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Information Inequality in Financial Markets

Jason V. Chen
University of Illinois

Venky Nagar
Stephen M. Ross School of Business
University of Michigan

Jordan Schoenfeld
University of Utah

UNIVERSITY OF MICHIGAN

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Jason V. Chen
U. of Illinois, Chicago
jchen19@uic.edu

Venky Nagar
University of Michigan
venky@umich.edu

Jordan Schoenfeld
University of Utah
j.schoenfeld@utah.edu

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Abstract

Public disclosures can level information inequality in financial markets by removing informed traders' advantage, or can exacerbate inequality by further increasing these traders' knowledge of the firm. This study finds evidence of the latter phenomenon in earnings conference calls, where management releases new information, and financial analysts on the call immediately respond and question management. The linguistic tone of analyst questions moves the stock price almost instantly in a manner that suggests that analyst assessment of management disclosures contains information not present in the disclosures themselves.

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1 Introduction

In both price-taking and price-setting models of rational financial markets with costly information, equilibrium prices cannot fully reflect traders' private information, yielding abnormal trading profits to those who have a comparative advantage over others at acquiring private information (Grossman and Stiglitz, 1980; Kyle, 1985). The U.S. Securities and Exchange Commission (SEC) therefore aims to improve the price system by making information cheaper for traders to obtain (in line with Conjectures 1-3 of Grossman and Stiglitz, 1980). Specifically, the SEC attempts to ensure that all investors "have access to certain basic facts about an investment prior to buying it" by mandating that public companies "disclose meaningful financial and other information to the public."[1] When such disclosures are noiseless and complete, all information asymmetry is indeed leveled. However, in more realistic markets with noisy prices and costly information, the equilibrium obtains only when informed traders cannot trade away all their private information (even by opening new markets), and so still have some residual private information (Grossman and Stiglitz, 1980, p. 404). When these traders receive noisy public disclosures, they can combine it with their private information to gain a further understanding of the firm; e.g., these informed traders can put two and two together in a manner that uniformed traders cannot (Kim and Verrecchia, 1994). Public disclosure thus creates heterogeneity in trader beliefs (Harris and Raviv, 1993), but in a manner that serves to tilt the playing field further in favor of informed traders, contrary to the SEC's goals. Consequently, there has been considerable research on the leveling impact of public disclosures in financial markets.

The main approach of this research is to examine how various empirical measures of adverse selection in the market for a firm's shares move when a firm makes a public disclosure (Krinsky and Lee, 1996; Holden and Jacobsen, 2014). The advantage of such measures is that one can study the patterns of information asymmetry among the entire population of the firm's traders without identifying the informed traders. However, Collin-Dufresne

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[1] See http://www.sec.gov/about/whatwedo.shtml.

and Fos (2015) show that these adverse selection measures perform poorly when matched to specific instances of trading by informed traders. The only measure that performs well is price itself, which rises somewhat when these informed traders secretly buy shares (in line with Conjectures 4 and 5 of Grossman and Stiglitz, 1980), and rises strongly when these trades are subsequently publicly announced. Applying the Collin-Dufresne and Fos (2015) results to a disclosure setting would suggest that a stronger empirical test of whether public disclosures further advantage already-informed capital market participants would need a setting where these participants' immediate assessments of the public disclosure can be observed and valued. This study conducts such a test.

Specifically, this study examines the stock market reaction to financial analyst comments and questions in earnings conference calls. These calls, which typically occur right after quarterly earnings announcements, are demonstrably important public disclosure events where management releases new information (Frankel et al., 1999; Matsumoto et al., 2011; Mayew and Venkatachalam, 2012).[2] On the call, management first summarizes the company's performance, and then immediately takes questions and comments from financial analysts. Investors are known to pay keen attention to analysts' views of the firm (Brav and Lehavy, 2003; Huang et al., 2014; Li et al., 2015), suggesting that they view these analysts as informed capital market participants who possess a superior understanding of the firm and its competitive prospects (Brown et al., 2015). Analyst questions and comments are therefore likely to represent an informed capital markets participant's live and immediate assessment of the information just presented.[3] If this analyst assessment is additionally informative, it should be immediately priced in rational markets. For example, when an analyst remarks "that is great news," the analyst assessment is likely positive. Therefore, if price reacts positively to a positive analyst remark (and negatively to a negative remark), it suggests

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[2]This is especially true in the post Regulation Fair Disclosure (Reg FD) era where management faces the risk of legal sanctions if it leaks material information on the call to select analysts beforehand.

[3]By contrast, an analyst's prepared report is typically released with some delay, and the possibility of correlated intervening events in the elapsed time implies that this report cannot be as clearly tied to a specific prior public disclosure.

that investors view analysts' assessment of the public disclosures as being additionally informative over and above the disclosures themselves. If other explanations for this result can be convincingly accounted for, one can conclude that already-informed capital market participants are further advantaged by receiving public disclosures.[4]

We identify analyst comments and questions from the transcripts of about 46,000 conference calls that occurred during the trading periods from 2002 to 2013 (post Reg FD era). To measure analyst tone, we use the Loughran and McDonald (2011) linguistic tone dictionary and identify the number of positive (i.e., optimistic) versus negative (i.e., pessimistic) words in each analyst question and comment. For example, if an analyst says "that is great news," we conjecture that the analyst has developed a more positive belief about firm value, and vice versa for a negative comment (see Appendix A for an example). By contrast, if no such statement is made, we conjecture that there was no change to analysts' beliefs. We measure analyst tone as the difference of positive to negative words scaled by the sum of positive and negative words. We validate our tone measure at the analyst level by showing that an individual analyst's tone predicts her future calls on the company; her tone does appear to reflect her underlying assessment of the firm. With this property of tone established, we next use it in our returns tests.[5]

We first find that prices react to management presentation and earnings news, suggesting that these disclosures are informative. We then find that prices react strongly to analyst tone during the Q&A portion of the call (which is when analysts are speaking) and also in the 30 minutes following the call. For a one standard deviation increase in analyst tone, abnormal

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[4]Analysts may also be superior processors of other company disclosures such as annual reports (or even reports of other analysts), but, unlike conference calls, it is difficult for us to measure their immediate reaction upon receiving these reports. A concurrent study by Brockman et al. (2015) also studies analyst assessment of the firm in conference calls, but as we describe in detail at the end of this section, there are substantial differences between our goals and research design and theirs.

[5]We motivate the use of this dictionary in Section 3.2.1. The idea that linguistic analysis of communication is informative is by no means new (e.g., Tetlock et al., 2008; Li, 2010). However, what is important to note is that, depending on its purpose, linguistic analysis of speech can take different forms: some analyses measure the occurrence of financial words (Matsumoto et al., 2011), while others look for self-attribution and other psychological traits of the speaker (Larcker and Zakolyukina, 2012). Our innovation is to use linguistic analysis not to measure the information content of management's disclosures, but to measure in real time the beliefs of capital market participants in response to the earnings disclosure.

returns increase by 0.031 percent during the Q&A portion of the call (1% level) and 0.036 percent (1% level) from the end of the Q&A to 30 minutes after that. These returns amount to about 1/3 of the total unsigned return for the discussion period. Note that rational traders will form expectations of forthcoming analyst tone based on prior information, and react to deviations from these expectations. Our analysis proxies for these expectations by using a rich set of regressors including measures of information just released by management, which we show are related to analyst tone, suggesting that analysts are responding to management disclosures, and not initiating an altogether unrelated information narrative. All our tests are within-firm, within-year-quarter analyses; so we do not have to account for persistent firm-specific factors such as the extent of manager-analyst agency problems in conference calls, or time-effects such as market-wide innovations in trading technologies, etc.

To conclude from the previous results that analysts are superior processors of public information in that their assessment of management disclosures contains information not present in the disclosures themselves, we must establish that analysts are reacting to management disclosures, and investors are reacting to analyst tone, and both parties are not reacting to correlated past events or future expected events. To do so, we must eliminate several alternative explanations. For example, the immediate price reaction to analyst tone could be the result of smart investors guessing what analysts are likely to say to their institutional clients, and then front-running these clients' trades. We control for such investor front-running by including future abnormal institutional trading as a regressor. It could also be the case that investors are sentiment-driven and not rationally news-driven. We show otherwise in our return reversal and other tests. Analysts likewise could be responding in real time not to managers' disclosures, but to stock price movements, sounding more optimistic as they see prices rise. We control for this possibility as well.

We then test the possibility that the price reaction is not related to the event itself but to some other correlated intervening event. This is a special concern for analyst tone tests using longer return windows, such as the daily returns employed by Brockman et al.

(2015). For example, our Figure 1 shows that additional analyst outputs, such as forecast and recommendation revisions, are released on the same day as the earnings call. Daily returns will incorporate the information content of these additional analyst outputs. We show that these output releases are correlated with analyst tone, raising the possibility that the daily returns are reacting not to the analyst tone on the call, but to other concurrent analyst releases, as already documented by studies such as Brav and Lehavy (2003). Additionally, Soltes (2014, p. 266) reports that analysts on the conference call can also have private phone calls with management immediately after the earnings call; the information gleaned in these private calls could find its way into analyst output releases and could drive the daily returns results.[6] If such private information is correlated with the analyst assessment of conference calls, it could improperly boost the significance of analyst tone in the daily returns tests. Our tight intraday return windows, by contrast, minimize several of these problems, because the earnings call and analysts' comments are ongoing in our time period.[7]

Another potentially correlated intervening event is the possibility that a positive analyst comment in itself signals a higher likelihood of subsequent private access to management, who could then take additional steps to consolidate and validate the analyst's already bullish beliefs (and such an analyst's bullishness could have more investor credence than management's bullishness). Smart investors would then trade on analyst comments, not because they reflect the analyst's judgment of management disclosures on the call, but because they signal post-call access to private information. In that case, even the shortest return window could not eliminate this effect. We therefore include as controls future revisions to analyst earnings forecasts, price targets, and stock recommendations up to 20 days after the call. Our intuition is that analysts' current and future acquisition of private information will

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[6]Although Reg FD (to the extent its enforcement has deterrence power) prohibits the private release of material information in such settings, an acute listener can learn much from the speaker's body language and other biological attributes, even if the speaker's words have no materially new content (Bushee et al., 2011).

[7]Analyst revisions of their other outputs could occur even during the conference call period. In Section 4.4, we re-run our main tests and find similar results after removing conference calls with analyst revisions occurring during or shortly after the call.

eventually enter into their other future outputs. Our main results obtain in these analyses, but at economic magnitudes that are slightly less than our initial tests. This procedure gives us confidence that the analyst tone coefficient in our returns regressions can be construed as arising from analysts' interpretation of management's disclosures, not their future private information acquisition activities.[8]

We note two important observations about our findings: first, we do not mean to imply that there is no substitution effect of public disclosures; all we document is that these disclosures can complement the information advantage of one class of capital market players, namely financial analysts. We make no statement about other classes of informed traders. Second, the market reaction to analyst tone does not imply that analysts' information advantage has fully entered prices. If analysts' perceptible reaction on the call paints an incomplete picture of their beliefs (the call is too compressed an event compared to a detailed analyst report), or if the market is comprised of risk-averse traders for whom processing analyst reactions is costly, the price will not be fully informative, and analysts will still continue to have an information advantage over price. Analysts may thus find it worthwhile to partly reveal their hand to the market in order to gain valuable insight about the firm. In fact, we show in Section 4 that the returns response to analyst tone is smaller than the response documented for other analyst outputs such as recommendations.

In their review of the analyst and disclosure literature, Beyer et al. (2010, Section 5.2.1) note that an important empirical question deserving more study is whether analyst following and disclosure practices are complements or substitutes. Our study provides an answer by showing that analysts' advantage in part arises from their ability to better process public disclosures. We extend Price et al. (2012), who find a 3-day price reaction to the tone of the entire Q&A conference call session but do not distinguish between analysts and management, and Brockman et al. (2015), who report a 2-day price reaction to both manager and analyst comments measured separately (they do not control for other analyst output released during

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[8]Accordingly, rational traders will also form expectations of future analyst behavior based on current management disclosures. As previously noted, we control for these expectations in our analyses.

that time period). However, as discussed previously, the long window return employed by Brockman et al. (2015) is not appropriate for our research question. Additionally, unlike this study, Brockman et al. (2015) do not use firm-fixed effects, making it harder to eliminate the possibility that some across-firm effects are driving their results. Brockman et al. (2015) also show that their long window returns effects are stronger for firms with more institutional investors, consistent with Soltes (2014), who reports that analysts contact their private clients and managers after the conference call. This result does not obtain in our tight-window returns tests, an expected outcome because the entire market can observe analysts' comments, not just institutional investors. Finally, Brockman et al. (2015) also do not conduct our individual analyst-level analysis that validate the variation in the tone measure.

