ABSTRACT

Title of Document: ANALYSTS' SUPERIORITY IN PROCESSING PUBLIC INFORMATION: EVIDENCE FROM RECOMMENDATION REVISIONS

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Directed by: Professor Oliver Kim
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In this paper, I study analysts' superiority over the market in processing publicly disclosed earnings information by examining a sample of recommendation revisions issued subsequent to annual earnings announcements within a short period of thirty trading days. The main findings of this study are as follows: First, I provide strong evidence that these recommendation revisions convey valuable information to the market for clarifying the long term implications of recently released earnings. These revisions significantly alter the market's belief about the value implications of announced earnings, suggesting that analysts do have superiority over the market in processing pubic

information. Also, the extent of this superiority is positively related to analysts' performance in picking stocks and forecasting earnings. Recommendation revisions issued by analysts with superior performance can make the market revise its assessment about the value implications of previous earnings to a much greater extent than those issued by analysts with moderate performance. Moreover, the extent of this superiority increases with the level of information complexity of earnings signals. Analysts' information is even more valuable to the market for reevaluating previous earnings when the earnings information is more difficult to analyze. Lastly, on average, the extent of this superiority declines after Regulation Fair Disclosure, but still remains significant, suggesting that analysts do not solely rely on inside information from the management to interpret public information. Actually, the decline in the extent of superiority is more likely due to a great increase in the number of revisions issued by analysts whose expertise is not in processing public information.

Prior studies document that investors also use subsequent earnings announcements to adjust their estimate of the value implications of previous earnings. This study finds initial evidence that when analysts' information and subsequent earnings announcements provide consistent predictions on how previous earnings is misinterpreted, subsequent earnings announcements become less useful to investors for updating their beliefs regarding the implications of previously released earnings. This paper also compares the extent of analysts' superiority in processing publicly released earnings information across industries and find that analysts exhibit a greater degree of superiority for firms in the manufacturing and retail industry.

ANALYSTS' SUPERIORITY IN PROCESSING PUBLIC INFORMATION: EVIDENCE FROM RECOMMENDATION REVISIONS

By

Zheng Wang

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Advisory Committee:
Professor Oliver Kim, Chair
Professor Martin Loeb
Professor Taewoo Park
Professor Jim Bedingfield
Professor Sarah Eno

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Table of Contents

Chapter 1: Introduction 1

Chapter 2: Literature Review 9

Chapter 3: Methodology and Hypothesis Development 13

3.1 Methodology Development 13

3.2 Hypothesis Development 16

Chapter 4: Sample Selection and Design of Empirical Tests 22

4.1 Sample Selection 22

4.2 Design of Empirical Tests 23

Chapter 5: Results and Discussion 30

5.1 Descriptive Statistics 30

5.2 Regression Results 32

5.2.1 Analysts' superiority in processing public information 32

5.2.2 The Relationship between Analysts' Performance and Their Ability to Analyze Public Information 35

5.2.3 Information Complexity 37

5.2.4 The Impact of Reg FD 39

Chapter 6: Subsequent Earnings Announcements 47

Chapter 7: Industry Analysis 51

Chapter 8: Conclusion 53

References 69

List of Figures

Figure 1: Groups of Observations with Increased or Decreased ERC...................... 55

Figure 2: Daily Average Cumulative Abnormal Returns 56

List of Tables

Table 1: Sample Descriptive Statistics 57

Table 2: Estimated Results of Belief Revision of Value Implication....................... 58

Table 3: Estimated Results of Stock Picking Ability and Forecasting Ability......... 60

Table 4: Estimated Results of the Effect of Information Complexity 62

Table 5: Estimated Results of the Impact of Reg FD 63

Table 6: New Analysts v.s. Experienced Analysts 65

Table 7: Estimated Results of the Impact of Reg FD on Good News v.s. Bad News 66

Table 8: Subsequent Earnings Announcements.. 67

Table 9: Industry Analysis... 68

Chapter 1:

Introduction

Prior studies consistently document that the market reacts to analysts' forecast and recommendation revisions. It is implicitly assumed in those studies that the value of analysts' information is attributed to their ability to collect and create information that is totally new to the market. For example, analysts have access to the management's inside information before it becomes public (Francis et al., 1997; Bowen et al., 2002). However, it could be that another crucial aspect of analysts' expertise, analysts' superior ability to process public information, which has been neglected by prior literature, also makes a significant contribution to the value of analysts' information.

In fact, this aspect of analysts' expertise may have become the dominant factor of their ability to make recommendations and forecasts valued by the market after the adoption of Regulation Fair Disclosure (Reg FD). This regulation prohibits selective disclosure of material information to financial professionals including analysts and requires broad, non-exclusionary disclosure of such information.[1] Eliminating selective disclosure could create more incentives for analysts to research on public information release such as earnings announcements. Even before the implementation of Reg FD, earnings announcements already drive a large fraction of forecast and recommendation revisions, implying that analysts rely on material public information to issue forecasts and recommendations (Stickel, 1989; Ivkovic and Jegadeesh, 2004).

[1] Recent studies have shown evidence that Reg FD is taking effect (e.g., Sunder, 2002; Zitzewitz, 2002; Eleswarapu et al., 2004).

This paper studies analysts' superiority in processing public information by examining a sample of their recommendation revisions issued within thirty trading days after annual earnings announcements. While analysts could acquire private information from the management any time during the year, revisions issued following the release of material public information are more likely to come from their analysis of announced pubic signals. If analysts were more skilled at processing public information, these revisions would be useful to the market for reevaluating previously released public information. During earnings announcements, the management publicly disclose significant information about firms' performance. Price sensitivities to earnings announcements are determined by the value implications of currently announced earnings for future earnings such as its persistence (Kormendi and Lipe, 1987; Easton and Zmijewski, 1989). However, the value implication of earnings is uncertain to both analysts and the market, and can only be estimated by them based on their respective knowledge.[2] If analysts were superior to the market in interpreting public information, they would be able to make a more accurate estimation than the market.[3]

This paper argues that by revising their recommendations following earnings announcements, analysts reveal their belief about the value implications of recently released earnings. After observing those recommendation revisions, the market would realize that it may have misreacted to prior earnings news and would revise its own belief accordingly. Thus, the extent of the market's belief revision represents the extent of analysts' superiority over the market in processing public information. Ivkovic and

[2] There are many studies investigating investors' learning process under parameter uncertainty (e.g., Lewellen and Shanken, 2002; Chen, Francis and Jiang, 2005)

[3] Kim and Verrecchia (1994) suggest that earnings announcements provide information that allows certain traders to make judgments about a firm's performance that are superior to the judgments of other traders.

