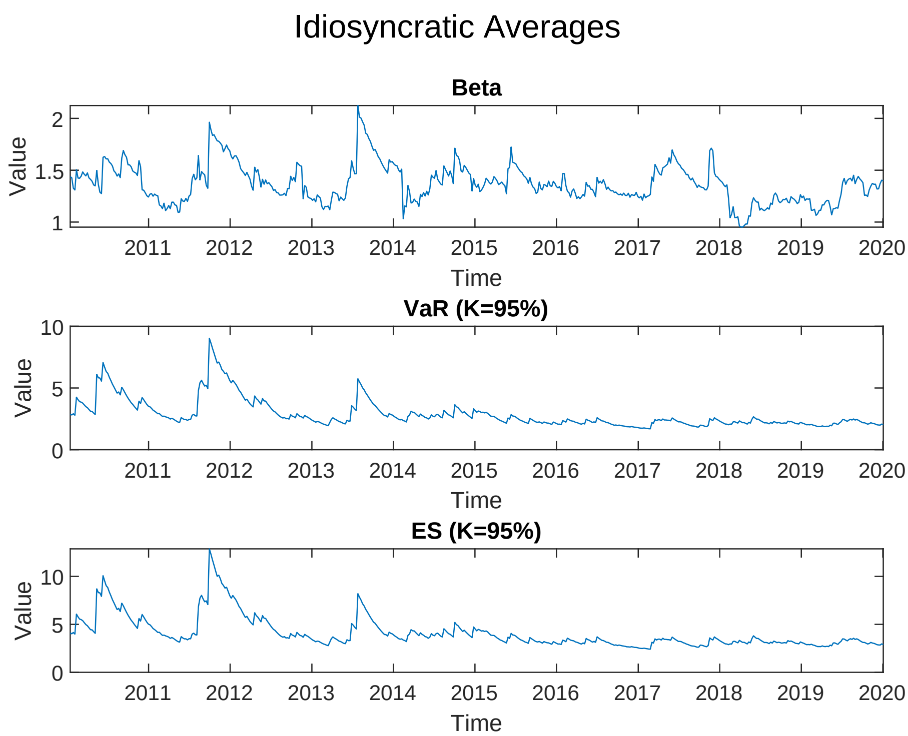

Figure 22 - Historic Idiosyncratic Averages Hungary (Source: authors analysis)

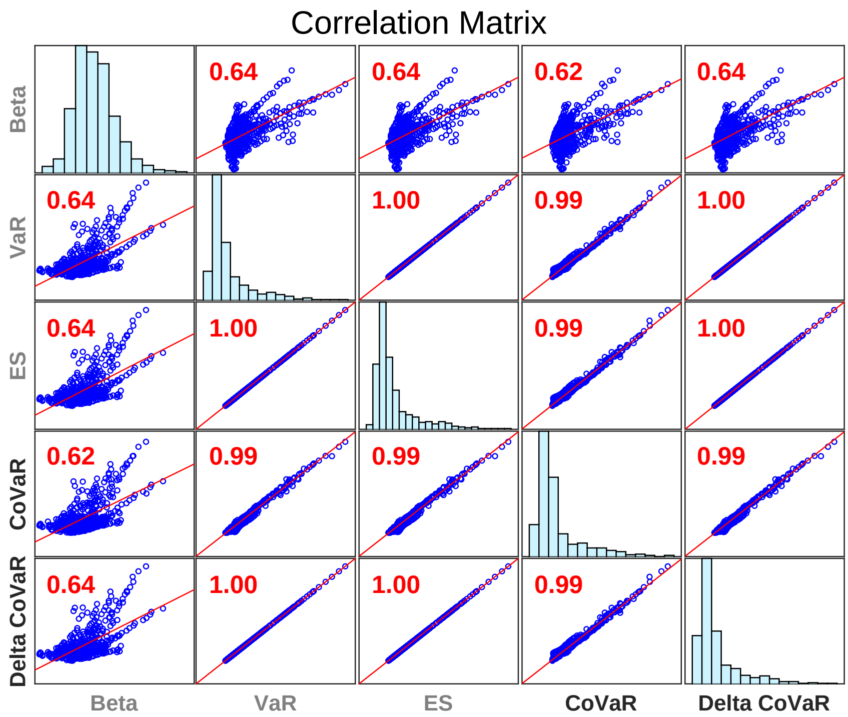

Figure 23 - CoVaR Correlation Matrix Hungary (Source: authors analysis)

