Textual Opinion in Analyst Reports

Abstract

A large body of research studies analyzes informativeness of analyst reports on the basis of quantitative outputs (e.g., earnings forecasts and recommendations). In this study, by analyzing a long-term price reaction to the textual tone of headlines in analyst reports, I show that textual opinion in the reports – a representative qualitative output – also provide incremental information. The analysis reveals that stock prices react considerably to the report tone. In addition, economically and statistically significant price drifts, indicating price underreaction, are observed in cases of negative report tone. However, these price behaviors are relatively weak when the report tone is used to support quantitative measures. In sum, the result supports the view that textual opinion in reports by itself provides value-relevant information, especially when textual opinion is used to provide independent information.

Keywords: Financial analyst; Textual analysis; Report tone; Information content

JEL classification: G10, G14

1. Introduction

Financial analysts research macroeconomic and microeconomic conditions, along with company fundamentals, to make predictions about company performance. They also recommend buying or selling a company's stock based upon its outlook. They provide information by issuing reports to institutional and individual investors.

Previous studies have analyzed whether analyst reports contain incremental information regarding stock valuation. A large number of studies report that quantitative summary measures, including stock recommendation, earnings forecast, and target price, contain economically significant information, which is gradually incorporated into the stock price (Stickel, 1995; Womack, 1996; Francis and Soffer, 1997). On the other hand, whether qualitative information, e.g., textual

opinion of reports, is useful to investors is still an open question.

Analysts are generally constrained to issue recommendations in one of five broad categories. In addition, analysts' incentive structures might prevent analysts from expressing their "true" opinions in their recommendations (Das et al., 1998; Jackson, 2005; Irvine et al., 2007; Libby et al., 2008; Mayew, 2008; Groysberg et al., 2011). Thus, the textual opinion of analyst reports, specifically the tone of the report, may provide investors with a valuable source of additional information, since there are fewer constraints in the textual opinion than in the quantitative outputs.

On the other hand, text might not provide independent information. Analysts might use it merely to support or justify the contemporaneously issued quantitative summary measures (Francis and Soffer, 1997). Report tone could also reflect linguistic preferences and an analyst's biased view induced by their cognitive biases and incentives. Furthermore, investors may find text difficult to use because, in contrast to quantitative signals, textual discussion in analyst reports may not be comparable across different reports or easily converted into numerical inputs that investors can use in their quantitative investing models.[1]

Despite the apparent importance of analyzing qualitative information in analyst report text, extant literature largely overlooks it and focuses almost entirely on analysts' quantitative research outputs (Ramnath et al., 2008; Bradshaw, 2009). Recently, a few studies (e.g., Twedt and Lee, 2012; Huang et al., 2014) analyzed analysts' tone in report text. However, some results regarding the effect of report tone are not statistically strong, and there is some inconsistency between results.[2] Furthermore, while they focus on the short-window price reaction to the textual tone, they do not provide enough evidence regarding price behavior after the publication of an analyst report. Therefore, unfortunately, they do not provide enough evidence to conclude whether the report tone contains useful incremental information.

This imbalance in the research effort between quantitative outputs and qualitative outputs might prevent the literature from developing a comprehensive understanding of the analysts' information role (Bradshaw, 2009). Therefore, in this study, I provide more robust evidence as to whether the

[1] This argument also raises the possibility that prices underreact to qualitative information.
[2] This is explained in more detail in Section 2.

textual opinion of analyst reports has informational value in stock valuation.

To this end, I analyze not only immediate (short-window) price responses to analysts' textual tone, but also price behavior after the publication of an analyst report. If the price response around the publication date is significantly corrected in a subsequent period, analysts' textual tone cannot be considered to have informational value (Tetlock, 2007). Thus, checking the existence of price correction is necessary for the analysis of the informational value of analysts' textual tone. Furthermore, I analyze the interaction effect with the quantitative measures (i.e., stock recommendation, earnings revision, and target price revision). Specifically, I examine whether the informational value of the tone is higher or lower when the tone is used to support analysts' quantitative outputs.

To perform more correct and precise evaluations of analysts' textual tone, I evaluate the tone of report headlines, rather than that of the body of the report. Analyst reports have no standardized structure, using different styles, various formats, and including redundancy (irrelevant content). These prevent accurate evaluation of tone in analyst reports. On the other hand, headlines of reports that are considered brief summaries of the main reports (especially in Japan), have a certain standardized structure, style, and format. Furthermore, they include less redundancy and offer greater accessibility (than the body of the report). Thus, analyzing the tone of the headline (especially for Japanese stocks) could show a clearer picture and provide more robust evidence regarding the informational value of analysts' textual opinions.[3]

Overall, my results support the view that textual opinion, especially negative one, contains stand-alone informational value. First, I find that stock prices react significantly to report tone, even after controlling for the quantitative measures of the report. In addition, price reaction is much stronger for the negative-tone reports than the positive-tone reports. In terms of post-event price behavior, no price correction is observed; in fact, a long-term price drift is observed for negative-tone reports. These results indicate that the report tone, specifically negative report tone, contains incremental information, and prices do not immediately reflect information contained in

[3] Consistent with this prediction, Huang et al. (2014) report that the textual tone of more concise reports offers more informational value.

negative-tone reports. Finally, the analysis reveals that price reaction to report tone is weaker when the direction of the report tone coincides with that of the quantitative summary (specifically, stock recommendations and earnings forecast revisions). The result suggests that the report tone is less useful when it is used for supporting quantitative outputs, consistent with the argument of Francis and Soffer (1997). In other words, the report tone has informational value, especially when the report tone is used to provide information that is not reflected in the quantitative output.

In sum, my overall analysis provides evidence of price responses to report tone, the existence of underreaction to report tone, and the interaction effect with quantitative measures. All these results support the view that analysts' textual opinions have stand-alone informational value.

The remainder of this paper is organized as follows. Section 2 shows motivation and related literatures. Section 3 presents the development of my hypotheses. Section 4 provides the sample and methodologies. Section 5 describes findings regarding informational value of analysts' textual tone. Finally, in section 6, I summarize the findings.

2. Motivation and Related Literatures

The usefulness of the analyst report has been analyzed mainly on the basis of the quantitative summary, for example, stock recommendations, earnings forecasts, and target prices (Stickel, 1995; Womack, 1996; Francis and Soffer, 1997). However, as pointed out by Tsao (2002) and Ramnath et al. (2008), this quantitative information is part of the summarized information, and significant information remains within the text of the analyst report. In particular, there are various restrictions on issuing quantitative outputs. Prior research shows that quantitative measures are optimistically biased (Das et al., 1998; Libby et al., 2008, Mayew, 2008) due to incentives to generate underwriting business (Lin and McNichols 1998) and trading commissions (Jackson, 2005; Irvine et al., 2007). Michaely and Womack (1999) and Barber et al. (2007) demonstrate that these conflicts of interest adversely affect the quality of analysts' quantitative outputs, since these conflicts of interest disturb the reflection of their (honest) opinions. On the other hand, text in analyst reports is subject to less of such restrictions. Therefore, qualitative information, specifically, tone (optimism and pessimism) in

their reports, might reflect their true opinions. The above arguments suggest that analysts' textual opinion, represented by the report tone, will have informational value.