Jegadeesh (2004) mention that the concentration of recommendation revisions following earnings announcements suggests that analysts identify instances of mispricing during this period. Otherwise, there is no reason to expect that recommendation revisions are triggered by public earnings announcements. A simple model developed in this paper explains how analysts' recommendation revisions help the market correct security mispricing attributed to its prior misassessment about the value implications of announced earnings. Upward (downward) recommendation revisions following good (bad) earnings news reveal that as compared to analysts, the market has underestimated the value implication of previously released earnings. Such revisions would cause the market to revise its belief about value implication upward. In contrast, downward (upward) recommendation revisions issued subsequent to good (bad) earnings news suggest that the market has overestimated the value implication of earnings during the announcement. The market would revise its belief about value implication downward.

Therefore, after earnings announcements, a statistical relation should be found between return responses and prior earnings innovations surrounding analysts' recommendation revisions if the market reassesses the value implications of prior earnings innovations according to analysts' information released through those revisions. The direction of the relation depends on whether analysts' assessment about value implication is higher or lower than the market's prior assessment. The strength of the relation, which represents the extent of the market's belief revision, could be used to measure the value of analysts' expertise in processing public information.

The above setting provides a methodology to examine analysts' superiority over the market in processing public information. Using this methodology, the following questions have been studied: 1. Do analysts indeed have superiority over the market in processing public information? If so, what is the extent of this superiority? 2. Does the extent of this superiority differ among analysts? 3. When information complexity increases, does this superiority become more (less) significant? 4. Does this superiority truly come from analysts' intellectual skill in processing public information or guidance from the management?

The main findings regarding the above four questions are as follows: First, I find a significant statistical relation between returns to recommendation revisions and prior earnings innovations in the predicted directions after earnings announcements. Price responses to recommendation revisions are positively (negatively) related to prior earnings innovations for the group of observations, where analysts' assessment about the value implications of announced earnings is higher (lower) than the market's prior assessment. This is consistent with the conjecture that recommendation revisions are informative about the value implications of previously released earnings, which causes the market to revise its prior belief. Results reveal that the extent of the market's belief revision can be as high as about 14%, suggesting that analysts can process public information better than the market to a great extent.

Second, analysts possess differing abilities to interpret public information. Analysts who have performed better in forecasting earnings and picking stocks also have exhibited greater expertise in analyzing the value relevance of public information. Following prior studies, I use average excess returns earned by analysts' past recommendation revisions to proxy for their stock picking ability and their past forecast accuracy to proxy for their forecasting skills. Using both proxies, I find consistent evidence that recommendation revisions issued by skilled analysts can alter the market's assessment about the value implications of previous earnings at least 110% greater than those issued by moderately skilled analysts. It seems that this superiority is an integral part of financial analysts' ability as information intermediaries, an important part of whose jobs is to forecast earnings and pick profitable stocks.

Third, investors need to use more of analysts' information to clarify the implications of previously released earnings news when the information complexity (uncertainty) of earnings news is high. The extent of analysts' superiority increases with the complexity of earnings signals. When earnings information is difficult to analyze, the market may need more guidance from the analysts to help them correctly infer its long-term implications for firms' future performance. Following prior studies, I use the measure of three-day window abnormal trading volumes surrounding the earnings announcement to represent its information complexity. The results show that the extent of the market's belief revision caused by analysts' recommendation revisions goes up by at least 43% with the increase of information uncertainty.

Finally, by examining the impact of Reg FD on analysts' superiority in processing public information, this study reveals some evidence on the sources of this superiority. Since the adoption of Reg FD, analysts have lost their access to the management's inside information. However, if they continue to process public information better than the market, then it means that intellectually, they are indeed more skillful than the market as to analyze the value relevance of public information. The estimated results on the impact of Reg FD show that price reactions surrounding recommendation revisions are still significantly associated with previous earnings innovations even in the post Reg FD period, although the extent of the association did decline. Therefore, it seems that at least analysts do not solely rely on the guidance from the management to help themselves interpret publicly disclosed earnings information. Actually, the decline of the extent of this superiority is more likely due to the fact that analysts who are not so skilled at processing public information started issuing recommendation revisions following earnings announcements after Reg FD.

The methodology adopted in this paper is similar to that used in Freeman and Tse (1989), Mendenhall (1991), and Koch and Sun (2004). These studies find that the market learns about the value implications of previously announced earnings in light of postannouncement information such as current-quarter earnings announcements, analyst forecasts, or dividend announcements.

However, this study differs from theirs in several critical aspects. This paper is the first one to apply this methodology to closely investigate analysts' superiority over the market in processing public information. Also, I explicitly propose the extent of the market's belief revision about the value implications of earnings as a measure of the value of analysts' informational advantage as public information processors. In addition, in contrast with Mendenhall's study, I use recommendation revisions rather than forecast revisions to investigate the role of analysts' information in signaling the value implications of previous earnings. Compared to forecast revisions, analysts' recommendation revisions directly reflect analysts' evaluation on security value relative to its price. Therefore, recommendation revisions triggered by earnings announcements are more indicative as to whether the security is mispriced because of the market's misreaction to previously released earnings information.

An interesting by-product of this paper is the finding that analysts' information can substitute for subsequent earnings announcements in terms of helping investors reevaluate prior earnings announcements. Freeman and Tse (1989) find that investors use subsequent earnings announcements to adjust their estimate of the persistence of previous periods' earnings. I document that when analysts' information and subsequent earnings announcements provide consistent predictions on how the value implications of prior earnings news are misestimated, subsequent earnings announcements become less useful to investors for clarifying the implications of previous earnings news. This finding also confirms that analysts' information is valuable to investors for helping correct their misreactions to publicly disclosed earnings news.

In this study, I also compare the role of analysts and the extent of their superiority across industries. According to the SIC industry classification code, I divide the whole sample into seven industries: Manufacturing, Agriculture, Mining, Wholesale, Retail, Service, Construction and Transportation and Public Utility. I find that analysts exhibit a greater degree of superiority in processing publicly released earnings information for firms in the manufacturing and retail industry. A possible explanation for this result is that manufacturing and retail firms usually report financial information that is more difficult to analyze than firms in the other industries due to their complex operation processes. Therefore, guidance from analysts who follow these two industries is even more important to investors.

The rest of the paper is organized as follows: Chapter 2 highlights related prior research; Chapter 3 develops the main hypothesis; Chapter 4 describes sample selection and design of empirical tests; Chapter 5 discusses the empirical results; Chapter 6 examines the information content of subsequent earnings announcements with the existence of analysts' information. Chapter 7 presents the industry analysis. Chapter 8 concludes.

