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Analyst Report Readability, Earnings Uncertainty and Stock Returns

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Analyst Report Readability, Earnings Uncertainty and Stock Returns

Abstract

This study investigates the association among readability of analyst reports, stock price and expectations of future earnings. Readability is one important feature of analyst reports that may affect value relevant information. We find that readability reduces analyst dispersion but is not associated with revision news, and stock markets reactions are significantly positive to the issuance of more readable reports. In addition, we document that market reacts positively to the predicted component of forecast dispersion reduction due to report readability. Finally, the positive effect of readability on stock prices is higher when it effectively reduces investors' uncertainty, specifically when the uncertainty is higher, when analysts are more experienced, or when forecasts are issued after earnings announcements. Overall, our empirical findings suggest the linguistic features of analysts' reports reduce uncertainty about future earnings, and investors price that reduction of uncertainty.

1. Introduction

Analyst forecast reports contain detailed information regarding analysts' views of future profitability. Asquith, Mikhail and Au (2005) suggest that disclosure of the research logic and of the reasoning behind an analyst report is critical for investors to better understand a firm's value. Readability is one important feature of analyst reports that may affect value relevant information. For example, Lehavy, Li and Merkley (2011) provide empirical evidence that less readable 10-K filings are associated with greater overall uncertainty in analyst earnings forecasts. This paper examines the association among linguistic features of analyst reports, expectations of future earnings and stock returns.

We argue that stock market reacts positively towards reports with higher levels of readability, because readability reduces the uncertainty about future earnings. Security analysts are important information intermediaries who facilitate communication between investors and managers (Healy and Palepu, 2001). Analyst reports contain vital information that explains the reasoning behind forecast revisions (Francis, Schipper and Vincent, 2002). A well-written report demonstrates how a forecast is formulated. Therefore, a better written report lowers the information-processing cost to the investors, allowing them to apply the EPS revision to their trading decisions with less uncertainty (Bloomfield 2002; Lehavy et al., 2011). We therefore hypothesize a greater reduction of uncertainty following the issuance of more readable reports. In addition, as the reduction of uncertainty suggests a lower discount rate in the pricing of expected earnings (e.g. Bowen, Chen and Cheng, 2008; Clement, Frankel and Miller, 2003), we also hypothesize a positive association between readability and stock price reactions.

To measure readability, we follow Li (2008) and other previous studies in using linguistic measures to define the complexity and ambiguity of a report (e.g., the Fog index).¹ We first study the association between readability of analyst reports and change in earnings expectations, i.e. analyst dispersions and forecast revisions. Second, we examine the influence of readability on investment decisions in terms of stock returns around the time reports are issued, by using an event study setting. Third, we investigate whether the association between changes in uncertainty and stock prices can be attributed to report readability. In the last section, we provide cross-sectional evidence that readability has a stronger effect on stock prices when uncertainty is higher and when analysts are more experienced.

Using a sample of 2,930 analyst reports from 2005 to 2007, we find that readable reports significantly reduce uncertainty about forecasted future earnings. Using analyst forecast dispersion as an empirical measure of market uncertainty about forecasting future earnings, we find that changes in forecast dispersion around an analyst report is significantly more negative if the report is more readable. Our finding is both statistically and economically significant. However, we find no association between analyst forecast revision news and readability. This finding is consistent with the notion that readability improves the precision of market expectations, but is not associated with the forecast revision news contained in analyst reports.

In the second part of this study, we test whether market prices respond to report readability. We find significant evidence that market reactions around the issuance of analyst

¹ Our results are robust using two other commonly used measures in linguistics, Flesch and Flesch-Kincaid, to supplement the Fog index.

reports are significantly more positive when the reports are more readable. In the third part of the study, we test whether the positive market reaction to readable reports is attributable to the reduction of uncertainty about future earnings expectations. We adopt a two-stage test. First, we estimate the component of dispersion change predicted by report readability by regressing change in dispersion against readability. Second, we regress the market reaction against the predicted component of dispersion change in the first stage. Our results show significant positive association between return and predicted reduction of forecast dispersion. The explanatory power of the predicted component in the market reaction test is not significantly different if we use the change of dispersion directly. Our test results suggest that market reacts positively to readability because it reduces the uncertainty of earnings forecasts.

In the fourth part of the study, we provide cross-sectional evidence on whether the main findings are stronger when report readability is more effective in reducing market uncertainty. To execute empirical tests of these predictions, we use three measures of effectiveness in reducing market uncertainty: the bid-ask spread, the level of analyst experience (Mikhail, Walther and Willis, 1997) and whether reports are issued right after an earnings announcement (Baginski and Hassell, 1990; Leavy et al., 2011). Our findings show that market reacts more positively to readability when the bid-ask spread around the time of report issuance is wider, when the analyst issuing the report is more experienced, and when the report is issued after an earnings announcement. This is consistent with the notion that the positive association between readability and stock return is stronger when readability is better at reducing the market

uncertainty. Finally, sensitivity analysts indicate that our findings of positive market reactions are not driven by forecast bias, but attributable to the reduction of uncertainty.

This study makes three contributions to the literature. First, the study generates new insights by examining the quality of analyst reports. These reports are a product that is publicly available to investors, but poorly understood by researchers. To the best of our knowledge, our study is among the first to examine whether readability of analyst reports affects market reactions, in the case that go beyond simple earnings forecasts or stock recommendations. This study also contributes to understanding concerning the value of analysts as information intermediaries. Readability directly affects an investor's understanding of the information provided in a report, and it is indicative of whether the analyst has exerted effort to "promote or sell" a forecast or a product recommendation through providing a more readable document. By studying the linguistic aspect of readability in analyst reports, we find that the quality of writing in earnings forecasts associates positively with the reduction of market uncertainty.

The second contribution of this study lies in its analysis of whether report readability conveys some important message that the market recognizes and reacts to. Readability reflects the difficulty (or ease) of understanding analyst reports, which directly affects investors' interpretation of forecast revisions made in the report. By showing that readability of analyst reports affects firm value, this study extends the existing research on market reaction to analyst reports. We provide empirical evidence that the quality of communication in an analyst report influences the investors' interpretation of the report. This study thus improves our understanding

of investors' behavior and the role of financial analysts as information intermediaries in the market.

This paper makes a third contribution by incorporating linguistic research on text readability into analyst research. Asquith et al. (2005) suggest that analyst reports provide useful information to investors. Li (2008) extends this insight by providing empirical evidence for the importance of readability in annual reports, and posits that studying the readability of analyst reports allows us to understand the reports from a different angle. Leavy et al. (2011) further extend these studies on the readability of financial reports by studying the association between the readability of 10K filings and analyst behavior. As previous work in this area has not considered measuring the role of linguistics in financial analysis research, we know little about whether linguistic factors affect the role of analysts as information intermediaries in financial markets. This study explores the consequences of the language used in analyst reports has on the stock market, and whether particular linguistic features are associated with market reactions around analyst report issuance. Our findings contribute to both the literature on linguistics and the literature on financial analysts.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes the research plan and methodology. Empirical findings are discussed in Section 4, and Section 5 concludes.

2. Literature Review and Hypothesis Development

Financial analysts have been the subject of much attention in studies on finance and accounting. Topics related to analysts' influence on capital markets and the role they play in improving market efficiency or reducing information asymmetry have been studied comprehensively. For example, prior studies examine the association between forecast accuracy and analyst characteristics (Clement, 1999; Clement and Tse, 2003). Zhang (2008) shows how analyst responsiveness mitigates post-earnings-announcement drift, and facilitates market efficiency. Although these studies suggest that analysts play a positive role in the capital market, the focus of these investigations has primarily concerned two final outputs of analysts, namely earnings forecasts and stock recommendations. Several more recent studies have examined the informativeness of analyst reports. For example, Kothari, Li and Short (2009) examine the tone (favorable versus unfavorable) of analyst reports, and Asquith et al. (2005) investigate the specific information components of reports. These studies focus on *what* information is communicated. This paper, however, examines analyst reports from a different angle, and uses different tools. The focus in this study is on *how* the information is communicated (the readability of the report). The study of analyst report readability raises the previously unanswered question of whether the quality of writing itself affects market reactions to reports.

We expect report readability to influence market reaction because readable reports are better able to reduce the uncertainty of future earnings expectations. Previous studies suggest that analyst reports provide a significant amount of information to the market. Francis, Shipper and Vincent (2002) provide empirical evidence that although analyst reports are on average less informative than earnings announcements, aggregate market reactions to analyst reports are

larger than the reactions to earnings announcements. Readability is a key feature of analyst reports, as it conveys the reasoning behind the reports' conclusions. By definition, a more readable report means that readers can better understand the report. This implies that investors incur a lower cost for processing the information contained in a forecast report (e.g., Bloomfield, 2002; Lehavy et al., 2011). For example, if the report is well written, investors can understand that the EPS revision is based on, say, a favorable industry outlook. It is therefore easier for an investor to judge the feasibility of this new information, instead of simply choosing whether to accept the stated EPS forecast revisions as a valid basis for making trading decisions.