As Twedt and Ree (2012) point out, however, an alternative argument could also be made for the opposite result. Less informed analysts could use detail in their reports as a means of obfuscating their lack of firm-specific information, and report tone could reflect obfuscation. Furthermore, the influence of various cognitive biases can be seen in analyst reports. For instance, analysts' long-term views of company performance are excessively optimistic (Lakonishok et al., 1994; La Porta, 1996). In addition, analysts are optimistic about stocks with good past performance (Jegadeesh et al., 2004). Report tone might reflect the analysts' biases. Last, there is concern that financial analysts, like all people, have natural variations in their linguistic styles, and the more optimistic tone of some reports relative to others may simply be a reflection of idiosyncrasies in their linguistic styles rather than their private estimates of firm value (Pennebaker and King, 1999). It is also possible that analysts' textual opinion will not have informational value.

There are also competing arguments regarding the interaction effect between textual opinion and quantitative outputs. According to the argument of Twedt and Lee (2012), report tone offers additional informational value when it can be used as an additional piece of information to assess the analysts' quantitative outputs. Meanwhile, according to Francis and Soffer (1997), report tone could have lower informational value in that case.

Although competing arguments exist for the informational value of analysts' textual opinion, there has been limited empirical evidence regarding informational value. Twedt and Lee (2012) and Huang et al. (2014) analyze immediate price responses to report tone. However, some results are not statistically strong; some evidence from Twedt and Lee (2012) is not strong enough to support the stand-alone informational values of textual opinion.[4] Furthermore, there is some inconsistency between both studies regarding the interaction effect between quantitative measures and report tone. For instance, while Huang et al. (2014) conclude that investors view report tone as useful information for how they should react to quantitative measures, Twedt and Lee (2012) conclude that

[4] For instance, statistical significance regarding price impacts of measures of abnormal tone is too weak to suggest that the tone has informational value.

report tone do not provide such information. At any rate, the statistical significance of the interaction effects found in both of the studies is weak. In addition to the weakness of these results, they do not provide enough evidence regarding price behavior after the publication of an analyst report. If the price reaction is corrected subsequently (if the return is reversed), report tone cannot be considered to be useful information (Tetlock, 2007). Therefore, it is necessary to check for the existence of a price correction. [5] In sum, due to lack of empirical evidence, it is inconclusive whether analysts' textual tone has informational value.

In this study, I examine the informational value of textual opinion by analyzing long-term price reaction to analysts' textual tone. To analyze the tone, specifically, I focus on that of report headlines, which are considered well-structured summaries of analyst reports, since their structured style and conciseness help conduct precise evaluation of the textual tone. To the best of my knowledge, no study has focused on the textual tone of report headlines and price behavior after the publication date. My analysis could provide more robust evidence of whether analysts' textual opinions have informational value.

This detailed analysis on the informational value of analysts' textual tone contributes not only existing studies regarding the information role of financial analysts, but also studies regarding the value of textual information in financial markets. Recently, an increasing number of studies performs textual analysis on corporate disclosures (e.g., Henry, 2008; Li, 2010; Doran et al., 2010; Loughran and McDonald, 2011; Rogers et al., 2011; Price et al., 2012; Ferris et al., 2013; Jegadeesh and Wu, 2013; Arslan-Ayaydin et al., 2016), media articles (e.g., Tetlock, 2007; Tetlock et al., 2008; Engelberg et al., 2012; Garcia, 2012), and internet postings (e.g., Antweiler and Frank, 2004; Das and Chen, 2007; Bollen et al., 2011; Curtis et al., 2016; Bartov et al., 2018). Despite these burgeoning literatures, extant literature largely overlooks the importance of analyzing analyst report text. The analysis on the report text is expected to provide further robust evidence regarding the value of qualitative (textual) information in financial markets, for the following reasons. First,

[5] Tweet and Lee (2012) show that there is no statistically significant association between report tone and post-event return. However, Huang et al. (2014) criticize that samples of Twedt and Lee (2012) are too limited to generalize their conclusions, since their analysis is limited to analyst coverage initiations in 2006.

financial research reports are expected to contain essential information regarding stock valuation, because financial analysts are considered as important professional information providers to investors. Second, both quantitative and textual outputs (opinions) are available for analysts' research reports, while only textual outputs are available for most of textual information sources (e.g., news articles and internet postings); thus, the analysis on the report text has the advantage that it can clarify incremental role of qualitative outputs relative to quantitative outputs.

3. Hypotheses Development

3.1. Short-window Price Reaction to Report Tone

Textual tone in analyst reports might contain information that is incremental to the quantitative summary (e.g., stock recommendations, earnings forecasts, target prices). They might include additional information and opinion that is not reflected in quantitative outputs. Investors can easily get this information by reading analyst reports (headlines), thus, prices may quickly react to report tone. My first prediction can be described by the following hypothesis:

H1: Price positively (negatively) responds to positive (negative) report tone.

On the other hand, prices might not react to report tone, since (investors realize that) it may merely reflect analysts' linguistic preferences, analysts' biased views induced by their cognitive biases and incentives, and so on. I state my report tone hypotheses in null form as follows:

$H1_a$: There is no market reaction to tone in analyst reports.

3.2. Post-event Return

Even if the hypothesis H1 is supported, we cannot conclude that the report tone contains useful information. If stock returns subsequently reverse, the short-window price reaction is considered to be investors' misreactions to analysts' linguistic preferences or analysts' biased views. In this case, report tone does not contain any incremental information regarding stock valuation. On the other hand, if the price correction does not occur, it is likely that report tone contains incremental information, which has a permanent price impact. As argued in Sections 1 and 2, both cases are

possible for report tone. This argument leads to the following competing hypotheses:

H2: Short-window price reaction to report tone is not corrected subsequently (stock price returns are not reversed in a subsequent period).

$H2_a$: Short-window price reaction to report tone is corrected subsequently (stock returns are reversed in a subsequent period).

If the hypothesis H2 is supported, we should examine whether prices underreact to the report tone. Investors may find textual tone difficult to use because, in contrast to quantitative signals, textual tone in analyst reports may not be verifiable ex post, comparable across different reports, or easily converted into numerical inputs that investors can use in their quantitative investing models. Thus, there might be some delay in price reactions to textual tone in their reports, as an indicator of analyst informativeness, or as an unbiased reflection of analysts' intrinsic firm value estimates. In order to assess the extent to which investors quickly react to the information contained in the report tone, I test the following hypotheses.

H3: Stock prices underreact to report tone.

I state the hypothesis in null form as follows:

$H3_a$: There is no delay in price reactions to report tone.