Chapter 2:

Literature Review

Numerous studies have shown that analysts' information is valuable to the market by examining market's reactions to revisions of analysts' forecast or recommendations. Early studies such as Lloyd-Davies and Canes (1978) find on average, an event day abnormal return of 0.93% (-2.37%) for new favorable (unfavorable) recommendations, which appear in the Wall Street Journal. Lys and Sohn (1990) provide evidence that individual analysts' earnings forecasts are informative, even when they are preceded by earnings forecast, which is made by other analysts or by corporate accounting disclosure. More recent studies (Stickel, 1992; Womack, 1996; Mikhail et al., 2005) also provide consistent evidence that forecast and recommendation revisions have information content to the market. Asquith, Mikhail and Au (2005) investigate the contents of analyst reports in their entirety and find that the other elements of their reports are also significantly and positively associated with the market's reaction at the time a report is released. Some studies record that the information content of analysts' forecasts or recommendations is related to factors such as analyst reputation, firm size, brokerage profits, and brokerage size, etc. (Stickel, 1992; Gleason and Lee, 2003; Frankel et al., 2003).

Partially, the value of analysts' forecasts and recommendations stems from their ability to collect non-public information from the management, which has caught the attention of the SEC. The SEC is concerned that the issuers' selective disclosure of material non-public information to security analysts has hurt uninformed investors.

Despite the controversial evidence as to whether private communications between analysts and management make the market better or worse off (Bushman, 1991;[4] Das et al., 1998; [5] Francis et al., 1997 [6]), Reg FD became effective on October 23, 2000.

Motivated by Reg FD, Ivkovic and Jegadeesh (2004) evaluate the information content of analysts' one-quarter ahead earnings forecast and recommendation revisions at various points in time relative to earnings announcement dates. They find that price reactions and the sensitivity of price reactions to revisions are weaker for revisions in the week after earnings announcements than in the week before earnings announcements and conclude that analysts' informational advantage as private information collector is more important than as public information processor. Asquith, Mikhail and Au (2005) suggest that analysts may play a role in interpreting information previously released by examining market reactions to analyst reports which occurred simultaneously with other information releases. Park and Pincus (2000) look into a similar issue by examining whether analysts' recommendation revisions have incremental information content beyond current earnings surprises during earnings announcements. I find evidence of analysts' superiority in processing public information in the sense that the impact of analysts' information is related to prior earnings surprises. Therefore, my study directly shows how analysts' interpretation of publicly disclosed earnings information is valued by the market.

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[4] Bushman (1991) draws on the conclusion that if firms are given the power to alter the structure of the private information market through selective disclosures of private information before any public release, traders may be made better off.

[5] Das et. al (1998) provide evidence that analysts issued optimistic forecasts to facilitate their access to management's non-public information.

[6] Francis et al (1997) find that both firms and analysts benefit from corporate presentations to security analysts.

The evidence on the market's misreaction to earnings announcements is mixed. There are several studies trying to explain post-earnings announcement drifts as an initial underreaction to earnings and a subsequent delayed price response in the same direction (Bernard and Thomas, 1990; Wiggins, 1991; Mendenhall, 1991; Abarbanell and Bernard, 1992; Shane and Brous, 2001; Liang, 2003;). There are also studies documenting prior overreactions to news events (DeBondt and Thaler, 1985, 1987, 1990; Klein, 1990; Chopra and Ritter, 1992;). Abarbanell and Bernard also find that value line analysts appear to underreact to recent earnings information. However, stock prices appear to underreact to an even greater degree. Mendenhall's evidence also indicates that stock prices reflect less information than analysts' forecasts.

The methodology aspect of this paper is in the spirit of Freeman and Tse (1989), Mendenhall (1991), and Koch and Sun (2004). Freeman and Tse (1989) report that the market learns about the value implications of previously announced earnings from current earnings announcements. [7] Koch and Sun (2004) show that investors reassess the persistence of recently announced earnings using information released during dividend announcements. Their studies also suggest that the market may overreact or underreact to earnings news.

Finally, this study joins a growing literature examining the impact of Reg FD on analysts' information environment. Bailey et al. (2003) show that analysts' forecast

[7] Mendenhall (1991) finds that investors correct their previous underweights to earnings when analyst forecast revisions have the same sign with prior earnings innovations. In contrast to recommendation revisions, analysts naturally update their forecasts following earnings announcements. Even though forecast revisions have the same sign as prior earnings innovations, the extent of the revision would be larger or smaller than the market's prior expectation change on future earnings during earnings announcements, which means that the market could underweight or overweight prior earnings news. Therefore, in Mendenhall's paper, the R^2 of the regression results is very smaller.

dispersion and other measures of disagreement increases after the adoption of Reg FD. Zitzewitz (2002) finds that multi-forecast days that typically follow public announcements or events now account for over 70 percent of the new information about earnings, up from 35% before Reg FD. Agrawal, Chadha and Chen (2006) document that earnings forecasts become less accurate and forecast dispersion across individual analysts following a firm increases post-Reg FD.[8] My paper augments this literature by directly examining whether analysts' informational advantage in processing public information has changed in the post-Reg FD periods.

[8] Some of the other papers that examine the impact of Reg FD on analysts' information environment are Mohanran and Sunder (2001), Heflin, Subramanyam and Zhang (2003), Irani and Karamanou (2003).

Chapter 3:

Methodology and Hypothesis Development

3.1 Methodology Development

Prior studies suggest that the Earnings Response Coefficient (ERC) is an increasing function of current earnings' value implications for future earnings, i.e., persistence and reliability, under the assumption of discounted earnings valuation. However, during an earnings announcement, the real value implication is unknown or uncertain to the market. For example, investors may not be able to discern how much of current earnings innovation will persist in the future periods or how reliable the reported earnings number is. Therefore, the market has to react to the earnings news based on its assessment about its value implication. After observing the market's reaction to the earnings announcement, an analyst revises her recommendation for the firm's stock if she believes that the market misprices prior earnings news according to her own assessment about earnings value implication.

Assume, during earnings announcement, the initial price reaction to the announcement of E_t (period t's reported earnings) is determined as:

$$R = ERC \times (E_t - F_t^{\,t}), \tag{1}$$

where ERC is the value multiple attached to the announced earnings by the market which is determined by various factors related to the value implication of earnings such as persistence, reliability and others based on the market's initial assessment of these factors.