Our results also speak to the open question in the literature of the sources of analyst expertise. While several studies document significant market reactions to analyst outputs (e.g., Brav and Lehavy, 2003; Huang et al., 2014; Li et al., 2015), others find that these outputs "piggyback" on concurrent information events, making it difficult to infer their true value (Altinkilic and Hansen, 2009; Loh and Stulz, 2010). We show that the tone of analyst comments on conference calls foreshadows their future revisions, thus providing a rationale for why some studies find analyst revisions to be "information free" events: the market has already partly anticipated these future revisions through analyst tone in the conference call. More importantly, by showing that analysts' advantage in part arises from their ability to better process public disclosures, we directly identify one source of analyst expertise.

Section 2 describes our conceptual framework for analyzing conference calls, Section 3 describes the data, and Section 4 describes the results. Section 5 concludes.

2 A Conceptual Framework for Analyzing Conference Calls

Our main assumptions are that management releases important information in earnings conference calls, and that analysts on the call are informed capital markets participants whose immediate assessment of management disclosures is evident in the way they immediately respond and question management.[9] The information content of management disclosure in conference calls is well established (Frankel et al., 1999; Matsumoto et al., 2011; Mayew and Venkatachalam, 2012). Likewise, analysts are known to be experts, not so much in limited roles as forecasters of earnings, but in their deep understanding of the firm and its future prospects (Brown et al., 2015). Investors also react significantly to analyst outputs (e.g., Brav and Lehavy, 2003; Huang et al., 2014; Li et al., 2015), indicating that analyst reports indeed contain new information. Nonetheless, to the extent analysts' private information cannot be completely traded away (and such trades are impossible in equilibrium in Grossman and Stiglitz, 1980), we can view analysts as players who still continue to retain some private information when they join the conference call.

A typical feature of analyst output like an analyst report is that it occurs with some delay after the management's earnings announcement, raising the possibility of correlated intervening events. For example, Soltes (2014) establishes that analysts have private contact with management before releasing their reports (see footnote 6). By contrast, analyst questions on the call happen immediately after management disclosure, so we have more confidence in tying the two events together. However, the ongoing relationship among management and analysts implies that virtually all key aspects of the conference call are endogenous choices that involve trade-offs. Management may want pliant analysts on the call, but may also find it advantageous to have independent but influential analysts who can attract a larger

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[9]One can point out that it is not analysts but their clients who trade, but a similar distinction can be made between the analyst division and the trading/execution desk of other informed traders such as a hedge fund. Such distinctions are void if there are no major agency problems between the analyst and his trader.

investor base. On the call, an analyst may not wish to reveal her hand by asking a crucial question, but will then miss the chance to get information from management (especially if that information is difficult to privately obtain from management due to Reg FD), and thus lose an opportunity to understand the firm better and make a more accurate stock pick.[10] The analyst may also choose to low-ball and praise management to curry favors, but likewise may then lose out career-wise to a more independent and accurate analyst who uses that opportunity to truthfully challenge and gain valuable insight from management and make a more accurate stock pick for his clients. Rational investors will likewise pay more attention to an analyst they believe is superior, even when she agrees with management, because such an endorsement reduces investor uncertainty about the firm's future. Accordingly, Brown et al. (2015) survey evidence suggests that analysts have to balance management relationships with client needs. In sum, while one can get carried away by second-best deviations and view the entire conference call as an elaborate posturing event between devious management and subservient analysts, our position, based on the studies cited previously and our evidence in Section 4, is that reputation considerations for management and analysts limit the scope of such second-best deviations, and genuine information is released and analyzed in conference calls. In any event, note that to the extent the second-best deviations are firm-specific, they should be accounted for by the use of firm fixed-effects in all our analyses.

Turning to the information itself, in theoretical models such as Kim and Verrecchia (1994), the public disclosure is a noisy signal of firm value, and privately informed traders, by virtue of being privately informed, receive an additional private signal on the noise in the public disclosure. However, the information exchanged in real conference calls is not a sequential realization of one-dimensional signals of firm value, but an open-ended back-and-forth conversation. It is therefore hard to directly map such a conversation to the information flow in theoretical models. For example, if an analyst asks a question on a topic

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[10]See Groysberg et al. (2011) on the importance of accurate stock picking for analyst compensation. Survey evidence by Brown et al. (2015) also suggests that analysts view industry expertise as central to their compensation.

that management did not allude to in its presentation, one can interpret it as an analyst just taking advantage of the conference call venue to satisfy her own information needs, irrespective of what management said. But our interpretation is that this is evidence of the analyst processing management disclosures—she believes management should have spoken on that topic, but did not.[11] In addition, as noted in the previous paragraph, any such conversation will have subtle group dynamics. There could be disagreements and shifting alliances, where analysts may change their minds based on the comments of other analysts, or may hesitate to openly take a contrarian questioning stance. These factors create additional obstacles to precisely mapping a natural sequential human conversation to the Kim and Verrecchia (1994) model.

The previous obstacles are faced by all studies that examine text or speech (e.g., Mayew and Venkatachalam, 2012). The main approach of these studies is to link the relevant textual construct to stock price, an approach we also follow. The advantage of stock price is that it enables us to partially disentangle competing theories of analyst motives. For example, as discussed previously, analyst tone correlation with management tone could arise as a sign of analyst pliancy or as a sign of genuinely informed endorsement. In rational markets, only when traders believe the latter explanation will prices move. We show that the market reacts in the short-run not just to management disclosures but also to the aggregate analyst tone on the call, and that this phenomenon most likely occurs because public disclosures are complements to analysts' private information.

We acknowledge that our approach of aggregating the tone of all the analysts on the call misses some of the subtle inter-group and individual dynamics on the call, e.g., the order in which all-star and other analysts speak, and the interrelations among their thoughts and opinions. However, we have no hypotheses on whether the market prices specific group dynamics more than others, nor do we have a hypothesis on whether the market prices the identity of a famous individual analyst (irrespective of her comments) more than an insightful

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[11]Management may speak about this topic in a future disclosure event (e.g., Chapman and Green, 2015), but these events occur too far into the future for our intraday research design.

comment by a less famous analyst. We therefore believe that our empirical design, which aggregates all these factors, serves our main purpose well (Section 3.2.1 builds on this point further). We motivate our measures and our empirical approach in more detail next.

3   Sample, Variable Definitions, and Descriptive Statistics

3.1   Sample

We obtain a sample of U.S. public company quarterly earnings conference call transcripts produced by Thomson Reuters from 2002 to 2013 (post Reg FD era) for which accompanying Compustat, CRSP, TAQ, and I/B/E/S data is also available. Table 1, Panel A provides the sample sizes for our empirical tests based on data availability.

Thomson Reuters quarterly earnings conference call transcripts have XML-friendly headers containing the date and starting time of the call, firm identifiers, and whether the call was related to an earnings announcement. XML tags also identify different segments of the call (e.g., presentation and discussion) and individuals like analysts and managers. We parse the text using a Perl script and require at least one manager and one analyst to be present in each call. We also match each individual analyst on the call to his or her earnings forecasts, price targets, and stock recommendations on I/B/E/S for the years 2002-2007.[12] Finally, for the returns tests, we exclude calls that begin during after-market and pre-market hours, because we have no immediate returns data for these calls (we ignore any ensuing selection bias effects). Our final sample is about 46,000 calls.

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[12]In 2008 I/B/E/S stopped providing their matching table for analyst names, banks, and their I/B/E/S identifiers. We therefore limit our individual analyst tests to the years 2002-2007. Also, because our matching process relies on analyst and broker names from the conference call transcripts, and because these names do not always perfectly align with the I/B/E/S matching database (due to misspellings, etc.), we cannot match every analyst to I/B/E/S.

3.2   Measures

The variables used in this study, along with their sources, are tabulated in Appendix B. Table 1, Panels B and C provide a full set of descriptive statistics, univariate statistics, winsorizing details (our results are not sensitive to winsorizing at the 1% and 99% levels), and the correlation matrix.

3.2.1   Analyst Tone Measure

We measure analysts' belief revisions using the analyst tone in the Q&A portion of the conference call. We use the Loughran and McDonald (2011) positive and negative word dictionaries to calculate tone.[13] There are many dictionaries that can be used to measure textual tone (e.g., Harvard IV-4 TagNeg H4N). Our motive for using the Loughran and McDonald (2011) dictionaries is that it is designed specifically to measure the optimism/pessimism tone of financial communications, which is exactly our setting. Other studies such as Matsumoto et al. (2011) have developed different dictionaries for financial communications, but for different goals such as identifying the information content of financially-oriented and forward-looking words. We show later that these information-based measures are substantially different than our tone-based belief measure.

On average, analysts speak a total of 1,181 words during the discussion portion in the sample of calls. In order to alleviate concerns about conference call length and scaling issues, we create one scaled measure for tone, using a measure similar to those employed in other studies (e.g., Tetlock et al., 2008; Li, 2010). We call this aggregate measure $ANALYST\ TONE$:

$$ANALYST\ TONE_{it} = \frac{(ANALYST\ POSITIVE_{it} - ANALYST\ NEGATIVE_{it})}{(ANALYST\ POSITIVE_{it} + ANALYST\ NEGATIVE_{it})} \quad (1)$$

For each firm i's conference call at time t, $ANALYST\ POSITIVE_{it}$ equals the number of positive words spoken by all the analysts on the call and $ANALYST\ NEGATIVE_{it}$

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[13]See http://www.nd.edu/~mcdonald/word_lists.html.

equals the number of negative words (according to our dictionary) spoken by all analysts on the call.[14] Appendix A provides examples of our tone measure.

We compute analyst tone at both the individual analyst level for each call and at the aggregate level over all analysts on the call. We use the aggregate measure for our returns tests, the reason for which is three-fold. First, analysts on the call are likely to be superior and thus comprise a homogeneous subset of all the analysts following the firm (Mayew et al., 2012). The market therefore is likely to react to all these analysts.[15] Second, we explicitly show that individual analyst tone measures predict subsequent changes in individual analyst outputs such as recommendations, suggesting that tone measures can be aggregated in the same way that other analyst outputs such as forecasts are aggregated in the literature.[16] Third, as we show next, we estimate various call lengths based on a multiple of the words spoken in the call. This method becomes more accurate as the number of words increase; so it works much better at the longer call-level time-period than the shorter individual-analyst-on-the-call level time-period.

Any measure that aggregates speech will be subject to aggregation problems. For example, a potential concern with our analyst tone measure is that it depends only on the number of positive and negative words, not on the total number of words spoken by the analyst. This aggregation property can induce across-firm heterogeneity (e.g., compare our Equation 1 with Tetlock et al., 2008's Equation 1). However, such heterogeneity is not a concern for any of our analyses, because all our returns analyses are conducted at the within-firm level, not across-firm level, and all our analyst tests are conducted at the analyst-firm level, through careful use of fixed effects.

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[14]We also count different tenses of the positive and negative words (e.g., "concerned" would count negative for "concern"). There is no call with no positive or negative words.

[15]Mayew (2008, p. 632) argues that although management would like to favor pliant analysts on the call, capital market pressures can force management to give airtime to good analysts. In addition, Groysberg et al. (2011) document that analysts have strong incentives to be competent and accurate. These considerations further justify our decision to aggregate all analysts on the call.

[16]We thus do not build an explicit empirical model of aggregate analyst tone; instead, our approach is to show that its variation is consistent with variation in analysts' belief revisions. We explicitly test for this consistency in Section 4.1.

