The crash alarm is ringing:
The predictability of earnings conference call tone for price crash risk

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Abstract

This paper investigates whether and how the linguistic tone of earnings conference calls predicts future stock price crash risk. Using a large sample of U.S. public firm earnings conference call transcripts from 2010 to 2015, we find strong evidence that firms face higher stock price crash risk in the coming year exhibit less optimistic tone during current year-end calls. The predictability of call tone for future crash risk is mainly driven by the manager tone and the Q&A section tone. Taken together, our results shed light on the predictive ability of corporate voluntary communication for future price crash risk.

Keywords: Price crash risk, Earnings conference calls, Linguistic tone, Textual analysis, Voluntary disclosure

JEL Classification: D80, G10, G12, G14, G30, M41

1. Introduction

This paper studies whether and how the linguistic tone of earnings conference calls predicts future stock price crash risk. Stock price crash risk captures the asymmetry of return distribution, especially the downside risk (Chen *et al.*, 2001; Hutton *et al.*, 2009). Given that extreme bad cases could lead to non-negligible losses for investors and that investors require a high risk premium for ex ante crash risk, predicting stock price crash risk is of great importance. Extant research has documented significant power of various factors in predicting crash risk, such as corporate governance quality, managerial characteristics and financial reporting attributes (Andreou *et al.*, 2017; Chen *et al.*, 2001; DeFond *et al.*, 2015; Hung and Qiao, 2017; Kim *et al.*, 2011b; Kim *et al.*, 2014; Kim *et al.*, 2016). However, there is insufficient evidence of how voluntary disclosure helps investors predict future crash risk (apart from Hamm *et al.*, 2016).

Earnings conference calls, as a timely platform for managers to directly communicate with investors, are one of the most important channels for voluntary disclosure. Prior research shows that these calls are informative market events (Brown *et al.*, 2004; Matsumoto *et al.*, 2011). Hence, it would be beneficial for capital market participants to identify and to protect themselves from future price crash risks using earnings call disclosure.

While quantitative financial information during conference calls only conveys a partial picture of firm performance and fundamental information, narrative financial information completes the picture (Arslan-Ayaydin *et al.*, 2016; Liu *et al.*, 2017; Price *et al.*, 2012). This paper focuses on the tone of earnings conference call, a subtle yet significant feature of narrative financial information. Extant research finds that the tone of earnings conference calls conveys useful information about firm performance. Davis *et al.* (2015) report that manager tone is significantly associated with three-day abnormal return of earnings calls, illustrating the short-term market reaction to call tone. Price *et al.* (2012) document that conference call tone

dominates earnings surprises over 60 trading days after the call. Add to the prior literature, we explore if call tone predicts extreme firm future stock price performance over a longer horizon. More specifically, we investigate whether call tone conveys forward-looking information that predicts stock price crash risk up to one year into the future.

The agency theoretic framework proposed by Jin and Myers (2006) states that price crash risk arises from the information asymmetry between corporate insiders and external stakeholders. Managers may delay the disclosure of bad news for various reasons. However, managers' ability to hoard bad news is limited. When they withhold bad information up to a certain threshold, bad information will be revealed to the market all at once, leading to stock price crash. Previous literature documents the relation between various corporate disclosure attributes and price crash risk. For example, Kim *et al*. (2014) find a negative relation between annual report readability and price crash risk. Hamm *et al*. (2016) find a positive relation between optimistic managerial earnings guidance and price crash risk.

Different from written disclosures, earnings conference calls contain spontaneous conversations between managers and call participants (i.e., analysts and investors) so that these calls can better reveal managers' natural linguistic style. Therefore, these calls provide a unique and interesting setting for our research question. We hypothesize that call tone predicts future price crash risk. According to the agency theory, managers have incentives to hoard bad news and may use earnings conference calls as an opportunity to inflate investors' impression on the firm. Accordingly, managers would exhibit overly optimistic tone, suggesting a positive relation between call tone and future crash risk. On the contrary, even if managers have tendency to hide bad news, they may involuntarily communicate bad news, because natural language contains emotion and sentiment in a subtle and even undiscoverable manner. In addition, since firms tend to attract increased attention and be under scrutiny when in bad situations, managers have strong incentives to warn investors about bad news to avoid potential

litigation and reputational costs (Davis *et al*., 2015). Accordingly, managers exhibit relative pessimistic tone during earnings conference calls, suggesting a negative relation between call tone and future price crash risk.

Empirical analyses show persistent results that earnings conference call tone is negatively associated with future crash risk, i.e., more pessimistic tone is associated with higher future crash risk. The unobservable time invariant omitted variables are controlled by firm fixed effects and we apply lead-lag regression to reduce potential reverse causality issue. Our main results are robust to alternative measures of earnings conference call tone as well as additional controls for short-term market reaction, other linguistic features of the call, managerial characteristics and corporate governance features. Further analyses find that the predictability of the question-and-answer (hereafter, the Q&A) section tone and manager tone are more pronounced, rather than the presentation section tone and other call participant tone. Results suggest that the Q&A section reveals firm conditions more truthfully due to interactions between managers and call participants, and that manager tone contains greater information content due to managers possess more information than call participants. In addition, subsample analyses indicate that the predictive ability of call tone is stronger for firms with lower risk, better information environment and better corporate governance quality.

The contribution of our study is twofold. First, we add to the literature on price crash risk by illustrating that the pessimistic tone of earnings conference calls predicts higher future price crash risk. To the best of our knowledge, we are the first to link firm-level future stock price crash risk to linguistic features of voluntary financial disclosure. Given that price crashes are major events that damage investor welfare, it is important to understand whether and how financial communication and disclosure predict such events. Second, we add to the extant financial disclosure literature by showing that conference call tone, a nuanced but important feature of financial communication, has great implications for the financial market. Prior

literature emphasizes the short-term market reaction associated with call tone. This paper fills the void of the literature by showing that earnings conference call tone conveys forward-looking component that is informative and has predictive ability even over a long horizon (i.e., future one year).

The remainder of the paper is organized as follows. Section 2 reviews the related literature and develops hypothesis. Section 3 explains data and empirical methods. Section 4 shows main results on whether and how earnings conference call tone predicts future price crash risk. Additional analyses on different call sections and speakers are presented in Section 5. Section 6 provides subsample analyses considering firms' bad news hoarding incentives. At last, Section 7 concludes.

2. Related literature and hypothesis development

2.1. Literature on price crash risk

Due to the importance of price crash risk, several streams of literature have investigated potential determinants of crash risk, including manager idiosyncratic characteristics (Kim *et al.*, 2016; Andreou *et al.*, 2017), the quality of corporate governance (Andreou *et al.*, 2016), external monitoring mechanism (Xu *et al.*, 2013; Xu *et al.*, 2016), as well as informal institutional mechanisms (Li *et al*., 2017).

Recent studies start to examine whether and how corporate financial disclosures predict stock price crash risk. Kim *et al.* (2011b) find that corporate tax avoidance predicts crash risk, suggesting aggressive tax strategies raise incentives for managers to hoard negative news and increase crash risk. DeFond *et al.* (2015) show that mandatory IFRS adoption affects crash risk of non-financial and financial firms in different ways. Mandatory IFRS adoption decreases non-financial firm crash risk as it increases disclosure transparency, whereas it does not affect

financial firm crash risk. Moreover, Kim *et al.* (2014) report that firms with better corporate social responsibility disclosures experience lower crash risk.

Since the 1990s, earnings conference calls have emerged to be an important channel for corporate voluntary disclosure (Bushee *et al.*, 2003). However, to the best of our knowledge, the potential usefulness of earnings conference call in predicting stock performance is tested over short horizons, and its power in predicting future one-year stock price crash risk remains unexplored. In this paper, we examine whether the tone of earnings conference calls contains relevant forward-looking information in predicting stock price crash risk.