F_t^t denotes the consensus analyst forecast for E_t before it is announced. After analyzing the earnings news released during the announcement, the analyst believes that the price should react to the earnings innovation - $E_t - F_t^t$ with an ERC equal to ERC^A based on her own assessment about the value implication of earnings innovation. Therefore, to the analyst, the price reaction to the announced earnings should be equal to:

$$R^A = ERC^A \times (E_t - F_t^t). \tag{2}$$

Any difference between ERC and ERC^A means that the analyst would think the market misprices prior earnings news and would revise her recommendation based on the sign of ($R^A - R$), which is equal to:

$$R^A - R = (ERC^A - ERC) \times (E_t - F_t^t). \tag{3}$$

When $ERC^A > ERC$ and the earnings innovation is positive (negative), the analyst would revise her recommendation upward (downward) because the security is underpriced (overpriced). When $ERC^A < ERC$ and the earnings innovation is positive (negative), the analyst would revise her recommendation downward (upward) because the security is overpriced (underpriced). After observing the recommendation revision, the market would know whether it underreacted or overreacted to prior earnings news during the announcement and correct its prior misreaction by the amount of ($R^A - R$). Therefore, after earnings announcement, price response surrounding the analyst's recommendation revision would still be related to prior earnings innovation as equation (3). The sign of the coefficient on $(E_t - F_t^{\,t})$ can be identified by the signs of prior earnings innovations and analysts' recommendation revisions as illustrated in Figure 1.[9]

[INSERT FIGURE 1 HERE]

For Group 1, the analyst revises her recommendation upward (downward) and prior earnings innovation is positive (negative). This means that the firm's stock is underpriced (overpriced) due to the market's underreaction to prior good (bad) news. For Group 2, the analyst revises her recommendation downward (upward) and prior earnings innovation is positive (negative). This means that the firm's stock is overpriced (underpriced) due to the market's overreaction to prior good (bad) news. [10]

From equation (3), the magnitude of the coefficient on $(E_t - F_t^{\,t})$ is equal to $\left|ERC^A - ERC\right|$, which represents the difference between the analyst's opinion on the value implication of the earnings innovation and that of the market. If the market follows the analyst's opinion, then $\left|ERC^A - ERC\right|$ can also be understood as the extent to which the market's belief about the value implication of previous earnings is altered by the analyst's information. Therefore, the magnitude of this coefficient measures the value of

[9] I assign a numerical value for each recommendation: 5 strong buy; 4 buy; 3 hold; 2 underperform; 1 sell. Therefore, positive revision means that the recommendation is revised upward, while negative revision means that the recommendation is revised downward.

[10] I use the recommendation revision rather than the recommendation itself (Buy or Sell) to group the observations because of two reasons: first, recommendation revisions reflect the change of analysts' opinions on security prices caused by the market's reaction to earnings announcements. Second, analysts are reluctant to issue "sell" recommendations. In a sample of 17,093 recommendations examined by this paper, there are only 1,412 "underperform" or "sell" recommendations and 15,680 "buy" or "strong buy" recommendations.

analysts' information advantage over the market in processing publicly disclosed earnings information.

3.2 Hypothesis Development

From the previous discussions, I hypothesize that if analysts can interpret public information better than the market, their recommendation revisions issued after earnings announcements convey valuable information to the market for reassessing the value implication of recently released earnings information. If so, as indicated by equation (3), there would exist a statistical relation between returns surrounding analysts' recommendation revisions and prior earnings innovations post earnings announcements. The sign of this relation is positive (negative) if the observation falls into group 1 (2) as described in Figure 1. The strength of this relation - the absolute magnitude of the coefficient on $E_t - F_t^t$, represents the extent of analysts' superiority over the market in processing publicly released earnings news. Specifically, I predict:

H1: For Group 1 (2), returns to recommendation revisions issued after earnings announcements are positively (negatively) related to prior earnings innovations.

H1 investigates whether generally analysts are superior to the market in processing public information, specifically publicly disclosed earnings information. However, if this superiority in processing public information is an integral part of analysts' abilities as information intermediaries, shouldn't the extent of this superiority also differ among analysts themselves? Shouldn't analysts with superior performance exhibit greater extent of this superiority? Otherwise, the expertise of analyzing public information would not be regarded as useful skills to analysts.

Prior studies evaluate analysts' superiority (performance) based on their stock picking and earnings forecasting records. Mikhail et al. (2004) find that security analysts exhibit persistent differences in their stock picking ability. Analysts whose recommendation revisions earned more (less) excess returns in the past continue to outperform (underperform) in the future. Stickel (1992) and Mikhail et al. (1999) document that analysts' promotions and job terminations are related to their forecasting ability gauged by their past forecast accuracy.

The next set of tests focuses on examining whether analysts' ability to process public information contributes to their abilities to pick stocks and forecast earnings. If so, analysts' performance would be positively related to the extent of their superiority in processing public information. In this study, the extent of this superiority is measured by how much the market's assessment about the value implications of previous earnings can be altered by their recommendation revisions. Therefore, I expect that the revisions issued by superior analysts would be able to cause a greater assessment revision than those issued by moderate analysts, which means that the strength of the association between returns to those revisions issued by superior analysts and prior earnings innovations should be stronger. Following prior studies, I use high excess returns earned by the analyst's past recommendation revisions to represent superior stock picking ability and her accurate forecast record as a proxy for superior forecasting ability. Hypothesis 2 is as follows:

H2: The strength of the statistical relation between returns to recommendation revisions issued after earnings announcements and prior earnings innovations increases *with the average excess returns earned by the analyst's past recommendation revisions and the accuracy of her past forecast record.*

If I find that analyst information can help the market solve its uncertainty about the value implications of earnings, then consequently, another research question arises: can analysts help resolve more uncertainty for the market as the level of information uncertainty (complexity) increases? When earnings information is really difficult to analyze, would analysts' information become more or less valuable to investors in terms of clarifying the value implications of previous earnings?

When the level of information uncertainty is higher, it is expected that price misreactions to earnings announcements would be more severe due to investors' less accurate estimate of the implications of earnings news. One may think that analysts' guidance would become more important and valuable to investors for reevaluating previous earnings news and thus under such situations, analysts would exhibit a greater extent of superiority over the market. However, as earnings information becomes more difficult to analyze, analysts would also have more difficulties in correctly assessing its value implication themselves. If analysts do not have enough expertise to deal with the difficulties, it is not certain that their information would be more useful to investors and could cause investors to adjust their estimate about the value implications of previous earnings as much as when earnings information is less complex.