Previous studies suggest that the dispersion among analysts' forecasts reflects uncertainty about the future economic performance of a firm (Barron and Stuerke, 1998, Clement et al., 2003). When the report is easier to understand, different readers are more likely to interpret the information more consistently, which reduces the dispersion of future earnings forecasts. For example, let us consider a situation in which the revised EPS forecast in the report is \$3, and two investors read the report to formulate their revised beliefs concerning the earnings forecast. Without clear and readable discussion in the report, the two investors may update their own forecasts as \$2 and \$3 respectively, because the first investor is either unconvinced, or is confused by the logic behind the analyst's revision. When the report is clearly written, the first investor is more likely to be convinced that the forecasted future earnings are indeed \$3. The two investors are therefore more likely to share the same belief after reading the report. This reduces the dispersion of beliefs among investors and the overall uncertainty in the market. Hypothesis 1 is developed as follows:

Hypothesis 1: The reduction of uncertainty of future earnings forecasts is greater following more readable analyst reports.

In the second part of this study, we expect that the market rewards the reduction of uncertainty following more readable reports. The traditional discount cash flow model of stock valuation models stock price is as follows:

$$P_t = k * \sum E_t / (1+r)^t,$$

where P is the stock price, k is the dividend payout rate that we assume to be a constant percentage of earnings, E_t is the expected earnings, and r is the discount rate.

As the model describes, stock return can be driven by two factors: 1) change in the expected cash flow, and 2) change in the discount rate. Prior studies suggest that analyst information affects the discount rate. For example, analytical studies suggest that increased investor confidence in analyst forecasts reduces the portion of the bid-ask spread that is caused by adverse selection, and thus reduces the information effects of large block trades on prices (e.g. Amihud and Mendelson, 1986; Diamond and Verrecchia, 1991). Brennan and Subrahmanyam (1996) suggest that analyst following reduces the adverse selection cost of transactions, and improves liquidity. Bowen, Chen and Cheng (2008) document a negative association between analyst following and the discount at issuance of seasoned equity offerings. This finding provides evidence of a direct link between analyst following, information asymmetry, and the cost of capital. In another stream of literature, studies have suggested that public information that reduces market uncertainty is rewarded with a positive market reaction. Clement et al. (2003)

provide empirical evidence that market reacts positively to confirming management forecasts. These authors conclude that this positive stock return is associated with the reduction of uncertainty provided by confirming management forecasts. Following a similar logic, if readability reduces the uncertainty about future earnings, we expect that the risk associated with uncertain future earnings is also reduced. This results in a lower discount rate and a positive return. Hypothesis 2 is thus developed as follows:²

Hypothesis 2: Readability of analyst reports is associated with positive stock return.

In the third part of this paper, we examine the cross-sectional variation of market reaction towards report readability. We expect that the main finding in Hypothesis 2 is stronger when a more readable report is more likely to reduce uncertainty in the market. First, we expect that if ex-ante uncertainty is higher, readable information in the analyst report is more likely to reduce the uncertainty about future earnings expectations. Investors update of their beliefs on future earnings depend on both the relative noise in their prior beliefs, and the new information. A lower precision (higher uncertainty) of prior beliefs thus results in a higher weight placed on the new information. Therefore, following our previous arguments that market reacts favorably to readable reports, we expect the return is more positive if readable reports are issued when the

² If analysts write readable reports to convey good or bad news, we would expect that the expected cash flow is also higher or lower following more readable reports. However, there is no theoretical expectation on how readability is associated with the news content. A financial analyst could write readable reports that convey either good or bad news.

market uncertainty over future earnings expectations is higher. Hypothesis 3A is developed as follows:

Hypothesis 3A: Readability of analyst reports is associated with more positive stock returns if the ex-ante uncertainty of forecast future earnings is higher.

The second factor we investigate is analysts' experience. Prior studies suggest that forecasts issued by experienced analysts result in stronger market reactions (Mikhail et al., 1997, 1999). This suggests that investors are more willing to act on forecasts issued by experienced analysts. We expect that readability in analyst reports issued by experienced analysts have a stronger influence on investors' beliefs about future earnings, and result in greater reduction of uncertainty and the discount rate. Therefore, markets have a more positive reaction to reports written by more experienced analysts. Hypothesis 3B is developed as follows:

Hypothesis 3B: Readability of reports is associated with more positive stock returns if the reports are written by more experienced analysts.

The third factor we investigate is the information environment of the firm that analysts are following. Lehavy et al. (2011) have shown that accounting information helps analysts better predict future performance. Their papers provide empirical evidence that more readable 10Ks are associated with better analyst forecast accuracy and lower dispersion. Barron, Byard and Kim (2002a) provide evidence that private information acquisition by security analysts increases after quarterly earnings announcements. Overall, empirical evidence suggests that accounting

disclosures result in more informative analyst reports, which improves its influence on market expectation of future earnings. As a result, we expect that readability has a stronger effect on discount rates and results in a more positive market reaction if the analyst reports are issued concurrently with, or immediately after, earnings announcements. Hypothesis 3C is developed as follows:

Hypothesis 3C: Readability of reports is associated with more positive stock returns if the reports are issued after earnings announcements.

3. Research Plan and Methodology

3.1 Measures of analyst report readability

To capture readability, we adopt measures of readability used in previous studies (Soper and Dolphin, 1964; Schroeder and Gibson, 1990; Li, 2008). Specifically, we use Fog index, which indicates the number of years of education required to understand an article, with a lower value implying that the text is easier to understand. The variable *Fog_Index* is measured as $0.4 * ((\text{words/sentence}) + 100 (\text{complex words/words}))$.

To provide a better understanding of “readability” of analyst reports, Appendix A shows two analyst reports with different levels of readability. The examples are from the summary sections at the beginning of two analyst reports. For comparability, we select two reports on the same company issued on the same date, but by two different analysts. The first report has fewer

words (155) than the second (214). However, the first report contains more complex words, with an average of 1.79 syllables per word, as compared to 1.58 syllables per word in the second report. In addition, the first report has an average of 25.83 words per sentence as compared to 6.29 words per sentence in the second report. Due to the complexity of the words and sentences used, report one is identified as the less readable report, with a *Fog_Index* of 17.82, as compared to the *Fog_Index* of 9.81 for the second report.

3.2 Tests of change of analyst forecasts

To test Hypothesis 1, we follow Clement et al. (2003) in measuring the change of information environment around the analyst reports by using two variables, namely the change of dispersion and the change of earnings expectations, i.e. $\Delta Dispersion$ and $\Delta Consensus$. $\Delta Dispersion$ represents changes in the coefficient of variation in analyst consensus forecasts surrounding an analyst report date. This variable is calculated as the standard deviations in analyst consensus forecasts after the report's issuance date, minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. $\Delta Consensus$ represents the revisions of analyst consensus surrounding an analyst report date, scaled by the stock price 10 days before the report date. To enable comparison across these two variables, we then convert both variables to standardized rankings across the sample, $CVCHANGE$ and $CFCHANGE$, which range from zero to one.

To examine the association between report readability and information environment, we adopt the following OLS regressions:

$$CVCHANGE = a + b * READ + Controls + Industry\ and\ year\ dummies + e, \quad (1a)$$

$$CFCHANGE = a + b * READ + Controls + Industry\ and\ year\ dummies + e, \quad (1b)$$

where *READ* is the *inverse* of rankings in the *Fog_Index*, standardized between zero and one. A higher *READ* value represents better readability.