2.2. Literature on earnings conference call tone

Prior research shows that conference calls are informative market events. Brown *et al.* (2004) show that earnings conference calls contribute to the long-term reductions in information asymmetry. As these calls contain immediate interaction between managers and call participants, linguistic features of these calls, including the tone, are informative to investors (Brockman *et al.*, 2015; Larcker and Zakolyukina, 2012; Price *et al.*, 2012).

There is a burgeoning body of research investigating the tone of earnings conference calls. The tone indicates how optimistic the language is, and can be measured by the use of positive and negative words (Davis *et al.*, 2015). Analyzing tone focuses on how information is disclosed, instead of what is disclosed (Price *et al.*, 2012). Evidence shows that such a subtle linguistic feature conveys information to financial markets above and beyond the content of discussions during earnings conference calls per se. Davis *et al.* (2015) report that cumulative abnormal returns of earnings conference calls are significantly correlated with the manager tone during these calls. Price *et al.* (2012) report that the tone has significant predictive power for abnormal returns and trading volume. Brockman *et al.* (2015) compare the tone of managers

and analysts during earnings conference calls, and document that managers exhibit more optimistic tone than analysts and that the market reacts more strongly to the analyst tone.

2.3. Predictive ability of earnings conference call tone for future price crash risk

As an important form of voluntary financial disclosure, earnings conference calls provide useful information to financial markets and reduce information asymmetry between managers and investors (Brown *et al*., 2004; Matsumoto *et al*., 2011). The tone of earnings conference calls reflects past, current and future situations of the firm. We therefore hypothesize that earnings conference call tone has predictive power for future price crash risk.

On the one hand, the credibility of voluntary financial disclosure has been widely questioned (Gu and Li, 2007; Stocken, 2000). According to the agency theory, managers have incentives to overstate performance by strategically concealing bad news and accelerating the release of good news (Kim and Zhang, 2016). In addition to corporate mandatory disclosure, managers may also use earnings conference calls as an opportunity to inflate investors' impression on the firm. They might be coached to exhibit overly optimistic tone during earnings conference calls to withhold negative news and create a positive image of the firm. As a result, earnings conference call tone would be positively associated with future price crash risk.

On the contrary, there are reasons that earnings conference call tone might be negatively associated with future price crash risks. First, comparing to annual report texts which could be deliberately prepared, conference call conservations are more spontaneous. Hence, the linguistic tone in conference call may represent unconscious behaviors and thought processes (Bloomfield, 2008). In other words, even if managers intend to hide bad news through managing contents of conference calls, their natural language might give them away. Second, rather than deliberately altering market's perception, managers use earnings conference call as

a platform to convey private information to the market (Matsumoto, 2002). When firms attract increasing attention and are under scrutiny due to their exposures to potential future price crashes, to avoid potential litigation and reputation risk, financial disclosures might become more credible and less obfuscating (Hamm *et al*., 2016). Rogers *et al*. (2011) find that the use of overly optimistic tone increases the likelihood of class action lawsuits. Also, Davis *et al.* (2015) argue that overly optimistic tone increases the likelihood of manager's reputation damage. As a result, conference call tone would be negatively associated with future price crash risk.

Accordingly, we posit our hypothesis (in null form) with no directional prediction:

H1. There is no association between earnings conference call tone and future price crash risk.

3. Data and methodology

3.1. Sample

Our sample is constructed using earnings conference call transcripts of U.S. public firms from Thomson Reuters Eikon. We focus on the 2010 - 2015 period to avoid potential confounding effects of the 2007 - 2008 financial crisis. Daily and monthly stock data are downloaded from CRSP. Accounting information is obtained from Compustat. Data on analyst forecasts are downloaded from I/B/E/S. During the sample period, we obtain 11,345 annual earnings conference call transcripts in English with available financial data.

Table 1 shows the sample composition across industry and year. Panel A shows sample distribution by industry. Our sample covers a wide range of industries. The number of firm-year observations from the "manufacturing" industry is the largest, contributing to 47.09% of the sample. Panel B presents sample distribution across years. The sample appears to be

relatively evenly distributed across years 2010 through 2015. The year 2011 has the largest number of observations (2,037 firms) and 2010 has the smallest (1,802 firms).

[Insert Table 1 here]

3.2. Model specification

To investigate whether the linguistic tone of earnings conference calls predicts future price crash risk, we use the following regression model in our empirical analysis:

$$CRASH\_RISK_{i,t} = \alpha + \sum_{k=1}^{M} \beta_k \, TONE_{i,t-1}^{k} + \sum_{j=1}^{N} \gamma_j CONTROL_{i,t-1}^{j} + Firm\ Fixed\ Effect + Year\ Fixed\ Effect + \varepsilon_{i,t} \quad (1)$$

In order to address potential endogeneity issues, we employ firm-fixed effects to reduce issues related to unobservable time-invariant omitted variables. The application of firm-fixed effects allows us to estimate the predictive power of tone on future price crash risk using within-firm variation. Year-fixed effects are also included to control macroeconomic shocks. In addition, we apply lead-lag regressions to reduce issues relate to the reverse causality.

$CRASH\_RISK$ is measured by different variables: $COUNT$, $NCSKEW$ and $DUVOL$. $TONE$ includes five measures of the tone of various sections and speakers of conference calls. $CONTROL$ includes control variables on investor belief heterogeneity, stock historical performance, firm characteristics, and accounting quality. Details of these variables are discussed in following subsections. The coefficient of interest in the model is β, which captures the predictability of earnings conference call tone for future price crash risk.

3.3. Measures of price crash risk

We follow Hutton *et al*. (2009) and Kim *et al*. (2011a) to measure stock price crash risk. Weekly returns for each firm and each fiscal year are used in estimating firm-specific weekly returns. First, we estimate the following regression model:

$$r_{i,t} = \alpha_i + \beta_{1i} r_{m,t-2} + \beta_{2i} r_{m,t-1} + \beta_{3i} r_{m,t} + \beta_{4i} r_{m,t+1} + \beta_{5i} r_{m,t+2} + \varepsilon_{i,t} \quad (2)$$

where $r_{i,t}$ is the return on stock i in week t, and $r_{m,t}$ is the return on the CRSP value-weighted market index in week t.[1] Lead and lag returns for the market index are included to allow for nonsynchronous trading. The residual term from the above regression model is used to calculate firm-specific weekly returns (W_{it}):

$$W_{i,t} = \ln(1 + \varepsilon_{i,t}) \quad (3)$$

Three measures, reflecting the asymmetry of firm-specific weekly returns, are used as proxies of the stock price crash risk. The first proxy $COUNT$ is based on the number of firm-specific weekly returns exceeding 3.20 standard deviations above and below the mean firm-specific weekly return over the fiscal year. $COUNT$ is the downside frequencies minus the upside frequencies. A higher value of $COUNT$ indicates a higher frequency of crashes.

The second proxy is the negative skewness of firm-specific weekly returns ($NCSKEW$). $NCSKEW$ is calculated as follow:

$$NCSKEW = -\frac{N(N-1)^{\frac{3}{2}} \sum W_{it}^3}{(N-1)(N-2)(\sum W_{it}^2)^{\frac{3}{2}}} \quad (4)$$

where N is the number of firm-specific weekly returns of firm i in a fiscal year. A higher value of $NCSKEW$ indicates a higher level of crash risk.

The last proxy measures the down-to-up volatility of firm-specific weekly returns ($DUVOL$). All weeks in a fiscal year are divided into two groups, down weeks with firm-specific weekly return below the annual mean and up weeks with firm-specific weekly return

[1] To estimate the regression model, a firm must have at least 26 weekly returns available in one fiscal year.

above the annual mean. $DUVOL$ is the natural logarithm of the ratio of the standard deviation of firm-specific weekly returns in down weeks to that in up weeks:

$$DUVOL = \ln\left(\frac{(N_U-1)\sum W_{i_D t}^2}{(N_D-1)\sum W_{i_U t}^2}\right) \quad (5)$$

where $W_{i_D t}/W_{i_U t}$ is firm i's firm-specific weekly return in a down/up week, and N_D/N_U is the number of down/up weeks in a fiscal year. A higher value of $DUVOL$ indicates that a stock is more "crash prone".

