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To cite this article: Jing Ning, Luqiao Zhang, Biao Mi, Jessica Hong Yang & Lei Tao (06 May 2024): Signalling through managerial tone and analysts' response, Accounting Forum, DOI: 10.1080/01559982.2024.2339911

To link to this article: <https://doi.org/10.1080/01559982.2024.2339911>



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Signalling through managerial tone and analysts' response

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ABSTRACT

This study investigates the interaction between a tone signaller and receiver through managerial tone on a conference call. Based on a signalling framework, we examine the following research questions: Does the signal (tone) match the latent information it intends to convey? Can a receiver (analyst) interpret the signal correctly and send feedback to confirm (or disconfirm) it? Does the signalling environment impact signalling effectiveness? Using a sample of 3680 transcripts of earnings conference calls from 241 UK firms in the FTSE 350 Index, we find that managerial tone can produce effective signals that match private information from managers. Analysts understand tone signals accurately and send confirmation feedback to managers. They revise their forecasts upward (downward) following more (less) optimistic managerial tones. They consistently confirm and respond to managers with a similar tone. Analysts with superior expertise, experience and ability better understand the tone signal, leading to a larger reduction in forecast error. The information environment can moderate signalling effectiveness. This shows that managerial tone represents a reliable signalling device for transmitting latent information on a firm's quality and future performance and that receivers can understand this signal correctly. This study highlights the signalling role of managerial tone in managers and analysts' communication.

HIGHLIGHTS

- Managerial tone effectively communicates private information to analysts.
- Analysts accurately interpret tone signals and adjust forecasts accordingly.
- Analysts with superior expertise better understand tone, reducing forecast errors.
- Managerial tone's signalling effectiveness varies with information environment.

ARTICLE HISTORY

Received 4 December 2021

Accepted 3 April 2024

KEYWORDS

Managerial tone; signalling theory; earnings call; analyst; two-way communication


ACCEPTED BY

Daphne Lui

1. Introduction

Information asymmetry underpins research on corporate narrative disclosure (Beattie, 2014; Bergh et al., 2019), where managers possess more information about a firm's

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 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/01559982.2024.2339911>.

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economics, prospects, and risks than outsiders (Healy & Palepu, 2001). Signalling theory (Spence, 1973) has been vital in explaining how managers use corporate narrative disclosure to reduce this information gap. The signaller needs to choose if and how to signal information and the receiver needs to process and interpret the signal (Connelly et al., 2011).

Managerial tone has gained unprecedented academic attention in the literature on corporate narrative disclosure. Extant tone studies have investigated whether tone plays a signalling role to convey incremental information. For example, a positive association between tone and stock return suggests that tone provides useful information to impact the capital market (Bochkay et al., 2020; Feldman et al., 2010; Yekini et al., 2016). A positive association between tone and future performance suggests that tone contains valuable signals to predict a firm's prospects (Davis et al., 2012; Li, 2010; Mayew et al., 2015). Tone can convey information to predict a firm's policy (Law & Mills, 2015) and future investment activity (Berns et al., 2021). We have ample knowledge of the informational role of managerial tone in that it can signal insightful information on a firm's economics, prospects, and risks to help outsiders better assess the firm. However, to date, we only have limited knowledge of how the receiver perceives or interprets signals (e.g. managerial tone). Many existing tone studies have focused largely on how the aggregate market reacts to the managerial tone, such as whether tone affects the stock return in short term and long term (De Amicis et al., 2021; Durnev & Mangen, 2020; Wisniewski & Yekini, 2019) or whether tone affects market liquidity (Elshandidy & Shrivs, 2016) and abnormal trading volumes (Baginski et al., 2018), but there is limited focus on how the specific group of receivers (i.e. financial analysts) notice, interpret, and act upon signals from firms. This study utilises the signalling framework built by Connelly et al. (2011) to examine interactions between managers and analysts through managerial tone and empirically test the key signalling process (Connelly et al., 2011) using a conference call as a setting. It examines whether the signal (e.g. managerial tone) fits well with the unobservable information (private information) that it wants to convey; whether the receiver (i.e. analysts) can interpret the signal correctly and send feedback to the signaller; and whether the signalling environment can affect the entire signalling process.

Signal fit is a statistical association description (Connelly et al., 2011) of the correlation between the signal and private information (e.g. managers' expectations of the firm's prospects). A strong correlation enhances signalling, while a disconnect can lead to poor signalling (Bergh et al., 2019). Managers confident in their future success will be more likely to choose an optimistic tone, to convince the investors of its ability/prospects. Managers expecting poor performance may choose a less optimistic tone to signal the risk in advance to reduce investors' expectations. This study aims to test whether managerial tone as a signal fits well with the managers' superior private information to enhance tone signalling (Connelly et al., 2011).

Signalling theory suggests successful signalling occurs when the audience accurately receives and confirms the signal (Connelly et al., 2011). Extant tone research has focused mostly on how the market reacts to the signal (Azimi et al., 2021; Davis et al., 2012; Yekini et al., 2016), treating the market participants passive recipients (Brennan & Merkl-Davies, 2018) and emphasising one-way communication model where tone can convey information to arouse a comprehensive investor's reaction (i.e. stock return). However, very few studies have zoomed in to investigate whether the specific audience understands a signaller correctly, to change their decision-making

behaviour and confirms the signal with feedback. Thus, this study fills this gap by considering how the receiver (analysts in a conference call) interpret and respond to a signal. Furthermore, the drive to reduce information symmetry and obtain investor support incentivises managers to signal information. When firms are in a good (poor) information environment and have less (more) information asymmetry, managers will have less (more) incentive to signal. The information environment is expected to correlate with the signalling motivation and moderate a tone's signalling function.

We selected corporate earnings conference calls to examine the aforementioned questions, as they capture real-time, two-way communication (Gow et al., 2021; Matsumoto et al., 2011). The earnings conference call, held shortly after financial results are released, typically at the end of each financial quarter, features the top management team (e.g. CEO, CFO, president of investor relationship, and so on) providing a performance summary and future prediction during the presentation session, followed by a Questions and Answers (Q&A) session with analysts. Analysts can process vast narrative disclosure information more easily than unsophisticated audience members. They pay close attention to how a firm's management responds and ask more questions or offer comments.¹ This rapid feedback loop enhances the visibility and speed of the entire signalling process, making conference calls uniquely valuable for studying real-time signalling process. Furthermore, the Q&A section of a conference call is less formal, fostering spontaneity and reduced the use of boilerplate language by firm managers (Bochkay et al., 2020). It offers insights through the corroboration between managers and analysts (Bochkay & Joos, 2021), making conference call an ideal setting to study the managerial language choice and the receiver's response.

We analyse 3680 earnings conference call transcripts from 241 firms in the FTSE350 index. We conduct regression and robust analyses to test our hypotheses, yielding the following findings: First, the signal provided through managerial tone matches the private information it aims to convey. Firms expecting good performance (private information) used a more optimistic tone, whereas those expecting poor performance spoke less optimistically. We speculate that the tone that managers employ to signal fits well with insider information or managers' expectations of future performance. Second, analysts, being the primary conference call audience, can effectively decode the managerial tone signal and offer feedback. They interpret the optimistic tone as a sign of the firm's promising prospects to raise their forecast, and the less optimistic tone as indicative of unpromising situation to lower the forecast. This reveals their incorporation of the private information that the signaller intends to convey and the development of the same expectation as that of managers. Their tone mirrors the managerial tone, suggesting that analysts confirm the signal through their own tone to the managers. Analysts send a more (less) optimistic response to more (less) optimistic managers. We also assess the abnormal tone, which reflects the extent to which managers exercise discretion or embellish their communication (Lee & Park, 2018) or the portion of the managerial tone that cannot be accounted for by their future performance (Baginski et al., 2018). We find that the abnormal tone, which also represents the unfit portions between managerial tone and future performance, could impact the analysts' evaluations. The greater the discrepancy

¹During the Q&A session, analysts inquire about the firm's financial results, business operations, and future outlook. They often pose follow-up questions to seek additional information or clarify topics (Comprix et al., 2022). Online Appendix A12 offers two anecdotal examples illustrating this interaction between firms and analysts.

between signal (managerial tone) and future performance (unobservable quality), the greater impact on analysts' ability to make accurate forecasts, leading to a greater forecast error. Various moderator variables, including analysts' all-star status, prior forecast accuracy, prior experience, and broker size, which signify the analysts' expertise, ability, and access to resources, can weaken the association, indicating that some analysts with superior ability can understand managerial signals more effectively than others, resulting in a larger reduction in forecast error. Third, we find that the signalling environment moderates tone signalling. Firms with better information environments are less likely to signal using tone. Robustness estimations conducted using different tone and performance measurements are consistent with the above main empirical results and support the hypothesis that managers interact with analysts through their tone.