In addition, our aggregation choice also raises institutional concerns, as noted in Section 2. For example, we are unable to capture subtle inter-analyst dynamics, or second-by-second market reaction to analyst words. We are also unable to conduct comparative statics on whether the market reacts more to some analysts than others. But this is not as severe an omission as it seems, for we do not have a clear hypothesis on the kinds of subtle inter-analyst dynamics the market is looking for, or the extent to which the market favors the importance of the analyst over what she says. Consequently, we believe that our procedure is a step forward in understanding analysts' superiority at processing public disclosures.

Finally, rational traders will react not to raw analyst tone, but to unexpected analyst tone. We explain in Section 4.2 as to how our multivariate regression design yields a measure of unexpected analyst tone.

3.2.2 Intraday Abnormal Returns

Our first set of return windows includes the following intraday times: the presentation portion of the call, the Q&A portion of the call, the 30 minutes after the call, and an additional 30 minutes after that. Our motivation for using 30-minute intervals comes from Tetlock et al. (2008, p. 1452), who conjecture that traders need 30 minutes to digest and trade on media-driven news.

We obtain the conference call start time from the conference call transcript and estimate the duration of various components of the call (e.g., presentation end time and Q&A end time) using the words-per-minute analysis from Matsumoto et al. (2011). Specifically, based on their sample (which is similar to ours), Matsumoto et al. (2011, p. 1392) compute duration assuming that 160 words are spoken per minute during the presentation, and 157 words are spoken per minute during the discussion. They also assume that (1) the start of the presentation occurs 116 seconds after the scheduled start time of the conference call, and (2) the beginning of the discussion starts 28 seconds after the end of the presentation. For return windows constructed in such a manner, we calculate intraday returns using the last

traded price just before the beginning of the intraday return window and the last traded price just before the end of the intraday return window. All intraday returns are net of the value weighted market return for the same window.

3.2.3   Other Analyst Outputs

We substantiate our individual analyst tone measure (i.e., tone is not a meaningless conversational sideshow) by showing that it translates to future revisions in individual analyst outputs such as earnings forecasts, price targets, and stock recommendations. We assume that 20 days from the conference call (day 0) provides enough time for analysts to make such revisions, and accordingly use day +20 as our date to measure future analyst outputs (e.g., Lys and Sohn, 1990; Kasznik and McNichols, 2002). We obtain EPS forecasts, stock recommendations, and price targets from I/B/E/S. We arrange the data at the analyst-level by matching analysts on the call to I/B/E/S using their name and brokerage house from the conference call transcript.[17] The three future outputs we measure are as follows:

Individual Analyst EPS Forecasts: We calculate the change in the analyst EPS forecast by comparing the analyst EPS forecast for the next quarter at the end of day +20 to the analyst EPS forecast for the current quarter at the end of day 0 (conference call day). Where there is no change, we code it as zero. This procedure thus yields a conservative analyst revision measure, because a significant portion of analysts make revisions on the call date (see Figure 1). Also note that the presence of analyst-firm fixed effects in our analyses implies that we are comparing within analyst-firm variation, not across analyst-firm variation; so the scaling parameter is not a crucial issue.

Individual Analyst Price Targets: We calculate the percentage change in the analyst price target by comparing the analyst price target for a firm's stock at the end of day +20 to the end of day 0. Where is there is no change, we code it as zero. As with the analyst EPS forecast measure, this procedure also yields a conservative analyst revision measure.

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[17]As noted before, this sample only includes calls through 2007. I/B/E/S stopped providing the analyst name to the I/B/E/S ID matching file after this point in time.

Individual Analyst Recommendation Level: We identify analyst upgrades and downgrades by comparing the analyst recommendation level for a firm's stock at the end of day +20 to the end of day 0. We code an upgrade as +1, a downgrade as −1, and no change as zero. We do not distinguish between different types of upgrades and downgrades. As with the previous two revision measures, this measure is also conservative.

3.2.4   Control Variables

We employ several control variables, all of which are described in Appendix B. We have taken care to ensure that our descriptive statistics in Table 1, Panel B match prior studies.

Our first set of control variables pertains to information released by the management:

Concurrent Management Tone Measures: We use management presentation and discussion tone to proxy for management's views, which may also be highly informative to investors. We calculate presentation tone using only words from the scripted presentation portion of the call, and similarly for the management discussion part. On average, and similar to Matsumoto et al. (2011), managers speak 2,408 words in the discussion portion of the call and 2,334 words in the presentation portion. Noting that our firm-fixed effect analyses only examine the within-firm variation, not across-firm variation in the data, we construct our management measure for firm i in quarter t as:

$$MGMT\ TONE_{it} = \frac{(CEO\ POS_{it} + CFO\ POS_{it}) - (CEO\ NEG_{it} + CFO\ NEG_{it})}{(CEO\ POS_{it} + CFO\ POS_{it}) + (CEO\ NEG_{it} + CFO\ NEG_{it})}, \quad (2)$$

where POS and NEG represent positive words and negative words from the Loughran and McDonald (2011) dictionaries, respectively.

Call Characteristics: Matsumoto et al. (2011) find that call length and management communication patterns are associated with firm value. We therefore control for the length of the presentation and the discussion.

Prior Firm Performance: We control for financial disclosures by including indicators for

whether the firm met the zero, prior quarter, and analyst consensus EPS benchmark. We also include the magnitude of any earnings surprise scaled by price and indicator variables for earnings surprises in the sample's top and bottom two scaled earning surprise deciles.[18]

Institutional Investor Shareholdings: We obtain institutional investor shareholdings data from the Thomson Reuters 13F filing database. The SEC requires investment managers with portfolios worth $100 million or more to file a quarterly summary of their equity positions in a 13F filing. Our measure for institutional investor shareholdings is the percentage of a firm's shares held by institutional investors; the average institutional ownership for a firm in our sample is 60%.

Past Returns Measures: We include past returns to control for factors such as momentum.[19] We include prior abnormal returns from $[-2, -1 \text{ day}]$, as well as prior abnormal intraday returns to control for this momentum effect. In our individual analyst tests we also control for $[-90, -1 \text{ day}]$ abnormal returns.

Abnormal Institutional Investor Trading: Astute traders may react to analyst tone in real time not because tone is fundamentally informative, but because it could predict analyst recommendations to institutional clients. To control for such front-running possibilities, we include abnormal institutional investor trading over days $[0, +1]$ as a control. We obtain daily institutional trading data from Ancerno, and construct a daily measure of abnormal institutional investor net buying in a manner similar to Irvine et al. (2006, Table 4), which is also similar to the measure used in Griffin et al. (2003).[20] We calculate abnormal institutional investor net buying for each firm i, AIB_{it}, at the conference call-firm level as follows: first,

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[18]The focus on earnings as the metric of financial information is standard in the empirical information literature for two reasons: first, more disaggregated financial items (such as provisions) may vary in importance across firms; earnings by contrast represent a common and important aggregate performance measure for all firms. Second, there exist well-studied measures of analysts' expected earnings, thus allowing one to compute earnings news.

[19]For example, Altinkilic and Hansen (2009) argue that such momentum effects could arise from pre-event news releases.

[20]This data set is the focus of several studies, including Irvine et al. (2006), who provide a detailed description of the data.

we take the net trading imbalance scaled by shares outstanding for the given day t:

$$R_{it} = \frac{Total\ Institutional\ Buys_{it} - Total\ Institutional\ Sells_{it}}{Shares\ Outstanding\ (in\ 1,000s)_{it}} \quad (3)$$

We then subtract the average daily net trading imbalance for that firm over a control period of $[-60, -20\ \text{days}]$ and $[+20, +60\ \text{days}]$. As an example, the calculation for day zero AIB for a given firm i is as follows:

$$AIB_{i,0} = R_{i,0} - \frac{1}{\#\ of\ trading\ days\ in\ [-20, -60]\ \&\ [+20, +60]} \left[\sum_{t=-60}^{-20} R_{it} + \sum_{t=20}^{60} R_{it} \right] \quad (4)$$

Information Measures: Since the ostensible goal of the analyst Q&A is to gain information from the management, we control for several information measures from the call using the Matsumoto et al. (2011) dictionaries for financial words and forward looking statements, which they find are associated with absolute excess returns. Our controls include the log of management and analyst financial words and forward looking words from the discussion and Q&A portions of the call. And, as mentioned before, we also include controls for presentation and Q&A length.

Fixed Effects: In the returns regressions, we use firm fixed effects and year-quarter of the call date fixed effects to control for firm effects such as the extent of firm-specific manager-analyst agency problems in conference calls, and time-effects such as market-wide innovations in trading technologies, etc. All our analyses are therefore within-firm and within-year-quarter. In the individual analyst regressions, we control for analyst-firm fixed effects to control for analyst-firm relationships, and also use time fixed effects. All standard errors are appropriately clustered.

4 Empirical Results

4.1 Individual Analyst Tone Findings

Given the high visibility of conference calls and the value relevance of the information exchanged in these calls (e.g., Mayew and Venkatachalam, 2012), we conjecture that the tone of analysts' questions, comments, and responses to management replies reveals their beliefs. However, since information in our setting does not literally take its analytical representation "firm value + noise" with known mean and variance, no theoretical model can validate that our analyst tone measure reflects beliefs. We must validate our measure empirically, which we do next.

We first link our analyst tone measure at the analyst-level to that analyst's future forecasts, price targets, and stock recommendation revisions. As described in Section 3.2.3, our future analyst revision measures are conservative, because a significant portion of analysts make revisions on the conference call date (see Figure 1), and we measure future revisions from the end of the call date. Our measurement strategy should bias against finding significance.

Table 2 documents how an individual analyst's tone predicts his or her respective revisions to the EPS forecast, price target, and stock recommendation level, all from the end of the conference call day to the end of day +20. We estimate our regressions with a rich set of controls, including analyst-firm fixed effects. These fixed effects should account for any analyst-firm pair heterogeneity or bias arising from factors such as analyst-management relationships that determine which analyst gets to be on the call (e.g., Mayew, 2008).

We expect and find that the coefficient on analyst tone is positive and significant for EPS forecasts (5% level) and price targets (1% level; 0.004 and 0.658, respectively). A one standard deviation increase in analyst tone increases the EPS forecast for the next quarter by 0.22 cents and the price target by 0.36% (compared to respective on average increases of

1 cent and 1%).[21]

For analyst recommendations, we find that a one standard deviation increase in analyst tone significantly increases the recommendation dependent variable by 0.011, i.e., the probability of an recommendation uptick significantly increases by 1.1 percent. This magnitude may appear small, until we recall that recommendation changes are not that common (only 8.6% of our observations have a recommendation change).[22] The previous results give us confidence that our analyst tone measure captures analyst belief revisions about firm value, especially in light of our conservative measurement of future analyst output revisions.

More important, given the strong value-relevance of analyst outputs such as targets and recommendations (Brav and Lehavy, 2003; Bradley et al., 2014), the previous result alleviates concerns that analyst tone on the call is a conversational sideshow not reflective of the analyst's true assessment of the firm. In fact, the variation in the analyst tone is an economically meaningful one. More interestingly, the explanatory power of the regressions is about 0.3, suggesting that the analyst tone, at least as we measure it, conveys a noisy picture of future analyst actions. Existence of such noise is essential to the model of Grossman and Stiglitz (1980); otherwise the analyst will not ask any questions for fear of losing his entire information advantage to the market. We next show how the tone arises from analysts reacting to management disclosure and how the market in turn reacts to this tone.

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[21]To allow us to better interpret the economic significance of our results, we use level changes in EPS forecasts; however, our results are similar in sign and statistical significance when we scale EPS by stock price at the quarter's fiscal end date. Also note that firm-fixed effects control for across-firm variation in EPS.

[22]Another feature of our recommendation analysis is that we use OLS, which assumes that the difference between 1 and 0 (upgrade vs. no change) is of the same economic magnitude as the difference between 0 and -1 (no change vs. downgrade). While this appears to be a reasonable assumption, we nonetheless replicate the recommendation analysis with ordered and multinomial logit regressions, and find significance for the analyst tone measure. However, econometric and computational limitations prevent us from including analyst-firm fixed effects in the logit regressions (Greene, 2004). We therefore do not tabulate these results.