Indonesia

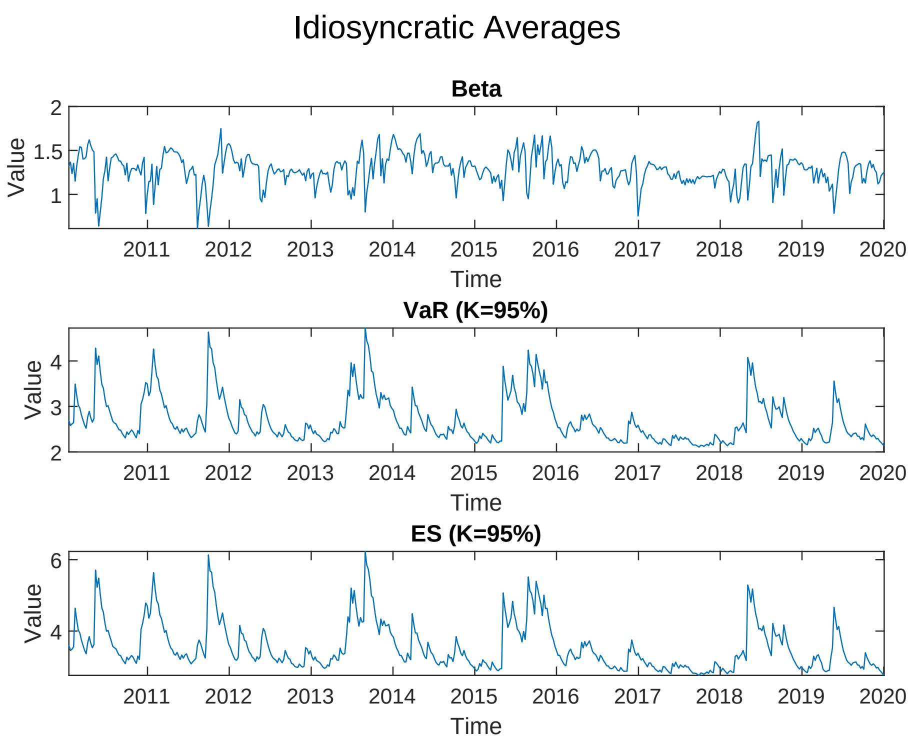

Figure 24 - - Historic Idiosyncratic Averages Indonesia (Source: authors analysis)