3.4. Measurement of tone

Our independent variable of interest is the tone of earnings conference calls, which is measured using the frequency of positive and negative words in year-end earnings conference call transcripts. A typical transcript contains: (1) firm and call information, (2) manager list, (3) call participant list, (4) the presentation section, and (5) the Q&A section.

We use a Python script to parse different sections of transcripts and construct our tone variables. Our tone measurement relies on the positive and negative wordlists in Loughran and McDonald Dictionary (hereafter, LM Dictionary).[2] We calculate the tone for the whole call ($TONE\_C$), the presentation section ($TONE\_P$), and the Q&A section ($TONE\_Q$) as the difference between the numbers of positive words and negative words scaled by the total number of words in the call or the specific section, respectively. We also calculate the manager (participant) tone, $TONE\_MAN$ ($TONE\_PAR$), as the difference between positive and negative words scaled by total words spoken by managers (call participants) during the Q&A section, respectively.

[2] The dictionary is available at: http://www3.nd.edu/~mcdonald/Word_Lists.html. In this paper, we use the March 2015 version of the dictionary. The LM Dictionary was specifically developed for studies on financial markets and it is one of the most widely-used and comprehensive dictionaries for tone measurement in financial documents.

3.5. Control variables

Following prior research on price crash risk (Andreou *et al*., 2016; Chen *et al*., 2001; DeFond *et al*., 2015; Hutton *et al*., 2009; Kim and Zhang, 2016; Kim *et al*., 2016), we include the following control variables in regression models. To control for investor belief heterogeneity, we include the detrended stock trading volume ($\Delta TURNOVER$) to measure the difference of opinions among investors. To capture the potential persistence of the third moment of stock returns and address concerns about dynamic endogeneity, we use the lag value of the negative skewness of past firm-specific stock returns ($NCSKEW$) as a control variable. Because stocks with higher past returns and stocks with higher volatilities have higher potential to experience crashes, the average and the standard deviation of firm-specific weekly return ($MEANFSRET$ and $STDFSRET$) over the previous year are included in the regression. In addition, earnings conference call discussions and tone could reflect firm fundamentals and historical performance. To control for firm performance and the discussion content of calls, various firm fundamental characteristics are considered: firm size ($SIZE$), which is the natural logarithm of a firm's market capitalization; market-to-book ratio (MTB); and financial leverage (LEV), which is the ratio of long-term debt to total assets; and return on assets (ROA). Finally, we include measures of accounting quality: financial reporting opacity ($OPAQUE$) and accounting conservatism (C_SCORE). $OPAQUE$ is the three-year moving sum of the absolute value of annual performance-adjusted discretionary accruals. Due to the documented nonlinear effect of financial reporting opacity on crash risk (Hutton *et al*., 2009), we include both $OPAQUE$ and its square ($OPAQUE\_SQ$) as additional control variables. C_SCORE is the firm-year conditional conservatism score. Appendix A provides definitions for all variables.

4. Empirical results

4.1. Descriptive statistics

Table 2 presents summary statistics of main variables in our study. Mean values of $COUNT$, $NCSKEW$, and $DUVOL$ are 0.014, 0.076, and 0.042, respectively. The average overall earnings conference call tone ($TONE\_C$) is 0.671. The mean value of $TONE\_P$ is 0.985, while $TONE\_Q$ has the mean of 0.417, suggesting that the tone of the presentation section is on average more optimistic than that of the Q&A section. Within the Q&A section, the mean value of $TONE\_MAN$ is 0.672, while that of $TONE\_PAR$ is -0.184, consistent with evidence in Brockman *et al*. (2015).

[Insert Table 2 here]

Table 3 presents the correlation matrix. Panel A shows that all three measures of stock price crash risk are highly positively correlated, indicating that these measurements capture common aspects of price crash risk. Panel B displays correlations between any two tone variables. As expected, all tone measures are positively correlated, but indicate distinguished linguistic style of different earnings conference call sections and speakers.

[Insert Table 3 here]

4.2. Future stock price crash risk and the tone of earnings conference call

Table 4 displays firm-fixed effect regression results of stock price crash risk on overall earnings conference call tone. In three columns, we use $COUNT$, $NCSKEW$ and $DUVOL$ as the dependent variable, respectively. Results show that, for all three stock price crash risk measures, the coefficient on $TONE\_C$ is negative and statistically significant at a 1% level. With respect to the economic significance, in model (1), the effect of one standard deviation (0.461) increase in $TONE\_C$ leads to $0.461 \times 0.095 = 0.0438$ decrease in $COUNT$. In model

(2), the coefficient on $TONE\_C$ is -0.178 with a t-statistic of -5.06, indicating that increasing $TONE\_C$ by one standard deviation (0.461) decreases $NCSKEW$ by $0.461 \times 0.178 = 0.082$. In model (3), the coefficient on $TONE\_C$ is -0.105 with a t-statistic of -4.77, and this indicates that one standard deviation increase in $TONE\_C$ leads to a decrease in $DUVOL$ by $0.461 \times 0.105 = 0.048$. Taken together, the predictive power of call tone for future price crash risk is both statistically and economically significant.[3] These results are consistent with our hypothesis that earnings conference call tone predicts future crash risk. Specifically, less optimistic tone of earnings conference calls predicts higher crash risk over the future one-year period.

[Insert Table 4 here]

Furthermore, it is crucial to control for the effect of word misclassification (Loughran and McDonald, 2016). Appendix B presents the 30 most frequent negative and positive words in our sample. Among 30 top negative words, words "question" and "questions" take up more than 25% of all negative word in our sample, and they are commonly used in a neutral way by analysts. For example, analysts usually start their questions with "I have a question on...". To ensure our results are not driven by the misclassification, we measure tone in two alternative ways: (1) using a term weighting scheme to reduce the impact of those two words; (2) excluding "question" and "questions" from the negative wordlist. Un-tabulated results confirm that a

[3] While firm-fixed effects regression controls for time invariant omitted factors, it fails to control the selection bias causing by time varying facts. To this end, we use propensity score matching approach with treatment group (control group) being conference call tone that is above (below) median. The treatment and control groups are matched to be as statistically alike as possible with covariates that are the same as controls in main regressions. The match firms using a nearest neighbor algorithm with caliper 0.01, no replacement and restrict results to common support. After matching, we still find a significant and negative association between conference call tone and price crash risk. Results are available upon request.

negative relationship between conference call tone and stock price crash risk still holds when using above two alternative measures.[4]

4.3. Future stock price crash risk and the residual tone

One limitation of our tone measure used in the previous subsection is that it contains both the discussions on past performance and forward-looking statements. Thus, our tone measure might mainly captures how managers and call participants discuss firm past performance, instead of future prospects. To mitigate such a concern and isolate the forward-looking information about managerial and investor perceptions for the future, we apply a residual tone measurement to proxy the unexpected optimistic or pessimistic component of tone that cannot be explained by past performance and firm fundamental characteristics (Huang *et al*., 2014; Borochin *et al*., 2017).

The residual tone is calculated from a cross-sectional regression of tone on firm current year performance and fundamentals. Following prior research (Huang *et al*., 2014; Borochin *et al*., 2017), our residual tone measurement is calculated as the residual term of the following regression:

$$TONE_{jt} = \alpha + \beta_1 EARN_{jt} + \beta_2 RET_{jt} + \beta_3 SIZE_{jt} + \beta_4 BTM_{jt} + \beta_5 STD_{RET\,jt} + \beta_6 STD_{EARN\,jt} + \beta_7 AGE_{jt} + \beta_8 BUSSEG_{jt} + \beta_9 GEOSEG_{jt} + \beta_{10} LOSS_{jt} + \beta_{11} \Delta EARN_{jt} + \beta_{12} AFE_{jt} + \beta_{13} AF_{jt} + \varepsilon_{jt} \quad (6)$$

We use residual tone to replace tone variables for robustness analysis. Results in Table 5 show that all our findings are robust to the residual tone measurement. Both levels and significance of coefficients on residual tone variables are comparable to our main results in

[4] Results are available upon request.