4.2 The Association of Analyst Tone with Future Stock Returns and Alternative Explanations

We now show that analysts are reacting to management disclosures, and investors are reacting to analyst tone, i.e., the results are not being driven by correlated past events or future expected events. We then conclude that analysts gain further information advantage from the public information released by management.

We conduct this analysis at the call-level, by aggregating all analysts on a given call. This aggregation approach, justified in Section 3.2.2, elides over much of the interpersonal group dynamics and individual analyst variation in the call, but as we noted in Section 2, we have no particular hypotheses on how the market prices these phenomena, and our measurement approach cannot analyze returns accurately over very small time intervals. However, our use of firm and year-quarter fixed effects should control for across-firm and across-time heterogeneity (e.g., firm-specific agency problems in conference calls, and market-wide innovations in trading, etc.,) in these phenomena.

We first provide some descriptive statistics. The mean analyst discussion tone in Table 1, Panel B is -0.04, suggesting that analysts voice about 1 positive word for each negative word in a conference. This 1:1 mean ratio is consistent with the idea that firms in large and deep capital markets have to get good analysts on the call, as a result of which the average beliefs over many information events are neutral.[23] By comparison, the mean manager discussion tone is 0.11, and the mean manager presentation tone is 0.21. The higher mean relative to the analyst tone suggests, as expected, that management is systematically more bullish or positive about the firm's prospects.

The correlations between analyst tone and management presentation tone and management discussion tone are significant at 0.23 and 0.28 (Table 1, Panel C), suggesting that

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[23]Mayew (2008) finds that analysts participating in the conference call are more optimistic about the firm's prospects than nonparticipating analysts, but this relative comparison is not what we are portraying. We are portraying the mean level of participating analysts' belief changes. In fact, Mayew (2008, Section 6) acknowledges that it could be the nonparticipating analysts who are being irrational about the firm's prospects.

analysts are responding to management disclosures, and not initiating an altogether disconnected information event (recall that we have already shown in Table 2 that an analyst's tone is not a sideshow, but predicts her future calls on the company). We examine management-analyst correlation further in Table 3, where we regress aggregate analyst tone on the other covariates in Table 4, Panel A. Analyst tone is indeed significantly positively correlated with variables such as earnings news, management tone in the conference call, and presentation-period returns, as one would expect if analyst tone indeed responds to the news released in the call.

Observing analyst agreement with management sheds no light on whether the analyst is pliant, or is endorsing management actions from a superior information position about the firm's competitive prospects. If the latter is the likelier explanation, rational traders will view analyst agreement as complementing and accrediting management disclosures. Prices will then additionally move to analyst tone, as we show next. However, in order to conduct a price test with rational traders, we need a measure of traders' expectation of analyst tone. The leftover variation in the analyst tone in Table 3 can be viewed as capturing the unexpected component of analyst tone, and will drive the analyst tone results in Table 4, Panel A. That is, the analyst tone covariates in Tables 3 and 4 that occur before analyst speech will set up rational market expectations for the forthcoming analyst tone, only deviations from which will be rationally priced (we will show evidence of rational pricing shortly).

Table 4, Panel A provides results on intraday returns during the conference call. The first column in Table 4, Panel A presents the returns to management disclosures. Prices react significantly to management presentation tone and unexpected earnings news, corroborating prior studies that view conference calls as informative events (Matsumoto et al., 2011). The next column shows that during the Q&A portion of the call, prices react strongly to analyst tone: for a one standard deviation increase in analyst tone, abnormal returns significantly increase by 0.031 percent (1% level). The market is thus reacting not just to management disclosures but also to analysts' resulting belief revisions. This result obtains in conjunction

with an extensive set of controls, including management disclosures, momentum returns, and fixed effects. As noted previously, the residual variation in the analyst tone measure can be viewed as representing unexpected analyst tone. Furthermore, the presence of fixed effects ensures that the previous result is within-firm and within-year-quarter.

An immediate alternative explanation for our main result, based on Table 3, is that analysts are watching the stock price on the call and become more positive in their tone when they see positive stock price movements. One solution to eliminate this alternative explanation is suggested by Tetlock et al. (2008, p. 1452), who conjecture that traders need 30 minutes to digest and trade on media-driven news. So we look to returns in the 30-minute period after the conference call ends. A result in that subsequent window cannot be attributed to analyst tone responding to stock price movements. Table 4, Panel A presents the results. We find that analyst tone predicts abnormal returns for the window of [Q&A End, +30 minutes]: for a one standard deviation increase in analyst tone, abnormal returns increase by 0.036 percent (1% level), after controlling for past returns. Our results therefore cannot be entirely attributed to analysts responding to the stock price in real time.

To put the magnitude of our results in perspective, Matsumoto et al. (2011, Table 3) find that the average *unsigned abnormal* return for both the presentation and the discussion part of the conference call is 0.2 percent. A standard deviation in analyst tone can, over the [Q&A Beginning, Q&A End +30 minutes] period, explain about 1/3rd of the total unsigned return for the discussion period. But our result is still much smaller in magnitude compared to other analyst outputs such as recommendations: Bradley et al. (2014) find a 2 percent return to recommendation changes. The previous difference in magnitudes illustrates the nature of analyst tone: it is a timely but a compressed and incomplete measure of analyst beliefs, whereas an analyst recommendation or a report is a more detailed and thorough output. Recall that is also theoretically necessary for analyst tone to be noisy; otherwise, analysts will not reveal their hand.[24]

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[24]An alternative explanation for the substantial returns results for analyst recommendations is Loh and Stulz (2010), who find that these recommendations overlap with concurrent information events.

As noted previously, past returns can also be construed as proxies for expected analyst tone (people expect analysts to be more positive when the stock price has moved up during the management presentation). In particular, an interesting result in Table 4, Panel C, Column 1 is that the abnormal return in the presentation period is significantly associated with analyst tone, even though analysts have not spoken yet. This result suggests that active market participants form similar beliefs as analysts when listening to the management's presentation and trade accordingly, in the process setting up an expectation for the upcoming analyst tone. This result therefore not only suggests the presence of rational traders, but also justifies our construction of the measure of unexpected analyst tone in Table 4, Panel A by including covariates such as management disclosures on the call and past returns.

If traders truly respond to unexpected analyst tone, then measures of expectation of analyst tone should have a negative coefficient, because the unexpected, by definition, is actual less expected. By and large, management disclosure measures and past returns, which we use as proxies for the market expectation of analyst tone, have a negative sign in the latter columns in Table 4, Panel A, though the magnitudes are largely insignificant, except for presentation-period returns. There are some significant exceptions, one being the management tone, which is strongly positively significant in the second column. One conjecture is that the management presentation tone gets a renewed sense of credibility from the market after analysts speak.

The previous conjecture lends credence to one of our hypothesized alternatives for the association of intraday returns with analyst tone, namely that analyst comments could signal their propensity for acquiring new private information in the near future. For example, managers may reward bullish analysts only by fielding private requests for additional information after the call, where they further help these analysts consolidate their bullish beliefs (and this process could be more credible than management touting the firm directly to investors).[25] If smart investors interpret analyst comments this way and trade immediately

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[25]See footnote 6.

on this information, even the shortest return window could not eliminate this effect (which could be correlated with analyst tone). Since we cannot directly confirm that analysts' comments are not related to their propensity to acquire new private information after the call, we measure and explicitly control for revisions to their other outputs up to 20 days after the call. Our reasoning is that analysts' current and future acquisition of private information will eventually enter into their earnings forecasts, price targets, and stock recommendations for a firm. In the presence of such controls, analyst tone can be plausibly construed as analysts' interpretation of management's disclosures, not their future private information acquisition activities. In Table 4, Panel B, our main results for the Q&A portion of the call and the Q&A End to +30 minutes still obtain with the future analyst revision controls (1% level), but at economic magnitudes that are 16.8% and 12% less than our initial results from Table 4, Panel A, respectively. These results confirm that our main findings are not driven by expectations of analysts' future private information acquisition activities, further buttressing our inferences from Table 3 that analyst tone is responding to management disclosures. In this case, rational traders will also form expectations of future analyst behavior based on current management disclosures, expectations we control for in our analyses.

A second alternative explanation for the association of returns with analyst tone is front-running, i.e., smart investors trade on analyst tone not because tone is informative, but because it predicts future institutional trading based on analysts' future recommendation. Table 4, Panel A therefore includes current and future institutional abnormal trading over the days [0, +1] as a control. The significance of this regressor not only suggests that the front-running argument argument has merit, but also that our measure of institutional trading has the power to capture this phenomenon. Therefore, the incremental significance of analyst tone in the presence of the institutional trading regressor in Table 4, Panel A cannot be solely attributed to smart investors front-running institutional investors.[26]

We next demonstrate that our returns results are unlikely to be due to investor sentiment,

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[26]We acknowledge, but do not consider, other classes of investors against whom the smart investors could be front-running.

i.e., investors behaviorally reacting to old news. In that case, investor reaction to analyst tone in the subsequent periods occurs from that portion of the analyst tone variation that already reflects known information. As a first step, note that this information has to be such that it is not captured by the extensive set of analyst tone covariates in Table 4, Panel A, including past returns. An additional test is suggested by Tetlock (2007, p. 1142), who uses noise-trading models to argue that returns triggered by investor sentiment should reverse in the future as investor beliefs shift again toward fundamentals. We therefore follow Tetlock (2007)'s empirical lead and test for returns reversals in future periods.

For consistency with Table 4, Panel A, we measure the future in 30-minute intervals. Table 4, Panel C presents the results. For the three intervals we measure after the last period in Table 4, Panel A, we find that analyst tone is uniformly insignificant. These results suggest no evidence of return reversals.[27] Investors thus appear to view analysts as superior information processors of management disclosures.

Our main results thus establish analyst tone to be a different source of information to the market than management disclosures on the call. In asking their questions, analysts indeed reveal their hand to the market. Our underlying premise is that this revelation is not complete, in that analyst questions are too compressed and brief to give a full picture of analyst beliefs (the explanatory power of the regressions in Table 2 and the magnitude of the results in Table 4, Panel A provide evidence to support this assumption). Analysts are therefore willing to bear this cost to gain valuable insight about the firm. Our additional tests strengthen our inference from the main results that markets conceive of analysts as superior processors of management disclosures.

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[27]There are significant differences in the nature of the information event studied by Tetlock (2007) and this study; so we cannot execute his tests literally. For example, our interval duration, which we motivate using the argument in Tetlock et al. (2008, p. 1452), is different than Tetlock (2007)'s. Furthermore, between Table 4, Panels A and C, we use four future intervals, while Tetlock (2007) uses five. However, in unreported tests we find that the much longer window of daily returns is also positively correlated with analyst tone, providing further evidence of no reversals.

4.3 Robustness Checks and Additional Tests

We first test whether analyst EPS forecast, price target, and recommendation revisions occurring during or around the conference call time are driving our intraday return results. Figure 1 indicates that a majority of analyst outputs occur on the day of the conference call. In addition, Table 5 shows that some of these outputs occur during the call. We therefore eliminate calls that have concurrent analyst revisions in the hour windows of $[-8$ hours, -5 hours], $[-4$ hours, -1 hours], $[0$ hour, $+3$ hours], $[+4$ hours, $+7$ hours], where hour 0 is the conference call start time.[28] Table 6 reports the results after these eliminations. Analyst tone retains similar levels of economic and statistical significance even after removing the calls with concurrent revisions. These results provide assurance that our intraday return tests measure the analyst tone effect, and not the effect of a correlated concurrent revision.