Our study contributes to the literature in three ways. First, we contribute to the literature on signalling, with its predominant focus on signal receivers, and empirically test the theoretical framework in Connelly et al. (2011). The receiver and signalling environment in the signalling process are relatively insufficiently researched areas in signalling theory (Connelly et al., 2011). We add to the literature with new empirical evidence on how a receiver interprets and acts upon a signal and how the environment affects signalling. Second, we contribute to the literature on the role of managerial tone in corporate disclosure. Many extant tone studies have predominantly examined the reaction of the aggregate market to the tone, from the perspective of diversified groups of information user as signal receiver in the comprehensive market, such as its impact on stock return (Durnev & Mangen, 2020; Wisniewski & Yekini, 2019), market liquidity (Elshandidy & Shrikes, 2016) and abnormal trading volumes (Baginski et al., 2018). Our study focuses on the specific group of audience, investigating the signalling-feedback interaction between managers and analysts. This provides insights into how a group of receivers (i.e. analyst) interprets and responds to the managerial tone to change their decision-making behaviour and also demonstrates that managerial tone can be used in the two-way communication model, therefore advancing our understanding of the role of tone in corporate communication. Third, we contribute to the literature on analysts by providing further evidence at the individual analyst level, rather than solely focusing on the consensus forecast level. Our finding suggests that an analyst in earnings calls may pay attention to the managerial tone and use it as a valuable source of information revise their forecasts and reduce forecast error. Furthermore, our findings highlight the importance of analysts' expertise, experience, and the access to resources to our understanding of whether and how the analysts can interpret the signal accurately.

The rest of this paper is organised as follows. Section 2 reviews the literature and formulates the hypotheses. Section 3 describes the sample selection process and research methods. Sections 4 and 5 discuss the empirical results and robustness tests. Section 6 concludes the paper.

2. Literature review and hypothesis development

2.1. Signalling theory and framework

Signalling theory notes that managers can reduce information asymmetry by signalling more information (Morris, 1987). For example, a dividend increase is a meaningful

signal, especially when firms have poorer information environments (Aggarwal et al., 2012). Similarly, firms with a promising outlook will undertake more CSR activities, which signal a firm's future performance (Lys et al., 2015). Overall, managers use different signalling devices, to convey favourable information, reducing information asymmetry, lowering the cost of capital, and enhance the value of share prices.

This study applies the signalling framework developed by Connelly et al. (2011), as illustrated in Figure 1.

Connelly et al. (2011) considered signallers as insiders with private, superior information, often representing firms or managers in corporate disclosure. Managers communicate about the firm's unobservable quality to the audience to reduce information asymmetry. Signals contain information that signallers communicate and convey. They should be observable as failing to do so will lead to this signal not being noticed by the receivers, resulting in the failure of the signalling process (Connelly et al., 2011). In this study, the signal refers to the managerial tone on a conference call. Receivers are outsiders who lack information on the firm and thus seek it. They may send countersignals (feedback) to signallers (Connelly et al., 2011), indicating how they interpret the signals (i.e. confirm or disconfirm). The signalling environment refers to the degree of information asymmetry between a firm and outsiders (Connelly et al., 2011) and can influence the signallers, signals, and receivers (three predominant actors in the signalling process) individually, as well as their interactions.

2.2. Signalling role of managerial tone

Much of the research on managerial tone focuses on examining its relationship with a firm's performance, including stock returns, current and future earnings. For example, Wisniewski and Yekini (2019) discover that activity and realist tones in the UK annual reports are positively associated with future stock returns. Bochkay et al. (2020) find that when managers used more extreme words (e.g. extremely positive or negative),

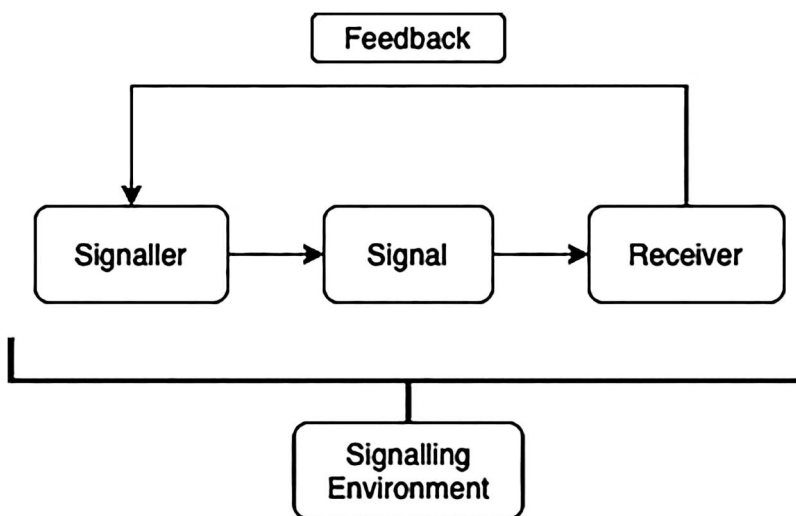


Figure 1. Signalling framework.

stock prices experience more pronounced reaction. Suslava (2021) also presents evidence suggesting that the use of euphemism in tone is negatively associated with both initial and future stock return, indicating that managers employ euphemism to mitigate investor reactions to unfavourable news. The information effect of tone can have a lasting impact on the market, with continued responses from investors. Some studies have extended this line of research to investigate whether tone can provide information on market risk. For example, Borochin et al. (2018) reported results that higher (lower) net positive tone in conference calls leads to less (more) perceived market uncertainty. Fu et al. (2021) find that a less optimistic tone in conference call is related to future stock price crash risk, suggesting that tone can convey truthful information about future downside risk.

A few studies have reported that managerial tone can predict and explain future good or poor performance. Davis et al. (2012) find that net positive tone in earnings press releases is positively associated with future return on assets. Elsayed and Elshandidy (2020) create comprehensive wordlists of corporate failure and find that this tone can predict corporate failure for up to two years ahead of the actual failure. A few recent studies have provided rich evidence on the signalling role of managerial tone in investment and corporate policy. For example, Berns et al. (2021) find that the change in net positive tone in MD&A was positively associated with subsequent internal and external investment activities. Law and Mills (2015) reported that financially constrained firms that express a more negative tone in 10-K filings will pursue a more aggressive tax policy. Ertugrul et al. (2017) reported that firms with more uncertain tone and weak modal words in 10-K filings can have more stringent contractual terms in bank loans.

Managerial tone serves as a signalling mechanism, containing incremental information that can affect the capital market (i.e. stock return, market volatility, trading volume) and predict a firm's economic outcomes (earnings, bankruptcy, policy, and investment). We now have increasing academic knowledge on the informational role of tone, but there is very limited focus on how the specific audience (i.e. stakeholders) changes its decision-making behaviour after it notices and interprets a signal (i.e. managerial tone). A few recent tone studies began to divert attention away from the capital market to focus on stakeholders. Greiner et al. (2020) reported that a more certain and optimistic tone in CEO letters is associated with higher audit fees, as auditors interpret it as a lack of compromise and low credibility, which is inconsistent with their scrutiny and conservatism preferences, and may involve higher audit fees. Hossain et al. (2020) reported that a higher abnormal positive tone in 10-K filings is associated with a higher likelihood of a going concern modified audit opinion, as auditors view it as an indicator of greater risk and are more inclined to issue such opinions. This shows that managerial tone is an important source of information for stakeholders, and that they rely on qualitative disclosure information in addition to quantitative information.

2.3. Hypothesis development

We built our hypothesis based on key concepts from Connelly et al. (2011) and their signalling framework, which is a useful theoretical lens to understand how managerial tone engages in managers and analysts' communication. According to this framework, managers employ their tone (observable) to signal private information (unobservable) to the audience.

2.3.1. *Signal fit*

Connelly et al. (2011, p. 53) discussed the signal fit as “the extent to which a signal is correlated with unobservable quality”, This representation focuses on the characteristics of the signal, such as whether there is a relationship between the observable signal and unobservable private information. We investigate the signal fit – the relationship between managerial tone and private information, with a focus on whether tone can send signals matching private information and alter audiences’ understanding of a firm’s future state (Ciuchta et al., 2017), that is, whether tones can perform a reliable signalling role.