We use the log value of market value of equity, *MVE*, to control for firm size as a general measure of firm information environment. The market-to-book ratio, *MTB*, is used as a control for growth, measured as the market value of the equity plus the book value of liabilities, scaled by total assets. We also use the 180-day buy-and-hold return up to the report's date, *Momentum*, to control for the information environment in the period leading up to the analyst report. To control for public disclosure prior to the issuance of the analyst report, we use *Release_News*, defined as the quarterly EPS from most recent earnings release, minus the actual EPS in the same quarter of the preceding year, scaled by the quarter-end stock price. As the main interest of the study is to examine the readability of the analyst reports, we control for another dimension of language, *Tone*, which is defined as the percentage of words with positive emotion, *PCT_POS*, minus the percentage of words with negative emotion, *PCT_NEG*, in a given report. The emotions of words used are defined according to the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. We also use forecast revision from the same analyst, ΔEST , to control for the revision news contained in the analyst report. ΔEST is defined as the difference between the analyst's EPS forecast on the report date and the previous forecast for the same period from the same analyst, scaled by the stock price at the end of previous quarter. To control for uncertainty over forecasting future earnings in the market, we control for *RET_VOL*, the standard deviation

of 15-month stock returns for a specific quarter, and for *EPS_VOL*, the standard deviation of EPS during the preceding 16 quarters, as a control for earnings volatility. We include a variable on firm leverage, *LEVERAGE*, to control for the influence of a firm's capital structure in financial reporting. *LEVERAGE* is the ratio of total assets to stockholder equity for the most recent quarter. We further control for the predictability of forecasting earnings by using *EGROWTH*, and *PREDICTLOSS*. Earnings are more difficult to forecast if they are negative (Brown 2001), or if they are significantly different from the prior period. *EGROWTH* is the change of income before extraordinary items during the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst-predicted earnings are negative, and zero otherwise. Industry and year dummies are also included in the regressions to control for industry and time-fixed effects, and standard errors are adjusted for firm clustering. This research design allows us to test whether readability reduces market uncertainty, and whether readability is associated with changes in expectations about future earnings across reports with different levels of readability.

Following Hypothesis 1, we expect the coefficient of *READ* to be significantly negative when *CVCHANGE* is the dependent variable, because reports with better readability are expected to reduce the uncertainty of investor expectations about future earnings. The coefficient of *READ* is expected to be insignificant when *CFCHANGE* is the dependent variable, as we do not expect any association between changes in earnings expectations around the analyst report date and the report readability.

3.3 Tests of stock returns

To test Hypothesis 2, we adopt an event study setting, and examine the market reactions around the analyst report issuance dates. Specifically, stock returns are measured across $[-1, +1]$ days window around the time of analyst report issuance. This measure allows us to establish whether the return (adjusted for market return) differs across reports with different levels of readability.

We test whether the sensitivity of market reaction to forecast revisions differs with report readability by using the following regression:

$$CAR[-1, +1] = a + b * READ + Controls + Industry\ and\ year\ dummies + e, \quad (2)$$

where CAR is the market-adjusted cumulative abnormal returns for $[-1, +1]$ days around the forecast revision date. We follow the standard control variables used in the extant literature on market reactions towards forecast revisions, e.g., Gleason and Lee (2001). Following Hypothesis 2, we expect b to be significantly positive in Equation (2). In other words, market reaction is expected to be favorable towards the reduction of uncertainty over future earnings due to readable reports.

3.4 Data

We use the *Investext* database provided by Thomson Financial as our source for analyst report data. This is the world's largest online database for company and industry information, which provides the full texts for two million company, industry, and geographic research reports, written by analysts from more than 600 leading investment banks, brokerage houses and

consulting firms worldwide. *Investext* also provides in-depth analyses and data about approximately 60,000 publicly traded companies, including data on sales and earnings forecasts, market projections, and research and development expenditure.

The analyst reports were downloaded from *Investext* in PDF files. To analyze the readability of these reports, we first converted the files into machine-readable form. An important step was to manually select the discussion parts from each report, instead of performing computerized batch transformation. Manual selection was used because the typesetting of analyst reports is usually complicated (as it is in company annual reports), and the reports vary in style across brokerage houses and analysts. An analyst report typically contains various non-text features such as brokerage firm logos, figures or tables. In addition, there are often sections of text on subjects other than company analysis, including disclaimer statements, descriptions of analyst qualifications, analyst contacts (e.g., phone numbers and emails), or page numbers. These irrelevant pieces of information may cause measurement errors that could possibly be correlated with our testing variables. To reduce these measurement errors, we manually collected and verified each analyst report before using computing software to calculate the readability index and to formulate our report readability measures.

We started our analysis by focusing on data from the hi-tech industry in order to obtain a sample in which analyst research is highly important. The high-tech industry has generated great research interest from security analysts, given its high growth and high level of uncertainty in valuation. For example, prior studies (Barth, Kasznik and McNichols, 2002; Barron, Byard, Kile and Riedl, 2002b) provide evidence that investors demand more information from securities

analysts when the firms have higher growth and a larger proportion of intangible assets. Firms with larger proportions of intangible assets also attract greater analyst coverage and more analyst research (Barron et al., 2002b). As shown in Appendix B, the high-tech industry has high growth, with a market-to-book ratio 30% higher than that of non-high-tech industries, and high-tech firms have a proportion of intangible assets (as measured by R&D and advertising expenses) that is about 8.3 times higher than that for non-high-tech industries. The high-tech industry has larger cross-sectional variations in growth and intangible assets than other firms. Standard deviation of MTB ratio is 36% higher, and that of intangible assets is 3.29 times greater than for other firms. Appendix B also shows that the high-tech industry is followed by more analysts than other industries, with an average of 6.90 analysts following each firm. Other industries listed in Compustat have an average of 6.03 analysts following each firm, which is 14% less than for the high-tech industry. A higher number of analysts following a firm means that we have a larger sample of reports per firm with which to conduct more powerful tests. As a result, focusing on the high-tech industry enhances the ability to test report readability, and this focus provides important insights into analysts' role in valuation of the capital market.

Sample descriptions are reported in Table 1. We obtained a total of 2,930 reports for 132 firms for the years 2005-2007. Panel A shows the sample selection. A large part of the sample has been deleted because analyst names were missing from the reports, and/or analyst forecast data from I/B/E/S were missing. Table 1, Panel B shows the distribution of analyst characteristics of the testing sample. The left columns report the mean and median of the poor readability sub-sample, defined as those reports with *READ* values below the sample median.

The right hand columns report characteristics of the sub-sample with good readability reports. The results reveal that good readability reports are from analysts who issue more frequent forecasts, cover more firms and industries, and have longer firm-specific experience. This finding is consistent with previous studies (e.g. Clement, 1999), which find that these analysts issue more accurate forecasts. The findings in Panel B suggest that reports with high readability and ex-post accuracy of forecasts come from analysts with similar characteristics. In other words, forecast accuracy and readability are both important features valued by quality analysts. The only exception is broker size. We find that analysts from smaller brokerage houses issue more readable reports.

Panel A of Table 2 shows descriptive statistics for the variables. In terms of readability, it requires (on average) around 14 years of education to understand an analyst report (mean *Fog_Index* = 14.01), indicating that analyst reports may not be easily understood by investors without a college education. The median of *CAR*[-1, +1] is about 0.25%, indicating that the market has a generally positive reaction to analyst report. The median of *CVCHANGE* is negative, suggesting that analyst reports reduce market uncertainty. Both *ΔEST* and *CFCHANGE* are close to zero. This indicates that analyst reports on average provide a balance of good and bad news to the market.

Panel B of Table 2 shows the Pearson variable correlations. *READ* is positively correlated with *CAR* (correlation coefficient 0.06), suggesting that markets react positively to more readable reports. *READ* is negatively correlated with *CVCHANGE* (-0.07) but not significantly correlated with *CFCHANGE* (-0.01), *ΔEST* (-0.03), or *RELEASE_NEWS* (-0.01). This is consistent with our

hypothesis that readable reports reduce the coefficient of variation change *CVCHANGE*, but are not related to changes in market expectation. The correlation table also suggests that reports with less favorable tones have better readability. None of these variables have correlations high enough to raise the concern of multicollinearity.

4. Empirical Findings

4.1 Readability and changes of forecast dispersion and earnings expectation

Table 3 shows the results concerning Equations (1a) and (1b). The first column reports the results using change of dispersion, *CVCHANGE*, as the dependent variable. In this regression, we control for the change of forecasts, *CFCHANGE*. The coefficient of *READ* is significantly negative in both simple and fully controlled regression models, with little difference in magnitude of the coefficients or the *t*-statistics. This suggests that our findings are less likely to be driven by omitted variables. In the full model with control variables, the coefficient of *READ* is significantly negative, -0.0531, with a *t*-statistic of -2.32. This finding is consistent with our prediction in Hypothesis 1, that a more readable report is better able to reduce the uncertainty of analyst forecasts in the market. The control variables are also consistent with previous studies. *RELEASE_NEWS* values are significantly positive, suggesting that there is a smaller reduction of dispersion around analyst report, when previous earnings surprises have been more positive. This is consistent with negative news resulting in stronger revisions of market beliefs about future earnings than positive news (e.g. Gleason and Lee, 2003). *MVE* is significantly positive, consistent with bigger firms having better information environments. This finding suggests that analyst reports are better in reducing market uncertainty concerning bigger firms.