3.3. Direction of Textual Opinions

There are several reasons that negative tone contains more incremental information than positive tone. As discussed in Sections 1 and 2, analysts' incentive structures constrain the expression of their bearish views within quantitative output. Thus, negative report tone might reflect these bearish views. Second, prior research shows that analysts' cognitive biases result in optimistically biased views. Thus, positive report tone might merely reflect analysts' biased opinions, while negative report tone might reflect their true opinions. Third, Hong et al. (2000) propose that analysts are especially important in propagating bad news because managers push out good news as fast as possible, but are less forthcoming with bad news (Miller, 2002; Kothari et al., 2009). This asymmetric disclosure by managers implies that the market is more likely to have advance

knowledge of favorable content than unfavorable content in analyst reports, resulting in higher incremental information in negative tone than in positive tone. Since higher informational value in negative tone could induce stronger short-window price reactions and price drifts to negative-tone reports than positive-tone reports, these intuitions lead to the following hypothesis:

H4: Investors react more strongly and slowly to negative-tone reports than to positive-tone reports.

I state my report tone hypotheses in null form as follows:

$H4_a$: There is no difference in price reaction and drift between positive-tone and negative-tone reports.

3.4. Interaction with Quantitative Summary

Report tone can be used as an additional piece of information to assess analysts' quantitative outputs. In other words, report tone could guide investors on how they should respond to the quantitative summary outputs. In this case, price reaction are stronger for report tone that coincides (is supportive of) quantitative outputs (e.g., positive tone with favorite recommendation, and negative tone with negative earnings forecast revision).

Meanwhile, Francis and Soffer (1997) argue that the information value of report tone might be significantly lower if analysts use it merely to support or justify the contemporaneously issued quantitative summary measures. If this is the case, the price reaction is weaker for such report tones. These intuitions lead to the following competing hypotheses:

H5: The informational value of report tone is higher when report tone is used to support quantitative outputs.

I state the competing hypothesis as follows:

$H5_a$: The informational value of report tone is lower when report tone is used to support quantitative outputs.

4. Data and Methodology

4.1. Samples

As well-standardized qualitative information, I analyze the headlines of analyst reports on Japanese stocks (in Japanese). Headlines of analyst reports for US stocks sometimes only describe the company name or the purpose of issuing the report (e.g., review of quarterly result, updating price target and earnings forecasts, and so on). On the other hand, headlines of reports for Japanese stocks mainly give a brief summary of their view. Thus, we can expect more precise tone analysis from these samples. In terms of the informational value of analyst reports for Japanese stocks, Kondo and Ota (2010) reports that the quantitative summary of reports has informational value and Japanese stock prices significantly react to those quantitative measures; there is no difference in their informational value and the price reactions between U.S. and Japanese samples. In terms of the qualitative information of the reports, no study has provided enough evidence regarding Japanese samples.[6]

Analyst headline data has been obtained from the Factset database. Factset manually collect report headlines or request analysts to provide headline information to add to the database. I included reports which recommendations are reiterated[7], since, as explained in Section 4.2., reiterated reports with positive (negative) words that are frequently used in upgraded (downgraded) reports are regarded as positive-tone (negative-tone) reports. In addition, I excluded reports in a non-Japanese language and ones which headline only describe the company name or the purpose of issuing the report. When an analyst issues more than two reports for a stock within a day, the first report is only included in my sample.

Analyst report data and corresponding prices and accounting data have also been obtained from the FactSet database. Stock returns are calculated based on the Japanese Yen. The review period ranges from January 2013 to December 2017, because sufficient historical data for report headlines are available from 2013.

4.2. Tone Measure

In terms of evaluating the tone of a report, I basically utilize the bag of words method, utilizing

[6] Ota (2009) manually analyzed textual information in reports for Japanese stocks. However, since their sample is quite limited (232 reports issued by one foreign-affiliated security company for 2007), their conclusions are hardly generalizable.

[7] The reiterated reports are defined as reports which recommendations are decided to be reiterated. Thus, my sample does not include reports where an analyst does not make any decision on their recommendation.

word lists (dictionaries). Unlike English language, there is no suitable finance-specific dictionary for Japanese language. Therefore, following the study of Kobayashi et al. (2017), which developed tone measures for analyst reports written in Japanese, the word list is originally generated from upgraded and downgraded analyst reports. Specifically, words that are frequently used in upgraded (downgraded) analyst reports are considered to be positive (negative) words. In this study, analyst reports, in which the recommendation is reiterated, but where the text contains positive (negative) words, are considered to be reports that compound their positive (negative) textual opinions. Thus, I calculate textual tones for reports which recommendations are reiterated.

To identify positive and negative words, I extracted 1,389 upgraded reports and 1,178 downgraded reports. I calculated the frequency that word *t* appeared in headlines of upgraded reports (S_U) and downgraded reports (S_D), denoted as TF(*t*, S_U) and TF(*t*, S_D), respectively. Higher TF(*t*, S_U) and TF(*t*, S_D) means that word *t* frequently appears in upgraded reports and downgraded reports, respectively. Then, I calculated the information entropy of word *t* for upgraded reports (H(*t*, S_U)) and downgraded reports (H(*t*, S_D)). The information entropy is defined as:

$$\mathrm{H}(\mathrm{t}, S_U) = -\sum_{s \in S_u} P_U(t,s) log_2 P_U(t,s)$$

$$\mathrm{H}(\mathrm{t}, S_D) = -\sum_{s \in S_d} P_D(t,s) log_2 P_D(t,s)$$

$P_U(t,s) = \frac{tf(t,s)}{\sum_{s \in S_U} tf(t,s)}$, $P_D(t,s) = \frac{tf(t,s)}{\sum_{s \in S_D} tf(t,s)}$, where $tf(t,s)$ is the frequency that word *t* appeared in sentence *s*.

Higher H(*t*, S_U) (H(*t*, S_D)) means that word *t* is widely and equally observed in upgraded (downgraded) reports, indicating that word *t* can be observed in every positive (negative) report. I calculated the degree of positiveness and negativeness of each word, denoted as W_P(t) and W_N(t), as:

$$W_P(\mathrm{t}) = \mathrm{TF}(\mathrm{t}, S_U)\mathrm{H}(\mathrm{t}, S_U)$$

$$W_N(\mathrm{t}) = \mathrm{TF}(\mathrm{t}, S_D)\mathrm{H}(\mathrm{t}, S_D)$$

Since analysts prefer to use positive words more than negative words in their reports, $W_P(\mathrm{t})$ tends to be higher than $W_N(\mathrm{t})$; in fact, $\sum W_P(\mathrm{t})$ is approximately 1.5 times higher than $\sum W_N(\mathrm{t})$.