Trueman (1986) asserted that managers have incentives to signal a firm’s future performance as signals can help investors make apt evaluations of the firm’s future performance and motivate their investment decisions. With earlier or a larger number of signals, their assessment of a firm’s prospects will be more favourable, and the firm’s market value will be higher. Signals concerning a firm’s future performance can influence investors’ judgement and the firm’s market value (Healy & Palepu, 2001).

Conference calls involve sophisticated investors who are more interested in the future than in the current firm performance. This preference can be attributed to the disclosure of current performance in other channels before the conference call (i.e. earnings press releases) and the inclusion of this disclosed information in stock prices. Chapman and Green (2017) showed that analysts requested forward-looking information in nearly one-third of the discussion segments. The information demanded from the sophisticated audience drives managers to change their disclosure choices and adopt tools to facilitate further disclosure. Based on this, managers are very likely to signal private information in conference calls to influence the audience’s understanding of the firm’s prospects and reinforce its confidence in the firm. Langberg and Sivaramakrishnan (2010) showed that managers disclose information to seek feedback from analysts on proposed project initiatives, before making long-term commitments. Market participants predominantly follow analysts as their recommendations and earnings forecast determine the movement of stock prices (Soltes, 2014). This two-way flow of information between managers and analysts shapes a firm’s signalling motivation and behaviour. We posit that the signal provided through managerial tone matches private information. Firms expecting a good (poor) performance in the subsequent period are more likely to choose an optimistic (less optimistic) tone for signalling, which is consistent with the following signal fit hypothesis:

Hypothesis 1: Managerial tone is positively related to future firm performance (signal fit hypothesis).

2.3.2. *Receiver interpretation and confirmation*

Connelly et al. (2011, p. 54) defined receiver interpretation as “the process of translating signals into perceived meaning”. Receivers interpret signals to make informed decisions and may send feedback to confirm or disconfirm the signal. This feedback helps signallers assess the accuracy of receiver interpretation. A common confirmation is stock market reaction (e.g. cumulative abnormal returns) to the signal. However, given that this reaction is broad, it is difficult to determine the confirmation of a specific audience.

Studies have found that analysts can acquire management information by participating in the conference calls. For example, Green et al. (2014), and Mayew et al. (2013) showed that analysts can gain superior private information to provide more accurate and timelier earnings forecasts through their participation in conference calls and by asking questions. This suggests that conference calls can be a valuable source of information for analysts. Bochkay and Joos (2021) report that a net positive tone in conference calls, along with quantitative earnings guidance,² are negatively associated with analysts' risk forecasts. Druz et al. (2020) find that when a more negative tone is used, analysts tend to lower their earnings estimates. Additionally, Lee (2015) found that when managers maintain a consistent tone speaking style between the presentation and discussion sessions of a conference call, analysts tend to downgrade their forecasts, perceiving this as a negative signal of reduced spontaneity. This suggests that analysts pay attention to managers' tone in conference calls, in addition to quantitative earnings guidance, to infer relevant information. Building on this, we hypothesise:

Hypothesis 2: analysts can interpret and confirm the managerial tone correctly (receiver interpretation and confirmation hypothesis).

If analysts can interpret managerial tone correctly, they may also develop the same expectation of firm performance and accordingly increase or decrease their forecast. More (less) optimistic tone may disseminate the firm's promising prospect (uncertainty) and bring larger (less) confidence to make analysts revise their forecast upward (downward). Analysts forecast revisions before and after the call are observed following the managerial tone on the call. If analysts are willing to confirm the managerial tone, then there will be an observed correlation between the managerial and analysts' tone. More (less) optimistic analysts respond to more (less) optimistic managers. Therefore, we posit thus:

Hypothesis 2a: Analysts' forecast revision is positively related to managerial tone (receiver interpretation hypothesis).

Hypothesis 2b: Analysts' tone is positively related to managerial tone during the presentation (receiver confirmation hypothesis).

Furthermore, if the analysts can interpret the tone accurately, they may incorporate this information to enhance their forecast accuracy (e.g. reduce forecast error). Analysts possess varying levels of ability, with some having access to superior resources and support, as well as better expertise or experience, which enables them to understand these signals more effectively than others (Kim et al., 2019; Kirk et al., 2014). Therefore, we aim to investigate whether some analysts can better understand these signals than others, leading to larger reduction in the forecast error for earnings of future quarter.

We decompose the managerial tone into two parts. The first part is the normal tone, which represents the part of the tone that fits well with the future performance (Huang et al., 2014), and is tested in the above hypothesis 1. The second part is abnormal tone, which reflects the part of the managerial tone that is not explained by their future

²In the study by Bochkay and Joos (2021), quantitative earnings guidance is the company's public estimate for its current and future earnings, providing quantitative information that is easily interpreted by users. Managerial tone refers to the emotion conveyed by managers in their communication language, representing qualitative information.

performance (Baginski et al., 2018). We expect the abnormal tone, which is also the gap between managerial tone and future performance, may become one of the factors affecting the analysts' evaluation. Obviously, the greater gap between managerial tone and future performance, the greater impact on analysts' ability to make accurate forecasts, which may lead to a greater forecast error. Moreover, we expect to observe several moderator variables, including analysts' all-star status, prior forecast accuracy, prior experience, and broker size, which represents the analysts' ability, can weaken the association. This indicates that highly skilled analysts can better understand manager signals, resulting in a larger reduction in forecast error. Therefore, we posit thus:

Hypothesis 2c: Analysts' forecast error is positively related to abnormal managerial tone and analysts' ability can weaken this association (receiver interpretation hypothesis).

2.3.3. Signalling environment

The signalling information environment can be set as a boundary condition as it can influence the behaviour of the signaller and receiver (Bergh et al., 2019). It can also influence the extent to which signalling reduces information asymmetry (Connelly et al., 2011). We use firm size as the proxy for signalling environment (Bochkay et al., 2020) to test the moderating effect of the signalling environment on tone.

An increase in firm size will increase the amount of information available on the firm to investors (Bochkay et al., 2020). Larger firms will have more disclosure regulation requirements and appear more often on other disclosure media (i.e. newspapers, financial press, social media, and analyst reports). Therefore, it is likely that large firms have less incentive to signal via conference calls than do smaller firms.

Studies have shown that firms with a poor information environment have greater incentives for voluntary disclosure. Chen et al. (2002) noted that firms are more likely to voluntarily disclose balance sheets when current earnings are less informative and future earnings are more uncertain. Aggarwal et al. (2012) showed that firms with worse information environments are more likely to use dividends to signal information. This suggests a positive relationship between managers' disclosure incentives and voluntary disclosure. If firms with poor information environments have stronger incentives to signal insider information, these firms will also be more likely to use tone to communicate with outsiders. Accordingly, we propose thus:

Hypothesis 3: The signalling environment can moderate the relationship between tone and future firm performance (signalling environment moderation hypothesis).

3. Sample and research design

3.1. Sample selection

We initially collect 6165 quarterly earnings conference call transcripts from 241 FTSE350 firms covering the period 2002–2020 through Thomson Reuters. After removing 427 transcripts with repetitive content and those lacking discussion sessions, we have 5399 transcripts for tone measurement. Financial data is sourced from DataStream, and analyst forecast data from I/B/E/S is matched with tone variables. After excluding

1719 transcripts with missing financial data and control variables, our final sample comprises 3680 observations. The specific final sample for each regression varies based on the availability of control variables. Sample selection procedures are summarised in [Table 1](#).

3.2. Variable measurements

3.2.1. Tone measurement

We assess managerial tone in the entire earnings conference call and its presentation and discussion sections. Analyst tone is measured exclusively in the discussion section. We employ positive and negative word dictionaries from Loughran and McDonald (2011) with equal weighting. The conference call transcripts are in XML format and contain identifiers, dates, times, section tags, and roles (e.g. managers or analysts). Using Python programming, we segment the transcripts, separate manager and analyst speeches, and calculate tone variables. Python divides the transcripts into presentation and discussion sections, extracts managers and analysts' speeches in the discussion section, and counts positive and negative words in each segment. The tone measure is calculated as the difference between the percentages of positive and negative words, resulting in the net tone, expressed as:

$$\frac{\text{Pos} - \text{Neg}}{\text{Pos} + \text{Neg}}$$

Pos and Neg represent the positive and negative words from Loughran and McDonald (2011), respectively. We measure the tone variable *Tone* for the managers' speech in the presentation and discussion sections together. We measure the presentation tone (*Tone_pres*) for the managers' speech in the presentation. Other tone variables – managers (*Tone_Mdis*) and analysts' (*Tone_A*) net tones – are only measured in the discussion. Additionally, we compute the residual term *Ab_Tone* by regressing *Tone* on future performance while controlling for various firm fundamental variables, as described in Model (1) of Section 3.3.