Subsection 4.2, confirming that the unexpected pessimistic component of tone predicts higher future price crash risk over a long-term horizon.

[Insert Table 5 here]

4.3. Additional Controls

To ensure the robustness of our main results, we re-estimate main regression models and control for additional factors.[5] First, we consider short-term market reaction to conference calls (Price *et al*., 2012; Davis *et al*., 2015). Following prior studies, we measure short-term market reaction using the cumulative abnormal return (CAR) over the three-day event window around the earnings conference call. Second, we consider other linguistic features of conference call communication that may affect the informativeness of qualitative disclosure: the length of the call, the use of uncertain words during the call, as well as script similarity between presentation and Q&A sections (Li, 2008; Lee, 2015; Dzieliński *et al*., 2017). Third, we consider executive characteristics, including age, overconfidence, and equity incentives (Andreou *et al.*, 2017; Kim *et al.*, 2011a; Kim *et al.*, 2016). Last, we consider corporate governance characteristics (Andreou *et al.*, 2016). We use three proxies to capture corporate governance quality: the board size, CEO duality (i.e., whether the CEO is the chairman) and percentage of outside directors.

Table 6 displays regression results. We find that $TONE\_C$ continues to have significant predictive ability even after considering additional variables, confirming the robustness of our main results. By and large, most effects of additional controls are consistent with priori literature.

[5] The number of sample observations varies depending on the data availability of additional controls.

[Insert Table 6 here]

5. Further analyses

5.1. Future stock price crash risk and the tone of different call sections

After confirming the predictive power of the conference call tone, we compare the predictability of two sections of earnings conference calls, the presentation section and the Q&A section. On the one hand, the Q&A section tone may have higher predictive power. Evidence shows that the Q&A section provides more information to the market because questions from call participants may make managers exhibit their true linguistic tone and opinions (Matsumoto *et al*., 2011; Price *et al*., 2012). The presentation section is typically carefully edited in advance and can be used by managers to strategically conceal negative news. On the other hand, although the tone of presentation can be carefully edited in advance, managers might not deliberately use overly optimistic language before price crashes because of the increasing scrutiny, litigation risk and potential loss of reputation (Davis *et al*., 2015; Rogers *et al*., 2011). Therefore, the tone of the presentation might also reflect the firm's situation truthfully and, hence, have comparable predictive power for price crashes to the Q&A section.

Panel A of Table 7 presents firm fixed effect regression results of future crash risk on the tone of different earnings conference call sections. Columns (1) to (3) display results of regressions using $COUNT$ as the dependent variable. Columns (1) and (2) show that coefficients on $TONE\_P$ and $TONE\_Q$ are negatively and significantly correlated with crash risk, respectively. Column (3) shows that the coefficient on $TONE\_Q$ is more significant than the one on $TONE\_P$, both statistically and economically. This indicates that the tone of the Q&A section is more relevant in predicting future stock price crash risk. Results are consistent when using $NCSKEW$ and $DUVOL$ as dependent variables.

Results in Panel A of Table 7 indicate that, the tone of both the presentation and the Q&A sections of earnings conference calls have significant predictive power for stock price crash risk over the future one-year period. The less optimistic the tone of either section, the higher the risk of stock price crash. Furthermore, the tone of the Q&A section has greater predictive power for future crash risk than that of the presentation section. The reason might be that the presentation section is carefully scripted in advance and provides managers an opportunity to strategically obfuscate bad news. However, during the Q&A section, because of questions from call participants, managers are pressured into revealing their natural linguistic style and, thus, true opinions on the firm's situation and outlook.

5.2. Future stock price crash risk and the tone of managers and participants

Next, we further shed light on what is the main driver of the predictability of the Q&A tone. Prior research shows that both manager tone and call participant tone convey useful information to financial markets (Brockman *et al*., 2015). However, for price crash risk, it is difficult to expect ex-ante which one has greater predictive power. On the one hand, manager tone may have greater predictability than participant tone for price crash risk. As managers possess private information, they are expected to know more about future crashes than call participants. Managers may choose to indicate negative future outlook through the use of pessimistic tone to reduce litigation risk and the potential damage to reputation (Davis *et al*., 2015; Rogers *et al*., 2011). On the other hand, participant tone may have greater predictability. Participants are mainly consist of analysts, and prior research shows that analysts' participation and their tone during earnings conference calls lead to stronger market reactions (Brockman *et al*., 2015; Matsumoto *et al*., 2011).

Panel B of Table 7 displays firm fixed effect regression results for future crash risk on the tone of managers and call participants in the Q&A section of earnings conference calls. In

general, results reveal that the coefficient on $TONE\_MAN$ is statistically and economically more significant than the one on $TONE\_PAR$. This suggests that, overall, both manager and call participant tone in the Q&A section of current annual earnings conference calls have significant predictive power for price crash risk in the future one-year period. Also, we find that manager tone in the Q&A section has greater predictive power than participant tone. These results are consistent with the argument that, in the Q&A section, managers tend to exhibit their natural linguistic tone and true opinion due to the pressure from call participants' questioning. As managers are corporate insiders and possess private information, their natural tone has more significant predictive power for future crash risk.

[Insert Table 7 here]

6. Subsample analyses

So far, results show that less optimistic tone of earnings conference calls predicts higher future price crash risk. In this section, we further investigate whether such a negative association between tone and price crash risk varies for firms in different subsamples.

6.1. Firm leverage

Firms with higher levels of leverage are riskier than unlevered firms since they are more likely to face significant potential bankruptcy costs. Thus, we investigate whether the risk of a firm, captured by leverage, affects the association between earnings conference call tone and future price crash risk. According to Kim *et al.* (2011a), managers of highly levered firms might have stronger incentives to hide their risk-taking behavior. On the contrary, for firms with lower levels of leverage, potential bankruptcy risk is lower and insiders of those firms have less incentive to hide news about firm risk-taking behavior. As a result, they convey

information more transparently and truthfully during earnings conference calls. Panel A of Table 8 re-estimates our main regressions for subsample firms with above- and below-median leverage. We find that, consistent with our conjecture, the predictive power of conference call tone for future crash risk is statistically more significant for the subsample of firms with lower levels of leverage.

[Insert Table 8 here]

6.2. Monitoring mechanisms

Monitoring may affect the relation between earnings conference call tone and future price crash risk through two different channels (Kim *et al.*, 2014). On the one hand, managers might convey more genuine information during conference call under more effective monitoring, leading to stronger predictive power of call tone for future price crash risk. On the other hand, better monitoring quality might prevent managers from hoarding bad news in the first place, leading to limited relation between conference call tone and future price crash risk. Therefore, we expect that firms under stronger monitoring mechanism exhibit a stronger relation between conference call tone and price crash risk. In this subsection, we use two proxies to capture monitoring quality: the number of analysts following and the percentage of outside directors.

Results in panels B and C of Table 8 are consistent with the view that effective monitoring stimulates firms to convey more useful and reliable information during conference calls that helps to predict future crash risk.

7. Conclusion

This paper investigates whether and how the tone of earnings conference calls predicts future stock price crash risk. We find strong and persistent evidence that the more pessimistic

tone of earnings conference calls predicts higher crash risk of the next year, indicating that the tone contains forward-looking component that is useful for investors. Results are robust to the use of alternative tone measures and the control of additional variables. Moreover, the tone of the Q&A section exhibits greater predictive ability than that of the presentation section, and that the tone of managers exhibits greater predictive ability than that of call participants. Subsample analyses suggest that the negative association between call tone and future price crash risk is stronger for firms with lower risk and better monitoring quality.