The third and forth columns of Table 4 report regression results using *CFCHANGE* as the dependent variable. The coefficient of *READ* is not significant in all columns, and a *t*-statistic of 1.11 in the full model. This result is consistent with our expectation that the readability of analyst reports is not associated with the change of expectations about future earnings at the time of report issuance. Coefficients of *ΔEST*, *RELEASE_NEWS* and *TONE* are all significantly positive. This is consistent with *CFCHANGE* capturing changes in the level of earnings expectations, and is positively associated with earnings surprises and a favorable reporting tone.

4.2 Readability and market reaction

Table 4 shows the results from Equation (2) using the 3-day market reactions around the analyst report issuance date as the dependent variable. The first column reports the results without control variables; the second column includes the control variables used in Gleason and Lees (2003), together with report tone; and the third column reports results including all control variables. In all of the three columns, the coefficient of *READ* is significantly positive with *t*-statistics from 2.59 to 3.50. The coefficient of *READ* ranges from 0.0174 to 0.0229, and this coefficient is more positive after adding additional control variables. This finding is consistent with our prediction in Hypothesis 2 that the market reacts positively to more readable reports. The control variables are also consistent with previous studies. The coefficient of the forecast revision in the analyst report *ΔEST* is significantly positive. *RELEASE_NEWS* is significantly negative, which suggests a negative market reaction if public disclosures report positive earnings surprises. *TONE* is significantly positive, suggesting that the market reacts positively towards

analyst reports with favorable tones. *MOMENTUM* is significantly positive, suggesting a positive association between market reaction towards analyst reports and returns prior to the reports. The R-squares of the tests increase substantially after adding additional control variables (Column 2). However, the additional controls on earnings properties and performances add little incremental power.

To ensure that our finding on the positive market reaction towards *READ* is not driven by the correlation between readability and revision news, we include the interaction between *READ* and *ΔEST* as an additional control variable in the regression (Column 3). The results (untabulated) suggest that the coefficient of *READ*ΔEST* is not significant, with a *t*-statistic of -1.37. The coefficient of *READ* is 0.0207 (*t*-statistics 2.52) and this coefficient is insignificantly different (*p*-value = 0.20) from the coefficient of *READ* (0.0223).

4.3 Link between change of forecasts and readability in market reactions

In the next set of tests, we provide evidence that the positive market reactions for higher report readability occur because readable reports reduce uncertainty about future earnings. We thus test whether the component of *CVCHANGE* that is predictable (or explainable) by *READ* is associated with positive stock returns. To execute this empirically, we follow Clement and Tse (2003), and first estimate the following equation:

$$CVCHANGE = g_0 + g_1 * READ + e \quad (3a)$$

We define the predicted component of *CVCHANGE* as *ALPHA* (i.e., $ALPHA = g_1 * READ$). As a result, *ALPHA* represents the component of *CVCHANGE* that is explained by

READ, or the degree of report readability. Next, we test the association between *CVCHANGE* and *CAR*, and further replace *CVCHANGE* with *ALPHA* as follows:

$$CAR [-1, +1] = a + b*CVCHANGE + c*CONTROLS + e \quad (3b)$$

$$CAR [-1, +1] = a + b1*ALPHA + c*CONTROLS + e \quad (3c)$$

If the market's positive reaction to readability is associated with readability reducing the uncertainty of future earnings, we expect the coefficient of *ALPHA* to be significantly negative.

Table 5 reports the findings of these tests. Column (A) reports results of the first stage (3a) equation. Consistent with the evidence presented in the early part of the paper, *CVCHANGE* and *READ* are significantly related, with a coefficient of -0.0698 and a *t*-statistic of -3.79.³ In Column (B), the original result of *CVCHANGE* is reported. The coefficient of *CVCHANGE* is -0.0137, with a *t*-statistic of -1.86, suggesting that the market reacts positively to a reduction in the dispersion of forecasts. In column (C), *ALPHA* is significantly negative, with *t* statistics of -3.25 and a coefficient of -0.2964. These findings further support our expectation that the favorable market reaction towards readability is associated with readability reducing market uncertainty in predicting future earnings. To add further support for our conclusion, we run the Vuong test and compare the incremental explanation power of *CVCHANGE* in column (B) and that of *ALPHA* in column (C). Our findings suggest that the incremental explanatory power of *ALPHA* in column (B) is not significantly different from that of *CVCHANGE* in column (B), with a *t*-statistic of 1.05 and a *p*-value = 0.29. As a benchmark, in column (D), we also use the

³ The R-square of the first stage regression is only 0.45%, suggesting that readability explains only a minor part of *CVCHANGE*. However, our focus of the test is to examine whether the component of *CVCHANGE* that is predicted by *READ* is associated with *CAR* in the second-stage test.

residual component of *CVCHANGE* that is not predicted by *READ* in Equation (3a), *RESID*, and use this to replace *CVCHANGE* in Equation (3b). The coefficient is only marginally significant, with a *t*-statistic of 1.66. The coefficient of *RESID* in column (C) is also significantly smaller than that of *ALPHA* in column (D), with *p*-value<0.01 (untabulated). The Vuong test suggests that the incremental explanatory power of *RESID* is significantly smaller than *CVCHANGE*, with a *t*-statistic of -2.20 and *p*-value of 0.028. Overall, our results suggest that the positive stock returns for report readability can be attributed to the reduction of uncertainty about future earnings forecasts.

4.4 Cross-sectional evidence

We further provide cross-sectional evidence on our main findings using three empirical measures to test whether the market reacts more positively in terms of reduced uncertainty when readability is better. Specifically, we test the following regression:

$$CAR[-1, +1] = a + b*PART + c*READ + d*READ*PART + e*CONTROLS + f, \quad (4)$$

where *PART* is a dichotomous variable that equals one if a continuous variable is greater than or equal to the sample median, and zero otherwise.

Following Hypothesis 3A (and Collier and Yohn, 1997), we first use bid-ask spread (*BA_Spread*) as our partition variable of market uncertainty. The first column of Table 7 shows that the interaction of *READ* and *PART* is significantly positive, with a *t*-statistic of 2.63. This pattern is consistent with the prediction of Hypothesis 3A that positive stock returns for readable reports is higher when the *BA_Spread* is greater, i.e. when the market uncertainty is higher.

In the second column of Table 6, we partition the sample based on analysts' firm-specific experiences ($F_Experience$). Following Hypothesis 3B, we predict that the market's positive reaction to readable reports is higher if the report is issued by analysts with longer firm-specific experience. Consistent with our expectation, the coefficient of $READ \times PART$ is significantly positive, with a t -statistic of 2.67.

In the third column of Table 6, we partition the sample based on a dichotomous variable, $Earn_Release$, that equals one if there is an earnings release issued within five days before the analyst report date (i.e., $PART = Earn_Release$). Following Hypothesis 3C, we predict that the market's positive reaction to readable reports is higher if the report is more informative, i.e. if the report is issued following earnings releases. The coefficient of $READ \times PART$ is significantly positive, with a t -statistic of 1.95. After controlling for the partition variables, the main effect of $READ$ is either no longer significant, or is only marginally significant (Column 2). This suggests that investors consider analyst report readability in their investment decisions only when ex-ante uncertainty is high, or when the reports are issued with credible information, e.g., reports from experienced analysts or following earnings releases. Overall, our empirical findings indicate that our main findings are stronger when readability is more likely to reduce uncertainty about future earnings.

4.5 Forecast bias and market reactions

In the end, we test whether positive market reactions towards readable reports are associated with ex-post forecast bias. Prior studies suggest that analyst have the incentive to bias

forecast upwards. For example, Lin and McNichols (1998) show empirical evidence that analysts are more likely to issue optimistic forecasts about the firms they are affiliated with. One conjecture is that investors could understand the bias and react negatively to the forecast. Readability may serve as an indication of less optimistic bias, and is therefore likely to be associated with more positive market reaction. One may argue that analyst reports include the reasoning behind the conclusion(s) and provide vital information to verify the ex-post accuracy, and readability improves investors' understanding on the logic behind the forecast revisions, which increase ex-post verifiability and intensify any reputation concerns of issuing inaccurate forecasts. Therefore, it is possible that readability is associated with lower forecast bias and more positive market reactions. If this is the case, our findings are not driven by the reduction of uncertainty about forecast, but rather the association between forecast bias and readability.

To verify whether this conjecture is true, we first split the sample using forecast bias and errors, and then regress market reaction against readability following Equation (2). Forecast bias is defined as the difference between the analyst forecasts issued on the report date and the actual earnings for the forecast period, scaled by stock price at the end of the fiscal quarter. Forecast error is the absolute value of the forecast bias. Table 7 reports the findings of the tests. Columns A and B are the tests using sub-samples with ex-post forecast bias below and above the sample median. Columns C and D are partitions formed by the median of forecast errors. In both partitions, we observe that the coefficients of *READ* are not significantly different across the sub-samples, with p-values equal to 0.86 and 0.79 respectively. As a result, we conclude that our findings are not driven by forecast bias, but attributed to the reduction of uncertainty.