3.2.2. Financial variables

To measure firm performance, we use a matrix of variables to capture different aspects of performance (Davis et al., 2015; Huang et al., 2014). We consider the quarterly earnings before interest and taxes (*EBIT*) as the main performance proxy (Li, 2010). We use the statistics and data time-series command to obtain the *EBIT* in the subsequent quarter (*EBITnextQ*) and the average *EBIT* for the next four quarters (*EBITnextY*) for the primary test. We define a separate dummy variable *EBITloss* to control the relationship

Table 1. Data collection.

Sample selection	
Earnings call transcripts by FTSE350 extracted from Thomson Reuters from 2002 to 2020	6165
Same transcript content with a different title	-427
Call transcripts without discussion portions	-339
Call transcripts for tone measurement	5399
Call transcripts with missing financial data and control variables from DataStream	-1719
Sample available to all models	3680

Note: This table presents the information about our sample selection process.

between tone and poor performance. *EBITloss* is a dummy variable that equals 1 if *EBIT* is less than 0, and 0 otherwise. We consider Return on Asset (*ROA*) and the pre-tax income (*Epretax*) as proxies of performance to measure the quarterly variables (*ROAnxtQ*, *EpretaxnxtQ*) and the average yearly variables (*ROAnxtY*, *EpretaxnxtY*) accordingly. For control variables, we include *MBE* (whether the firms meet or beat analysts' expectation), *SURP* (earnings surprise), *Return* (the current quarter stock returns), *ACC* (accruals), *Size* (firm size), *BTM* (book-to-market ratio), *Busiseg* (business segments), *Geoseg* (geographic segments), *Firmage* (the number of years since a firm appeared in the DataStream database), *Returnvol* (return volatility), *EBITvol* (earnings volatility) and *AF* (analyst following number). These have been employed as control variables in other financial disclosure studies (Davis et al., 2012; Feldman et al., 2010; Li, 2010). The variable definitions are presented in Appendix.

3.2.3. Analyst variables

We use two different measures to capture the analyst forecast revision (Lee, 2015). The first is the magnitude of analyst revision scaled by stock price (*AFREV_Amount*); the second is the relative analyst revision, namely the proportion of analysts revising their forecast (*AFREV_Prop*). We measure the analyst forecast error as the mean absolute difference between the forecasted earnings per share (EPS) and the actual EPS for the quarter (Mayew et al., 2013; Mayew et al., 2020). We consider four analysts characteristics – *Pre_accuracy* (analysts' previous forecast error), *Experience* (forecast experience), *Brokersize* (the number of analysts employed by the brokerage firm) and *All-star* (all-star status). They are frequently employed by prior analyst's research to be associated with analysts' expertise, experience, and access to resources (Kim et al., 2019; Kirk et al., 2014). We also include *Attend* as a dummy variable that equals 1 if the analyst attends, asks a question or interacts with managers in the Q&A session of the earnings conference call, and 0 otherwise. This is to differentiate them from other analysts who listen to the earnings conference call but do not ask their own questions (Mayew et al., 2013). The variable definitions are presented in Appendix.

3.3. Regression models

To test Hypotheses 1–3, we conducted a series of regression tests using the following models. Each regression test controlled for the firm and year fixed effects, together with the use of heteroskedasticity robust standard errors.

$$\text{Model (1) : } \textit{Tone} = \alpha_0 + \alpha_1 \textit{Future Performance} + \text{controls} + e \quad (1)$$

$$\text{Model (2): } \textit{AFREV} = \alpha_0 + \alpha_1 \textit{Tone} + \text{controls} + e \quad (2)$$

$$\text{Model (3): } \textit{Tone_A} = \alpha_0 + \alpha_1 \textit{Tone} + \text{controls} + e \quad (3)$$

$$\begin{aligned} \text{Model (4): } \textit{Error} &= \alpha_0 + \alpha_1 \textit{Ab_Tone} + \alpha_2 \textit{Analysts' ability} \times \textit{Ab_Tone} + \text{controls} \\ &+ e \end{aligned} \quad (4)$$

$$\text{Model (5): } \textit{Tone} = \alpha_0 + \alpha_1 \textit{Future EBIT} + \alpha_2 \textit{Size} \times \textit{Future EBIT} + \text{controls} + e \quad (5)$$

In Model (1), the dependent variables are manager's net tone in the entire call (*Tone*), presentation (*Tone_pres*), and discussion (*Tone_Mdis*). The primary observed independent variables are *EBITnxtQ*, *EBITnxtY*, and their respective coefficient α_1 . Other proxies for future performance (e.g. *ROA*, *Epretax*, *MBE*, and *SURP*) are also considered for robustness tests. If the estimate of α_1 is statistically positive, it implies that managerial tone corresponds well to the private information it intends to convey. In Model (2), the dependent variables are analysts forecast revision expressed in revision magnitude and proportion. The independent variables are *Tone*, *Tone_pres*, and *Tone_Mdis*. If the estimate of α_1 in Model (2) is statistically positive, it implies that analysts upgrade (downgrade) their forecast of future performance following a more (less) optimistic tone. In Model (3), we replaced the analysts' forecast revision with analysts' tone and tested whether it conforms with managerial tone. In Model (4), we regress analyst forecast error on abnormal tone, while including analysts' ability as moderator variables to test whether some analysts possess superior expertise and can better understand the signal, leading to a larger reduction in the forecast error. Model (5) added a moderation item based on Model (1) to test whether the signalling environment can moderate tone signalling.

4. Empirical results

4.1. Descriptive statistics and correlation analysis

Descriptive statistics are presented for all tone, financial, analysts, and control variables in Table 2. The mean value of various managers' net tone is positive, whereas the analysts' net tone mean value is negative. The managers' net tone in the presentation (*Tone_pres* mean value 0.390) is more optimistic than that in the discussion (*Tone_Mdis* mean value 0.058) and the analysts' net tone in the discussion (*Tone_A* mean value -0.251), which is relatively pessimistic. These differences suggest distinct reporting patterns between managers and analysts. We further examine the economic significance in the subsequent regression analysis. Correlations between dependent and independent variables are provided in the online appendix (Table A1).

4.2. Regression analysis results

This section summarises our empirical findings. In the first subsection 4.2.1, we examine the signal fit hypothesis, which states that firms with an expectation of better (poor) performance in the next period use a more (less) optimistic tone. In the second subsection 4.2.2, we examine the receiver interpretation and confirmation hypothesis, namely that analysts can interpret managerial tone correctly by adjusting their forecasts following the conference call, and that the analysts will provide feedback on managerial tone. Analysts with superior expertise, experience and ability better understand the tone signal, leading to a larger reduction in forecast error. The third subsection 4.2.3 examines whether the information environment influences the tone's signalling role. The following subsections present empirical results for each hypothesis, with Tables 3–7 corresponding to H1, H2a, H2b, H2c, and H3.

Table 2. Descriptive statistics.

	<i>N</i>	Mean	Std. Dev.	min	Median	max
Tone variable						
Tone	4961	0.274	0.203	-0.556	0.292	0.762
Tone_pres	4960	0.390	0.217	-1	0.415	1
Tone_Mdis	4961	0.058	0.247	-1	0.070	0.840
Tone_A	4957	-0.251	0.276	-1	-0.259	1
Tone_R	4961	0.013	0.011	-0.034	0.014	0.049
Tone_pres_R	4961	0.021	0.013	-0.028	0.020	0.071
Tone_Mdis_R	4961	0.003	0.011	-0.082	0.003	0.047
Tone_A_R	4961	-0.010	0.013	-0.225	-0.010	0.037
Ab_Tone	15,392	0.005	0.130	-0.366	0.000	0.378
Analyst variable						
AFREV_Amount	3947	-0.012	0.691	-2.790	0.001	2.649
AFREV_Prop	3947	-0.001	0.066	-0.0226	0	0.229
Error	17,129	0.080	0.065	0.000	0.069	0.390
Pre_accuracy	18,264	-0.638	2.446	-34.118	-0.106	-0.001
Experience	16,697	3.261	0.801	1.386	3.466	4.564
Brokersize	17,829	8.388	1.157	1.609	8.617	10.206
All-star	19,254	0.287	0.452	0.000	0.000	1.000
Attend	19,254	0.236	0.425	0.000	0.000	1.000
Financial variable						
EBIT	4516	0.041	0.059	-0.616	0.036	1.116
EBITnxtQ	4094	0.040	0.054	-0.543	0.036	1.108
EBITnxtY	4456	0.039	0.044	-0.194	0.034	1.108
Epretax	4879	0.034	0.058	-0.623	0.028	1.113
EpretaxnxtQ	4415	0.033	0.054	-0.556	0.028	1.105
EpretaxnxtY	4692	0.032	0.043	-0.203	0.026	1.105
ROAnxtQ	4174	7.517	9.245	-56.86	6.555	106.77
ROAnxtY	4618	7.31	7.887	-30.37	6.243	221.72
MBE	2101	0.254	0.435	0	0	1
SURP	1821	-0.016	0.045	-1.113	-0.005	0.083
Return	4742	-0.880	0.374	-1.981	-0.901	4.698
Control variable						
EBITloss	4561	0.101	0.301	0	0	1
Epretaxloss	4879	0.125	0.331	0	0	1
EBITupdown	4561	0.429	0.495	0	0	1
Epretaxupdown	4879	0.435	0.496	0	0	1
ACC	4152	-0.017	0.064	-0.825	-0.009	1.109
size	4761	15.375	1.515	10.491	15.171	20.327
BTM	4738	0.714	0.281	0.016	0.727	1.779
busiseg	4915	1.596	0.447	0.693	1.609	2.398
geoseg	4926	1.607	0.555	0.693	1.609	2.398
firmage	4932	22.623	7.115	1	28	28
Returnvol	4738	0.295	0.138	0.001	0.268	2.898
EBITvol	4861	0.053	0.026	0.001	0.048	0.443
Epretaxvol	4865	0.053	0.026	0	0.05	0.452
AF	4761	2.723	0.485	0.693	2.833	3.784