This study has implications for both scholars and practitioners. Stock price crashes impair managerial reputation, the credibility of corporate financial disclosure and investor confidence in the financial system. Recent studies show that price crash risk is associated with corporate financial disclosure behavior, including earnings management, corporate social responsibility disclosure, and biased earnings guidance. Our study extends this line of research and provides insight into how the tone of earnings conference calls can assist investors in predicting future price crash risk. An understanding of the relation between earnings conference call tone and future stock price crash risk is important and beneficial to not only investors but also other capital market participants.

Appendix A. Variable Definitions

Dependent variables: Price crash risk measures	
$COUNT$	The difference between the number of firm-specific weekly returns exceeding 3.20 standard deviations below the mean firm-specific weekly return over the fiscal year and the number of firm-specific weekly returns exceeding 3.20 standard deviations above the mean firm-specific weekly return.
$NCSKEW$	The negative skewness of firm-specific weekly returns during the fiscal year period.
$DUVOL$	The natural logarithm of the ratio of the standard deviation of firm-specific weekly returns for down weeks to that for up weeks. For a firm over a fiscal year period, down weeks are defined as all weeks with firm-specific weekly returns below the annual mean and up weeks are defined as all weeks with firm-specific weekly returns above the annual mean.
Test variables: Tone measures	
$TONE\_C$	Tone over a whole earnings conference call, which is the ratio of the difference between the number of positive words and the number of negative words to total number of words over the whole call.
$TONE\_P$	Tone over the presentation section of an earnings conference call, which is the ratio of the difference between the number of positive words and the number of negative words to total number of words during the presentation section.
$TONE\_Q$	Tone over the Q&A section of an earnings conference call, which is the ratio of the difference between the number of positive words and the number of negative words to total number of words during the Q&A section.
$TONE\_MAN$	Tone of managers during an earnings conference call, which is the ratio of the difference between the number of positive words and the number of negative words to total number of words spoken by managers during a call.
$TONE\_PAR$	Tone of participants during an earnings conference call, which is the ratio of the difference between the number of positive words and the number of negative words to total number of words spoken by participants during a call.
RE_TONE_C	The residual term of a cross-sectional regression of tone on firm current year performance and fundamentals.
Control variables	
$\Delta TURNOVER$	Change in average monthly stock turnover compared to the previous fiscal year. The monthly stock turnover is defined as the ratio of monthly trading volume to average number of share outstanding.
$MEANFSRET$	The mean of firm-specific weekly returns during one fiscal year.
$STDFSRET$	The standard deviation of firm-specific weekly returns during one fiscal year.
$SIZE$	The natural logarithm of a firm's market capitalization at the end of one fiscal year.
MTB	The ratio of market value of equity to book value.
LEV	The ratio of long-term debt to total assets.

ROA	The return on assets, which is the ratio of income before extraordinary items to closing total assets.
$OPAQUE$	The previous three years' moving sum of the absolute value of annual performance-adjusted discretionary accruals, where the discretionary accruals are estimated following Kothari et al. (2005).
$OPAQUE\_SQ$	The square of $OPAQUE$.
C_SCORE	The conservatism score estimated following Khan and Watts (2009).

Variables for residual tone calculation

$EARN$	The ratio of earnings before extraordinary items to beginning total assets.
RET	Contemporaneous annual stock returns calculated using CRSP monthly return data.
$SIZE$	The natural logarithm of the market capitalization at the end of one fiscal year.
BTM	Book-to-market ratio at the end of one fiscal year.
STD_RET	The standard deviation of monthly stock return over one fiscal year.
STD_EARN	The standard deviation of $EARN$ over the previous five years.
AGE	The natural logarithm of one plus age from the first year the firm entered the CRSP dataset.
$BUSSEG$	The natural logarithm of one plus the number of business segments. If the data is missing from Compustat, $BUSSEG$ is set to be one.
$GEOSEG$	The natural logarithm of one plus the number of geographic segments. If the data is missing from Compustat, $GEOSEG$ is set to be one.
$LOSS$	A dummy variable which equals to 1 when $EARN$ is negative, and 0 otherwise.
$\Delta EARN$	The first difference of $EARN$.
AFE	Analyst forecast error, which is IBES earnings per share minus the median of the most recent analysts' forecasts divided by stock price per share at the end of the fiscal year.
AF	Analyst consensus forecast for one-year-ahead earnings per share divided by stock price per share at the end of the fiscal year.

Additional control variables

CAR	The cumulative abnormal return for the three-day window (-1, +1) around the earnings conference call date.
$CALL\_LENGTH$	The log of the number of words spoken by mangers in the earnings conference call.
MAN_UNCER	The number of uncertain words spoken by managers in the earnings conference call, scaled by the number of words by managers. The uncertainty wordlist in Loughran and McDonald Dictionary is used to measure uncertain words.
$PART\_UNCER$	The number of uncertain words spoken by analysts in the earnings conference call, scaled by the number of words by analysts. The uncertainty wordlist in Loughran and McDonald Dictionary is used to measure uncertain words.
$SCRIPT$	The length-adjusted cosine similarity measuring script similarity of manager language between the presentation and Q&A sections.
CEO_AGE	The age of CEO.
CFO_AGE	The age of CFO.

CEO_OC	A dummy variable which equals 1 beginning the first time the CEO holds options that are more than 100 percent in the money, and exhibit at least twice of such behavior during sample period. Calculation follows Campbell et al. (2011).
CFO_OC	A dummy variable which equals 1 beginning the first time the CFO holds options that are more than 100 percent in the money, and exhibit at least twice of such behavior during sample period. Calculation follows Campbell et al. (2011).
CEO_IC_OPTN	The incentive ratio for CEO option holdings over total compensation.
CEO_IC_STK	The incentive ratio for CEO stock holdings over total compensation.
CFO_IC_OPTN	The incentive ratio for CFO option holdings over total compensation.
CFO_IC_STK	The incentive ratio for CFO stock holdings over total compensation.
$BOARD\_SIZE$	The natural logarithm of total number of directors on the board.
$CEO\_DUALITY$	A dummy variable which equals 1 when the CEO is also the Chairman.
$PERC\_OUT$	The number of outside directors over the total number of directors on the board.

Appendix B. Top 30 Negative and Positive Words over Conference Calls

	Negative		Positive	
Ranking	Word	Percentage	Word	Percentage
1	Question	18.17	Good	11.95
2	Questions	7.58	Strong	6.56
3	Decline	3.63	Great	5.88
4	Loss	3.14	Better	3.99
5	Negative	1.99	Opportunities	3.66
6	Closing	1.80	Able	3.33
7	Restructuring	1.78	Opportunity	3.27
8	Difficult	1.74	Improvement	2.62
9	Against	1.73	Positive	2.55
10	Late	1.47	Benefit	2.20
11	Declined	1.41	Progress	2.11
12	Challenges	1.21	Best	1.92
13	Challenging	1.08	Improve	1.91
14	Closed	1.06	Pleased	1.91
15	Force	1.04	Improved	1.89
16	Critical	0.90	Success	1.28
17	Recall	0.90	Profitability	1.21
18	Impairment	0.89	Effective	1.19
19	Break	0.85	Excited	1.10
20	Litigation	0.79	Strength	1.07
21	Declines	0.76	Successful	1.06
22	Losses	0.76	Improving	1.04
23	Slow	0.71	Greater	1.01
24	Challenge	0.65	Improvements	1.00
25	Bad	0.65	Confident	1.00
26	Problem	0.61	Achieved	0.93
27	Weak	0.61	Advantage	0.88
28	Volatility	0.61	Gain	0.88
29	Lost	0.60	Despite	0.86
30	Weakness	0.59	Achieve	0.86

References

Andreou, P. C., Antoniou, C., Horton, J., Louca, C. (2016). Corporate governance and firm-specific stock price crashes. *European Financial Management*, *22*, 916-956.