As elite information processors, analysts are expected to provide valuable guidance to investors for interpreting publicly released information especially when the information is difficult to analyze. Therefore, the next hypothesis is developed to study whether the extent of analysts' superiority over the market becomes greater or smaller when the level of information complexity of earnings announcements increases. Prior theoretical studies suggest that trading volume is related to the market's different opinions of a signal (Holthausen and Verrecchia, 1990, Kim and Verrecchia, 1991, 1994). High abnormal trading volume reflects a greater degree of heterogeneity of investors' opinions on the same information signal when they are uncertain about the signal. Since it is not clear how information uncertainty affects the extent of analysts' superiority over the market, I predict:

H3: The strength of the statistical relation between returns to recommendation revisions driven by earnings announcements and prior earnings innovations is not related to the information uncertainty of earnings announcements.

Until now, an important question that has not been addressed yet is the source of analysts' superiority in processing public information if it does exist. Does this superiority indeed stem from analysts' intellectual skills? Or actually analysts rely on inside information from the management to help themselves interpret public information. Reg FD provides an ideal environment to investigate whether analysts' channel to the management's non-public information is the sole or major source of this superiority. Since Reg FD was adopted on October 23, 2000, the management have been required to disseminate any material information simultaneously to all market participants. Therefore, after Reg FD, analysts' channel to the management's inside information has been blocked. Zitzewitz (2002) reports evidence that Reg FD has had its desired effect of reducing selective disclosure of information about firms' future performance to individual analysts. If analysts' access to the management's inside information is the sole source of their superiority, after Reg FD, they would no longer exhibit significant advantage over the market in processing public information. At the same time, analysts would revise their recommendations less frequently after Reg FD because they can not get as much the management's private information as before Reg FD.

However, if analysts are indeed more skillful than investors in processing public information, after their access to the management's inside information has been blocked, they would still be able to process public information better than investors. Meanwhile, since private communications of material information between the management and analysts have been prohibited after Reg FD, analysts whose expertise is in seeking inside information from the management would be forced to follow material public information release such as earnings announcements to make recommendations. Therefore, in the post-Reg FD period, there would be an increase in the number of recommendation revisions issued subsequent to earnings announcements by analysts who may lack the expertise to process public information. Hence, on average, analysts' recommendation revision would be less informative to the market in the sense that they would not be able to cause the market to revise its belief about the value implications of announced earnings as much as before Reg FD.

As discussed above, after Reg FD, it is expected that the extent of analysts' superiority over the market may have declined, but it should remain significant if analysts' access to the management's inside information is not the sole source of this superiority. If not, then analysts' superiority in processing public information would have been gone after Reg FD. H4 is developed to investigate the impact of Reg FD on the extent of this superiority.

H4: The extent of the statistical relation between returns to recommendation revisions driven by earnings announcements and prior earnings innovations has changed after the adoption of Reg FD.

Chapter 4:

Sample Selection and Design of Empirical Tests

4.1 Sample Selection

The above hypotheses are tested on a sample of recommendation revisions made after November 1993 included in the 2004 I/B/E/S database. The annual earnings announcement dates and reported values of earnings also come from I/B/E/S. The stock returns and price data come from the 2004 Center for Research in Security Prices (CRSP) files. A sample firm must meet the following data requirements to be included in the tests:

(1) at least one analyst revises her recommendation following its annual earnings announcement within 30 trading days with the revision date recorded in I/B/E/S ;

(2) annual earnings information with actual reported value and actual reported date recorded in I/B/E/S;

(3) analysts' forecasts used to calculate earnings innovations for announced earnings;

(4) daily stock returns and beginning of period price for the 3-day window centered on the recommendation revision date in the CRSP daily files.

I eliminate observations with recommendation revisions equal to zero in order to identify instances of misreactions. Observations with earnings innovations equal to zero are also excluded because it is not meaningful to study the value implications of earnings innovations that are equal to zero. The variables of earnings innovations and three-day cumulative abnormal returns are winsorized at the 1% and 99% level in my sample. The above selection criteria yield 17,093 observations of recommendation revisions with 4,553 firms in the sample for H1.

4.2 Design of Empirical Tests

H1 predicts that recommendation revisions issued following earnings announcements could alter the market's belief about the value implications of previous earnings and cause prices to react as equation (3). In order to test this hypothesis, I estimate the following regression equation using the above sample:

$$CAR_{t,i,j} = \alpha + \beta_1 PER_{t,i,j} \times FERROR_{t,i} + \beta_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta_3 REV_{t,i,j} + \varepsilon_{t,i,j}, \tag{4}$$

where $CAR_{t,i,j}$ is the cumulative 3-day size adjusted abnormal returns surrounding analyst j's recommendation revision for firm i. $FERROR_{t,i}$ is firm i's earnings innovation (forecast error) which is equal to the difference between announced earnings and its consensus forecast (mean forecast) deflated by the firm's beginning price of the 3-day window centered on the recommendation revision date. $PER_{t,i,j}$ ($NPER_{t,i,j}$) is a dummy variable with the value equal to one if the recommendation revision falls into Group 1 (2) and zero otherwise. Group 1 (2) consists of all observations where prior earnings innovations and analyst recommendations have the same (opposite) sign and the market's belief about earnings value implications is revised upward (downward) as in Figure 1. While there are two dummy variables for two categories, each dummy variable is interacted with $FERROR_{t,i}$. Therefore, the above equation does not suffer from perfect collinearity. $REV_{t,i,j}$ is the difference between the numerical values of analyst's j's recommendation issued after the earnings announcement and her prior recommendation issued before the earnings announcement. $REV_{t,i,j}$ is included in the regression to control for the analyst's non-earnings information. The predicted sign for the coefficient on $REV_{t,i,j}$ is positive. However, since $REV_{t,i,j}$ already contains information related to analysts' interpretation of prior earnings news, a certain degree of multicollineary will be incurred after including $REV_{t,i,j}$ in the regression. Therefore, I will mainly use the estimated results of equation (4) without $REV_{t,i,j}$ to test the main hypothesis.[11]

β_1 (β_2) measures the extent of the market's belief revision caused by analysts' information for Group 1 (2). Since for Group 1 (2), the market revises its belief about value implication upward (downward), β_1 (β_2) is predicted to be positive (negative). Therefore, the predicted signs of the coefficients in equation (4) should be:

$$\beta_1 > 0, \beta_2 < 0, \beta_3 > 0.$$

Since $REV_{t,i,j}$ is expected to be highly correlated with $CAR_{t,i,j}$, to check the robustness of the estimated results of equation (4), I also test H1 by regressing the following equation:

[11] Following Freeman and Tse (1989) and Mendenhall (1991), I do not include an interaction variable of the intercept and dummy variables in equation (4). To check the robustness of the results, I estimated the following equation using the same sample:
$CAR_{t,i,j} = \alpha_1 PER_{t,i,j} + \alpha_2 NPER_{t,i,j} + \beta_1 PER_{t,i,j} \times FERROR_{t,i} + \beta_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta_3 REV_{t,i,j} + \varepsilon_{t,i,j}$,
Both α_1 and α_2 are similar to α and the other coefficients are also similar to those estimated using equation (4).

$$CAR_{t,i,j} = a + b_1 PER1_{t,i,j} \times FERROR_{t,i} + b_2 PER2_{t,i,j} \times FERROR_{t,i}$$
$$+ b_3 NPER1_{t,i,j} \times FERROR_{t,i} + b_4 NPER2_{t,i,j} \times FERROR_{t,i}$$
$$+ b_5 REV_{t,i,j} + \varepsilon_{t,i,j}, \quad (5)$$

where $PER1_{t,i,j}$ ($PER2_{t,i,j}$) is equal to one if earnings innovation and recommendation revision both have positive (negative) signs as in the upper left (right) diagonal of Figure 1 and otherwise zero. $NPER1_{t,i,j}$ ($NPER2_{t,i,j}$) is equal to one if earnings innovation is positive (negative), but recommendation revision is negative (positive) as in the lower left (right) diagonal of Figure 1 and otherwise zero. Therefore, the expected signs of b_1 and b_2 are positive and the expected signs of b_3 and b_4 are negative. [12]

It is conjectured in H2 that the magnitude of the coefficients on prior earnings innovations increases with analysts' stock picking skill and earnings forecasting skill measured using the excess returns earned by their past recommendation revisions and the accuracy of their past forecast record respectively. In order to test this prediction, I run the regression using the following equation:

$$CAR_{t,i,j} = \alpha + \beta'_1 PER_{t,i,j} \times FERROR_{t,i} + \beta'_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta'_3 SUPER_{t,j}$$
$$\times PER_{t,i,j} \times FERROR_{t,i} + \beta'_4 SUPER_{t,j} \times NPER_{t,i,j} \times FERROR_{t,i}$$
$$+ \beta'_5 REV_{t,i,j} + \beta'_6 SUPER_{t,j} \times REV_{t,i,j} + \xi_{i,t,j}, \quad (6)$$

[12] I also estimate equation (4) by grouping the observations as:
Group 1: (Innovation +, Buy); (Innovation -, Sell)
Group 2: (Innovation +, Sell); (Innovation -, Buy).
The implications of the results remain unchanged, but adjusted R^2 of equation (4) becomes very small because there are only a very small fraction of "underperform" or "sell" recommendations in the sample as discussed in footnote 6.

where $SUPER_{t,j}$ is a dummy variable representing analyst j's ability of picking stocks or forecasting earnings. For the analyst's ability of picking stocks, for each year I calculate the average cumulative size-adjusted 3-day (-1,0,1) window returns by taking long (short) positions in her upward (downward) recommendation revisions issued in the past year with 0 representing the revision date.[13] Because of additional data requirements, the sample size is reduced to 12,332 observations. Then, for each year, analysts are ranked into two groups based on the average excess returns earned by their recommendation revisions in the past year. $SUPER_{t,j}$ takes the value of one if analyst j has a high rank and zero otherwise. All the other variables are as defined in equation (4).

For analyst j's skill in forecasting earnings, I estimate her past mean absolute forecast errors using rolling three-year windows.[14] For this test, the sample size is reduced to 16,232 observations because of the lack of past analyst forecast information for some firm years. Then for each year, if the analyst's past mean absolute forecast error is lower than the mean of the sample, the dummy variable of $SUPER_{t,j}$ takes the value of one and zero otherwise.[15]

Therefore, for analysts with moderate skills in picking stocks or forecasting earnings, the coefficient on $FERROR_{t,i}$ is equal to β'_1 (β'_2) for observations in Group 1 (2). For analysts with superior skills, the coefficients on $FERROR_{t,i}$ are equal to $\beta'_1+\beta'_3$

[13] Following Mikhail et. al. (2004), reiterated recommendation revisions are eliminated from estimating the excess returns earned by the analysts' past recommendation revisions because reiterated revisions have little information content as recorded in prior studies.
[14] Gu and Wu (2003) argue that analysts seek to minimize mean absolute forecast errors.
[15] The results are robust using continuous variable of excess returns earned by the analyst's past recommendation revisions and the accuracy of the analyst's past forecast record. The estimated results using the dummy variables of $SUPER_{t,j}$ are presented in this paper in convenience of explanation.

and $\beta'_2 + \beta'_4$ for observations in Group 1 and 2 respectively. Since the absolute magnitude of the coefficients on $FERROR_{t,i}$ is predicted to increase with analysts' performance as information processors, β_3 should be positive, and β_4 should be negative. β_6 is predicted to be positive because recommendation revisions issued by analysts with superior skills are expected to cause larger price reactions. Therefore, the predicted signs for all coefficients should be:

$$\beta'_1 > 0, \beta'_2 < 0, \beta'_3 > 0, \beta'_4 < 0, \beta'_5 > 0, \beta'_6 > 0.$$

H3 is developed to investigate whether analysts' information can provide more guidance to investors for reevaluating recently announced earnings when they are more uncertain about its value implications. In the following equation, a dummy variable which represents information complexity is interacted with $PER_{t,i,j} \times FERROR_{t,i}$ and $NPER_{t,i,j} \times FERROR_{t,i}$:

$$\begin{aligned} CAR_{t,i,j} = \alpha &+ \beta''_1\, PER_{t,i,j} \times FERROR_{t,i} + \beta''_2\, NPER_{t,i,j} \times FERROR_{t,i} \\ &+ \beta''_3\, AVOL_{t,i} \times PER_{t,i,j} \times FERROR_{t,i} + \beta''_4\, AVOL_{t,i} \\ &\times NPER_{t,i,j} \times FERROR_{t,i} + \beta''_5\, REV_{t,i,j} \\ &+ \beta''_6 \times AVOL_{t,i} \times REV_{t,i,j} + \varsigma_{t,i,j}, \end{aligned} \tag{7}$$

where $AVOL_{t,i}$ measures abnormal trading volume around the three-day announcement window. Like Landsman and Maydew (2002), the variable $AVOL_{t,i}$ is estimated as:

$$AVOL_{t,i} = \sum_{n=-1}^{1} (V_{t,i,n} - \overline{V}_{t,i}) / \sigma_{t,i},$$

where $V_{t,i,n}$ is the trading volume of firm i during day n at year t deflated by shares outstanding of the firm on day n during the 3-day window (-1,0,1) at year t, with day 0 being the announcement date. For each firm year, I estimate $\overline{V}_{t,i}$ and $\sigma_{t,i}$ - the mean and standard deviation of firm i's daily trading volume divided by daily shares outstanding of the firm during the estimation period (-242, -20). Then for each year, the observations are ranked into two groups based on $AVOL_{t,i}$. Then, the value of $AVOL_{t,i}$ is replaced by one if the observation has a high rank and zero otherwise.[16] For earnings announcements of high information uncertainty, the coefficients on $FERROR_{t,i}$ are equal to $\beta''_1+\beta''_3$ and $\beta''_2+\beta''_4$ for Group 1 and 2 respectively. Since it is unclear whether the magnitude of the coefficients increases or decreases with the level of information uncertainty as discussed in Section 4, there are no predicted signs for β''_3 and β''_4.

For recommendation revisions issued around earnings announcement dates, $AVOL_{t,i}$ would be highly correlated with $CAR_{t,i,j}$. Therefore, I exclude 5,913 observations of recommendation revisions issued within three trading days from the announcement dates. [17] Because additional data are required to estimate information uncertainty, the sample of this test is further reduced to 10,919 observations.

The last set of tests is to study the impact of Reg FD on analysts' superiority as public information processors in order to examine the sources of this superiority. I investigate whether the extent of analysts' superiority has changed after the adoption of Reg FD by estimating the following regression.

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[16] I also run the test using continuous variable of $AVOL_{t,i}$. The results are robust. The results estimated using dummy variable are presented in this paper in convenience of interpretation.
[17] Equation (7) is also estimated using a sample of observations including recommendation revisions issused in (0, 2). The results are similar.

$$
\begin{aligned}
CAR_{t,i,j} = \alpha &+ \beta'''_1\, PER_{t,i,j} \times FERROR_{t,i} + \beta'''_2\, NPER_{t,i,j} \times FERROR_{t,i} \\
&+ \beta'''_3\, POST_{t,i} \times PER_{t,i,j} \times FERROR_{t,i} + \beta'''_4\, POST_{t,i} \\
&\times NPER_{t,i,j} \times FERROR_{t,i} + \beta'''_5\, REV_{t,i,j} \\
&+ \beta_6'''\, POST_{t,i} \times REV_{t,i,j} + \zeta_{t,i,j}\,, \qquad (8)
\end{aligned}
$$

where $POST_{t,i}$ is the dummy variable representing post-Reg FD periods. $POST_{t,i}$ takes the value of one if the earnings announcement date is after the adoption of Reg FD (10/23/2000) and zero otherwise. If $\beta_1''' + \beta_3'''$ and $\beta_2''' + \beta_4'''$ are significantly different from zero, it suggests that analysts can still process public information better than the market after Reg FD.

Chapter 5:

Results and Discussion

5.1 Descriptive Statistics

Panel A of Table 1 shows the breakdown of the sample into Group 1 and 2 as described in Figure 1. Group 1 contains 9,102 observations, and in Group 2, there are a total number of 7,973 observations. Thus, my sample contains 1,129 more observations of market underreaction than overreaction to earnings news.

[INSERT TABLE 1 HERE]

Table 1 also reports sample descriptive statistics. Panel B shows that the cumulative three-day market adjusted abnormal returns surrounding recommendation revisions range from -0.3828 to 0.3234 with mean equal to -0.0048 and median equal to -0.0007. As more analysts revise recommendations downward than upward in this sample as shown in Panel A, the mean and median of recommendation revisions are both negative. The mean of $FERROR_{t,i}$ is negative, and the median is positive suggesting that there are more firms reporting positive earnings innovations even though the magnitude of positive earnings innovations is smaller than that of negative earnings innovations.

The correlation table presented in Panel C shows that the cumulative three-day returns surrounding recommendation revisions are significantly positively correlated with the revisions, and the extent of the correlation is strong (ρ =0.3215). Returns are also significantly positively correlated with prior earnings innovations but in a much smaller magnitude (ρ=0.0309). Therefore, on average, returns to recommendation revisions in the post-announcement periods are not strongly associated with prior earnings news. Although the magnitude is small, the correlation between recommendation revisions and prior earnings innovations is also positive and statistically significant (ρ=0.0641), which may be due to the larger number of underreaction observations than overreaction observations as reported in Panel A.

Figure 2 graphs average cumulative abnormal returns for firm years in each of the subgroups in Figure 1 during the trading period (0, 39) with 0 representing the date of the analyst's recommendation revision. Consistent with prior literature, Figure 2 indicates an event day average abnormal return of about 2% (-2%) to analysts' recommendation revisions, suggesting analysts' information is valuable to the market. Another finding worth noting is that while investors react to bad news (downward recommendation revisions) quickly, it takes time for them to react to good news (upward recommendation revisions). For the two subgroups where analysts' recommendation revisions are revised upward, cumulative abnormal returns continues to increase and do not flatten out until after about forty trading days. However, for the other two subgroups with downward revised recommendation revisions, the average cumulative abnormal returns stop decreasing after about eight or nine trading days. It is possible that after analysts revise their recommendations, the management may release supportive information to endorse upward recommendation revisions, which would cause the market to continue to react positively, but they may be reluctant to issue confirming information for downward recommendation revisions. Figure 2 also indicates that the market reacts slightly more favorably (negatively) to upward (downward) recommendation revisions following bad (good) earnings news than those following good (bad) earnings news.