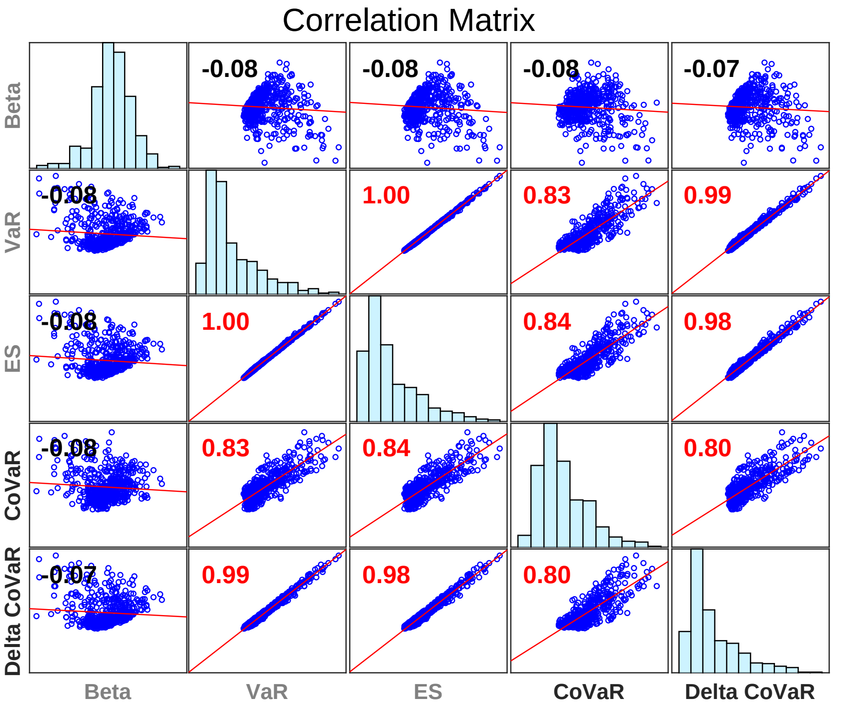

Figure 25 - CoVaR Correlation Matrix Indonesia (Source: authors analysis)

Malaysia

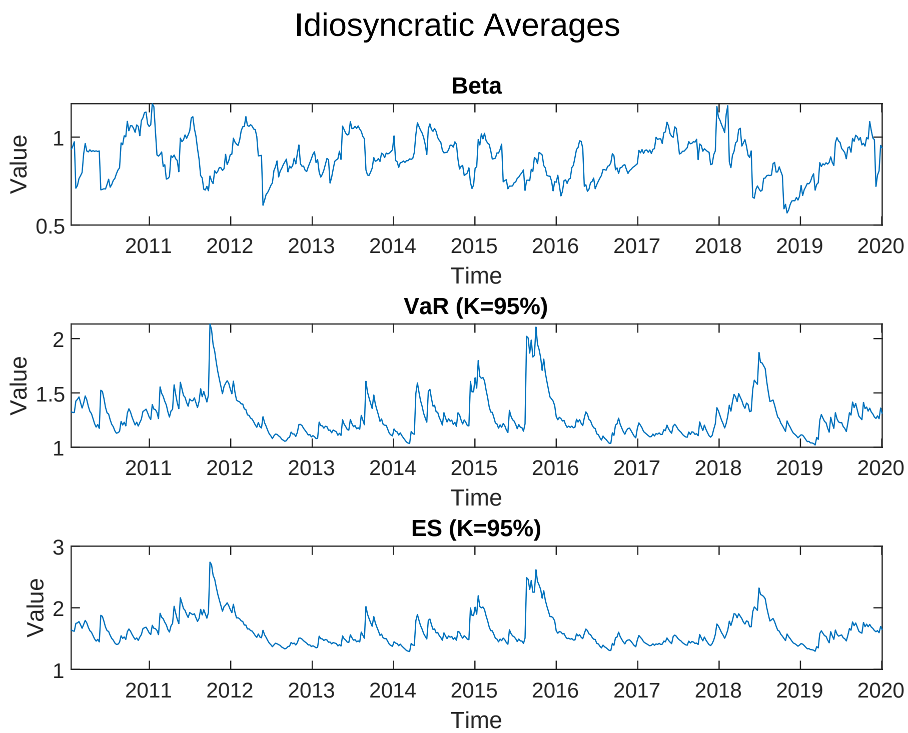

Figure 26 - Historic Idiosyncratic Averages Malaysia (Source: authors analysis)