Andreou, P. C., Louca, C., Petrou, A. P. (2017). CEO age and stock price crash risk. *Review of Finance, 21*, 1287-1325.

Arslan-Ayaydin, Ö., Boudt, K., Thewissen, J. (2016). Managers set the tone: Equity incentives and the tone of earnings press releases. *Journal of Banking and Finance, 72*, S132-S147.

Bloomfield, R. (2008). Discussion of "annual report readability, current earnings, and earnings persistence". *Journal of Accounting and Economics, 45*, 248-252.

Borochin, P., Cicon, J., DeLisle, J., Price, S. M. (2016). The Effects of Conference Call Content on Market Perceptions of Value Uncertainty. *Working Paper*, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2579907

Brockman, P., Li, X., Price, S. M. (2015). Differences in Conference Call Tones: Managers vs. Analysts. *Financial Analysts Journal*, *71*, 24-42.

Brown, S., Hillegeist, S. A., Lo, K. (2004). Conference calls and information asymmetry. *Journal of Accounting and Economics*, *37*, 343-366.

Bushee, B. J., Matsumoto, D. A., Miller, G. S. (2003). Open versus closed conference calls: the determinants and effects of broadening access to disclosure. *Journal of Accounting and Economics*, *34*, 149-180.

Campbell, T. C., Gallmeyer, M., Johnson, S. A., Rutherford, J., & Stanley, B. W. (2011). CEO optimism and forced turnover. *Journal of Financial Economics*, *101*, 695-712.

Chen, J., Hong, H., Stein, J. C. (2001). Forecasting crashes: trading volume, past returns, and conditional skewness in stock prices. *Journal of Financial Economics*, *61*, 345-381.

Davis, A. K., Ge, W., Matsumoto, D., Zhang, J. L. (2015). The effect of manager-specific optimism on the tone of earnings conference calls. *Review of Accounting Studies*, *20*, 639-673.

DeFond, M. L., Hung, M., Li, S., Li, Y. (2015). Does mandatory IFRS adoption affect crash risk? *The Accounting Review*, *90*, 265-299.

Dzieliński, M., Wagner, A. F., Zeckhauser, R. J. (2017). Straight Talkers and Vague Talkers: The Effects of Managerial Style in Earnings Conference Calls. *Working paper*, National Bureau of Economic Research, available at: http://www.nber.org/papers/w23425.

Gu, F., Li, J. Q. (2007). The credibility of voluntary disclosure and insider stock transactions. *Journal of Accounting Research*, *45*, 771-810.

Hamm, S. J., Li, E. X., Ng, J. (2016). Earnings Guidance, Bias, and Stock Price Crash Risk. *Working Paper*, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2055008

Huang, X., Teoh, S. H., Zhang, Y. (2014). Tone management. *The Accounting Review*, *89*, 1083-1113.

Hung, S., Qiao, Z. (2017). Shadows in the sun: Crash risk behind earnings transparency. *Journal of Banking and Finance, 83*, 1-18.

Hutton, A. P., Marcus, A. J., Tehranian, H. (2009). Opaque financial reports, R^2, and crash risk. *Journal of Financial Economics, 94*, 67-86.

Jin, L., Myers, S. (2006). R^2 around the world: New theory and new tests. *Journal of Financial Economics, 79*, 257-292.

Khan, M., & Watts, R. L. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics, 48*, 132-150.

Kim, J.-B., Li, Y., Zhang, L. (2011a). CFOs versus CEOs: Equity incentives and crashes. *Journal of Financial Economics*, *101*, 713-730.

Kim, J.-B., Li, Y., Zhang, L. (2011b). Corporate tax avoidance and stock price crash risk: Firm-level analysis. *Journal of Financial Economics*, *100*, 639-662.

Kim, J.-B., Wang, Z., Zhang, L. (2016). CEO overconfidence and stock price crash risk. *Contemporary Accounting Research*, *33*, 1720-1749.

Kim, J.-B., Zhang, L. (2016). Accounting conservatism and stock price crash risk: Firm-level evidence. *Contemporary Accounting Research*, *33*, 412-441.

Kim, Y., Li, H., Li, S. (2014). Corporate social responsibility and stock price crash risk. *Journal of Banking and Finance, 43*, 1-13.

Kothari, S. P., Leone, A. J., Wasley, C. E. (2005). Performance matched discretionary accrual measures. *Journal of Accounting and Economics, 39*, 163-197.

Larcker, D. F., Zakolyukina, A. A. (2012). Detecting deceptive discussions in conference calls. *Journal of Accounting Research*, *50*, 495-540.

Lee, J. (2015). Can Investors Detect Managers' Lack of Spontaneity? Adherence to Predetermined Scripts during Earnings Conference Calls. *The Accounting Review*, *91*, 229-250.

Li, F. (2008). Annual report readability, current earnings, and earnings persistence. *Journal of Accounting and Economics*, *45*, 221-247.

Li, X., Wang, S. S., Wang, X. (2017). Trust and stock price crash risk: Evidence from China. *Journal of Banking and Finance, 76*, 74-91.

Liu, B., McConnell, J. J., Xu, W. (2017). The power of the pen reconsidered: The media, CEO human capital, and corporate governance. *Journal of Banking and Finance, 76*, 175-188.

Loughran, T., McDonald, B. (2016). Textual analysis in accounting and finance: A survey. *Journal of Accounting Research, 54*, 1187-1230.

Matsumoto, D. A. (2002). Management's incentives to avoid negative earnings surprises. *The Accounting Review, 77*, 483-514.

Matsumoto, D., Pronk, M., Roelofsen, E. (2011). What makes conference calls useful? The information content of managers' presentations and analysts' discussion sessions. *The Accounting Review, 86,* 1383-1414.

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

Rogers, J. L., Van Buskirk, A., Zechman, S. L. (2011). Disclosure tone and shareholder litigation. *The Accounting Review, 86,* 2155-2183.

Stocken, P. C. (2000). Credibility of voluntary disclosure. *The RAND Journal of Economics, 31,* 359-374.

Xu, N., Jiang, X., Chan, K. C., Yi, Z. (2013). Analyst coverage, optimism, and stock price crash risk: Evidence from China. *Pacific-Basin Finance Journal, 25,* 217–239.

Xu, N., Jiang, X., Chan, K.C., Wu, S. (2016). Analyst herding and stock price crash risk: Evidence from China. *Journal of International Financial Management and Accounting, 28,* 308-348.

Table 1: Distribution of Observations over Industries and Years

Panel A: Distribution of Observations over Industry				
SIC Industry	SIC Codes	Freq.	Percent	Cum.
Agriculture, Forestry & Fishing	0-999	24	0.21	0.21
Mining	1000-1499	910	8.02	8.23
Construction	1500-1799	106	0.93	9.17
Manufacturing	2000-3999	5,342	47.09	56.25
Transportation, Communications, Electric, Gas & Sanitary Services	4000-4999	1,355	11.94	68.2
Wholesale Trade	5000-5199	351	3.09	71.29
Retail Trade	5200-5999	727	6.41	77.7
Finance, Insurance & Real Estate	6000-6799	309	2.72	80.42
Services	7000-8999	2,186	19.27	99.69
Public Administration	9100-9999	35	0.31	100
Total		11,345	100	

Panel B: Distribution of Observations over Year			
Year	Freq.	Percent	Cum.
2010	1,802	15.88	15.88
2011	2,037	17.96	33.84
2012	1,873	16.51	50.35
2013	1,877	16.54	66.89
2014	1,896	16.71	83.61
2015	1,860	16.39	100
Total	11,345	100	

Notes: This table presents how observations of individual firm-year distribute over different industries during the sample period from 2010 to 2015.