5. Conclusion

We examine the effects of analyst report readability on the market pricing of securities that the reports cover. We hypothesize that the market reacts positively to analyst report readability because readable reports are better able to reduce uncertainty about forecasts. In the first part of this study, we establish that report readability reduces uncertainty of forecasts, by providing empirical evidence of a negative association between readability and the analysts' forecast dispersions. We further examine the market's interpretation of analyst report readability. Our findings suggest that readability is associated with positive stock returns. In particular, we provide empirical tests to strengthen the logic that positive market reactions to readable reports are associated with reduction of uncertainty. Specifically, we use a two stage approach, first estimating a predicted value of change in analyst dispersion due to readability. In the second stage, we find that this predicted value has significantly positive association with stock returns.

To further improve our confidence in the findings, we partition our sample using bid-ask spread, analyst experience, and a dummy variable indicating whether a report is issued after earnings releases. We expect the results to show that report readability has a stronger influence on market pricing when the reports better reduce the level of uncertainty, i.e., when the market has higher ex-ante uncertainty about the future, analysts have a higher ability for making quality forecasts, and forecast revisions are triggered by more informative events. We find the evidence from this study consistent. Overall, our empirical findings suggest that market prices readability, and the positive reaction are associated with the reduction of uncertainty over future earnings forecasts.

This study contributes to the literature of financial analysis by studying the linguistic characteristics of analyst report information that is publicly available to investors, but poorly understood by researchers. This study is one of the first to examine the language and readability of analyst reports, and to establish an important link between the readability of analyst research reports and market pricing. First, this study provides important evidence of how the analysts' presentations of their research findings have consequences for market pricing beyond the forecast revisions presented in the reports. Second, we provide evidence concerning the aspects of report writing that are most significant. We show that the readability of a report does not depend on the specific news contained in the report. Although many other studies focus on the tone of reports, this study finds that report readability is a cleaner measure of how analyst reports reduce uncertainty about future earnings forecasts. Third, this study improves our understanding of the importance of analysts as information intermediaries. While recent studies suggest that analyst forecasts of risk ratings can predict future return volatilities (Lui, Markov and Tamayo, 2007), the positive association between stock returns and readability suggests that the writing of analyst research lowers the discount rate in pricing expected earnings.

Appendix A: Examples of Analyst Report Readability

Example 1: Analyst Report on Citrix Systems Inc, July 20, 2006

“CTXS posted a solid quarter, although unlike recent quarters in which they were firing on all cylinders CTXS in 2Q06 suffered some blemishes which weren't bad but which didn't make for the kind of out-performance the stock's premium valuation seemed to be discounting.

Higher costs absorbed higher revenues leading to inline EPS and guidance.

We don't think the quarter reflected a marked change in CTXS' business, though it could suggest that the positive benefit to license revs from end-of-life programs is largely over. It highlights though a willingness by CTXS to sacrifice near term profitability (or upside) for faster future growth that investors likely haven't fully appreciated.

We do believe the company will pursue additional investments/acquisitions which could prove dilutive, with WAN optimization companies topping the list, though CTXS' past success should give them better credibility with investors.

Near term though the stock is likely to remain under pressure as 'whisper expectations' of higher than consensus estimates get reigned in.”

Readability Indices

Number of words	: 155
Average syllables per word	: 1.79
Average words per sentence	: 25.83
Fog	: 17.82
Flesch	: 29.43
Flesch-Kincaid	: 15.57

Example 2: Analyst Report on Citrix Systems Inc, July 20, 2006

“CTXS reported strong revenue, but increased expenses led to inline EPS. We remain buyers into what we believe will be weakness from these results. We decrease our price target from \$45 to \$42.

Revenue of \$275.5M exceeded our and consensus estimate of \$266M and above the range of guidance of \$254m to \$266m. EPS of \$0.33 was inline with consensus and at the top end of guidance. Expenses were higher due to an increase in headcount additions and the Reflectent acquisition, which closed in the quarter and was mildly dilutive.

Guidance was above street estimates, but only modestly above for EPS.

Guidance for Q3 was for revenue between \$275m and \$280m, with EPS between \$0.33 and \$0.34.

Guidance for FY 2006 was for revenue between \$1.105B and \$1.12B with EPS between \$1.36 and \$1.39.

Consensus revenue and EPS estimates for Q3 had been \$273m and \$0.34, and for FY 2006 \$1.1B and \$1.38.

We are making revisions to our estimates. For Q3, we increase our revenue estimate from \$272m to \$281m, and maintain our EPS estimate of \$0.34. For CY 2006, we are increasing our revenue estimate from \$1.09B to \$1.11B and increase our EPS estimate from \$1.38 to \$1.39. For CY 2007, we are increasing our \$1.22B revenue estimate to \$1.23B and decreasing our \$1.55 EPS estimate to \$1.54.

We are reiterating our Buy rating but lowering our price target from \$45 to \$42, which reflects a 27x multiple on C'07 EPS (a slight premium to the group but a decrease from our previous 29 multiple).”

Readability Indices

Number of words	: 214
Average syllables per word	: 1.58
Average words per sentence	: 6.29
Fog	: 9.81
Flesch	: 66.83
Flesch-Kincaid	: 5.50

Appendix B. Comparison between characteristics of High-Tech and Other Industries

The following table reports characteristics of high-tech industries as compared to those of other industries. “High-tech” industries are defined as in Baginski, Hassell and Kimbrough (2004) (i.e. SIC codes = 2833-2836, 8731-8734, 7371-7379, 3570-3577 and 3600-3674). The “Other” industries are all remaining industries listed by Compustat. Analyst following data were obtained from I/B/E/S, and accounting data from Compustat for fiscal years 2005-2007. All firm-level variables are winsorized for the top and bottom 1% of observations. Descriptive statistics for the two groups are reported as follows: *NUMEST* is the number of estimates of annual earnings. *MTB* is market-to-book ratio, measured as market value of equity divided by common stock at fiscal year end. *ROA* is return on assets, measured as income before extraordinary items divided by total assets. *Intangibles* are research and development expenses plus advertising expenses divided by total operating expenses. *T* values (*Z* values) are reported for the *t*-test (Wilcoxon two-sample test) for differences in means (medians). ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

Comparison across Compustat Industries based on Industry Data for Fiscal Year 2005-2007																
													<i>t</i> -test for means		Wilcoxon test for medians	
	N		Mean		1 st Quartile		Median		3 rd Quartile		Std.		(t)		(z)	
	High-tech	Other	High-tech	Other	High-tech	Other	High-tech	Other	High-tech	Other	High-tech	Other				
NUMEST	1,905	7,306	6.90	6.03	2.08	2.00	4.83	4.25	9.56	8.42	6.20	5.37	5.6	***	4.5	***
MTB	1,905	7,306	3.74	2.86	1.66	1.40	2.74	2.06	4.59	3.29	4.91	3.60	7.3	***	12.8	***
ROA	1,905	7,306	-0.04	0.02	-0.09	0.00	0.01	0.02	0.04	0.04	0.14	0.06	-17.3	***	-12.3	***
Intangibles	1,905	7,306	0.25	0.03	0.08	0.00	0.19	0.00	0.34	0.03	0.23	0.07	42.1	***	53.2	***

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Table 1. Sample Distribution and Descriptive Statistics**Panel A. Sample selection**

	N
Reports from Investext covering high-tech industry companies that have data in I/B/E/S on the same date for the same analyst during fiscal year 2005 ~ 2007	3,554
Deduct:	
Reports without sufficient forecast and recommendation data in I/B/E/S and First Call	(435)
Reports without sufficient data in Compustat and CRSP	(189)
Sample number of reports:	2,930

Panel B. Distribution of Fog Index

Variable	Poor Readability		Good Readability		Difference (upper - lower)	
	<i>READ</i> in the lower half (N = 1,465)		<i>READ</i> in the upper half (N = 1,465)			
	Mean	Median	Mean	Median	t	z
Analyst characteristics						
<i>Forecast frequency</i>	9.65	9.00	10.25	10.00	2.85 ***	2.86 ***
<i>Broker size</i>	100.99	74.00	87.08	62.00	-5.28 ***	-6.32 ***
<i># Firm covered</i>	17.78	18.00	18.44	18.00	2.86 ***	2.88 ***
<i># Industry covered</i>	2.85	3.00	3.09	3.00	4.91 ***	5.53 ***
<i>Firm experience</i>	2.94	2.00	3.19	2.00	2.90 ***	2.12 **
<i>General experience</i>	6.95	7.00	7.20	7.00	1.63	-0.51

Note:

1. The t- and z-statistics are differences in means (t-test) and medians (Wilcoxon ranksum test), respectively. ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *Age* is firm age since the firm first appeared in CRSP monthly stock file. *#Business segment* is the logarithm of the number of business segments. *#Geographic segment* is the logarithm of the number of geographic segments. *#Compustat items* is the logarithm of the number of non-missing items in Compustat. *Special items* is special items scaled by total assets. *Delaware* is a dichotomous variable that equals one if a firm was incorporated at Delaware, and zero otherwise. *Forecast frequency* is analyst i's forecast frequency for firm j. *Broker size* is the number of analysts in brokerage that employs the analyst. *# Firm covered* is the number of companies analyst i followed in year t. *# Industry covered* is the number of industries analyst i followed in year t. *Firm experience* is the number of years through year t for which analyst i supplied at least one forecast during year t for firm j. *General experience* is the number of years for which analyst i supplied at least one forecast during year t.