To adjust this bias, I calculate adjusted $W_N(t)$ (denoted as $W_N^*(t)$) as:

$$W_N^*(t) = \left(\frac{\sum W_P(t)}{\sum W_N(t)}\right) * W_N(t)$$

Positive (negative) words can be defined by whether $W_P(t)$ ($W_N^*(t)$) is significantly higher than $W_N^*(t)$ ($W_P(t)$). Specifically, following the methodology of Kobayashi et al. (2017), I defined positive and negative words as:

Word *t* is included in the positive words list, if $W_P(t) > 2W_N^*(t)$

Word *t* is included in the negative words list, if $W_N^*(t) > 2W_P(t)$

For convenience, I define the tone of word *t*, denoted as IT(t), as:

$$IT(t) = \begin{cases} W_P(t) - W_N^*(t) & W_P(t) > 2W_N^*(t) \text{ or } W_N^*(t) > 2W_P(t) \\ 0 & elsewhere \end{cases}$$

Positive (negative) IT(t) means that word *t* is categorized into positive (negative) words. I denote *s* as the headline sentences of the report tone. I define the report tone of the headline (denoted as TONE) as:[8]

$$TONE(s) = \sum_{t \in s} IT(t)$$

where $t \in s$ represents the wordlist which appear in the headline *s*.[9]

Higher (lower) value of TONE indicates that the report is more positive (negative). In addition, I define the degree of positiveness (negativeness) of a report, denoted as $TONE_P$ and $TONE_N$, respectively, by counting how many positive (negative) words appear in the sentence:[10]

$$TONE_P(s) = \sum_{t \in s} \max(IT(t), 0)$$

$$TONE_N(s) = \sum_{t \in s} \min(IT(t), 0)$$

I found that some positive (negative) report tone merely reflect (describe) positive (negative) revisions of analyst earnings forecast or target price. Thus, the tone scores for positive-tone reports with an upgrade in earnings forecast or target price, and negative-tone reports with a downgrade in

[8] Since headlines are highly standardized with little redundancy, TONE measure is not scaled by the number of total words. However, additional analysis reveals that the result still holds, even if TONE is scaled (the detail is available upon request).

[9] In this study, the tone measure is calculated on the basis of how many kinds of positive and negative words appear in the headline, aiming to mitigate the effects of redundant expressions in the headline. However, in untabulated analysis, I find that the result still holds, even if the measure is based on the number of positive and negative words appeared in the headline.

[10] $TONE(s) = TONE_P(s) + TONE_N(s)$

earnings forecast or target price are set to be zero.

4.3. Research Design

4.3.1. Multivariate Analysis

I analyze the information content of report tone, in order to determine its usefulness to market participants. To test hypotheses H1 and $H1_a$, I analyze short-window market reaction to report tone. In order to determine the extent to which investors respond to the tone of analyst reports upon their publication, the following regression is estimated:

$$CAR = \alpha_0 + \beta_0 TONE + \gamma_1 EPS\_REV + \gamma_2 TP\_REV + \gamma_3 REC + (Controls) + \varepsilon \quad (1)$$

where:

EPS_REV= change in earnings per share forecast for current fiscal year deflated by stock price as of the publication date.

TP_REV= change in target price deflated by stock price as of the publication date.

REC= stock recommendation coded as: Buy=1, Hold=0, Sell=-1[11]

In addition, I include the following control variables:

SUE = earnings surprise for days t-1 through t. It equals each firm's standardized unexpected earnings, following Bernard and Thomas (1990), who use a seasonal random walk with trend model for each firm's quarterly earnings, if there is an earnings announcement for days t-1 through t, and 0 otherwise.

PCAR = a prior nine trading days market-adjusted return (a market-adjusted return for days t-9 through t-1).

SIZE = the logarithm of the market value of equity.

BM = book-to-market ratio.

I_i = a series of industry indicator variables based on the Tokyo Stock Exchange 10-industry classification scheme.

The dependent variable (CAR) is CAR[0,1], which is the market-adjusted return from cumulative

[11] Due to constraints of analyst detail data provided by Factset, I used three broad categories of recommendation (buy, hold, and sell).

two-day market adjusted returns starting from the current report date[12]. In Equation (1), I include the level of recommendation (REC), the revisions of earnings forecast (EPS_REV), and revisions of target price (TP_REV) because previous research shows that these quantitative measures are informative to investors (Jegadeesh et al., 2004; Barber et al., 2010). The regression also includes several control variables. Since analysts may piggyback on recent news or events, I include prior nine trading days market-adjusted returns skipping the most recent day (PCAR) to control for any potential short-term momentum or reversal in the event returns. In addition, to control for price reactions to earnings surprises around the publication date, I include earnings surprises for days t-1 through t (SUE). To control for investor reactions from firm characteristics, I include firm size (SIZE), measured as the logarithm of the market value of equity, book-to-market ratio (BM), and industry indicator variables in Equation (1). Because multiple analysts can follow the same firm, and multiple reports for the same firm might be issued on the same date, standard errors in all empirical tests are estimated with a two-way cluster control at the firm and publication date. The significant positive coefficient of TONE (positive β_0) indicates that prices react to report tone, supporting H1 and denying $H1_a$.

To test hypotheses H2, $H2_a$, H3, and $H3_a$, I analyze the post-event (post-publication) market reaction to the report tone. To this end, the market-adjusted returns from t+2 to t+50, denoted as CAR[2,50], are regressed on the same explanatory variables as in Equation (1). I first examine whether the coefficient of TONE (β_0) is significantly negative. If not, it is likely that short-window price reaction to report tone is not corrected in a subsequent period. In this case, the hypothesis H2 is supported, and the hypothesis $H2_a$ is denied. In addition, if β_0 is significantly positive, it is likely that there is a delay in price reaction to report tone. In this case, the hypothesis H3 is supported, and the hypothesis $H3_a$ is denied.

Then, to test hypotheses H4 and $H4_a$, I, separately, analyze the market reaction to positive tone ($TONE_P$) and to negative tone ($TONE_N$). To this end, I run the following regression model for

[12] I also performed the regression analyses where CAR is defined as size and value-adjusted returns, instead of market-adjusted returns on the basis of the methodology of the study of Daniel et al. (1997). In untabulated analysis, I find that the result still holds, even if CAR is the size and value-adjusted return.

CAR[0,1] and CAR[2,50].

$$CAR = \alpha_0 + \beta_P TONE_P + \beta_N TONE_N + \gamma_1 EPS\_REV + \gamma_2 TP\_REV + \gamma_3 REC + (Controls) + \varepsilon \quad (2)$$

I include the same control variables as in Equation (1). I compare β_P with β_N to test hypotheses H4 and $H4_a$.

To test hypotheses H5 and $H5_a$, I analyze the interaction effect between investor (price) response to report tone and the reports' quantitative summary measures. I examine whether the informational value of the report tone is higher or lower when the tone is used to support the quantitative summary measures. To analyze the interaction effect, following the study of Huang et al. (2014), I modify Equation (1) by including the interaction of TONE with each of the three quantitative summary measures, EPS_REV, TP_REV, and REC, as well as the variable indicating the direction of the corresponding measure, EPS_DIR, TP_DIR, and REC_DIR. The revision direction of earnings forecast, EPS_DIR, equals 1 if EPS_REV is positive, -1 if EPS_REV is negative, and 0 otherwise (in short, sgn(EPS_REV)). TP_DIR and REC_DIR is defined similarly.

$$CAR = \alpha_0 + \beta_0 TONE + \beta_1 TONE * REC\_DIR * REC + \beta_2 TONE * TP\_DIR * TP\_REV + \beta_3 TONE * EPS\_DIR * EPS\_REV + (Controls) + \varepsilon \quad (3)$$

Controls include *EPS_REV*, *TP_REV*, *REC*, $REC\_DIR * REC$, $EPS\_DIR * EPS\_REV$, $TP\_DIR * TP\_REV$, *PCAR*, *MV*, *BM*, and the industry variables.