Notes: This table presents the information about the descriptive statistics of variables used in the regression analyses. All variables are defined in Appendix.

4.2.1. Hypothesis 1 – signal fit hypothesis

The results in columns (1)–(3) of Table 3 show that all managers' tones – for the entire call or for the presentation and discussion sections – are positively related to *EBITnxtQ* and *EBITnxtY*. *Tone_pres* has the strongest signalling effect and is positively related to *EBITnxtQ* at 0.533 ($p < 0.01$). *Tone* in the entire conference call has a slightly weaker signalling effect and is associated with *EBITnxtQ* at 0.448 ($p < 0.01$). *Tone_Mdis* is relatively much weaker on the signalling effect with a coefficient of 0.283 ($p < 0.05$). This may be attributed to the discussion section's spontaneity, which can be tougher for managers

Table 3. Regression results for H1.

Variables	(1) Tone	(2) Tone_pres	(3) Tone_Mdis	(4) Tone	(5) Tone_pres	(6) Tone_Mdis
EBITnxtQ	0.448*** (0.073)	0.533*** (0.085)	0.283*** (0.104)			
EBITnxtY				0.542*** (0.103)	0.611*** (0.120)	0.430*** (0.149)
EBITloss	-0.087*** (0.011)	-0.108*** (0.013)	-0.050*** (0.015)	-0.087*** (0.011)	-0.108*** (0.012)	-0.043*** (0.015)
Return	0.046*** (0.008)	0.058*** (0.010)	0.009 (0.012)	0.048*** (0.008)	0.059*** (0.010)	0.009 (0.012)
ACC	-0.055 (0.051)	-0.018 (0.060)	-0.017 (0.073)	-0.066 (0.048)	-0.028 (0.056)	-0.019 (0.070)
Size	0.016* (0.009)	0.036*** (0.010)	-0.002 (0.013)	0.020** (0.009)	0.041*** (0.010)	-0.001 (0.013)
BTM	0.010 (0.027)	0.023 (0.032)	0.014 (0.039)	0.014 (0.027)	0.028 (0.031)	0.006 (0.038)
Returnvol	-0.227 (0.508)	0.322 (0.593)	-0.170 (0.726)	-0.186 (0.514)	0.348 (0.596)	-0.120 (0.740)
EBITvol	1.145 (0.806)	0.537 (0.941)	2.160* (1.154)	1.012 (0.817)	0.425 (0.946)	2.057* (1.175)
Busiseg	-0.583 (0.480)	-1.162** (0.561)	0.072 (0.687)	-0.684 (0.481)	-1.199** (0.558)	-0.204 (0.693)
Geoseg	0.014 (0.069)	0.137* (0.080)	-0.024 (0.098)	0.006 (0.068)	0.126 (0.079)	-0.053 (0.098)
Firmage	-0.036*** (0.013)	-0.058*** (0.016)	-0.014 (0.019)	-0.039*** (0.013)	-0.059*** (0.015)	-0.022 (0.019)
AF	0.051*** (0.012)	0.044*** (0.014)	0.057*** (0.017)	0.056*** (0.012)	0.050*** (0.013)	0.062*** (0.017)
Constant	1.680 (1.031)	2.734** (1.204)	0.056 (1.476)	1.859* (1.029)	2.736** (1.192)	0.749 (1.481)
Observations	3203	3203	3203	3385	3384	3385
R-squared	0.593	0.525	0.453	0.581	0.515	0.444
YEAR FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Notes: The table reports the coefficients estimates from the OLS regression of managerial tone and future EBIT and other control variables described in Model (1). The dependent variable is *Tone* in Columns 1 and 4, *Tone_pres* in Columns 2 and 5, *Tone_Mdis* in Columns 3 and 6. All independent variables are defined in Appendix. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

to control (Blau et al., 2015). The results in columns (4) to (6) of Table 3 show the yearly tone signalling effect that *Tone*, *Tone_pres*, and *Tone_Mdis* are positively related to *EBITnxtY*. Managerial tone fits with the information it intends to convey in the short and long periods.

The results in Table 3 show that *Tone*, *Tone_pres*, and *Tone_Mdis* are negatively related to *EBITloss*, which means that firms with EBIT losses may employ a less optimistic tone through the earnings conference call. This is consistent with Li (2010), who find that managers credibly use tone to describe current firm performance. Managers' net tone for the entire call (*Tone*) and in the presentation section (*Tone_pres*) are positively related to *Return*, which is also consistent with Li (2010) who find that firms with well-performing stock returns will speak more optimistically during earnings conference calls. *Tone*, *Tone_pres*, and *Tone_Mdis* are positively related to the number of analysts' following a firm. This is consistent with Schleicher and Walker (2010), who find that more analysts following a firm provides an additional incentive for managers to show more optimism during conference calls. Conversely, our findings that firm age and business

Table 4. Regression results for H2a.

Variables	(1) AFREV_Amount	(2) AFREV_Prop	(3) AFREV_Amount	(4) AFREV_Prop	(5) AFREV_Amount	(6) AFREV_Prop
Tone	0.996*** (0.286)	0.132*** (0.049)	0.843*** (0.251)	0.131** (0.056)	0.385** (0.187)	0.041 (0.032)
Tone_pres						0.014 (0.027)
Tone_Mdis						0.754 (0.663)
Return	0.080 (0.079)	0.008 (0.028)	0.079 (0.078)	0.007 (0.029)	0.121 (0.082)	0.041 (0.032)
ACC	3.617 (2.342)	0.727 (0.654)	3.692 (2.313)	0.732 (0.650)	3.807 (2.436)	0.754 (0.663)
Size	0.034 (0.089)	-0.078 (0.065)	0.025 (0.087)	-0.080 (0.066)	0.055 (0.090)	-0.075 (0.065)
BTM	0.144 (0.276)	-0.020 (0.077)	0.190 (0.267)	-0.013 (0.078)	0.101 (0.280)	-0.025 (0.078)
Returnvol	-0.121 (0.203)	-0.096 (0.109)	-0.081 (0.206)	-0.087 (0.109)	-0.226 (0.221)	-0.111 (0.112)
Busiseg	0.908 (1.538)	1.111 (1.029)	0.840 (1.603)	1.110 (1.038)	1.292 (1.663)	1.141 (1.027)
Geoseg	-0.049 (0.184)	0.083 (0.146)	-0.092 (0.195)	0.077 (0.145)	-0.012 (0.172)	0.086 (0.146)
Firmage	-0.077 (0.114)	0.054 (0.095)	-0.073 (0.125)	0.055 (0.097)	-0.056 (0.119)	0.055 (0.095)
Constant	-0.845 (4.196)	-2.061 (3.179)	-0.665 (4.572)	-2.065 (3.229)	-1.786 (4.593)	-2.124 (3.159)
Observations	3421	3421	3421	3421	3421	3421
R-squared	0.189	0.043	0.189	0.044	0.186	0.042
YEAR FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Notes: The table reports the coefficients estimates from the OLS regression of analysts forecast revision and managerial tone and other control variables described in Model (2). The dependent variable is *AFREV_Amount* in Columns 1, 3 and 5, *AFREV_Prop* in Columns 2, 4 and 6. All independent variables are defined in Appendix. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

Table 5. Regression results for H2b.