Table 2: Descriptive Statistics

Variable	Number	Mean	Std	P25	Median	P75
$COUNT$	11345	0.014	0.620	0.000	0.000	0.000
$NCSKEW$	11345	0.076	0.836	-0.409	0.016	0.479
$DUVOL$	11345	0.042	0.519	-0.308	0.016	0.360
$\Delta TURNOVER$	11345	-0.005	0.104	-0.038	-0.005	0.026
$STDFSRET$	11345	0.045	0.023	0.028	0.040	0.056
$MEANFSRET$	11345	-0.124	0.137	-0.154	-0.078	-0.039
$SIZE$	11345	7.040	1.832	5.786	7.015	8.266
MTB	11345	2.900	3.320	1.114	1.896	3.287
LEV	11345	0.189	0.180	0.003	0.160	0.308
ROA	11345	0.010	0.146	-0.003	0.039	0.077
$OPAQUE$	11345	0.150	0.150	0.067	0.109	0.179
C_SCORE	11345	0.052	0.236	-0.034	0.097	0.172
$TONE\_C$	11345	0.671	0.461	0.361	0.658	0.976
$TONE\_P$	11345	0.985	0.682	0.527	0.975	1.436
$TONE\_Q$	11345	0.417	0.457	0.121	0.408	0.704
$TONE\_MAN$	11345	0.672	0.514	0.331	0.647	0.992
$TONE\_PAR$	11345	-0.184	0.661	-0.560	-0.156	0.245
RE_TONE_C	10008	0.001	0.444	-0.302	-0.010	0.294

Notes: This table shows the summary statistics for key variables for U.S. firms with earnings conference calls during the period from 2010 to 2015. All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile.

Table 3: Correlation Table

Panel A: Dependent and Control Variables											
	COUNT	*NCSKEW*	*DUVOL*	*ΔTURNOVER*	*STDFSRET*	*MEANFSRET*	*SIZE*	*MTB*	*LEV*	*ROA*	*OPAQUE*
COUNT	1										
NCSKEW	**0.79**	1									
DUVOL	**0.65**	**0.90**	1								
ΔTURNOVER	0.01	**0.05**	**0.05**	1							
STDFSRET	-0.02	**0.05**	**0.05**	**0.22**	1						
MEANFSRET	**0.04**	-0.02	**-0.03**	**-0.25**	**-0.96**	1					
SIZE	**0.03**	0.01	0.02	**-0.03**	**-0.58**	**0.50**	1				
MTB	**-0.05**	**-0.05**	**-0.05**	**0.06**	**0.03**	**-0.04**	**0.17**	1			
LEV	0.01	0.01	0.01	**0.03**	**-0.13**	**0.10**	**0.22**	0.01	1		
ROA	0.01	**-0.03**	**-0.02**	**-0.03**	**-0.49**	**0.50**	**0.37**	**-0.05**	0.01	1	
OPAQUE	**-0.03**	-0.01	0.00	**0.04**	**0.38**	**-0.36**	**-0.26**	**0.14**	**-0.15**	**-0.21**	1
C_SCORE	-0.02	0.00	0.00	**0.03**	**0.31**	**-0.28**	**-0.48**	**-0.17**	**0.07**	**-0.20**	**0.08**

Panel B: Tone Measures				
	TONE_C	*TONE_P*	*TONE_Q*	*TONE_MAN*
TONE_C	1			
TONE_P	**0.84**	1		
TONE_Q	**0.75**	**0.38**	1	
TONE_MAN	**0.70**	**0.38**	**0.89**	1
TONE_PAR	**0.40**	**0.18**	**0.60**	**0.23**

Notes: This table presents Pearson correlation coefficients between any two key variables. All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. The values in bold represent correlations significant at a 1% level.

Table 4: Future Stock Price Crash Risk and the Tone of Earnings Conference Call

	(1) $COUNT_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$
$TONE\_C_{t-1}$	-0.095***	-0.178***	-0.105***
	(-3.68)	(-5.06)	(-4.77)
$\Delta TURNOVER_{t-1}$	0.055	0.024	-0.048
	(0.62)	(0.20)	(-0.60)
$NCSKEW_{t-1}$	-0.139***	-0.220***	-0.119***
	(-13.17)	(-15.44)	(-14.15)
$STDFSRET_{t-1}$	-0.529	-1.116	2.237
	(-0.21)	(-0.33)	(1.11)
$MEANFSRET_{t-1}$	0.047	0.080	0.495
	(0.12)	(0.15)	(1.59)
$SIZE_{t-1}$	0.253***	0.464***	0.315***
	(9.11)	(11.68)	(12.74)
MTB_{t-1}	-0.003	0.001	0.002
	(-0.51)	(0.15)	(0.37)
LEV_{t-1}	0.238	0.471**	0.270**
	(1.62)	(2.45)	(2.35)
ROA_{t-1}	0.054	-0.086	-0.050
	(0.40)	(-0.48)	(-0.44)
$OPAQUE_{t-1}$	0.055	-0.071	0.100
	(0.24)	(-0.21)	(0.51)
$OPAQUE\_SQ_{t-1}$	-0.007	0.153	-0.039
	(-0.03)	(0.39)	(-0.19)
C_SCORE_{t-1}	-0.044	-0.048	0.002
	(-0.90)	(-0.78)	(0.04)
Constant	-1.983***	-2.916***	-1.975***
	(-8.04)	(-8.27)	(-8.46)
Observations	8004	8004	8004
Adjusted R^2	0.06	0.10	0.10
Year fixed effect	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes

Notes: All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** stand for significance at 10%, 5%, and 1% levels, respectively.

Table 5: Future Stock Price Crash Risk and the Residual Tone of Earnings Conference Call

	(1) $COUNT_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$
$RE\_TONE\_C_{t-1}$	-0.089***	-0.164***	-0.099***
	(-3.18)	(-4.38)	(-4.30)
$\Delta TURNOVER_{t-1}$	0.055	0.034	-0.022
	(0.58)	(0.26)	(-0.26)
$NCSKEW_{t-1}$	-0.131***	-0.207***	-0.112***
	(-11.88)	(-13.76)	(-12.65)
$STDFSRET_{t-1}$	0.399	-1.275	1.994
	(0.15)	(-0.35)	(0.91)
$MEANFSRET_{t-1}$	0.262	0.250	0.572*
	(0.62)	(0.42)	(1.69)
$SIZE_{t-1}$	0.275***	0.518***	0.347***
	(8.96)	(12.14)	(13.28)
MTB_{t-1}	-0.004	-0.004	-0.002
	(-0.65)	(-0.40)	(-0.29)
LEV_{t-1}	0.274*	0.546***	0.322***
	(1.76)	(2.66)	(2.65)
ROA_{t-1}	0.096	-0.133	-0.064
	(0.68)	(-0.70)	(-0.54)
$OPAQUE_{t-1}$	-0.059	-0.208	0.060
	(-0.23)	(-0.58)	(0.29)
$OPAQUE\_SQ_{t-1}$	0.047	0.220	-0.045
	(0.18)	(0.54)	(-0.22)
C_SCORE_{t-1}	-0.009	0.010	0.039
	(-0.17)	(0.15)	(0.90)
Constant	-1.741**	-2.262***	-1.484***
	(-2.26)	(-3.26)	(-3.74)
Observations	7231	7231	7231
Adjusted R^2	0.06	0.10	0.10
Year fixed effect	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes

Notes: All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** stand for significance at 10%, 5%, and 1% levels, respectively.