If report tone can be used as an additional piece of information to assess the analysts' quantitative outputs (hypothesis H5 is satisfied), the intensity of the market reaction to the favorable quantitative summary measures (positive REC, EPS_REV, and TP_REV) is higher when TONE is higher; the intensity of the market reaction to the unfavorable quantitative summary measures (negative REC, EPS_REV, and TP_REV) is higher when TONE is lower. That is, the effect of report tone on the intensity of the market reaction to the quantitative summary signals depends on the direction of the quantitative summary signals. Thus, I include the revision direction variables, REC_DIR, TP_DIR, and EPS_DIR, for REC, TP_REV, and EPS_REV, respectively, so that the predicted sign of β_1, β_2, and β_3, respectively, is positive (negative) regardless of the direction of the quantitative summary measures when hypothesis H5 ($H5_a$) is satisfied.

4.3.2. Average Market Reaction

To clarify the economic significance of the results, I simply examine an average price reaction to reports with positive tone and negative tone, respectively. Then, I examine whether the result is supportive of the hypotheses H1, H2, H3, and H4.[13]

To this end, I first separate reports into those with positive, negative, and neutral tones. If TONE indicator for a report is positive (negative), the report is categorized as a positive-tone (negative-tone) report; otherwise, the report (with zero TONE score) is categorized as a neutral-tone report. Then, I calculate the average market-adjusted returns of positive, negative, and neutral-tone reports. To test hypothesis H1, I examine whether the market-adjusted returns for t through t+1 (CAR[0,1]) are significantly higher (lower) for positive-tone (negative-tone) reports than for neutral-tone reports. To test hypotheses H2 and H3, I compare the market-adjusted returns for days t+2 through t+50 (CAR[2,50]) between positive-tone (negative-tone) reports and neutral-tone reports. To test hypothesis H4, I examine whether a difference in the return between negative-tone and neutral-tone reports is larger than a difference between positive-tone and neutral-tone ones.

This analysis does not control for the effects of size, value (book-to-market). In addition, we should be concerned that positive (negative) report tone might merely reflect positive (negative) revisions of analyst earnings forecast or target price[14]. To account for the possibility, I exclude positive-tone reports with an upgrade in earnings forecast or target price, and negative-tone reports with a downgrade in earnings forecast or target price. In addition, to control for size and book-to-market effects, I utilize size and value-adjusted returns, instead of market-adjusted returns. Following the study of Daniel et al. (1997), I sort all stocks into quintiles based on the market value of their equity. Second, within each quintile, I further sort stocks into quintiles based on their book-to-market ratios. The size and value-adjusted returns are calculated by subtracting each stock return from the return on a portfolio of firms that are matched for market equity and

[13] I only perform multivariate analysis when testing H5 and H5a, since adjustment for several control variables is necessary to identify the interaction effect between report tone and quantitative measures.
[14] These factors are controlled in the multivariate regression analysis, by including EPS_REV and TP_REV.

book-to-market.[15]

5. Empirical Results

5.1 Descriptive Statistics and Correlations

As described in Section 4.2., the positive and negative words have been selected by utilizing headlines of analyst reports for which recommendations have been upgraded or downgraded. As shown in Table 1, 28 positive words and 33 negative words have been selected for the calculation of the report tone.

I extracted the report date and report headline (title) from the Factset database. As shown in Table 2(a), my sample consists of 36,995 reports; within the sample, 14,032 reports (37.9%) are recommendations to buy and 3,340 reports (9.0%) are recommendations to sell; earnings forecasts of 11,308 reports (30.6%) are revised upward, and forecasts of 8,093 reports (21.9%) are revised downward; target prices of 9,744 reports (26.3%) are revised upward, and the prices of 4,838 reports (13.1%) are revised downward. In terms of TONE measures, there are 7,516 positive-tone reports (20.3%) and 2,971 negative-tone reports (8.0%).

Table 2(b) shows the correlation of TONE measures with other variables. The report tone has no strong association with the recommendation and other quantitative measures (revisions in earnings forecasts and target prices). In addition, since there is no significant association with returns during the nine trading days prior to the report date (PCAR) and earnings surprises (SUE), it is unlikely that the tone is subsumed by recent event return (e.g., earnings announcement return). Thus, these results might indicate that reports contain independent information.

[Table 1]

[Table 2]

5.2. Stand-alone informational value

[15] Since I analyze analyst reports of Japanese stocks where the momentum effect is not observed in Japan, I do not control for the momentum effect.

Table 3 and Table 4 show price reactions to report tone. Table 3 presents the results from estimating the regression of Equation (1). First, the result reveals that the estimated coefficients on REC (stock recommendations), EPS_REV (earnings forecast revisions), and TP_REV (target price revisions) are significantly positive, indicating that stock prices positively reacts to quantitative measures. In terms of reactions to the report tone, the result is consistent with the hypothesis H1, which states that stock prices (investors) react to the tone of analyst reports. The estimated coefficient of 0.0308 on TONE is statistically significant. On average, one standard deviation increase in TONE increases the short-window return (CAR[0,1]) by 24 basis points. To further understand the economic significance of the impact of report tone, I also show the differences in the short-window returns between positive-tone reports and negative-tone reports in Table 4(a). The two-day market-adjusted return around the publication date is higher for positive-tone reports than for negative-tone ones by 1.48%. As shown in Table 4(b), even if I control for size, and value effect, we can observe a 1.42% difference. These differences are statistically and economically significant. All these results support the hypothesis H1, which posits that stock prices react significantly to the tone of analyst reports.

Tables 3 and 4 also show the effect of report tone on post-event returns (market-adjusted returns for days t+2 through t+50). According to Table 3, which also presents the estimated results for the regression for CAR[2,50], quantitative measures, i.e., stock recommendation (REC), earnings revisions (EPS_REV), and target price revisions (TP_REV), have no negative association with post-event returns; there is no price correction for the quantitative measures. Similarly, Table 3 reveals that the coefficient of 0.0039 on TONE is not negative. In addition, Table 4(a) shows that post-event returns for positive-tone reports are significantly higher than those for negative-tone reports by 70 basis points (79 basis points on the basis of the characteristic-adjusted returns).

These results suggest that the initial price reaction to report tone is not corrected in a subsequent period[16]. In other words, report tone has a permanent impact on stock prices. It clearly supports the

[16] To examine the robustness of the results, I additionally include sgn(TONE)*TONE*CAR[-1,+1] in Equation (1) and analyze a sign of the coefficient. When a price correlation occurs for the reaction to the report tone, the positive (negative) report tones with higher (lower) CAR[-1,+1], i.e., more positive (negative) sgn(TONE)*TONE*CAR[-1,+1], are likely to be accompanied with lower (higher) subsequent returns. Thus, a negative sign of the coefficient indicates an existence of the price correlation. The untabulated result shows that the coefficient is insignificant, supporting the view that the initial price reaction to report tone is not corrected in a

hypothesis H2 and suggests that report tone provides incremental information beyond the quantitative summary measures.