Our final tests are comparative statics tests. First, we consider firms with more institutional investors, the natural clients of analysts. Second, we consider the amount of new information released in the call, as proxied by the magnitude of the earnings surprise. Third, we consider whether the analyst tone effect is affected by other management disclosures, as proxied by whether management provides quarterly earnings guidance. Two realities are possible for companies that provide guidance: it could be that there is in general more information for analysts to interpret, or that management guidance substitutes for analyst expertise on the call. We test if the analyst tone effect is more pronounced in firms with more institutional investors, when there is more new information to interpret, and when managers provide guidance. We add the appropriate interaction terms to Table 4, Panel A, but find no

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[28]We acknowledge that some intraday timestamps in I/B/E/S may be inaccurate. Bradley et al. (2014) find that recommendation timestamps cannot be corrected without manually checking each analyst report, and therefore we do not attempt to adjust the times. However, they find that in their limited sample timestamps are delayed on average by 2.4 hours. We thus use three-hour windows when eliminating calls with concurrent analyst revisions.

intraday results for any of the three cases.[29] Finally, we hypothesize that more liquid stocks price public disclosures faster, and check if the stock price reaction to analyst tone is more pronounced for liquid stocks. We break the sample into deciles by Amihud illiquidity and bid-ask spreads and find no across-decile differences for intraday returns. These results attest to the importance of using within-firm analyses to eliminate the possibility that across-firm effects such as the extent of agency problems in conference calls are driving our results (and likewise for time effects), and of choosing return windows that minimize the possibility of contamination through other information sources.

5   Conclusion

Well-functioning markets are central to resource allocation in modern economies. However, information inequality in financial markets can raise fears that select traders with private information will make large profits, and deter other people from entering these markets. One of the SEC's central tenets therefore is to level the information playing field by forcing firms to release informative public disclosures. From a theoretical standpoint though, public disclosures can substitute or complement traders' private information.[30] Our study suggests that the complementary aspect of public disclosures cannot be ignored as a theoretical curiosity. Specifically, we examine earnings conference calls, where analysts respond to management disclosures almost immediately, and find that the linguistic tone of financial analyst questions in earnings conference calls moves the stock price in a manner that suggests that the immediate analyst assessment of management disclosures contains information not present in the disclosures themselves. Our extensive set of tests suggests that

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[29]Brockman et al. (2015) include a multiplicative term for analyst tone and firm-level institutional investor holdings in their return tests, which unlike ours are long-window, and find that analyst tone effect is more pronounced in firms with higher institutional holdings. But they do not use firm-fixed effects, and therefore their result could arise from institutional investors' correlated (and unmodeled) stock selection strategies rather than institutions having a comparative advantage at interpreting analyst tone or direct access to analysts. We can, however, replicate Brockman et al. (2015)'s findings when we use long-window returns (the conference call-day daily abnormal returns) as the dependent variable.

[30]Note that in models such as Grossman and Stiglitz (1980, p. 404), traders can have private information in equilibrium; they cannot trade it all away, even by opening new markets.

a plausible inference for the main results is that public disclosures additionally advantage informed capital market participants such as analysts.

Public disclosure will be interpreted differently by traders with different prior beliefs who haven't yet had an opportunity to resolve their differences via trading (Harris and Raviv, 1993). Our study focuses on one such class of traders, namely privately informed analysts. We therefore cannot speak to the collective impact of conference calls on all classes of traders. Furthermore, the significant returns to analyst tone do not imply that prices fully incorporate analyst's private information; if analysts' reaction on the call paints a brief and incomplete picture of their beliefs, or if other risk-averse traders cannot process analyst tone in a cost-effective manner, prices will not be fully informative, and analysts will find it worthwhile to ask questions on the call because they will still continue to retain their information advantage over prices. The magnitudes of our returns results in Section 4 are certainly consistent with this hypothesis.

Our findings lead to the natural question of whether more public disclosure is welfare-improving. The theoretical answer to this question is ambiguous because a disclosure policy that increases information asymmetry in the market can cause Akerlof-lemons breakdown of financial markets, but on the other hand, an over-disclosure policy that reduces information asymmetry can cause Grossman-Stiglitz price breakdown of the market by deterring costly information collection by all parties (including the firm itself, which may withdraw from the market). The true answer is likely to be found only empirically.

References

Altinkilic, O., and R. Hansen, 2009, On the information role of stock recommendation revisions, *Journal of Accounting and Economics* 48, 17–36.

Beyer, A., D. Cohen, T. Lys, and B. Walther, 2010, The financial reporting environment: Review of the recent literature, *Journal of Accounting and Economics* 50, 296–343.

Bradley, D., J. Clarke, S. Lee, and C. Ornthanalai, 2014, Are Analysts' Recommendations Informative? Intraday Evidence on the Impact of Time Stamp Delays, *The Journal of Finance* 69, 645–673.

Brav, A., and R. Lehavy, 2003, An Empirical Analysis of Analysts' Target Prices: Short-term Informativeness and Long-term Dynamics, *The Journal of Finance* 58, 1933–1968.

Brockman, P., X. Li, and S. M. Price, 2015, Differences in Conference Call Tones: Managers versus Analysts, *Financial Analysts Journal* 1–19.

Brown, L., A. Call, M. Clement, and N. Sharp, 2015, Inside the "black box" of sell-side financial analysts, *Journal of Accounting Research* 53, 1–47.

Bushee, B., M. Jung, and G. Miller, 2011, Conference Presentations and the Disclosure Milieu, *Journal of Accounting Research* 49, 1163–1192.

Chapman, K., and J. Green, 2015, When Analysts Talk do Managers Listen?, *Working Paper* 1–50.

Collin-Dufresne, P., and V. Fos, 2015, Do Prices Reveal the Presence of Informed Trading?, *The Journal of Finance* 70, 1555–1582.

Frankel, R., M. Johnson, and D. Skinner, 1999, An Empirical Examination of Conference Calls as a Voluntary Disclosure Medium, *Journal of Accounting Research* 37, 133–150.

Greene, W., 2004, The behaviour of the maximum likelihood estimator of limited dependent variable models in the presence of fixed effects, *Econometrics Journal* 7, 98 – 119.

Griffin, J., J. Harris, and S. Topaloglu, 2003, The Dynamics of Institutional and Individual Trading, *The Journal of Finance* 58, 2285–2320.

Grossman, S., and J. Stiglitz, 1980, On the Impossibility of Informationally Efficient Markets, *American Economic Review* 70, 393–408.

Groysberg, B., P. Healy, and D. Maber, 2011, What Drives Sell-Side Analyst Compensation at High-Status Investment Banks?, *Journal of Accounting Research* 49, 969–1000.

Harris, M, and A Raviv, 1993, Differences of opinion make a horse race, *Review of Financial Studies* 6, 473–506.

Holden, C., and S. Jacobsen, 2014, Liquidity Measurement Problems in Fast, Competitive Markets: Expensive and Cheap Solutions, *The Journal of Finance* 69, 1747–1785.

Huang, A., A. Zang, and R. Zheng, 2014, Evidence on the Information Content of Text in Analyst Reports, *The Accounting Review* 89, 2151–2180.

Irvine, P., M. Lipson, and A. Puckett, 2006, Tipping, *Review of Financial Studies* 20, 741–768.

Kasznik, R., and M. McNichols, 2002, Does Meeting Expectations Matter? Evidence from Analyst Forecast Revisions and Share Prices, *Journal of Accounting Research* 40, 727–759.

Kim, O., and R. Verrecchia, 1994, Market liquidity and volume around earnings announcements, *Journal of Accounting and Economics* 17, 41–67.

Krinsky, I., and J. Lee, 1996, Earnings announcements and the components of the bid-ask spread, *The Journal of Finance* 51, 1523–1535.

Kyle, A., 1985, Continuous auctions and insider trading, *Econometrica* 53, 1315–1336.

Larcker, D., and A. Zakolyukina, 2012, Detecting Deceptive Discussions in Conference Calls, *Journal of Accounting Research* 50, 495–540.

Li, E., K. Ramesh, M. Shen, and J. Wu, 2015, Do Analyst Stock Recommendations Piggyback on Recent Corporate News? An Analysis of Regular-Hour and After-Hours Revisions, *Journal of Accounting Research* 53, 821 – 861.

Li, F., 2010, The Information Content of Forward-Looking Statements in Corporate Filings-A Naïve Bayesian Machine Learning Approach, *Journal of Accounting Research* 48, 1049–1102.

Loh, R., and R. Stulz, 2010, When are analyst recommendation changes influential?, *Review of Financial Studies* 24, 593–627.

Loughran, T., and B. McDonald, 2011, When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks, *The Journal of Finance* 66, 35–65.

Lys, T., and S. Sohn, 1990, The Association Between Revisions of Financial Analysts' Earnings Forecasts and Security-Price Changes, *Journal of Accounting and Economics* 13, 341–363.

Matsumoto, D., M. Pronk, and E. Roelofsen, 2011, What Makes Conference Calls Useful? The Information Content of Managers' Presentations and Analysts' Discussion Sessions, *The Accounting Review* 86, 1383–1414.

Mayew, W., 2008, Evidence of Management Discrimination Among Analysts during Earnings Conference Calls, *Journal of Accounting Research* 46, 627–659.

Mayew, W., N. Sharp, and M. Venkatachalam, 2012, Using earnings conference calls to identify analysts with superior private information, *Review of Accounting Studies* 18, 386–413.

Mayew, W., and M. Venkatachalam, 2012, The Power of Voice: Managerial Affective States and Future Firm Performance, *The Journal of Finance* 67, 1–44.

Price, S. M., J. Doran, D. Peterson, and B. Bliss, 2012, Earnings conference calls and stock returns: The incremental informativeness of textual tone, *Journal of Banking & Finance* 36, 992–1011.

Soltes, E., 2014, Private Interaction Between Firm Management and Sell-Side Analysts, *Journal of Accounting Research* 52, 245–272.

Tetlock, P., 2007, Giving Content to Investor Sentiment: The Role of Media in the Stock Market, *The Journal of Finance* LXII, 1139–1168.

Tetlock, P., M. Saar-Tsechansky, and S. Macskassy, 2008, More Than Words: Quantifying Language to Measure Firms' Fundamentals, *The Journal of Finance* 63, 1437–1467.

Appendix A
Sample of Analyst Comments from Earnings Conference Calls from 2002 to 2013

Analyst Comment	Call	Positive Words	Negative Words
"...the inside the regional mall stores were the ones that were ***problematic****. Can you break out the average weekly sales or confirm that and sort of give us a sense of that differential?"*	California Pizza Kitchen, Oct. 23, 2003	0	1
"Al, you've done a ***great*** *job of positioning the company to the future in terms of external changes...Take us through your growth parameters, growth focus; what do you think you can do?"*	H.B. Fuller Company, Sept. 24, 2003	1	0
"...in September of last year Citigroup ***successfully*** *tapped the yen market with the largest ever Samurai offering, issuing bonds in 5, 7, 10, 15, 20 and 30...Would Citigroup ever consider a 40-year yen issue?"*	Citigroup, Feb. 10, 2006	1	0
"We're all ***concerned about*** *a price war out here. If I do the math on the full year revenue guidance it sounds like you guys are expecting about 15% sequential growth in Q3 and Q4."*	Intel, April 19, 2006	0	1

The bolded/underlined words represent words in the Loughran and McDonald (2011) positive and negative tone dictionaries.