Table 6: Future Stock Price Crash Risk and the Tone of Earnings Conference Call with Additional Controls

	(1) $COUNT_t$	(2) $NCSKEW_t$	(3) $DUVOL_t$	(4) $COUNT_t$	(5) $NCSKEW_t$	(6) $DUVOL_t$	(7) $COUNT_t$	(8) $NCSKEW_t$	(9) $DUVOL_t$	(10) $COUNT_t$	(11) $NCSKEW_t$	(12) $DUVOL_t$
Panel A: Short-Term Market Reaction												
$TONE\_C_{t-1}$	-0.055**	-0.119***	-0.069***	-0.085***	-0.169***	-0.097***	-0.122***	-0.211***	-0.112***	-0.129***	-0.235***	-0.137***
	(-2.06)	(-3.30)	(-3.05)	(-3.25)	(-4.71)	(-4.40)	(-3.23)	(-4.05)	(-3.58)	(-2.94)	(-3.88)	(-3.61)
CAR_{t-1}	-1.242***	-1.929***	-1.200***									
	(-9.74)	(-11.20)	(-12.25)									
Panel B: Other Linguistic Characteristics												
$CALL\_LENGTH_{t-1}$				0.125***	0.189***	0.132***						
				(2.91)	(3.13)	(3.68)						
MAN_UNCER_{t-1}				4.060	0.498	1.214						
				(0.82)	(0.07)	(0.29)						
$PART\_UNCER_{t-1}$				-0.892	0.127	-0.203						
				(-0.52)	(0.06)	(-0.15)						
$SCRIPT_{t-1}$				0.012	0.024	0.015						
				(0.33)	(0.50)	(0.52)						
Panel C: Executives Characteristics												
CEO_AGE_{t-1}							-0.006	-0.007	-0.004			
							(-1.38)	(-1.30)	(-1.07)			
CFO_AGE_{t-1}							-0.007**	-0.004	-0.002			
							(-1.98)	(-0.77)	(-0.52)			
CEO_OC_{t-1}							-0.100	-0.118	-0.065			
							(-1.57)	(-1.44)	(-1.27)			
CFO_OC_{t-1}							-0.146**	-0.221**	-0.121*			
							(-2.00)	(-2.34)	(-1.93)			
$CEO\_IC\_OPTN_{t-1}$							-0.051	-0.077	-0.078			
							(-0.26)	(-0.32)	(-0.53)			
$CEO\_IC\_STK_{t-1}$							0.110	0.198	0.055			
							(0.70)	(0.94)	(0.42)			
$CFO\_IC\_OPTN_{t-1}$							0.225	0.638*	0.537**			
							(0.86)	(1.73)	(2.44)			
$CFO\_IC\_STK_{t-1}$							0.032	-0.341	-0.261			
							(0.07)	(-0.57)	(-0.75)			

Panel D: Corporate Governance Characteristics												
$BOARD\_SIZE_{t-1}$										0.093	0.122	-0.014
										(0.56)	(0.54)	(-0.11)
$CEO\_DUALITY_{t-1}$										-0.055	0.009	0.000
										(-0.99)	(0.11)	(0.00)
$PERC\_OUT_{t-1}$										-0.004	-0.005	-0.002
										(-1.40)	(-0.96)	(-0.58)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7644	7644	7644	8004	8004	8004	3909	3909	3909	2902	2902	2902
Adjusted R^2	0.08	0.13	0.13	0.06	0.10	0.10	0.07	0.10	0.10	0.07	0.11	0.10
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Due to space limitation, detailed results for control variables are omitted. All results in Table 8 are obtained with firm-fixed and year-fixed effects included. All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** stand for significance at 10%, 5%, and 1% levels, respectively.

Table 7: Future Stock Price Crash Risk and Tone over Different Call Sections / Tone of Managers and Participants

	(1) $COUNT_t$	(2) $COUNT_t$	(3) $COUNT_t$	(4) $NCSKEW_t$	(5) $NCSKEW_t$	(6) $NCSKEW_t$	(7) $DUVOL_t$	(8) $DUVOL_t$	(9) $DUVOL_t$
Panel A: Future Stock Price Crash Risk and the Tone over Different Call Sections									
$TONE\_P_{t-1}$	-0.044**		-0.035*	-0.072***		-0.051**	-0.044***		-0.030**
	(-2.55)		(-1.93)	(-3.02)		(-2.06)	(-2.99)		(-2.03)
$TONE\_Q_{t-1}$		-0.065***	-0.055**		-0.137***	-0.122***		-0.084***	-0.075***
		(-2.90)	(-2.37)		(-4.52)	(-3.90)		(-4.41)	(-3.84)
Constant	-2.033***	-2.013***	-2.002***	-3.016***	-2.963***	-2.947***	-2.034***	-2.000***	-1.991***
	(-8.16)	(-8.22)	(-8.09)	(-8.43)	(-8.50)	(-8.35)	(-8.64)	(-8.67)	(-8.53)
Adjusted R^2	0.06	0.06	0.06	0.10	0.10	0.10	0.10	0.10	0.10
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8004	8004	8004	8004	8004	8004	8004	8004	8004
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Future Stock Price Crash Risk and the Tone of Managers and Participants									
$TONE\_MAN_{t-1}$	-0.053***		-0.050**	-0.104***		-0.093***	-0.061***		-0.054***
	(-2.68)		(-2.47)	(-3.87)		(-3.42)	(-3.59)		(-3.13)
$TONE\_PAR_{t-1}$		-0.020	-0.014		-0.056***	-0.044**		-0.036***	-0.029**
		(-1.39)	(-0.94)		(-2.93)	(-2.29)		(-3.07)	(-2.47)
Constant	-2.007***	-2.056***	-2.010***	-2.958***	-3.054***	-2.970***	-2.000***	-2.057***	-2.008***
	(-8.24)	(-8.34)	(-8.23)	(-8.52)	(-8.66)	(-8.51)	(-8.75)	(-8.81)	(-8.69)
Adjusted R^2	0.06	0.06	0.06	0.10	0.10	0.10	0.10	0.10	0.10
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8004	8004	8004	8004	8004	8004	8004	8004	8004
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** stand for significance at 10%, 5%, and 1% levels, respectively.

Table 8: Subsample Tests on Future Stock Price Crash Risk and the Tone of Earnings Conference Call

	(1) $COUNT_t$	(2) $COUNT_t$	(3) $NCSKEW_t$	(4) $NCSKEW_t$	(5) $DUVOL_t$	(6) $DUVOL_t$
Panel A: Leverage						
	High	Low	High	Low	High	Low
$TONE\_C_{t-1}$	-0.048	-0.125***	-0.103**	-0.218***	-0.062**	-0.137***
	(-1.35)	(-3.09)	(-2.10)	(-3.95)	(-1.99)	(-4.15)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3991	4013	3991	4013	3991	4013
Adjusted R^2	0.06	0.08	0.10	0.13	0.10	0.12
Panel B: The Number of Analysts Following						
	High	Low	High	Low	High	Low
$TONE\_C_{t-1}$	-0.109***	-0.048	-0.219***	-0.084	-0.132***	-0.055*
	(-3.06)	(-1.20)	(-4.68)	(-1.58)	(-4.41)	(-1.65)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4521	3483	4521	3483	4521	3483
Adjusted R^2	0.06	0.07	0.10	0.12	0.10	0.11
Panel C: Percentage of Outside Directors						
	High	Low	High	Low	High	Low
$TONE\_C_{t-1}$	-0.149**	-0.122*	-0.242***	-0.208**	-0.141**	-0.113**
	(-2.29)	(-1.92)	(-2.79)	(-2.32)	(-2.46)	(-2.10)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1472	1430	1472	1430	1472	1430
Adjusted R^2	0.07	0.08	0.10	0.13	0.09	0.13

Notes: Due to space limitation, detailed results for control variables are omitted. All results in Table 9 are obtained with firm-fixed and year-fixed effects included. All variables are defined in the Appendix A. All continuous variables are winsorized at the 1st and 99th percentile. T-statistics reported in parentheses are based on standard errors clustered by firm. *, **, and *** stand for significance at 10%, 5%, and 1% levels, respectively.