[Table 3]

[Table 4]

On the other hand, insignificant coefficients of 0.0042 on TONE does not support the existence of underreaction to report tone. However, Table 4 reveals that the difference in CAR[2,50] between negative-tone and neutral-tone reports is statistically and economically significant (62 basis points; 71 basis points on the basis of the characteristic adjusted return), while the difference between positive-tone and neutral-tone reports is insignificant (8 basis point; after the control, 9 basis points). The result indicates that underreaction is observed for negative tones and not for positive tone. Figure 1 plots the difference in buy-and-hold market-adjusted stock returns between positive-tone reports and neutral-tone reports, and between negative-tone reports and neutral-tone reports. The figure also supports the inference that a price drift occurs only for negative-tone reports. In fact, when I replace TONE with both $TONE_P$ and $TONE_N$, as shown in Equation (2), the regression analysis shows significant difference in underreaction to positive versus negative tones in analyst reports. The results, reported in the column "CAR[2,50]" of Table 5, show the significant coefficient of 0.0406 on $TONE_N$, while the coefficient of -0.0066 on $TONE_P$ is statistically insignificant.

These combined evidence shows that prices slowly response to negative-tone reports, supporting the hypothesis H3. Since price underreaction is not observed for quantitative measures, the result indicates that investors react less quickly to (negative) qualitative information than they do to quantitative information.

These results also highlight the existence of asymmetric reactions to positive versus negative tones in analyst reports. In fact, they show significant difference in immediate price reaction between positive-tone reports and negate-tone reports. The results, reported in the column "CAR[0,1]" of Table 5, show significant coefficients of 0.0138 and 0.0758 on $TONE_P$ and $TONE_N$, respectively. On average, one standard deviation increase in $TONE_N$ increases the short-window return (CAR[0,1])

subsequent period.

by 28 basis points, while a one standard deviation increase in $TONE_P$ increases the return by 10 basis points. Table 4 also reveals that the difference in CAR[0,1] between negative-tone reports and neutral-tone reports is 1.35%, while the difference between positive-tone and neutral-tone reports is only 0.13%. After controlling for the effects of size and value, the difference between negative-tone and neutral-tone reports is 1.29%, while the difference between positive-tone and neutral-tone ones is 0.13%. These results indicate that investors place more weight on negative versus positive tone in analyst reports.

These results regarding the significant difference in immediate and long-term price reaction between positive and negative tone reports support the hypothesis H4, suggesting that investors react more strongly and slowly to negative tone than to positive tone in analyst reports. These results support the view that negative report tone contains more incremental information than positive tone. As discussed in Section 3, several theories could explain this result: (1) there is more constraint in reflecting analysts' negative opinions in their quantitative outputs, and these views are instead reflected in negative textual tone of their reports; (2) analyst reports tend to be optimistic due to their cognitive bias and incentives, and positive report tone might merely reflect their optimistically biased opinion; (3) due to asymmetric disclosure between good news and bad news, negative opinion from analysts is more essential to investors than positive opinion.

[Table 5]

[Figure 1]

5.3 Interaction with Quantitative Measures

To test the hypotheses H5 and $H5_a$, I analyze whether the informational value of the report tone is higher or lower when the report tone is used to support the quantitative summary.

As shown in the regression result for Equations (1), (2), and (3) (shown in Tables 3, 5, and 6), CAR[0,1] has an significant association with the quantitative measures, while CAR[2,50] are not significantly associated with the quantitative summary measures. Thus, I focus on the interaction effect between the quantitative measures and short-window price reaction to report tone, and

examine whether the interaction effect is not corrected, subsequently. By performing these analyses, I can see whether the informational value of report tone is higher or lower when report tone is used for supporting the quantitative measure. Table 6 shows the interaction effect. I find that the estimated coefficients on β_1 (the interaction effect with REC, shown in the row "TONE*REC_DIR*REC"), and β_3 (the interaction effect with EPS_REV, shown in the row "TONE*EPS_DIR*EPS_REV") for CAR[0,1] are negative and significant (-0.0170 and -0.1840, respectively). The regression result suggests that price reaction to report tone is weaker when the report tone is accompanied by a same-direction quantitative output, e.g., positive (negative) tone with a buy (sell) recommendation, and positive (negative) tone with a upward (downward) earnings forecast revision. In addition, any price correction for the interaction effects (positive β_1 and β_3 for CAR[2,50]) is not observed. Overall, the results suggest that the informational value of report tone is significantly lower when analysts use report tone to support their quantitative outputs, supporting the hypothesis $H5_a$ and denying the hypothesis H5. In sum, the combined evidence in this section suggests that qualitative information in analysts' text could have high informational value, especially when the report text is not used to support quantitative output, but rather used to provide independent information that is not incorporated in the quantitative outputs. This result is consistent with the view that textual information can be useful if analysts put original (independent) information or ideas into report text.

[Table 6]

6. Conclusion

There are many constraints (obstacles) on reflecting analysts' opinions in quantitative outputs: the earnings forecast, stock recommendation, and target price. Thus, it is natural to consider that analysts express their opinions in the report text, rather than in the quantitative summary.

In this paper, I empirically examine whether textual tone in analyst reports contains incremental information regarding intrinsic firm value. The empirical evidence on textual tone in analyst reports contributes to studies by developing a comprehensive understanding of analyst's role on asset

pricing.

The empirical result reveals that stock prices react to analyst report tone, and the price reaction is economically significant. In addition, the price reaction is not corrected in a subsequent period, even, statistically and economically significant price drift can be observed for negative report tone. These findings support the view that report tone contains stand-alone information and prices underreact to negative report tone. Finally, the informational value of report tone is lower when an analyst uses textual tone to support their quantitative output; qualitative information in analyst text could have high informational value when report text is used to provide independent information that is not incorporated into the quantitative summary.

The contribution of my findings to existing studies can be summarized as follows.

First, my study provides robust evidence for the informational value of textual tone in analyst reports. Due to a lack of empirical evidence, it was inconclusive whether report tone reflects useful information or just biased opinion. By showing not only significant price reaction to report tone, but also a non-occurrence of price correction after the publication date, I show that report tone has significant informational value.

Second, my study shows that stock prices underreact to report tone, when the tone is negative. No other study provides evidence of whether prices immediately or gradually incorporate textual opinion. My study is the first to show the existence of price underreaction to qualitative information.

Third, my study clarifies the interaction effect between the textual tone and quantitative measures. Previous studies show mixed results for the interaction effect. My study provides evidence that informational value is significantly weaker when the report text is used to support quantitative outputs (specifically, stock recommendations and earnings forecasts).

The findings highlight the role of qualitative (textual) information in asset pricing. I focus on the headlines of analyst reports, which are more structured, concise, and more widely read by investors than the body of analyst reports. Since tone analysis is easier and more precisely conducted for this well-structured summary, the analysis provides more robust evidence of the informational value of the qualitative information in analyst reports.