Variables	(1) Tone_A	(2) Tone_A	(3) Tone_A	(4) Tone_A	(5) Tone_A	(6) Tone_A
Tone	0.335*** (0.030)					
Tone_pres		0.194*** (0.027)				
Tone_Mdis			0.287*** (0.021)			
Tone_R				6.432*** (0.575)		
Tone_pres_R					3.457*** (0.467)	
Tone_Mdis_R						6.168*** (0.479)
EBITloss	-0.002 (0.017)	-0.010 (0.018)	-0.015 (0.017)	-0.006 (0.017)	-0.012 (0.017)	-0.018 (0.017)
Return	0.006 (0.014)	0.010 (0.014)	0.019 (0.013)	0.005 (0.014)	0.009 (0.014)	0.018 (0.013)
ACC	0.153** (0.077)	0.132* (0.078)	0.138* (0.076)	0.159** (0.077)	0.143* (0.078)	0.147* (0.077)
Size	-0.010 (0.013)	-0.010 (0.013)	-0.005 (0.013)	-0.007 (0.013)	-0.008 (0.013)	-0.005 (0.013)
BTM	0.003 (0.040)	-0.006 (0.040)	-0.005 (0.039)	0.000 (0.040)	-0.010 (0.040)	-0.005 (0.039)
Returnvol	-0.014 (0.038)	-0.023 (0.038)	-0.023 (0.037)	-0.013 (0.038)	-0.020 (0.038)	-0.023 (0.038)
EBITvol	0.245 (0.215)	0.215 (0.217)	0.248 (0.213)	0.224 (0.215)	0.204 (0.217)	0.229 (0.213)
Busiseg	-0.519 (1.402)	-0.674 (1.416)	-0.281 (1.390)	-0.509 (1.402)	-0.656 (1.416)	-0.295 (1.394)
Geoseg	0.472 (1.041)	0.531 (1.052)	0.171 (1.032)	0.519 (1.041)	0.583 (1.051)	0.184 (1.035)
Firmage	-0.005 (0.016)	-0.008 (0.016)	-0.008 (0.016)	-0.005 (0.016)	-0.008 (0.016)	-0.009 (0.016)
Constant	-0.029 (0.867)	0.243 (0.875)	0.246 (0.857)	-0.169 (0.868)	0.071 (0.877)	0.265 (0.860)
Observations	3675	3674	3675	3675	3675	3675
R-squared	0.230	0.214	0.244	0.231	0.215	0.239
YEAR FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Notes: The table reports the coefficients estimates from the OLS regression of analyst's tone and managerial tone and other control variables described in Model (3). The dependent variable is *Tone_A* in all columns. All independent variables are defined in Appendix. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

segment numbers are negatively associated with *Tone* are inconsistent with Li (2010). Overall, the results in Table 3 support the signalling fit hypothesis that managerial tone can be an effective signal that matches the private information it intends to convey.³

4.2.2. Hypothesis 2 – receiver interpretation and confirmation

Columns (1) to (4) of Table 4 reveal a positive relationship between analysts' forecast revision and managerial tone for the entire call and the presentation portion. More

³We conduct the same regression model with uncertainty tone and forward-looking tone. We do not obtain the significant results on uncertainty tone. This lack of significance may be attributed to the significantly lower frequency of uncertainty words in our sample compared to positive and negative words. We obtain similar but weaker empirical results on forward-looking tone which may be attributed to the reduced observations of forward-looking tone.

(less) optimistic tone correlates with larger (smaller) analysts' forecast revision. This shows that analysts incorporate the tone signal and develop the same expectations of a firm's future performance. More (less) optimistic tone transfers higher (lower) confidence on part of the manager with respect to the firm's prospects to lead analysts to increase (decrease) their forecast following the earnings call. This is consistent with Druz et al. (2020) indicating that analysts tend to adjust their earnings estimates in response to a more negative tone. Similarly, this is in line with Bochkay and Joos (2021) who report that analysts tend to downgrade their risk forecasts following a more positive tone. Additionally, this extends the finding of a previous study by Lee (2015), which report that when managers maintain a consistent tone speaking style between the presentation and discussion sessions of a conference call, analysts tend to

Table 6. Regression results for H2c.

Panel A Variables	(1) Error	(2) Error	(3) Error
Ab_Tone	0.038*** (0.003)		
Ab_Tone_pres		0.019** (0.008)	
Ab_Tone_Mids			0.029*** (0.008)
All_star	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)
Attend	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)
Brokersize	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Experience	-0.001** (0.000)	-0.001** (0.001)	-0.001** (0.001)
Pre_accuracy	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)
Return	-0.016*** (0.001)	-0.016*** (0.004)	-0.016*** (0.004)
ACC	0.185*** (0.013)	0.179*** (0.056)	0.177*** (0.058)
Size	0.009*** (0.002)	0.009* (0.005)	0.009* (0.005)
BTM	-0.126*** (0.004)	-0.127*** (0.015)	-0.124*** (0.015)
Returnvol	-0.002 (0.005)	-0.003 (0.014)	-0.001 (0.014)
Busiseg	-0.627*** (0.075)	-0.627*** (0.169)	-0.640*** (0.173)
Geoseg	-0.040*** (0.008)	-0.039 (0.027)	-0.043 (0.027)
Firmage	-0.047*** (0.005)	-0.047*** (0.018)	-0.048*** (0.018)
Constant	2.078*** (0.229)	2.073*** (0.645)	2.119*** (0.664)
Observations	13,262	13,262	13,262
R-squared	0.574	0.571	0.574
YEAR FE	YES	YES	YES
FIRM FE	YES	YES	YES

The table reports the coefficients estimates from the OLS regression of analysts forecast error and abnormal tone and other control variables described in Model (4). The dependent variable is *Error* in all columns. All independent variables are defined in Appendix. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.



Table 6. Continued.

Variables	Panel B – All-star as Analysts' ability		Panel C – Attend as Analysts' ability		Panel D – Brokersize as Analysts' ability				
	(4) Error	(5) Error	(6) Error	(7) Error	(8) Error	(9) Error	(10) Error	(11) Error	(12) Error
Ab_Tone	0.032*** (0.003)			0.044*** (0.003)		0.085*** (0.021)			
Ab_Tone_pres		0.014*** (0.003)			0.023*** (0.003)		0.073*** (0.018)		
Ab_Tone_Mids			0.031*** (0.003)			0.033*** (0.003)			0.051*** (0.016)
Ab_Tone × Analysts' ability	-0.033*** (0.009)			-0.026*** (0.007)			-0.006** (0.003)		
Ab_Tone_Pres × Analysts' ability		-0.015*** (0.005)			-0.013** (0.005)			-0.006*** (0.002)	
Ab_Tone_Mdis × Analysts' ability			-0.008* (0.005)						-0.003 (0.002)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	13,262	13,262	13,262	13,262	13,262	13,262	13,262	13,262	13,262
R-squared	0.574	0.571	0.574	0.574	0.571	0.574	0.574	0.571	0.574
Variables	Panel E – Experience as Analysts' ability		Panel F – Pre_accuracy as Analysts' ability		Panel G – Pre_accuracy as Analysts' ability				
	(13) Error	(14) Error	(15) Error	(16) Error	(17) Error	(18) Error	(19) Error	(20) Error	(21) Error
Ab_Tone	0.065*** (0.012)			0.036*** (0.003)					
Ab_Tone_pres		0.038*** (0.010)			0.018*** (0.002)				
Ab_Tone_Mids			0.026*** (0.009)			0.029*** (0.002)			
Ab_Tone × Analysts' ability	-0.008** (0.004)			-0.003** (0.001)					
Ab_Tone_Pres × Analysts' ability		-0.006* (0.003)			-0.002* (0.001)				
Ab_Tone_Mdis × Analysts' ability			0.001 (0.003)			0.000 (0.001)			
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	13,262	13,262	13,262	13,262	13,262	13,262	13,262	13,262	13,262
R-squared	0.574	0.571	0.574	0.574	0.571	0.574	0.571	0.574	0.574

Notes: Panels B, C, D, E, and F respectively showcase the moderation effects of All-star, Attend, Brokersize, Experience, and Pre_accuracy. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

Table 7. Regression results for H3.