Table 2. Variable Statistics

Panel A. Descriptive statistics							
Variable	Mean	Std.	10%	25%	Median	75%	90%
<i>CAR[-1, +1]</i>	0.002	0.080	-0.098	-0.038	0.003	0.049	0.100
<i>Fog_Index</i>	14.008	2.080	11.495	12.525	13.824	15.322	16.797
<i>ΔDispersion</i>	-0.027	0.144	-0.130	-0.038	-0.010	0.010	0.040
<i>ΔConsensus</i>	0.000	0.002	-0.002	-0.001	0.000	0.000	0.001
<i>ΔEST</i>	0.000	0.002	-0.003	-0.001	0.000	0.001	0.001
<i>RELEASE_NEWS</i>	0.001	0.005	-0.005	-0.001	0.001	0.003	0.005
<i>TONE</i>	1.167	1.467	-0.510	0.270	1.140	1.900	2.830
<i>MVE</i>	8.448	1.781	6.284	6.966	8.377	9.656	11.171
<i>MTB</i>	2.928	1.527	1.405	1.915	2.504	3.570	4.749
<i>MOMENTUM</i>	0.088	0.292	-0.256	-0.092	0.065	0.251	0.440
<i>RET_VOL</i>	0.091	0.034	0.053	0.066	0.086	0.114	0.138
<i>EPS_VOL</i>	0.204	0.356	0.043	0.065	0.112	0.194	0.315
<i>LEVERAGE</i>	1.731	0.568	1.179	1.314	1.590	1.931	2.447
<i>EGROWTH</i>	0.099	1.164	-0.607	-0.221	0.043	0.308	0.769
<i>PREDICTLOSS</i>	0.025	0.157	0.000	0.000	0.000	0.000	0.000

Table 2 (Continued)**Panel B. Variable correlations**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) <i>CAR</i> [-1, +1]															
(2) <i>READ</i>	0.06														
(3) <i>CVCHANGE</i>	-0.02	-0.07													
(4) <i>CFCHANGE</i>	0.36	-0.01	0.03												
(5) <i>ΔEST</i>	0.27	-0.03	0.09	0.54											
(6) <i>RELEASE_NEWS</i>	0.00	-0.01	0.13	0.23	0.18										
(7) <i>TONE</i>	0.24	-0.08	0.05	0.22	0.16	0.08									
(8) <i>MVE</i>	0.03	-0.05	0.17	0.09	0.15	0.07	-0.02								
(9) <i>MTB</i>	0.04	0.03	0.01	0.02	0.04	-0.15	0.00	0.29							
(10) <i>MOMENTUM</i>	0.21	0.02	0.13	0.34	0.28	0.28	0.18	0.08	0.15						
(11) <i>RET_VOL</i>	-0.03	0.01	-0.11	0.00	-0.03	0.04	-0.01	-0.39	0.20	0.11					
(12) <i>EPS_VOL</i>	-0.01	0.03	0.01	-0.03	-0.06	-0.02	-0.07	-0.10	-0.07	0.01	0.16				
(13) <i>LEVERAGE</i>	0.00	-0.01	-0.06	0.02	0.03	-0.03	-0.03	-0.04	-0.09	0.06	-0.05	-0.04			
(14) <i>EGROWTH</i>	0.05	0.02	0.00	0.06	0.04	0.15	0.06	-0.03	0.01	0.08	0.04	-0.05	0.00		
(15) <i>PREDICTLOSS</i>	-0.05	-0.01	-0.07	-0.07	-0.14	-0.22	-0.08	-0.17	0.03	-0.06	0.12	0.02	0.24	0.01	

Note:

1. For Panel B, Pearson correlations are reported in the lower triangle. Correlations significant at a minimum of 10% level are in bold.
2. *CAR*[-1, +1] is the cumulative abnormal return for day -1 to day +1, where day 0 is the analyst report date. The estimation is based on market model using returns from day -131 to day -31. *Fog_Index* is the Fog readability index of a report. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *ADispersion* is the changes in the coefficient of variation of analyst consensus forecast surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. *CVCHANGE* is the standardized rankings of *ADispersion* between 0 and 1. *ΔConsensus* is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. *CFCHANGE* is the standardized rankings of *ΔConsensus* between 0 and 1. *ΔEST* is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end of last quarter. *RELEASE_NEWS* is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. *TONE* is the percentage of words with positive emotion (PCT_POS) minus the percentage of words with negative emotion (PCT_NEG) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. *MVE* is the logarithm of market value of equity. *MTB* is the market value of equity plus book value of liabilities scaled by total assets. *MOMENTUM* is the 180-day buy-and-hold return up to a report's date. *RET_VOL* is the standard deviation of 15-month stock returns for a specific quarter. *EPS_VOL* is the standard deviation of EPS during the preceding 16 quarters. *LEVERAGE* is the ratio of total assets to stockholders equity for the most recent quarter. *EGROWTH* is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.

Table 3. Association between Readability and Changes in Consensus Forecast and Dispersions

$$CVCHANGE = a_1 + b_1 * READ + c_1 * CONTROLS + d \quad (1a)$$

$$CFCHANGE = a_2 + b_2 * READ + c_2 * CONTROLS + e \quad (1b)$$

	(1a)				(1b)			
	Coef.		Coef.		Coef.		Coef.	
<i>Intercept</i>	0.5901	***	0.4800	***	0.5800	***	0.5422	***
	(7.76)		(4.75)		(5.03)		(5.26)	
<i>READ</i>	-0.0625	**	-0.0531	**	-0.0015		0.0221	
	-(2.45)		-(2.32)		-(0.06)		(1.11)	
<i>ΔEST</i>			2.6464				54.5927	***
			(0.63)				(13.81)	
<i>TONE</i>			0.0037				0.0204	***
			(0.72)				(4.79)	
<i>MVE</i>			0.0224	***			0.0035	
			(3.64)				(0.63)	
<i>MTB</i>			-0.0040				-0.0040	
			-(0.49)				-(0.79)	
<i>MOMENTUM</i>			0.1130	***			0.1789	***
			(3.50)				(5.74)	
<i>RELEASE_NEWS</i>			5.5911	***			5.1125	***
			(3.41)				(3.81)	
<i>RET_VOL</i>			-0.6405				-0.1474	
			-(1.58)				-(0.46)	
<i>EPS_VOL</i>			0.0388	*			0.0163	
			(1.68)				(0.99)	
<i>LEVERAGE</i>			-0.0345	*			-0.0018	
			-(1.87)				-(0.13)	
<i>EGROWTH</i>			-0.0034				0.0033	
			-(0.37)				(0.62)	
<i>PREDICTLOSS</i>			0.0140				0.0741	*
			(0.12)				(1.87)	
Industry dummies	Included		Included		Included		Included	
Year dummies	Included		Included		Included		Included	
N	2,930		2,930		2,930		2,930	
Adj. R ²	0.91%		6.71%		0.86%		34.80%	

Note:

1. Industry dummies are based on 2-digit SIC codes. T-values are reported in parentheses (standard errors are adjusted for firm clustering). ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. *Fog_Index* is the Fog readability index of a report. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *CVCHANGE* is the standardized rankings of *ADispersion* between 0 and 1, where *ADispersion* is the changes in the coefficient of variation of analyst consensus forecast surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. *CFCHANGE* is the standardized rankings of *ΔConsensus* between 0 and 1, where *ΔConsensus* is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. *ΔEST* is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end

of last quarter. *RELEASE_NEWS* is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. *TONE* is the percentage of words with positive emotion (PCT_POS) minus the percentage of words with negative emotion (PCT_NEG) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. *MVE* is the logarithm of market value of equity. *MTB* is the market value of equity plus book value of liabilities scaled by total assets. *MOMENTUM* is the 180-day buy-and-hold return up to a report's date. *RET_VOL* is the standard deviation of 15-month stock returns for a specific quarter. *EPS_VOL* is the standard deviation of EPS during the preceding 16 quarters. *LEVERAGE* is the ratio of total assets to stockholders equity for the most recent quarter. *EGROWTH* is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.