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Table 1

Word Lists

Tables shows 28 positive words and 33 negative words, which are selected to calculate the tone of the headline.

a) Positive Words (28 words)

	Word (in Japanese)	English Translation	Weight
1	改善	Improvement	0.294
2	拡大	Expansion	0.211
3	注目	Attention	0.115
4	継続	Continuation	0.107
5	割安	Cheap	0.101
6	増益	Profit increase	0.073
7	安定	Stability	0.065
8	加速	Acceleration	0.064
9	底	Bottom	0.061
10	向上	Improvement	0.061
11	好調	Good performance	0.059
12	ポジティブ	Positive	0.041
13	持続	Sustainability	0.040
14	増額	Increase	0.033
15	トレンド	Trend	0.026
16	強い	Strong	0.026
17	強気	Bullish	0.025
18	還元	Premium redemption	0.024
19	恩恵	Benefit	0.020
20	抑制	Suppression	0.019
21	印象	Impression	0.019
22	好転	Recovery	0.019
23	進展	Progress	0.019
24	増配	Increase in dividend	0.013
25	好機	Opportunity	0.013
26	力強い	Powerful	0.008
27	コストダウン	Cost reduction	0.008
28	進む	Advance	0.008

b) Negative Words (33 words)

	Word (in Japanese)	English Translation	Weight
1	懸念	Concern	-0.200
2	低下	Decline	-0.161
3	悪化	Worsening	-0.117
4	織り込み	Incorporated	-0.110
5	鈍化	Decelerating	-0.094
6	競争	Competition	-0.094
7	ネガティブ	Negative	-0.088
8	減益	Decreasing profit	-0.085
9	不透明	Unpredictable	-0.076
10	減速	Slow down	-0.076
11	縮小	Shrinking	-0.070
12	格下げ	Downgrade	-0.041
13	減額	Reduction	-0.041
14	遅れ	Delay	-0.039
15	下回る	Miss	-0.031
16	低迷	Slump	-0.031
17	低調	Sluggish	-0.031
18	乖離	Divergence	-0.028
19	踊り場	landing	-0.021
20	激化	Intensification	-0.021
21	遅延	Delay	-0.021
22	停滞	Stagnation	-0.021
23	尚早	Premature	-0.021
24	困難	Difficulty	-0.021
25	厳しい	Difficult	-0.014
26	過熱	Overheating	-0.013
27	警戒	Caution	-0.013
28	問題	Problem	-0.013
29	軟調	Weak	-0.013
30	不在	Absence	-0.013
31	不振	Slump	-0.013
32	織り込む	Incorporated	-0.005
33	伸び悩む	Stagnate	-0.005

Table 2

Descriptive Statistics and Correlations

Panel (a) reports the descriptive statistics for the 36,995 sample reports. The "Mean" row shows the average value. "Median" shows the median value. "Std" shows the standard deviation. "#(>0)", "#(<0)", and "#(=0)" show the number of values greater than zero, the number of the negative value, and the number of zero values, respectively. "Ratio(>0)", "Ratio(<0)", and "Ratio(=0)" show the probability that the value is greater than zero, or negative, or that it is zero, respectively. Panel (b) shows Pearson correlations between the variables.

a) Descriptive Statistics

	Mean	Median	Std	# (>0)	Ratio(>0)	#(<0)	Ratio(<0)	# (=0)	Ratio(=0)
TONE	0.0185	0.0000	0.0787	7516	20.3%	2971	8.0%	26508	71.7%
$TONE_P$	0.0280	0.0000	0.0718	8156	22.0%	0	0.0%	28839	78.0%
$TONE_N$	-0.0097	0.0000	0.0367	0	0.0%	3742	10.1%	33253	89.9%
REC	0.2890	0.0000	0.6213	14032	37.9%	3340	9.0%	19623	53.0%
EPS_REV	0.0003	0.0000	0.0381	11308	30.6%	8093	21.9%	17594	47.6%
TP_REV	0.0139	0.0000	0.0983	9744	26.3%	4838	13.1%	22413	60.6%
SUE	0.0121	0.0000	0.9849	6446	17.4%	6012	16.3%	24537	66.3%
PCAR	0.20%	-0.04%	5.22%	-	-	-	-	-	-
MV	5.7434	5.7315	0.5588	-	-	-	-	-	-
BM	0.7570	0.6828	0.4218	-	-	-	-	-	-
CAR[0,1]	0.25%	0.09%	4.19%	-	-	-	-	-	-
CAR[2,50]	0.68%	0.01%	12.03%	-	-	-	-	-	-

b) Correlation

	TONE	REC	EPS_REV	TP_REV	SUE	PCAR	MV	BM
TONE		0.081	-0.043	-0.137	0.021	-0.016	-0.028	0.010
REC			0.005	0.039	0.010	0.010	0.088	-0.099
EPS_REV				0.107	0.029	0.039	0.015	-0.047
TP_REV					0.022	0.205	0.022	-0.096
SUE						0.025	0.007	-0.023
PCAR							0.012	-0.021
MV								-0.220

Table 3

Market Reaction to Publication of Analysts' Reports

The table shows estimation results of Equation (1) (results for industry indicators are not reported): $CAR = \alpha_0 + \beta_0 TONE + \gamma_1 EPS_{REV} + \gamma_2 TP_{REV} + \gamma_3 REC + (Controls) + \varepsilon$. Column of CAR[0,1] and CAR[2,50] are regression results when dependent variables are CAR[0,1] and CAR[2,50], respectively. Standard errors are estimated with two-way cluster control at the firm and publication date levels. **, *** indicate statistical significance at the 0.05 and 0.01 levels, respectively.

	Dependent Variable:			
	CAR[0,1]		CAR[2,50]	
INTERCEPT	0.0147 ***	(2.84)	0.0483	(1.93)
TONE	0.0308 ***	(8.86)	0.0039	(0.55)
REC	0.0039 ***	(9.63)	-0.0014	(0.91)
EPS_REV	0.0455 ***	(3.03)	-0.0354	(1.62)
TP_REV	0.0622 ***	(16.72)	-0.0062	(0.70)
SUE	0.0018 ***	(4.20)	0.0033 ***	(3.41)
PCAR	-0.0220 ***	(3.44)	-0.0199	(1.08)
MV	-0.0016 ***	(3.21)	-0.0106 ***	(4.13)
BM	0.0032 ***	(3.49)	0.0041	(1.24)

Table 4

Average Market Reactions to Report Tone

The tables show average cumulative returns for positive-tone reports (the row of "Positive"), neutral-tone reports (the row of "Natural"), and negative-tone reports (the row of "Negative"), respectively. In addition, the tables show the difference in returns between positive-tone reports and negative-tone reports (the row of "Positive-Negative"), between positive-tone reports and neutral-tone reports (the row of "Positive-Neutral"), and between negative-tone reports and neutral-tone reports (the row of "Negative-Neutral"). The columns of CAR[0,1] and CAR[2,50] are an average of returns for t through t+1 and that of returns for days t+2 through t+50, respectively. Panels (a) and (b) show the results on the basis of the market-adjusted returns and return, which is controlled for the effects of size, book-to-market, earnings revision, and target price change. Standard errors are estimated with two-way cluster control at the firm and publication date levels. **, *** indicate statistical significance at the 0.05 and 0.01 levels, respectively.