Variables	(1) Tone	(2) Tone_pres	(3) Tone_Mdis	(4) Tone	(5) Tone_pres	(6) Tone_Mdis
EBITnxQ	2.388*** (0.680)	2.657*** (0.795)	1.300 (0.975)			
Size × EBITnxQ	-0.130*** (0.045)	-0.142*** (0.053)	-0.068 (0.065)			
EBITnxY				2.853*** (0.910)	2.788*** (1.055)	1.020 (1.311)
Size × EBITnxY				-0.155** (0.061)	-0.146** (0.070)	-0.040 (0.087)
EBITloss	-0.086*** (0.011)	-0.107*** (0.013)	-0.050*** (0.015)	-0.086*** (0.011)	-0.107*** (0.012)	-0.042*** (0.015)
Return	0.046*** (0.008)	0.057*** (0.010)	0.008 (0.012)	0.048*** (0.008)	0.059*** (0.010)	0.009 (0.012)
ACC	-0.057 (0.051)	-0.020 (0.060)	-0.018 (0.073)	-0.061 (0.048)	-0.023 (0.056)	-0.018 (0.070)
Size	0.021** (0.009)	0.041*** (0.011)	0.001 (0.013)	0.027*** (0.009)	0.047*** (0.011)	0.000 (0.013)
BTM	0.007 (0.027)	0.019 (0.032)	0.012 (0.039)	0.011 (0.027)	0.025 (0.031)	0.006 (0.038)
Returnvol	-0.340 (0.508)	0.198 (0.594)	-0.230 (0.729)	-0.324 (0.517)	0.218 (0.599)	-0.156 (0.745)
EBITvol	1.365* (0.809)	0.778 (0.945)	2.275** (1.159)	1.251 (0.821)	0.650 (0.951)	2.118* (1.183)
Busiseg	-0.538 (0.480)	-1.113** (0.560)	0.095 (0.687)	-0.640 (0.481)	-1.158** (0.558)	-0.193 (0.694)
Geoseg	0.002 (0.069)	0.125 (0.080)	-0.030 (0.098)	-0.002 (0.068)	0.119 (0.079)	-0.055 (0.098)
Firmage	-0.034** (0.013)	-0.057*** (0.016)	-0.013 (0.019)	-0.037*** (0.013)	-0.058*** (0.015)	-0.022 (0.019)
AF	0.051*** (0.012)	0.043*** (0.014)	0.057*** (0.017)	0.057*** (0.012)	0.051*** (0.013)	0.062*** (0.017)
Constant	1.512 (1.031)	2.550** (1.205)	-0.032 (1.478)	1.673 (1.031)	2.561** (1.194)	0.702 (1.485)
Observations	3203	3203	3203	3385	3384	3385
R-squared	0.594	0.527	0.453	0.582	0.516	0.444
YEAR FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Notes: The table reports the moderation effect of Size on the association between tone and future EBIT described in Model (5). The dependent variable is *Tone* in Columns 1 and 4, *Tone_pres* in Columns 2 and 5, *Tone_Mdis* in Columns 3 and 6. All independent variables are defined in Appendix. All specifications include firm and year fixed effects. Standard errors are in parentheses.

*** $p < .01$.

** $p < .05$.

* $p < .1$.

downgrade their forecasts, perceiving this as a negative signal of reduced spontaneity. In columns (5) and (6), we find that the magnitude of analyst forecast revision alone is positively correlated to *Tone_Mdis*. We do not find similar results on the proportion of analyst forecast revision. This may be because managers have limited control over the discussion section owing to their spontaneity (Blau et al., 2015) and limits their ability to convey too much information.

In columns (1) to (3) of Table 5, analysts' tone mirrors *Tone*, *Tone_pres*, and *Tone_Mdis*, suggesting that analysts confirm the signal from managers and send their feedback with the same tone to indicate their approval. We replace various tone variables with *Tone_R*, *Tone_pres_R*, and *Tone_Mdis_R* to estimate models (2) and (3) again and draw similar results in the robustness tests in Section 5. This is

consistent with Milian and Smith (2017) which show that analysts use favourable language to praise managers' performance during a conference call (i.e. "good year" and "nice quarter"). Analysts' compliments are positively related to the firm's current performance, which demonstrates their unbiased attitude and objective confirmation or approval of the firm's performance. Overall, the regression results support the receiver interpretation and confirmation hypothesis. Analysts can understand the signal of managerial tone accurately by adjusting their forecasts and confirm it with their own tone.

In columns (1) to (3) of Table 6, there is a positive association between abnormal tone and forecast error which suggests that the abnormal tone could be a factor to affect the analysts' forecast error. Several moderator variables, including *All-star*, *Attend*, *Brokersize*, *Experience* and *Pre_accuracy*, represents the analysts' ability. From the results of columns (4)-(18), these variables can weaken the association indicating that some analysts with superior ability can better understand manager signals than others, resulting in a larger reduction in forecast error. These findings provide additional evidence to support the conclusion of Kirk et al. (2014) and Kim et al. (2019) that analysts' ability and experience contribute to a better understanding of a company's reporting practice. *All-star* and *Attend* have a weakening effect on three separate regression associations, namely *Ab_Tone* and *Error*, *Ab_Tone_pres* and *Error*, and *Ab_Tone_Mdis* and *Error*. *Brokersize* has a weakening effect on *Ab_Tone* and *Error*, as well as *Ab_tone_pres* and *Error*, and this weakening effect is slightly stronger than that of *Experience* and *Pre_accuracy*. This is consistent with Mayew et al. (2013) and Green et al. (2014), who find that analysts attending the conference call and asking questions can obtain more information to issue more timely and accurate earnings forecasts than non-participating analysts.

4.2.3. Hypothesis 3 – signalling environment moderation

We use firm size as a proxy for a firm's signalling environment (Bochkay et al., 2020). Larger firms are expected to have a good information environment and less information asymmetry. Table 7 shows a strong negative moderating effect of firm size on the signalling of *Tone* and *Tone_pres*. Firm size will reduce managers' signalling incentives, especially in the entire call and presentation section. We do not find similar evidence for the managers' discussion tone *Tone_Mdis*. Hypothesis 3 suggests that larger firms face greater disclosure regulation requirements and are more likely to appear in various other disclosure media (i.e. newspapers, financial press, social media, and analyst reports). Therefore, large firms may have less incentive to signal via conference calls than smaller firms. The tone used in the presentation primarily summarises current performance and future predictions, and this information might already be disclosed elsewhere before the conference call, particularly for larger firms. On the other hand, the discussion session involves spontaneous, less formal and unplanned interactions between managers and analysts, which are unique to conference calls (Bochkay et al., 2020) and less likely to be observed in other disclosure media. As a result, the signalling of managerial tone in presentation is more sensitive to firm size, while the signalling of managerial tone in the discussion sessions is less easily affected by the firm's size.

5. Robustness and endogeneity

For H1, the signal fit hypothesis, we replicate the primary test with alternative measures for tone and firm performance. We measure each of the above tone variables using a different formula as follows: $(\text{pos} - \text{neg})/\text{number of words}$, where “number of words” is the total word count included in the narrative section. We replaced new calculated tone variables $Tone_R$, $Tone_pres_R$ and $Tone_Mdis_R$ in Model (1) to test the relationship between tone and future EBIT ($EBIT_{nxtQ}$, $EBIT_{nxtY}$). The results in the online appendix Table A2 strongly support the signal fit hypothesis that managerial tone is positively associated with future firm performance. We used future pre-tax income ($Epretax_{nxtQ}$, $Epretax_{nxtY}$) and Return on Asset ($ROAnxtQ$, $ROAnxtY$), and whether the firm meets and beats average analyst forecast (MBE) and earnings surprise ($SURP$) as proxies of a firm’s performance and ran Model (1) again. The results are presented in the online appendix Tables A3, A4, and A5. A similar conclusion can be drawn from the robustness tests, namely that managers’ tone matches with future firm performance. For H2 analyst interpretation and confirmation hypothesis, we replaced tone variables with $Tone_R$, $Tone_pres_R$ and $Tone_Mdis_R$ in Models (2), (3) and (4) to show the results in the online appendix Table A6, Table A7, and columns (4) to (6) of Table 5. The robustness tests report that analysts revise their forecast following managerial tone in the call (Table A6) and analyst tone agrees with managers’ tone as confirmation (Table 5). Furthermore, abnormal tone can impact analysts’ forecast and analysts with superior ability can understand the tone more effectively leading to a larger reduction on the forecast error (Table A7).