Variable Definitions

Variable*	Definition	Data Source
Tone and Returns Measures		
Analyst Q&A Tone$_{it}$	(Analyst Positive Words$_{it}$ - Analyst Negative Words$_{it}$) / (Analyst Positive Words$_{it}$ + Analyst Negative Words$_{it}$)	Thomson Reuters Call Transcript
Management Presentation Tone$_{it}$	(CEO & CFO Positive Words$_{it}$ - CEO & CFO Negative Words$_{it}$) / (CEO & CFO Positive Words$_{it}$ + CEO & CFO Negative Words$_{it}$)	Thomson Reuters Call Transcript
Management Q&A Tone$_{it}$	(CEO & CFO Positive Words$_{it}$ - CEO & CFO Negative Words$_{it}$) / (CEO & CFO Positive Words$_{it}$ + CEO & CFO Negative Words$_{it}$)	Thomson Reuters Call Transcript
TAQ Abnormal Returns$_{it}$	Holding period return from the start to the end of the time interval being measured, net of the value weighted market return over the same time	Trade and Quote (TAQ) Database
Individual Analyst Outputs for Analysts Matched from Conference Call Transcript		
Individual Δ EPS Forecast$_{ita}$	(Analyst EPS forecast for quarter t+1 measured at end of day +20 - Analyst EPS forecast for quarter t+1 measured at end of day 0), 0 if no change	I/B/E/S
Individual Δ Price Target$_{ita}$	(Stock price target at end of day +20 - Stock price target at end of day 0) / Stock price target at end of day 0, 0 if no change	I/B/E/S
Individual Δ Recommendation$_{ita}$	Indicator variable that equals 1 if analyst upgrades stock, -1 if analyst downgrades stock, and 0 for no recommendation change from end of day 0 to end of day +20 (we do not distinguish between different types of upgrades and downgrades)	I/B/E/S
Time-Varying Firm Variables		
Earnings Surprise$_{it}$	(Actual EPS$_{it}$ - Analyst consensus mean forecast EPS$_{it}$) / Stock price at fiscal quarter end date$_{it}$	I/B/E/S
Large Positive Surprise$_{it}$	Indicator that equals 1 if earnings surprise is in top 20% of sample earnings surprises$_{it}$	I/B/E/S
Large Negative Surprise$_{it}$	Indicator that equals 1 if earnings surprise is in bottom 20% of sample earnings surprises$_{it}$	I/B/E/S
Meet/Beat Analyst Forecast$_{it}$	Indicator that equals 1 if actual EPS equals or exceeds analyst consensus mean forecast EPS$_{it}$	I/B/E/S
Size$_{it}$	Log of Total Assets$_{it}$	Compustat
Market to Book$_{it}$	Market Value$_{it}$ / Book Value of Assets$_{it}$	Compustat, CRSP
ROA$_{it}$	Income Before Extraordinary Items$_{it}$ / Total Assets$_{it}$	Compustat
Log of Analyst Following$_{it}$	Log of outstanding analyst EPS forecasts at conference call date$_{it}$	I/B/E/S
S.D. of Analyst EPS Forecasts$_{it}$	Standard deviation of analyst EPS forecasts scaled by stock price on conference call date$_{it}$	I/B/E/S
Institutional Ownership$_{it}$	Percentage of common stock held by institutional 13F filers at fiscal quarter end date$_{it}$	Thomson Reuters 13F Holdings Database
Cumulative Abnormal Returns (CAR)$_{it}$	Firm returns from CRSP net of the value weighted market return	CRSP
Abnormal Institutional Trading$_{it}$	Abnormal daily institutional trading imbalance (net of control period; see section 2.2.4 for precise equations)	Ancerno
Conference Call Attribute Variables		
Log of Total Words$_{it}$	Log of total words spoken by CEO & CFO and analysts$_{it}$	Thomson Reuters Call Transcript
Log of Pres. Words$_{it}$	Log of total words spoken by CEO & CFO during presentation portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Mgmt. Q&A Words$_{it}$	Log of total words spoken by CEO & CFO during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Analyst Q&A Words$_{it}$	Log of total words spoken by analysts during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Mgmt. Pres. Fin. Words$_{it}$	Log of total financially oriented words (Matsumoto et al., 2011) spoken by CEO & CFO during presentation portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Mgmt. Q&A Fin. Words$_{it}$	Log of total financially oriented words (Matsumoto et al., 2011) spoken by CEO & CFO during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Analyst Q&A Fin. Words$_{it}$	Log of total financially oriented words (Matsumoto et al., 2011) spoken by analysts during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Mgmt. Pres. FLS$_{it}$	Log of total forward looking words (Matsumoto et al., 2011) spoken by CEO & CFO during presentation portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Mgmt. Q&A FLS$_{it}$	Log of total forward looking words (Matsumoto et al., 2011) spoken by CEO & CFO during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Log of Analyst Q&A FLS$_{it}$	Log of total forward looking words (Matsumoto et al., 2011) spoken by analysts during Q&A portion of call$_{it}$	Thomson Reuters Call Transcript
Morning Call$_{it}$	Indicator variable that equals 1 if call starts before noon EST, 0 otherwise	Thomson Reuters Call Transcript

* Balance sheet and income statement data are for the fiscal quarter that precedes the call date. Index it represents firm i's conference call for year-quarter t. Index a represents the individual analyst. Day 0 is the conference call day.

Table 1

Panel A: Sample Selection for Earnings Conference Calls from 2002 to 2013

Sample Selection for Individual Analyst Tests	
Earnings conference call transcripts extracted from Thomson from 2002 through 2013	186,069
Less foreign firms and calls missing Compustat, CRSP, and I/B/E/S data	(84,442)
Less calls we cannot match to analysts because they occur after 2007	(58,597)
Total calls for individual analyst tests	43,030
Number of analysts we successfully match to I/B/E/S based on name and bank from call transcript*	94,249
Sample Selection for Intraday Abnormal Return Tests	
Earnings conference call transcripts extracted from Thomson from 2002 through 2013	186,069
Less foreign firms and calls missing Compustat, CRSP, and I/B/E/S data	(84,442)
Less calls without TAQ data	(5,630)
Less calls occurring outside market hours	(49,556)
Less 6 observations for outliers in TAQ returns	(6)
Total calls for intraday TAQ analysis**	46,435

* The number of observations for the individual analyst tests in Table 3 vary based on whether the analyst issues an EPS forecast, price target, and stock recommendation. Analysts do not always provide all three of these.

** We follow Matsumoto et al. (2011) and: 1) define trading-hours calls to be those initiated from 9:30 AM EST to 2:30 PM EST; 2) define the call start time to be 116 seconds after the scheduled start time, which we obtain from the call transcript XML header; 3) estimate the length of the presentation assuming that 160 words are spoken per minute; 4) define the discussion start time to be 28 seconds after the end of the presentation; 5) estimate the length of the discussion assuming that 157 words are spoken per minute. All word counts come from the XML transcripts. Consistent with Matsumoto et al. (2011), who find that 39.6% of their sample firms always hold calls during trading hours, we find that 45.7% of our sample conference calls occur during trading hours.

Table 1

Panel B: Descriptive Statistics for Earnings Conference Calls from 2002-2013

#	Variable	n	Mean	S.D.	Min	25th %	Median	75th %	Max
Aggregate Call Tone Measures									
[1]	Analyst Q&A Tone$_{it}$	46,983	-0.04	0.27	-1.00	-0.22	-0.04	0.13	1.00
[2]	Management Presentation Tone$_{it}$	46,983	0.21	0.27	-1.00	0.04	0.23	0.40	1.00
[3]	Management Q&A Tone$_{it}$	46,983	0.11	0.27	-1.00	-0.06	0.12	0.29	1.00
Individual Call Tone Measures									
[4]	Individual Analyst Q&A Tone$_{ita}$	99,665	-0.05	0.55	-1.00	-0.40	0.00	0.33	1.00
Individual Analyst Output Measures									
[5]	Individual Δ EPS Forecast$_{ita}$	82,309	0.01	0.23	-0.96	-0.04	0.01	0.07	1.06
[6]	Individual %Δ Price Target$_{ita}$	87,841	0.01	0.11	-0.50	0.00	0.00	0.03	0.30
[7]	Individual Δ Recommendation$_{ita}$	80,101	0.00	0.29	-1.00	0.00	0.00	0.00	1.00
Intraday Abnormal Holding Period Returns (as a %)									
[8]	TAQ Abnormal Return [0, Presentation End]$_{it}$	46,435	0.01	1.30	-99.87	-0.31	0.00	0.32	22.38
[9]	TAQ Abnormal Return [Pres. End, Q&A End]$_{it}$	46,337	-0.01	1.41	-22.09	-0.39	0.00	0.37	23.54
[10]	TAQ Abnormal Return [Q&A End, +30 min.]$_{it}$	45,891	-0.01	1.44	-26.11	-0.45	-0.01	0.44	73.44
[11]	TAQ Abnormal Return [Q&A End +30, +60 min.]$_{it}$	45,233	-0.01	1.77	-30.94	-0.39	-0.01	0.37	27.28
[12]	TAQ Abnormal Return [Q&A End +60, +90 min.]$_{it}$	45,182	-0.01	1.35	-21.56	-0.29	-0.01	0.31	25.77
[13]	TAQ Abnormal Return [Q&A End +90, +120 min.]$_{it}$	44,684	0.00	1.11	-20.01	-0.25	0.00	0.25	23.91
Control Variables from Intraday Tests									
[14]	Earnings Surprise$_{it}$*	46,883	0.00	0.01	-0.11	0.00	0.00	0.00	0.05
[15]	Large Positive Surprise$_{it}$	46,883	0.18	0.38	0.00	0.00	0.00	0.00	1.00
[16]	Large Negative Surprise$_{it}$	46,883	0.20	0.40	0.00	0.00	0.00	0.00	1.00
[17]	Meet/Beat Analyst Forecast$_{it}$	46,883	0.67	0.47	0.00	0.00	1.00	1.00	1.00
[18]	Size$_{it}$	46,864	7.17	1.84	0.50	5.96	7.18	8.33	14.67
[19]	Market to Book$_{it}$	46,806	1.16	1.36	0.00	0.44	0.81	1.42	69.10
[20]	ROA$_{it}$	46,829	0.00	0.04	-0.26	0.00	0.01	0.02	0.09
[21]	Log of Analyst Following$_{it}$	46,883	1.42	0.96	0.00	0.69	1.61	2.20	3.66
[22]	Institutional Ownership$_{it}$	46,883	0.60	0.31	0.00	0.39	0.68	0.85	1.00
[23]	[−2, −1] Abnormal Returns$_{it}$	46,879	0.00	0.04	-0.61	-0.01	0.00	0.02	1.55
[24]	[0, +1] Abnormal Institutional Trading$_{it}$	46,450	-0.02	3.15	-11.72	-0.49	0.00	0.58	10.89
[25]	Log of Total Words$_{it}$	46,883	8.57	0.45	5.48	8.31	8.63	8.90	9.94
[26]	Log of Pres. Words$_{it}$	46,883	7.61	0.55	1.79	7.32	7.67	7.98	9.34
[27]	Log of Mgmt. Q&A Words$_{it}$	46,883	7.50	0.82	0.69	7.11	7.65	8.06	9.64
[28]	Log of Analyst Q&A Words$_{it}$	46,883	6.91	0.67	0.69	6.58	7.04	7.37	8.82
[29]	Log of Mgmt. Pres. Fin. Words$_{it}$	46,883	4.51	0.65	0.00	4.20	4.60	4.93	6.48
[30]	Log of Mgmt. Q&A Fin. Words$_{it}$	46,883	3.49	0.88	0.00	3.04	3.64	4.09	5.97
[31]	Log of Analyst Q&A Fin. Words$_{it}$	46,883	3.04	0.78	0.00	2.64	3.18	3.58	5.46
[32]	Log of Mgmt. Pres. FLS$_{it}$	46,883	3.30	0.62	0.00	2.94	3.37	3.71	5.07
[33]	Log of Mgmt. Q&A FLS$_{it}$	46,883	3.21	0.77	0.00	2.83	3.33	3.74	5.40
[34]	Log of Analyst Q&A FLS$_{it}$	46,883	2.67	0.63	0.00	2.30	2.77	3.09	4.37
[35]	Morning Call$_{it}$	46,883	0.82	0.38	0.00	1.00	1.00	1.00	1.00
Additional Control Variables Used in Individual Analyst Tests									
[36]	S.D. of Analyst EPS Forecasts$_{it}$	99,665	0.00	0.01	0.00	0.00	0.00	0.00	0.32
[37]	[-90, -1] Abnormal Returns$_{it}$	99,665	0.00	0.16	-0.87	-0.08	0.00	0.08	3.40

The index it represents firm i's conference call for year-quarter t. Index a represents the individual analyst. See Appendix B for variable definitions and Table 1, Panel A for TAQ timing definitions and sample selection criteria.

* Variable winsorized at the 1% and 99% level.

Table 1

Panel C: Subset of Pearson Correlations for Earnings Conference Calls from 2002-2013

Var.	# from Table 1	[1]	[2]	[3]	[8]	[9]	[10]
[1]	Analyst Q&A Tone$_{it}$	1.00					
[2]	Management Presentation Tone$_{it}$	0.23***	1.00				
[3]	Management Q&A Tone$_{it}$	0.28***	0.36***	1.00			
[8]	TAQ Return [0, Presentation End]$_{it}$	0.02***	0.02***	0.01**	1.00		
[9]	TAQ Return [Pres. End, Q&A End]$_{it}$	0.03***	0.01	0.01	0.02***	1.00	
[10]	TAQ Return [Q&A End, +30 min.]$_{it}$	0.02***	0.00	0.01	0.00	0.01	1.00

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. The index it represents firm i's conference call for year-quarter t. See Appendix B for variable definitions and Table 1, Panel A for TAQ timing definitions and sample selection criteria.