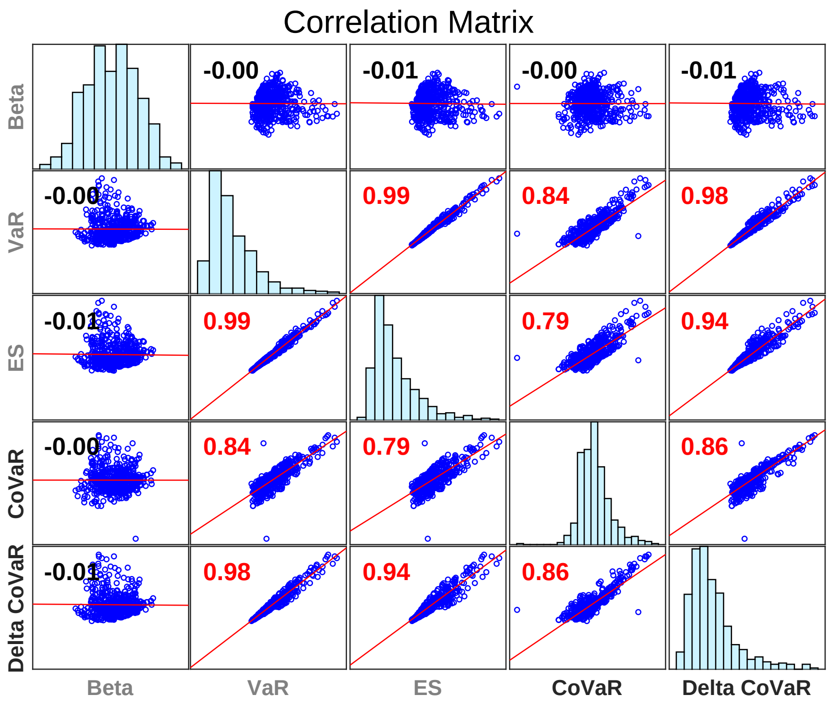

Figure 27 - CoVaR Correlation Matrix Malaysia (Source: authors analysis)

Mexico

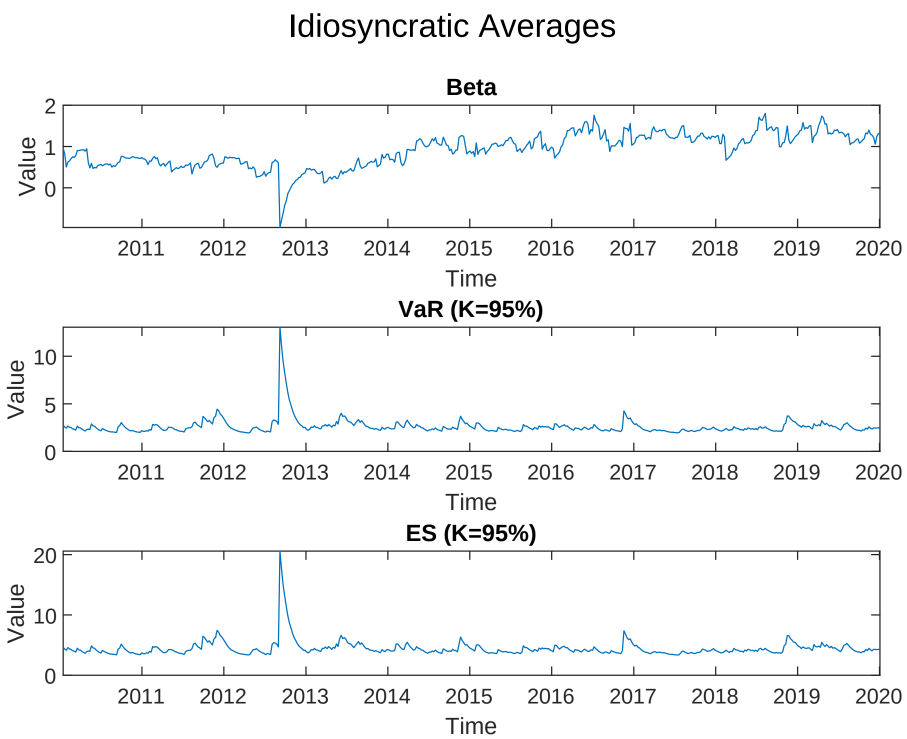

Figure 28 - Historic Idiosyncratic Averages Mexico (Source: authors analysis)