Table 4. Market Reaction to Analyst Forecast Reports

	$CAR[-1, +1] = a + b*READ + c*CONTROLS + e$			(2)
	Coef.	Coef.	Coef.	
<i>Intercept</i>	0.0069 (0.33)	0.0009 (0.03)	0.0232 (0.74)	
<i>READ</i>	0.0174 ** (2.59)	0.0229 *** (3.50)	0.0223 *** (3.49)	
<i>ΔEST</i>		6.8542 *** (5.15)	7.1576 *** (5.37)	
<i>TONE</i>		0.0110 *** (6.70)	0.0110 *** (6.66)	
<i>MVE</i>		-0.0006 (-0.33)	-0.0013 (-0.61)	
<i>MTB</i>		0.0007 (0.39)	0.0007 (0.31)	
<i>MOMENTUM</i>		0.0313 *** (3.74)	0.0394 *** (4.24)	
<i>RELEASE_NEWS</i>			-1.5252 ** (-2.62)	
<i>RET_VOL</i>			-0.1404 (-1.39)	
<i>EPS_VOL</i>			0.0048 (0.66)	
<i>LEVERAGE</i>			-0.0004 (-0.09)	
<i>EGROWTH</i>			0.0024 (0.93)	
<i>PREDICTLOSS</i>			-0.0014 (-0.12)	
Industry dummies	Included	Included	Included	
Year dummies	Included	Included	Included	
N	2,930	2,930	2,930	
Adj. R ²	0.62%	13.53%	14.44%	

Note:

1. Industry dummies are based on 2-digit SIC codes. T-values are reported in parentheses (standard errors are adjusted for firm clustering). ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. $CAR[-1, +1]$ is the cumulative abnormal return for day -1 to day +1, where day 0 is the analyst report date. The estimation is based on market model using returns from day -131 to day -31. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *CVCHANGE* is the standardized rankings of $\Delta Dispersion$ between 0 and 1, where $\Delta Dispersion$ is the changes in the coefficient of variation of analyst consensus forecast

surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. *CFCHANGE* is the standardized rankings of $\Delta Consensus$ between 0 and 1, where $\Delta Consensus$ is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. ΔEST is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end of last quarter. *RELEASE_NEWS* is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. *TONE* is the percentage of words with positive emotion (PCT_POS) minus the percentage of words with negative emotion (PCT_NEG) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. *MVE* is the logarithm of market value of equity. *MTB* is the market value of equity plus book value of liabilities scaled by total assets. *MOMENTUM* is the 180-day buy-and-hold return up to a report's date. *RET_VOL* is the standard deviation of 15-month stock returns for a specific quarter. *EPS_VOL* is the standard deviation of EPS during the preceding 16 quarters. *LEVERAGE* is the ratio of total assets to stockholders equity for the most recent quarter. *EGROWTH* is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.

Table 5. Using Readability to Predict Decreases in Analyst Forecast Dispersion

$$CVCHANGE = g_0 + g_1 * READ + r$$

(3a)

$$ALPHA = g_1' * READ;$$

$$RESID = r$$

$$CAR [-1, +1] = a + b * CVCHANGE + c * CONTROLS + e$$

(3b)

$$CAR [-1, +1] = a + b_1 * ALPHA + c * CONTROLS + e$$

(3c)

$$CAR [-1, +1] = a + b_2 * RESID + c * CONTROLS + e$$

(3d)

	(A)		(B)		(C)		(D)
	Coef.		Coef.		Coef.		Coef.
<i>Intercept</i>	0.5346 *** (50.23)	<i>Intercept</i>	0.0038 (0.15)		-0.0162 (-0.61)		-0.0029 (-0.11)
<i>READ</i>	-0.0698 *** (-3.79)	<i>CVCHANGE</i>	-0.0137 * (-1.86)				
		<i>ALPHA</i>			-0.2964 *** (-3.25)		
		<i>RESID</i>					-0.0122 * (-1.66)
		<i>CFCHANGE</i>	0.0723 *** (6.39)		0.0727 *** (6.38)		0.0725 *** (6.39)
		<i>ΔEST</i>	3.2253 ** (2.63)		3.1869 *** (2.63)		3.2128 ** (2.62)
		<i>TONE</i>	0.0092 *** (6.87)		0.0095 *** (6.60)		0.0092 *** (6.86)
		<i>MVE</i>	-0.0016 (-0.74)		-0.0016 (-0.75)		-0.0016 (-0.76)
		<i>MTB</i>	0.0013 (0.54)		0.0010 (0.44)		0.0013 (0.55)
		<i>MOMENTUM</i>	0.0283 *** (3.10)		0.0264 *** (2.78)		0.0281 *** (3.08)
		<i>RELEASE_NEWS</i>	-1.8226 *** (-3.27)		-1.8970 *** (-3.45)		-1.8316 *** (-3.29)
		<i>RET_VOL</i>	-0.1454 (-1.43)		-0.1297 (-1.32)		-0.1447 (-1.43)
		<i>EPS_VOL</i>	0.0041 (0.59)		0.0036 (0.53)		0.0040 (0.58)
		<i>LEVERAGE</i>	-0.0010 (-0.24)		-0.0003 (-0.06)		-0.0010 (-0.23)
		<i>EGROWTH</i>	0.0022 (0.91)		0.0021 (0.89)		0.0022 (0.92)
		<i>PREDICTLOSS</i>	-0.0074 (-0.63)		-0.0068 (-0.55)		-0.0075 (-0.63)
		Industry dummies	Included		Included		Included
		Year dummies	Included		Included		Included
N	2,930	N	2,930		2,930		2,930
Adj. R ²	0.45%	Adj. R ²	18.63%		18.94%		18.59%
Incremental Power vs. Model (A)							
		Vuong Z-Statistic			1.05		-2.20**

p-value

0.2949

0.0277

Note:

1. Industry dummies are based on 2-digit SIC codes. T-values are reported in parentheses (standard errors are adjusted for firm clustering). ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. $CAR[-1, +1]$ is the cumulative abnormal return for day -1 to day +1, where day 0 is the analyst report date. The estimation is based on market model using returns from day -131 to day -31. $READ$ is the reverse rankings of the Fog readability index, standardized between 0 and 1. $CVCHANGE$ is the standardized rankings of $\Delta Dispersion$ between 0 and 1, where $\Delta Dispersion$ is the changes in the coefficient of variation of analyst consensus forecast surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. $CFCHANGE$ is the standardized rankings of $\Delta Consensus$ between 0 and 1, where $\Delta Consensus$ is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. ΔEST is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end of last quarter. $RELEASE_NEWS$ is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. $TONE$ is the percentage of words with positive emotion (PCT_POS) minus the percentage of words with negative emotion (PCT_NEG) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. MVE is the logarithm of market value of equity. MTB is the market value of equity plus book value of liabilities scaled by total assets. $MOMENTUM$ is the 180-day buy-and-hold return up to a report's date. RET_VOL is the standard deviation of 15-month stock returns for a specific quarter. EPS_VOL is the standard deviation of EPS during the preceding 16 quarters. $LEVERAGE$ is the ratio of total assets to stockholders equity for the most recent quarter. $EGROWTH$ is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. $PREDICTLOSS$ is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.

Table 6. Market Reaction to Analyst Forecast Reports

$$CAR[-1, +1] = a + b*PART + c*READ + d*READ*PART + e*CONTROLS + f \quad (4)$$

	Partition variable (<i>PART</i>) based on		
	(A)	(B)	(C)
	BA_Spread	F_Experience	Earn_Release
	Coef.	Coef.	Coef.
<i>Intercept</i>	0.0358 (1.09)	0.0302 (0.96)	0.0243 (0.74)
<i>PART</i>	-0.0207 *** (-3.09)	-0.0121 ** (-2.25)	-0.0045 (-0.62)
<i>READ</i>	0.0073 (1.60)	0.0105 * (1.68)	0.0024 (0.30)
<i>READ × PART</i>	0.0306 ** (2.63)	0.0230 *** (2.67)	0.0257 * (1.95)
<i>ΔEST</i>	7.1687 *** (5.55)	7.1715 *** (5.45)	7.0043 *** (5.23)
<i>RELEASE_NEWS</i>	-1.5288 *** (-2.66)	-1.5264 ** (-2.62)	-1.5263 ** (-2.62)
<i>TONE</i>	0.0108 *** (6.74)	0.0110 *** (6.72)	0.0107 *** (6.61)
<i>MVE</i>	-0.0015 (-0.69)	-0.0015 (-0.68)	-0.0011 (-0.49)
<i>MTB</i>	0.0007 (0.34)	0.0009 (0.39)	0.0007 (0.31)
<i>MOMENTUM</i>	0.0394 *** (4.24)	0.0392 *** (4.25)	0.0397 *** (4.33)
<i>RET_VOL</i>	-0.1248 (-1.28)	-0.1418 (-1.40)	-0.1371 (-1.36)
<i>EPS_VOL</i>	0.0041 (0.57)	0.0047 (0.65)	0.0044 (0.61)
<i>LEVERAGE</i>	-0.0003 (-0.08)	-0.0001 (-0.03)	-0.0009 (-0.19)
<i>EGROWTH</i>	0.0026 (1.02)	0.0025 (0.96)	0.0023 (0.90)
<i>PREDICTLOSS</i>	-0.0006 (-0.05)	-0.0012 (-0.09)	-0.0003 (-0.02)
Industry dummies	Included	Included	Included
Year dummies	Included	Included	Included
N	2,930	2,930	2,930
Adj. R ²	14.79%	14.55%	14.70%