Table 2
Regressions of Future Individual Analyst Output Revisions on
Individiual Analyst Tone for Earnings Conference Calls from 2002 to 2007

Variable	Δ EPS Forecast Level$_{ita}$		% Δ Price Target$_{ita}$		Δ Recommendation$_{ita}$	
	coefficient	*t-stat*	*coefficient*	*t-stat*	*coefficient*	*t-stat*
Analyst Q&A Tone$_{ita}$	0.004**	(2.18)	0.658***	(8.12)	0.011***	(3.51)
Management Presentation Tone$_{it}$	0.012	(1.07)	3.544***	(8.65)	0.022**	(2.31)
Management Q&A Tone$_{it}$	0.018*	(1.75)	1.959***	(5.45)	0.021***	(2.69)
Earnings Disclosure Controls						
Earnings Surprise$_{it}$	2.870***	(5.41)	109.548***	(8.21)	0.617	(1.09)
Large Positive Surprise$_{it}$	0.000	(0.04)	1.327***	(9.14)	0.012**	(2.15)
Large Negative Surprise$_{it}$	-0.010	(-1.10)	-1.377***	(-6.04)	-0.018**	(-2.46)
Meet/Beat Analyst Forecast$_{it}$	0.014**	(2.61)	1.519***	(8.78)	-0.001	(-0.15)
Time-Varying Firm Controls						
Size$_{it}$	-0.028**	(-2.26)	-0.898	(-1.45)	-0.013	(-1.38)
Market to Book$_{it}$	0.011**	(2.77)	-0.012	(-0.07)	-0.006**	(-1.99)
ROA$_{it}$	-2.106***	(-9.82)	-10.095**	(-2.72)	-0.225***	(-2.61)
Log of Analyst Following$_{it}$	0.005	(0.60)	-0.044	(-0.29)	-0.005	(-1.06)
S.D. of Analyst EPS Forecasts$_{it}$	1.394	(1.12)	34.144***	(2.88)	0.068	(0.19)
Institutional Ownership$_{it}$	0.023**	(2.26)	-0.017	(-0.03)	-0.039**	(-2.16)
$[-2, -1]$ Abnormal Returns$_{it}$	-0.016	(-0.27)	18.303***	(8.92)	0.028	(0.53)
$[-90, -1]$ Abnormal Returns$_{it}$	0.054***	(4.25)	20.434***	(18.72)	-0.047***	(-4.39)
Conference Call Attribute Controls						
Log of Total Words$_{it}$	-0.054**	(-2.29)	-3.088***	(-5.05)	-0.017	(-0.79)
Log of Pres. Words$_{it}$	0.006	(0.31)	1.398***	(2.92)	-0.003	(-0.21)
Log of Mgmt. Q&A Words$_{it}$	0.020*	(1.88)	0.110	(0.35)	-0.001	(-0.05)
Log of Analyst Q&A Words$_{it}$	0.016*	(1.89)	-0.340	(-1.00)	-0.017	(-1.43)
Log of Mgmt. Pres. Fin. Words$_{it}$	-0.016*	(-1.91)	0.179	(0.89)	0.002	(0.27)
Log of Mgmt. Q&A Fin. Words$_{it}$	-0.006	(-0.85)	0.407**	(2.78)	0.004	(0.76)
Log of Analyst Q&A Fin. Words$_{it}$	-0.006	(-0.97)	-0.369**	(-2.78)	0.000	(0.04)
Log of Mgmt. Pres. FLS$_{it}$	-0.007	(-0.72)	-0.790***	(-4.38)	-0.003	(-0.44)
Log of Mgmt. Q&A FLS$_{it}$	0.001	(0.17)	0.216	(1.04)	0.003	(0.44)
Log of Analyst Q&A FLS$_{it}$	-0.003	(-0.27)	0.479*	(1.80)	0.009	(1.20)
Morning Call$_{it}$	0.010	(1.12)	0.106	(0.41)	0.000	(0.05)
Year-Quarter of the Call Date FE	Y		Y		Y	
Analyst-Firm Fixed Effects	Y		Y		Y	
Observations	82,309		87,841		80,101	
R-Squared	0.282		0.430		0.268	

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors are clustered by analyst-firm. The index it represents firm i's conference call for year-quarter t. Index a represents the individual analyst. See Appendix B for variable definitions and Table 1, Panel A for sample selection criteria.

Table 3
Regression of Aggregate Analyst Tone on Call Characteristics for Earnings Conference Calls from 2002 to 2013

Variable	Analyst Q&A Tone$_{it}$	
Tone Covariates	*coefficient*	*t-stat*
Management Presentation Tone$_{it}$	0.148***	(20.44)
Management Q&A Tone$_{it}$	0.231***	(32.52)
Past Returns		
[0, Presentation End] Abnormal Returns$_{it}$	0.003***	(2.98)
Earnings Disclosure Covariates		
Earnings Surprise$_{it}$	0.120	(0.91)
Large Positive Surprise$_{it}$	0.018***	(4.65)
Large Negative Surprise$_{it}$	-0.009*	(-1.81)
Meet/Beat Analyst Forecast$_{it}$	0.024***	(6.40)
Time-Varying Firm Covariates		
Size$_{it}$	0.010*	(1.87)
Market to Book$_{it}$	-0.003	(-1.29)
ROA$_{it}$	-0.052	(-0.91)
Log of Analyst Following$_{it}$	0.005	(1.36)
Institutional Ownership$_{it}$	0.019	(1.60)
[−2, −1] Abnormal Returns$_{it}$	0.086***	(2.60)
[0, +1] Abnormal Institutional Trading$_{it}$	0.001**	(2.06)
Conference Call Attribute Covariates		
Log of Pres. Words$_{it}$	-0.007	(-0.74)
Log of Mgmt. Pres. Fin. Words$_{it}$	0.014**	(2.48)
Log of Mgmt. Pres. FLS$_{it}$	-0.027***	(-4.47)
Morning Call$_{it}$	0.023***	(3.70)
Year-Quarter of the Call Date FE	Y	
Firm Fixed Effects	Y	
Observations	46,436	
Adjusted R-Squared	0.207	

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors are clustered by firm. The index it represents firm i's conference call for year-quarter t. See Appendix B for variable definitions and Table 1, Panel A for sample selection criteria.

Table 4
Panel A: Regressions of Intraday Abnormal Returns
on Aggregate Analyst Tone for Earnings Conference Calls from 2002 to 2013

Variable	Intraday Abnormal Return Window (as a %)					
	$[0, \text{Presentation End}]_{it}$		$[\text{Pres. End, Q\&A End}]_{it}$		$[\text{Q\&A End}, +30 \text{ min.}]_{it}$	
	coefficient	*t-stat*	*coefficient*	*t-stat*	*coefficient*	*t-stat*
Analyst Q&A Tone$_{it}$			0.113***	(4.05)	0.134***	(4.05)
Management Presentation Tone$_{it}$	0.056*	(1.88)	0.084**	(2.69)	-0.007	(-0.16)
Management Q&A Tone$_{it}$			0.002	(0.06)	0.012	(0.37)
[0, Presentation End] Abnormal Returns$_{it}$			-0.701***	(-3.85)	-0.100	(-1.19)
[Pres. End, Q&A End] Abnormal Returns$_{it}$					-0.004	(-0.33)
Earnings Disclosure Controls						
Earnings Surprise$_{it}$	0.587	(0.55)	2.462***	(3.13)	-0.718	(-0.62)
Large Positive Surprise$_{it}$	0.001	(0.04)	-0.027	(-1.20)	-0.002	(-0.07)
Large Negative Surprise$_{it}$	0.017	(0.85)	0.025	(0.97)	-0.023	(-0.88)
Meet/Beat Analyst Forecast$_{it}$	0.023*	(1.78)	-0.016	(-0.80)	-0.002	(-0.15)
Time-Varying Firm Controls						
Size$_{it}$	-0.008	(-0.33)	-0.017	(-0.42)	-0.003	(-0.11)
Market to Book$_{it}$	-0.006	(-0.54)	-0.006	(-0.49)	-0.040**	(-2.49)
ROA$_{it}$	-0.149	(-0.38)	-0.926**	(-2.68)	-0.544	(-0.84)
Log of Analyst Following$_{it}$	0.033	(1.77)	-0.003	(-0.13)	0.003	(0.23)
Institutional Ownership$_{it}$	-0.066	(-1.32)	-0.046	(-0.63)	-0.036	(-0.67)
$[-2, -1]$ Abnormal Returns$_{it}$	-1.007**	(-2.20)	-0.825**	(-2.26)	-0.746***	(-2.79)
$[0, +1]$ Abnormal Institutional Trading$_{it}$	0.011***	(4.36)	0.011***	(3.85)	0.014***	(5.10)
Conference Call Attribute Controls						
Log of Total Words$_{it}$			0.026	(0.42)	-0.024	(-0.30)
Log of Pres. Words$_{it}$	0.021	(0.58)	0.042	(0.72)	0.018	(0.32)
Log of Mgmt. Q&A Words$_{it}$			-0.018	(-0.79)	0.032	(0.98)
Log of Analyst Q&A Words$_{it}$			0.013	(0.38)	0.053	(1.34)
Log of Mgmt. Pres. Fin. Words$_{it}$	0.013	(0.62)	0.001	(0.05)	0.020	(0.54)
Log of Mgmt. Q&A Fin. Words$_{it}$			0.031	(1.57)	-0.019	(-0.93)
Log of Analyst Q&A Fin. Words$_{it}$			-0.025	(-1.40)	-0.028	(-0.97)
Log of Mgmt. Pres. FLS$_{it}$	-0.018	(-0.94)	-0.061*	(-1.91)	-0.030	(-1.36)
Log of Mgmt. Q&A FLS$_{it}$			-0.027	(-1.16)	0.004	(0.15)
Log of Analyst Q&A FLS$_{it}$			0.010	(0.51)	0.013	(0.39)
Morning Call$_{it}$	-0.049	(-1.37)	0.032	(1.66)	0.039	(1.35)
Year-Quarter of the Call Date FE	Y		Y		Y	
Firm Fixed Effects	Y		Y		Y	
Observations	46,436		46,337		45,891	
Adjusted R-Squared	0.033		0.035		0.032	

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors are clustered by calendar year-quarter. The index it represents firm i's conference call for year-quarter t. See Appendix B for variable definitions and Table 1, Panel A for TAQ timing definitions and sample selection critera.