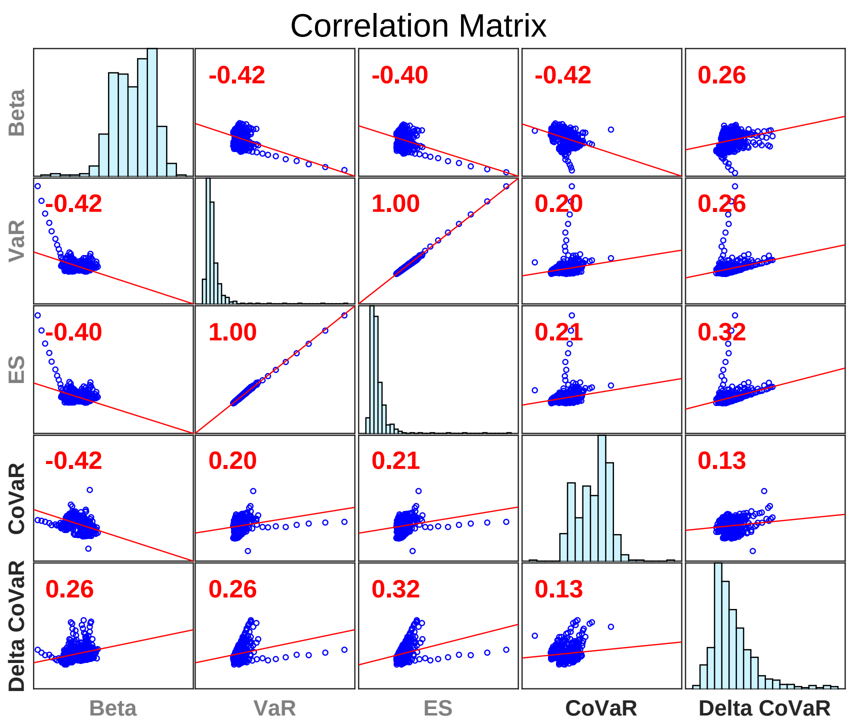

Figure 29 - CoVaR Correlation Matrix (Source: authors analysis)

Appendix D – Liquidity Creation Measurement Criteria

Assets		
Illiquid assets (weight=1/2)	**Semiliquid assets (weight=0)**	**Liquid assets (weight=-1/2)**
Commercial real estate loans	Residential real estate loans	Cash and due from other institutions
Loans to finance agricultural production	Consumer loans	All securities (regardless of maturity)
Commercial and industrial loans	Loans to depository institutions	Trading assets
Other loans and lease financing receivables	Loans to state and local governments	Federal fund sold
Other real estate owned	Loans to foreign governments	
Customers' liability on bankers' acceptances		
Investment in unconsolidated subsidiaries		
Intangible assets		
Premises		
Other assets		
Liabilities and equity		
Liquid liabilities (weight=1/2)	**Semiliquid liabilities (weight=0)**	**Illiquid liabilities and equity (weight= -1/2)**
Transaction deposits	Time deposits	Bank's liabilities on banker's acceptances
Saving deposits	Other borrowed money	Subordinated debt
Overnight federal funds purchased		Other liabilities
Trading liabilities		Equity
Off-balance sheet guarantees		

Illiquid guarantees (weight=1/2)	Semiliquid guarantees (weight=0)	Liquid guarantees (weight= -1/2)
Unused commitments	Net credit derivatives	Net participations acquired
Net standby letters of credit	Net securities lent	
Commercial and similar letters of credit		
All other off-balance sheet liabilities		
Off-balance sheet derivatives		
		Liquid derivatives (-1/2)
		Interest rate derivatives
		Foreign exchange derivatives
		Equity and commodity derivatives

Table 27 : Liquidity classification of bank activities based on categories "Cat" (Berger and Bouwman, 2009)