To address endogeneity concerns in our regression analysis, we employ a two-stage least-square regression (2SLS) approach. We use the industry average values of the firm’s future EBIT and the industry mean value of managerial tone as instrument variables to identify the first-stage models for H1 and H2, respectively. In our endogeneity tests, we expect a strong positive correlation between the industry average $EBIT_{nxtQ}$ and our endogenous variable, the firm’s future EBIT ($EBIT_{nxtQ}$), validating the instrument variable’s suitability. In the endogeneity tests for Models (2), (3), and (4), the industry mean value of managerial tone, as well as abnormal tone, exhibit significant positive correlations with the corresponding endogenous variables. However, they were less likely to influence the firm-analyst level variables. The results from 2SLS are consistent with our main analysis, supporting and confirming our findings. Online appendix Tables A8 to A11 provide detailed results of the endogeneity tests.

6. Conclusion

We adopted the signalling framework from Connelly et al. (2011) to examine how managers and analysts interact through tone in conference calls. First, we demonstrated that tone matches the insider information it intends to convey. Managers have insider information that is unavailable to the audience, and they use tone to signal their expectations of a firm’s prospects. Firms expecting good (poor) performance use a more (less) optimistic tone. Managerial tone plays a crucial signalling role in conveying the firm’s prospects.

Second, we examined a more complete signalling process in conference calls by determining whether the analysts can interpret the signal correctly and confirm it through

feedback. We find that analysts may revise their forecast following managers' tone in a conference call, suggesting that analysts incorporate the signal (e.g. managerial tone) and develop the same expectations as managers. We also show that analysts' tone is positively related to managerial tone in the presentation and discussion sections of the call, suggesting that analysts will confirm and respond to managers with a consistent tone. Moreover, the abnormal tone, which represents the portion of managerial tone that does not align with future performance, could affect the analysts' evaluations. A larger disparity between tone and future performance can result in a larger forecast error for analysts. However, analysts who are recognised as all-stars, have more forecast experience, higher previous forecast accuracy, and work for larger brokerage firms, are better equipped to interpret the signalling of managerial tone than others. This can lead to a larger reduction in forecast error.

Third, we find that the signalling environment moderates managerial tone signalling. Larger firms have more disclosure regulation demand and greater exposure to other disclosure settings. Naturally, they also communicate more frequently with their audience. Thus, larger firms have less incentive to signal than smaller firms. Firms with a better (poor) information environment and less (more) information asymmetry will be less (more) likely to signal through tone.

Overall, our findings illustrate how the audience (e.g. analysts) pay attention to managerial tone in conference calls and use it as a channel of information for decision-making, aligning with informational motivation and signalling theory. However, a limitation of this research is the reliance on a limited sample in empirical tests, potentially affecting the findings' generalisability. These tests cannot rule out the possibility that analysts are sophisticated professionals who can form their own future expectations of a firm. Nonetheless, our study provides evidence that managerial tone in conference calls serves as a vital information interaction channels. Future research could explore the length and contents of the interaction between managers and analysts. For example, on a specific topic, did the analyst ask more original or follow up questions? Did managers provide longer or shorter responses? Additionally, investigating whether the topics in the presentation section are similar to those discussed in the discussion section of the conference call is essential. This can provide additional evidence that whether the interaction between managers and analysts indicating the connection or disconnection in the communication process. This endeavour may benefit from further support through textual analysis techniques such as topic modelling and similarity analysis.

Acknowledgements

The authors acknowledge the valuable comments and feedback of the editor, the associate editor and two anonymous reviewers. This paper is much improved because of their helpful and constructive comments.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix. Variable definition

	Tone Variable
Tone	Managers' net tone in the entire conference transcript, calculated as $(\text{pos} - \text{neg})/(\text{pos} + \text{neg})$
Tone_pres	Managers' net tone in the presentation section, calculated as $(\text{pos} - \text{neg})/(\text{pos} + \text{neg})$
Tone_Mdis	Managers' net tone in the discussion section, calculated as $(\text{pos} - \text{neg})/(\text{pos} + \text{neg})$
Tone_A	Analysts' net tone in discussion section, calculated as $(\text{pos} - \text{neg})/(\text{pos} + \text{neg})$
Tone_R	Managers' net tone in the entire conference transcript, calculated as $(\text{pos} - \text{neg})/\text{total}$, used for robustness analysis
Tone_pres_R	Managers' net tone in the presentation section, calculated as $(\text{pos} - \text{neg})/\text{total}$, used for robustness analysis
Tone_Mdis_R	Managers' net tone in the discussion section, calculated as $(\text{pos} - \text{neg})/\text{total}$, used for robustness analysis
Tone_A_R	Analysts' net tone in discussion section, calculated as $(\text{pos} - \text{neg})/\text{total}$, used for robustness analysis
Ab_Tone	Abnormal component of the Tone, calculated as the residue term from the model 1 (regressing Tone on the future performance)
Ab_Tone_pres	Abnormal component of the Tone_pres, calculated as the residue term from the model 1 (regressing Tone_pres on the future performance)
Ab_Tone_Mdis	Abnormal component of the Tone_Mdis, calculated as the residue term from the model 1 (regressing Tone_Mdis on the future performance)
Analyst Variable	
AFREV_Amount	Average analyst forecast revision, the mean analyst forecast of earnings per share (EPS) for quarter $t + 1$ for all forecasts issued within the 20-day window following the earnings call, less the mean analyst EPS forecast for quarter $t + 1$ directly before the quarter t earnings call, scaled by stock price at the beginning of quarter t multiplied with 100.
AFREV_Prop	The proportion of analyst revision amount. Using analyst forecast revision amount AFREV_Amount scaled by the mean analyst forecast of EPS for quarter $t + 1$ for all forecasts issued within the 20-day window before the earnings call.
Error	Analyst forecast error, the mean absolute difference between the forecasted earnings per share (EPS) for quarter $t + 1$ within the 20-day window following the earnings call and the actual EPS for quarter $t + 1$, scaled by the actual EPS for quarter $t + 1$.
Pre_accuracy	The absolute value of the analyst's forecast error for the firm's previous fiscal quarter, scaled by the stock price two trading days before the earnings announcement date. We multiply by -1 so a higher <i>Pre_accuracy</i> value indicates higher accuracy.
Experience	The ln value of the number of quarters for which the analyst has issued earnings forecasts for the firm before the current quarter.
Brokersize	The ln value of the number of analysts employed by the brokerage firm issuing earnings forecasts in the quarter.
All-star	A dummy variable that equals 1 if the analyst is named to the <i>Institutional Investor's</i> All-America Research Team, Developed Europe Research Team, Emerging Europe Middle East Africa Research Team, or UK small & Midcap Research Team in the past year before the forecast date, and 0 otherwise.
Attend	A dummy variable that equals 1 if the analyst personally attends the earning conference call in the quarter and speaks to ask a question or interact with managers in the Q&A session, and 0 otherwise.
Financial Variable	
EBIT	Quarterly earnings before interest and taxes (EBIT) scaled by total assets
EBITloss	A dummy variable that equals 1 if EBIT is less than 0, and 0 otherwise
EBITnxtQ	EBIT of next quarter
EBITnxtY	Average EBIT of next four quarters
Epretax	Quarterly pre-tax income scaled by total assets used for robustness analysis
EpretaxnxtQ	Epretax of next quarter
EpretaxnxtY	Average Epretax of next four quarters
ROA	Return on asset
ROAnxtQ	Return on asset of next quarter
ROAnxtY	Average ROA of next four quarters
MBE	An indicator variable equals to one if the firm meets for beats the average analyst forecast for a given quarter
SURP	The difference between quarterly EPS and the mean analyst forecast scaled by stock price at the beginning of the quarter.
Return	Contemporaneous stock return

(Continued)

Continued.

		Tone Variable
Control variable		
ACC	Accruals calculated as earnings minus cash flow from operations, scaled by total assets	
Size	The logarithm value of the market value of equity	
BTM	Book-to-market ratio calculated as total assets scaled by market value of equity plus total liability	
Busiseg	The logarithm value of 1 plus the number of business segments	
Geoseg	The logarithm value of 1 plus the number of geographical segments	
Firmage	The number of years since a firm appeared in the DataStream	
Returnvol	Stock return volatility calculated using past 12-month stock return data	
EBITvol	Standard deviation of EBIT calculated using past 5-year data	
Epretaxvol	Standard deviation of Epretax calculated using past 5-year data, used for robustness	
AF	The number of analysts following calculated as the logarithm value of total estimates number on the mean of earnings per share	

Notes: Tone variables are measured with texts in the earnings conference call collected through Thomson Reuters. Analyst forecast data is sourced from I/B/E/S. Analyst all star status is sourced from Institutional Investor. Financial variables and control variables come from DataStream.