Table 4
Panel B: Regressions from Panel A with Controls for Future Analyst Revisions

Variable	Intraday Abnormal Return Window (as a %)			
	[Pres. End, Q&A End]$_{it}$		[Q&A End, +30 min.]$_{it}$	
	coefficient	t-stat	coefficient	t-stat
Analyst Q&A Tone$_{it}$	0.094***	(3.60)	0.118***	(3.61)
Management Presentation Tone$_{it}$	0.060*	(1.94)	-0.030	(-0.69)
Management Q&A Tone$_{it}$	-0.004	(-0.14)	0.006	(0.19)
[0, Presentation End] Abnormal Returns$_{it}$	0.018	(0.95)	-0.006	(-0.55)
[Pres. End, Q&A End] Abnormal Returns$_{it}$			0.000	(0.94)
Day 0 to Day 20 Mean Consensus Analyst Revisions For All Analysts				
Δ EPS Forecast$_{it}$	0.000	(1.01)	-0.000	(-1.10)
% Δ Price Target$_{it}$	0.007***	(6.44)	0.007***	(10.56)
Δ Stock Recommendation$_{it}$	-0.006	(-0.38)	-0.016	(-0.95)
Earnings Disclosure Controls				
Earnings Surprise$_{it}$	2.256***	(2.80)	-0.834	(-0.71)
Large Positive Surprise$_{it}$	-0.041*	(-1.86)	-0.015	(-0.72)
Large Negative Surprise$_{it}$	0.031	(1.25)	-0.017	(-0.68)
Meet/Beat Analyst Forecast$_{it}$	-0.030	(-1.44)	-0.015	(-0.90)
Time-Varying Firm Controls				
Size$_{it}$	-0.006	(-0.14)	0.007	(0.25)
Market to Book$_{it}$	-0.006	(-0.49)	-0.039**	(-2.48)
ROA$_{it}$	-0.228	(-2.50)	-0.572	(-0.86)
Log of Analyst Following$_{it}$	0.000	(0.02)	0.007	(0.46)
Institutional Ownership$_{it}$	-0.042	(-0.59)	-0.032	(-0.61)
[-2, -1] Abnormal Returns$_{it}$	-0.961**	(-2.69)	-0.874***	(-3.19)
[0, +1] Abnormal Institutional Trading$_{it}$	0.010***	(3.72)	0.013***	(5.07)
Conference Call Attribute Controls				
Log of Total Words$_{it}$	0.033	(0.52)	-0.019	(-0.24)
Log of Pres. Words$_{it}$	0.044	(0.74)	0.019	(0.34)
Log of Mgmt. Q&A Words$_{it}$	-0.022	(-0.94)	0.030	(0.91)
Log of Analyst Q&A Words$_{it}$	0.013	(0.39)	0.054	(1.39)
Log of Mgmt. Pres. Fin. Words$_{it}$	-0.003	(-0.09)	0.016	(0.42)
Log of Mgmt. Q&A Fin. Words$_{it}$	0.032	(1.62)	-0.018	(-0.89)
Log of Analyst Q&A Fin. Words$_{it}$	-0.024	(-1.34)	-0.028	(-0.96)
Log of Mgmt. Pres. FLS$_{it}$	-0.058*	(-1.81)	-0.027	(-1.24)
Log of Mgmt. Q&A FLS$_{it}$	-0.026	(-1.17)	0.004	(0.15)
Log of Analyst Q&A FLS$_{it}$	0.010	(0.51)	0.012	(0.38)
Morning Call$_{it}$	0.030	(1.53)	0.037	(1.31)
Year-Quarter of the Call Date FE	Y		Y	
Firm Fixed Effects	Y		Y	
Observations	46,337		45,891	
Adjusted R-Squared	0.038		0.034	

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors are clustered by calendar year-quarter. The index it represents firm i's conference call for year-quarter t. See Appendix B for variable definitions and Table 1, Panel A for TAQ timing definitions and sample selection critera.

Table 4
Panel C: Regressions from Panel A for Additional Time Periods

Variable	Additional Intraday Abnormal Return Window (as a %)							
	[0, Presentation End]$_{it}$		**[Q&A End +30, +60]**$_{it}$		**[Q&A End +60, +90]**$_{it}$		**[Q&A End +90, +120]**$_{it}$	
	coefficient	t-stat	coefficient	t-stat	coefficient	t-stat	coefficient	t-stat
Analyst Q&A Tone$_{it}$	0.095***	(3.85)	0.040	(1.08)	0.031	(1.30)	0.015	(0.61)
Management Presentation Tone$_{it}$	0.034	(1.19)	0.087	(1.36)	0.034	(1.18)	-0.014	(-0.51)
Management Q&A Tone$_{it}$			0.072*	(1.84)	0.006	(0.38)	0.027	(1.25)
[0, Presentation End] Abnormal Returns$_{it}$			-0.031*	(-1.68)	0.004	(1.24)	0.007	(1.28)
[Pres. End, Q&A End] Abnormal Returns$_{it}$			-0.000	(-0.86)	0.002	(1.12)	-0.003	(-0.37)
[Q&A End, +30 min.] Abnormal Returns$_{it}$			-0.220	(-1.02)	0.001	(1.06)	-0.001	(-0.09)
[Q&A End +30, +60 min.] Abnormal Returns$_{it}$					-0.001	(-0.84)	0.002	(1.25)
[Q&A End +60, +90 min.] Abnormal Returns$_{it}$							-0.007	(-1.19)
Earnings Disclosure Controls								
Earnings Surprise$_{it}$	0.553	(0.51)	0.752	(0.62)	0.800	(0.98)	1.691*	(1.76)
Large Positive Surprise$_{it}$	-0.001	(-0.06)	0.057***	(2.91)	-0.005	(-0.42)	0.032	(1.39)
Large Negative Surprise$_{it}$	0.018	(0.91)	0.006	(0.21)	0.019	(0.97)	-0.019	(-1.55)
Meet/Beat Analyst Forecast$_{it}$	0.022	(1.65)	-0.009	(-0.45)	-0.006	(-0.53)	-0.012	(-1.06)
Time-Varying Firm Controls								
Size$_{it}$	-0.009	(-0.39)	-0.041	(-1.65)	0.033*	(1.70)	0.017	(0.99)
Market to Book$_{it}$	-0.007	(-0.65)	-0.035**	(-2.40)	-0.000	(-0.00)	-0.008	(-0.91)
ROA$_{it}$	-0.156	(-0.40)	0.887	(1.09)	0.202	(0.62)	-0.218	(-0.74)
Log of Analyst Following$_{it}$	0.029	(1.60)	-0.006	(-0.40)	-0.001	(-0.06)	-0.009	(-0.62)
Institutional Ownership$_{it}$	-0.068	(-1.37)	0.067	(1.15)	0.038	(1.18)	-0.055	(-1.23)
[−2, −1] Abnormal Returns$_{it}$	-1.016**	(-2.22)	-0.480	(-1.67)	-0.227	(-1.61)	-0.385*	(-1.98)
[0, +1] Abnormal Institutional Trading$_{it}$	0.011***	(4.36)	0.014***	(3.88)	0.006***	(2.97)	0.007***	(4.44)
Conference Call Attribute Controls								
Log of Total Words$_{it}$	-0.096*	(-1.76)	0.044	(0.59)	-0.013	(-0.29)	-0.017	(-0.33)
Log of Pres. Words$_{it}$	0.055	(1.50)	0.104	(1.42)	-0.038	(-1.31)	-0.046	(-1.02)
Log of Mgmt. Q&A Words$_{it}$	0.029	(0.83)	-0.003	(-0.11)	-0.003	(-0.13)	-0.015	(-0.74)
Log of Analyst Q&A Words$_{it}$	0.014	(0.38)	0.009	(0.30)	0.006	(0.22)	0.006	(0.24)
Log of Mgmt. Pres. Fin. Words$_{it}$	0.016	(0.75)	-0.061	(-1.25)	0.023	(1.14)	0.038*	(1.74)
Log of Mgmt. Q&A Fin. Words$_{it}$	-0.044**	(-2.68)	0.001	(0.06)	0.019	(1.51)	-0.008	(-0.57)
Log of Analyst Q&A Fin. Words$_{it}$	0.037	(1.59)	-0.016	(-0.72)	-0.007	(-0.61)	0.019	(1.17)
Log of Mgmt. Pres. FLS$_{it}$	-0.020	(-1.01)	0.004	(0.15)	0.014	(0.80)	0.017	(0.84)
Log of Mgmt. Q&A FLS$_{it}$	0.039	(1.26)	-0.048	(-1.03)	0.002	(0.10)	0.028	(1.31)
Log of Analyst Q&A FLS$_{it}$	0.001	(0.04)	0.019	(0.58)	-0.019	(-0.91)	-0.007	(-0.39)
Morning Call$_{it}$	-0.051	(-1.45)	-0.011	(-0.41)	0.031	(1.67)	-0.000	(-0.01)
Year-Quarter of the Call Date FE	Y		Y		Y		Y	
Firm Fixed Effects	Y		Y		Y		Y	
Observations	46,435		45,233		45,182		44,684	
Adjusted R-Squared	0.034		0.045		0.034		0.025	

*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Standard errors are clustered by calendar year-quarter. The index it represents firm i's conference call for year-quarter t. See Appendix B for variable definitions and Table 1, Panel A for TAQ timing definitions and sample selection critera.

Table 5
Hourly Breakdown of the Timing of Analyst EPS Forecast, Target Price, and Recommendation Revisions on the Earnings Conference Call Date from 2002 to 2013

This table reports the average percentage of a firm's analysts who revise their EPS forecasts, target prices, and stock recommendations during the hours around the conference call time (time 0).

Hour Relative to Conference Call (T = 0)	Percentage of Firm's Analyst Following		
	EPS Revision	Target Price Revision	Stock Recommendation Revision
-12	0.000%	0.001%	0.000%
-11	0.002%	0.002%	0.012%
-10	0.005%	0.007%	0.010%
-9	0.017%	0.021%	0.033%
-8	**0.253%**	**0.813%**	0.026%
-7	**0.314%**	**0.377%**	0.061%
-6	**0.223%**	**0.205%**	0.046%
-5	**0.266%**	**0.249%**	0.090%
-4	**0.491%**	**0.432%**	**0.566%**
-3	**1.243%**	**1.268%**	**1.168%**
-2	**2.462%**	**1.858%**	**1.147%**
-1	**3.729%**	**2.435%**	**1.229%**
0	**2.097%**	**1.148%**	**1.269%**
+1	**0.922%**	**0.519%**	**0.477%**
+2	**0.543%**	**0.297%**	**0.598%**
+3	**0.809%**	**0.507%**	**0.283%**
+4	**1.101%**	**0.736%**	**0.326%**
+5	**1.269%**	**0.912%**	0.125%
+6	**1.067%**	**0.772%**	**0.212%**
+7	**0.768%**	**0.498%**	0.083%
+8	**0.440%**	**0.296%**	0.000%
+9	**0.325%**	**0.216%**	0.031%
+10	**0.236%**	**0.161%**	0.000%
+11	**0.193%**	0.120%	0.011%
+12	**0.256%**	**0.216%**	0.045%

Bold indicates statistical significance at the 10% level. We obtain the conference call time from the transcript and the analyst revision time from I/B/E/S. See Appendix B for variable definitions and Table 1, Panel A for sample selection critera.

Table 6

Regressions of Intraday Abnormal Returns (from Table 4) on Aggregate Analyst Tone for Earnings Conference Calls from 2002 to 2013 Excluding Calls with Confounding Analyst Revisions

This table excludes conference calls that have a concurrent EPS forecast, target price, or recommendation revision during the window noted in the first column. We report the coefficient for analyst tone after re-estimating our regressions from Table 4 (including controls).
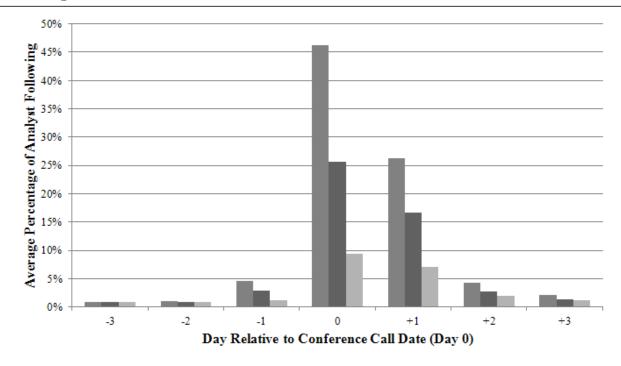
Hourly Window Relative to Conference Call (Hour 0)	n	[Pres. End, Q&A End] *Analyst tone coefficient*	[Q&A End, +30 min.] *Analyst tone coefficient*
Excluding [Hour -8, Hour -5]	45,117	0.1155***	0.1288***
Excluding [Hour -4, Hour -1]	44,686	0.1056***	0.1400***
Excluding [Hour 0, Hour +3]	43,120	0.1193***	0.1321***
Excluding [Hour +4, Hour +7]	44,868	0.1124***	0.1315***

$*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Standard errors are clustered by calendar year-quarter. Controls from Table 4 are included.

FIGURE 1
Analyst Earnings Forecast, Target Price, and Stock Recommendation Revisions Around Earnings Conference Calls from 2002 to 2013

This figure shows the on average percentage of a firm's analyst following that revise their EPS forecasts, target prices, and recommendations on the days leading up to and the days following the conference call date.