(a) Average Market-adjusted Return

	CAR[0,1]		CAR[2,50]		# of report
Positive	0.46%		0.79%		7,516
Neutral	0.34%		0.71%		26,508
Negative	-1.01%		0.09%		2,971
Positive－Negative	1.48%	***	0.70%	***	
	(14.96)		(3.03)		
Positive－Neutral	0.13%	**	0.08%		
	(2.30)		(0.56)		
Negative－Neutral	-1.35%	***	-0.62%	***	
	(15.17)		(2.96)		

(b) Average Return after the Characteristic Adjustments

	CAR[0,1]		CAR[2,50]		# of report
Positive	0.46%		0.27%		7,516
Neutral	0.33%		0.18%		26,508
Negative	-0.96%		-0.52%		2,971
Positive－Negative	1.42%	***	0.79%	***	
	(13.32)		(3.48)		
Positive－Neutral	0.13%	**	0.09%		
	(2.16)		(0.62)		
Negative－Neutral	-1.29%	***	-0.71%	***	
	(13.48)		(3.50)		

Table 5

Direction of Textual Opinions

The table shows estimation results of Equation (2) (results for industry indicators are not reported): $CAR = \alpha_0 + \beta_p TONE_p + \beta_n TONE_n + \gamma_1 EPS_{REV} + \gamma_2 TP_{REV} + \gamma_3 REC + (Controls) + \varepsilon$. Columns CAR[0,1] and CAR[2,50] are regression results when dependent variables are market-adjusted returns for t through t+1 and returns from t+1 to t+50, respectively. Standard errors are estimated with two-way cluster control at the firm and publication date levels. **, *** indicate statistical significance at the 0.05 and 0.01 levels, respectively.

	Dependent Variable:			
	CAR[0,1]		CAR[2,50]	
INTERCEPT	0.0161	(3.42)	0.0492	(1.94)
$TONE_P$	0.0138 ***	(4.08)	-0.0066	(0.83)
$TONE_N$	0.0758 ***	(9.83)	0.0406 ***	(2.82)
REC	0.0038 ***	(9.35)	-0.0015	(0.98)
EPS_REV	0.0457 ***	(3.03)	-0.0353	(1.62)
TP_REV	0.0614 ***	(16.52)	-0.0068	(0.77)
SUE	0.0018 ***	(4.21)	0.0033 ***	(3.40)
PCAR	-0.0222 ***	(3.49)	-0.0201	(1.09)
MV	-0.0017 ***	(3.38)	-0.0107 ***	(4.15)
BM	0.0033 ***	(3.56)	0.0042	(1.26)

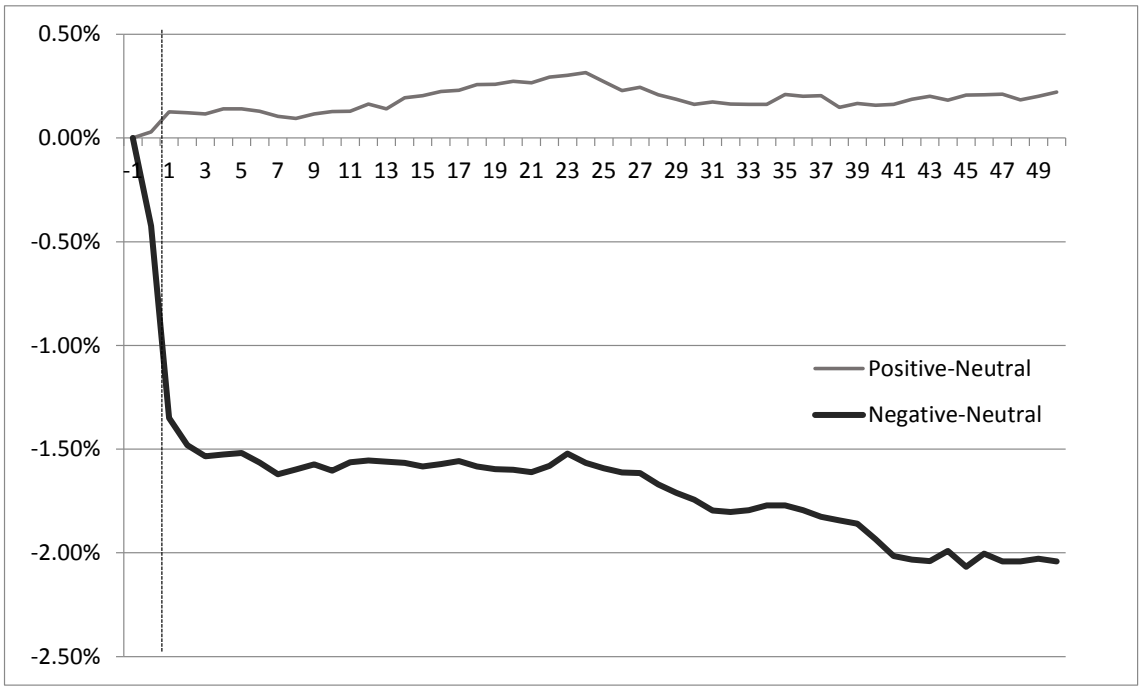
Table 6

Interaction Effects

The table shows estimation results of Equation (3) (results for industry indicators are not reported): $CAR = \alpha_0 + \beta_0 TONE + \beta_1 TONE * REC\_DIR * REC + \beta_2 TONE * TP\_DIR * TP\_REV + \beta_3 TONE * EPS\_DIR * EPS\_REV + (Controls) + \varepsilon$. Columns CAR[0,1] and CAR[2,50] are regression results when dependent variables are market-adjusted returns for t through t+1 and returns for days t+2 through t+50, respectively. Standard errors are estimated with two-way cluster control at the firm and publication date levels. **, *** indicate statistical significance at the 0.05 and 0.01 levels, respectively.

	Dependent Variable:			
	CAR[0,1]		CAR[2,50]	
INTERCEPT	0.0140 ***	(2.81)	0.0451	(1.81)
TONE	0.0393 ***	(8.98)	0.0077	(0.71)
REC	0.0037 ***	(7.89)	-0.0030	(1.38)
EPS_REV	0.0456 ***	(3.11)	-0.0330	(1.52)
TP_REV	0.0624 ***	(15.77)	-0.0060	(0.64)
SUE	0.0018 ***	(4.20)	0.0033 ***	(3.42)
PCAR	-0.0231 ***	(3.57)	-0.0207	(1.13)
MV	-0.0016 ***	(3.19)	-0.0104 ***	(4.07)
BM	0.0033 ***	(3.55)	0.0042	(1.24)
TONE *REC_DIR*REC	-0.0170 ***	(3.01)	-0.0091	(0.63)
TONE*TP_DIR*TP_REV	0.1237	(1.81)	-0.2663	(0.87)
TONE*EPS_DIR*EPS_REV	-0.1840 **	(2.39)	0.3917	(1.18)
REC_DIR*REC	0.0011	(1.84)	0.0039	(1.52)
TP_DIR*TP_REV	-0.0054	(1.30)	0.0126	(1.28)
EPS_DIR*EPS_REV	0.0179 ***	(5.17)	0.0044	(0.45)

Figure. 1 Cumulative Abnormal Return by Report Tone



This figure plots the difference in buy-and-hold market-adjusted stock returns between positive-tone reports and neutral-tone reports, and that between negative-tone reports and neutral-tone reports, respectively. The figure shows cumulated stock returns in the entire window of trading days, relative to the day before the announcement day, from [-1,+50]. The sample period extends from 2013 to 2017.