Note:

1. Industry dummies are based on 2-digit SIC codes. T-values are reported in parentheses (standard errors are adjusted for firm clustering). ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. $CAR[-1, +1]$ is the cumulative abnormal return for day -1 to day +1, where day 0 is the analyst report date. The estimation is based on market model using returns from day -131 to day -31. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *CVCHANGE* is the standardized rankings of *ADispersion* between 0 and 1, where *ADispersion* is the changes in the coefficient of variation of analyst consensus forecast surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date, divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter

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- most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. *CFCHANGE* is the standardized rankings of $\Delta Consensus$ between 0 and 1, where $\Delta Consensus$ is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. ΔEST is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end of last quarter. *RELEASE_NEWS* is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. *TONE* is the percentage of words with positive emotion (PCT_POS) minus the percentage of words with negative emotion (PCT_NEG) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. *MVE* is the logarithm of market value of equity. *MTB* is the market value of equity plus book value of liabilities scaled by total assets. *MOMENTUM* is the 180-day buy-and-hold return up to a report's date. *RET_VOL* is the standard deviation of 15-month stock returns for a specific quarter. *EPS_VOL* is the standard deviation of EPS during the preceding 16 quarters. *LEVERAGE* is the ratio of total assets to stockholders equity for the most recent quarter. *EGROWTH* is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.
3. *PART* is a dichotomous variable that equals one if *BA_Spread* is greater than or equal to sample medians, and zero otherwise in column (A); equals one if *F_Experience* is greater than or equal to sample medians, and zero otherwise in column (B); and equal to *Earn_Release* in column (C). *BA_Spread* is the bid-ask spread of the analyst report issuing month, scaled by month-end stock price. *F_Experience* is the number of years through year *t* for which analyst *i* supplied at least one forecast during year *t* for firm *j*. *Earn_Release* is a dichotomous variable that equals one if there is an earnings release issued within five days before the analyst report date.

Table 7. Market Reaction to Analyst Forecast Reports

$$CAR[-1, +1] = a + b*READ + c*CONTROLS + e \quad (2)$$

	Partition based on			
	Forecast bias		Forecast error	
	(A) Low Bias Coef.	(B) High Bias Coef.	(C) Low Error Coef.	(D) High Error Coef.
<i>Intercept</i>	0.0582 *	0.0148	-0.0125	0.0454
	(1.78)	(0.47)	(-0.31)	(1.31)
<i>READ</i>	0.0203 **	0.0223 ***	0.0208 **	0.0238 ***
	(2.31)	(2.79)	(2.59)	(2.67)
<i>ΔEST</i>	6.9228 ***	8.3936 ***	8.2078 ***	7.1079 ***
	(4.70)	(3.82)	(3.38)	(5.74)
<i>TONE</i>	0.0077 ***	0.0141 ***	0.0145 ***	0.0071 ***
	(4.43)	(6.33)	(5.80)	(4.39)
<i>MVE</i>	-0.0016	-0.0014	-0.0022	-0.0005
	(-0.75)	(-0.54)	(-0.82)	(-0.24)
<i>MTB</i>	-0.0025	0.0031	0.0032	-0.0019
	(-0.96)	(1.25)	(1.35)	(-0.66)
<i>MOMENTUM</i>	0.0446 ***	0.0308 **	0.0322 **	0.0424 ***
	(3.87)	(2.31)	(2.03)	(4.18)
<i>RELEASE_NEWS</i>	-1.6003 ***	-1.3874	-1.8870 *	-1.2998 **
	(-3.06)	(-1.30)	(-1.70)	(-2.34)
<i>RET_VOL</i>	-0.1570	-0.1375	-0.1550	-0.1286
	(-1.42)	(-0.99)	(-1.06)	(-1.04)
<i>EPS_VOL</i>	0.0092 **	0.0003	-0.0011	0.0089
	(2.18)	(0.02)	(-0.11)	(1.56)
<i>LEVERAGE</i>	-0.0041	0.0005	0.0000	-0.0044
	(-0.96)	(0.09)	(-0.01)	(-0.82)
<i>EGROWTH</i>	0.0002	0.0054	0.0055	0.0006
	(0.06)	(1.09)	(1.03)	(0.25)
<i>PREDICTLOSS</i>	-0.0288	0.0397	0.0294	-0.0190
	(-1.40)	(1.22)	(0.96)	(-1.21)
Industry dummies	Included	Included	Included	Included
Year dummies	Included	Included	Included	Included
N	1,465	1,465	1,467	1,463
Adj. R ²	13.68%	18.02%	17.81%	13.77%
Compare <i>READ</i>	(A) – (B)		(C) – (D)	
p-value	0.86		0.79	

Note:

1. Industry and year dummies are based on 2-digit SIC codes. T-values are reported in parentheses (standard errors are adjusted for firm clustering). ***, **, and * represent significance at 1%, 5% and 10% levels, respectively.
2. $CAR[-1, +1]$ is the cumulative abnormal return for day -1 to day +1, where day 0 is the analyst report date. The estimation is based on market model using returns from day -131 to day -31. *READ* is the reverse rankings of the Fog readability index, standardized between 0 and 1. *CVCHANGE* is the standardized rankings of $\Delta Dispersion$ between 0 and 1, where $\Delta Dispersion$ is the changes in the coefficient of variation of analyst consensus forecast surrounding an analyst report date, calculated as the standard deviations of analyst consensus forecast after the analyst report date minus the standard deviations before the report date,

divided by the absolute value of the consensus forecast after the report date. Consensus forecasts are the consensus of analyst forecasts for the fiscal quarter most recent to the analyst report date and are limited to those that contain at least three individual analyst forecasts. *CFCHANGE* is the standardized rankings of *ΔConsensus* between 0 and 1, where *ΔConsensus* is the revisions of analyst consensus forecast surrounding an analyst report date, scaled by stock price 10 days before the report date. *ΔEST* is the difference between the analyst's EPS forecast on the report date and his last forecast for the same period, scaled by the stock price at the end of last quarter. *RELEASE_NEWS* is quarterly EPS from most recent earnings release minus the actual EPS in the same quarter one year before, scaled by the quarter end stock price. *TONE* is the percentage of words with positive emotion (*PCT_POS*) minus the percentage of words with negative emotion (*PCT_NEG*) in a report. Emotion words are defined by the Linguistic Inquiry and Word Count (LIWC) 2007 dictionary. *MVE* is the logarithm of market value of equity. *MTB* is the market value of equity plus book value of liabilities scaled by total assets. *MOMENTUM* is the 180-day buy-and-hold return up to a report's date. *RET_VOL* is the standard deviation of 15-month stock returns for a specific quarter. *EPS_VOL* is the standard deviation of EPS during the preceding 16 quarters. *LEVERAGE* is the ratio of total assets to stockholders equity for the most recent quarter. *EGROWTH* is the change of income before extraordinary items for the most recent quarter, scaled by income before extraordinary items in the preceding quarter. *PREDICTLOSS* is a dichotomous variable that equals one if the analyst predicted earnings are negative, and zero otherwise.

3. Columns (A) and (B) are partition regression results based on *ex post* forecast bias, where the bias is defined as the difference between the analyst's forecast issued on the report date and the actual earnings for the forecast period, scaled by stock price at the end of the last fiscal quarter. The sub-sample of column (A) are those reports with forecast bias lower than the median value of the whole sample, while the sub-sample of column (B) are those with bias higher than or equal to the median value. Columns (C) and (D) are partition regression results based on *ex post* forecast error, which is defined as the absolute value of the forecast bias. The sub-sample of column (C) are those reports with absolute forecast error lower than the median value of the whole sample, while the sub-sample of column (D) are those with absolute error higher than or equal to the median value.