[INSERT FIGURE 2 HERE]

5.2 Regression Results

5.2.1 Analysts' superiority in processing public information

H1 is tested by estimating equation (4) and (5), the results of which are reported in Panel A and B of Table 2 respectively. In the third column of Panel A that presents results without $REV_{t,i,j}$ in the regression, the coefficient on $PER_{t,i,j} \times FERROR_{t,i}$ is positive as predicted and statistically significant at the 0.01 level (β_1=0.7605,t=15.87). The coefficient on $NPER_{t,i,j} \times FERROR_{t,i}$ is negative as predicted and statistically significant at the 0.01 level (β_2=-0.8421, t=-13.76). Therefore, as expected by H1, price responses to recommendation revisions are positively (negatively) related to prior earnings innovations for observations in Group 1 (2), suggesting that the market learns from recommendation revisions that its prior assessment about earnings value implication is too low (high) and accordingly revises its assessment upward (downward). If only consider the persistence of earnings and assume that earnings follow an IMA(1,1) process with a moving average parameter equal to 0.5 and a discount rate equal to 12%, the ERC of earnings innovations would be equal to 5.17.[18] With an ERC equal to 5.17, results

[18] In Collins and Kothari (1989), the sum of the present value of expectation changes on earnings of all the future periods is equal to (1-θ)/r if earnings is assumed to follow an IMA(1,1) process with the moving average parameter equal to θ and r is the discount rate. Therefore, ERC should be equal to 1+ (1-θ)/r.

reported in Column 3 reveal that recommendation revisions could alter the market's belief about the value implications of previous earnings upward by about 15% (0.7605/5.17) and downward to an extent of about 16% (0.8421/5.17) for Group 1 and 2 respectively. Therefore, these revisions convey valuable information about the long-term implications of previously released earnings news, evidencing that analysts can process public information better than the market.

[INSERT TABLE 2 HERE]

The adjusted R^2 of equation (4) without $REV_{t,i,j}$ is equal to 0.026. In Mendenhall (1991), the adjusted R^2 of his regression equation with the variable of forecast revision is only .9%. Although Mendenhall's sample covers a different period from 1982 to 1986, a large increase in adjusted R^2 is suggestive that recommendation revisions are more informative about the value implications of earnings than forecast revisions.

Column 4 of Panel A reports estimated results of equation (4) with $REV_{t,i,j}$ in the regression to control for non-earnings information. As predicted, the coefficient on $REV_{t,i,j}$ is positive and statistically significant at the 0.01 level (β_3 =0.0191, t=38.85) and the adjusted R^2 is increased from 0.026 to 0.105, suggesting that recommendation revisions can explain a significant portion of price reactions. As recommendation revisions already contain information about analysts' interpretation of prior earnings news, it is not surprising to find that the magnitude of the coefficients on $PER_{t,i,j} \times FERROR_{t,i}$ and $NPER_{t,i,j} \times FERROR_{t,i}$ decreases after including $REV_{t,i,j}$ in the regression

(β_1=0.2174; β_2=-0.2072). However, the fact that these two coefficients still have the predicted signs and are statistically significant at the 0.01 level provides strong support for the predictions of H1.

Results reported in Panel B are also as anticipated by H1. In both column 3 and 4, all the coefficients have the predicted signs and are at least statistically significant at the 0.05 level. For the two subgroups which belong to Group 1 (2), the coefficients on $FERROR_{t,i}$ are both positive (negative) as expected, suggesting that the market adjusts its belief about the value implications of prior earnings upward (downward). Therefore, the estimated results of equation (4) are consistent with H1 not because of the grouping method, which pools observations with the same signs in one group and observations with opposite signs in another group. I find results, which confirm H1 for each subgroup of Figure 1 as shown in Panel B. Furthermore, the average magnitude of the coefficients on $FERROR_{t,i}$ is larger in Panel B than that in Panel A for both Column 3 and Column 4. The adjusted R^2 also improves from 0.026 to 0.034 in Column 3 and from 0.105 to 0.106 in Column 4. Therefore, the estimated results of equation (5) provide even stronger support for H1.

The finding of a significant relation between returns around recommendation revisions and prior earnings innovations in the post-announcement period confirms that analysts' information is useful to the market for reevaluating previously released earnings information. The strength of this statistical relation provides a measure of the value of analysts' expertise in processing public information. Results presented above reveal that analysts' information can make the market adjust its belief about value implications of previous earnings by about 15%. Therefore, analysts do have superiority in processing public information that is valuable to the market. [19]

5.2.2 The Relationship between Analysts' Performance and Their Ability to Analyze Public Information

Equation (6) is estimated to examine whether analysts have different abilities to process public information. Especially, do analysts who possess superior skills in picking stocks and forecasting earnings also exhibit more expertise in processing public information? If not, then this superiority might not be a useful ability to analysts for performing as information intermediaries.

Panel A of Table 3 reports the estimated results of equation (6) on analysts' stock picking ability, which supports H2. In Column 3, the coefficient on $PER_{t,i,j} \times FERROR_{t,i}$ ($NPER_{t,i,j} \times FERROR_{t,i}$) is positive (negative) as predicted and statistically significant at the 0.01 level (β'_1= 0.3755; β_2= -0.3976). A positive coefficient on $PER_{t,i,j} \times FERROR_{t,i}$ and a negative coefficient on $NPER_{t,i,j} \times FERROR_{t,i}$ indicate that analysts with moderate skills in picking stocks can still process public information better than the market. To the market, their recommendation revisions are still informative about the value implications of earnings. Consistent with the predictions of H2, the coefficient on $SUPER_{t,j} \times PER_{t,i,j} \times FERROR_{t,i}$ ($SUPER_{t,j} \times NPER_{t,i,j} \times FERROR_{t,i}$) is positive (negative) and statistically significant at the 0.01 level (β'_3 =0.5400; β'_4 =-0.7893),

[19] In order to ascertain that it is the recommendation revisions that make the market reassess earnings value implication, I also test on the periods between two recommendation revisions, but I do not find any significant results.

suggesting that recommendation revisions issued by analysts with superior stock picking skills can cause the market to revise its estimate of the value implications of previous earnings by a greater amount. The magnitude of β'_3 and β'_4 measures the extent to which the strength of the statistical relation between returns to recommendation revisions and prior earnings innovations varies with analysts' stock picking ability. The results reveal that the strength of this statistical relation increases by 144% (0.5400/0.3755) and 199% (0.7893/0.3976) for Group 1 and 2 respectively if the recommendation revisions are issued by analysts whose recommendation revisions have earned high excess returns in the past.

[INSERT TABLE 3 HERE]

Column 4 provides similar results with those reported in Column 3. β'_3 and β'_4 have the predicted signs even after including $REV_{t,i,j}$ in the regression and β'_4 is statistically significant at the 0.05 level. The coefficient on $SUPER_{t,j} \times REV_{t,i,j}$ is positive as predicted and statistically significant at the 0.01 level, confirming that recommendation revisions issued by skilled analysts can cause bigger price reactions as recorded in prior studies.

The estimated results of equation (6) on analysts' forecasting skill that are reported in Panel B also present evidence that supports H2. β'_1 (β'_2) is positive (negative) as predicted and statistically significant at the 0.01 level, implying that analysts with less accurate forecast record still have more expertise to process public information than the market (β'_1 =0.6183; β'_2 =-0.6060). β'_3 (β'_4) has a positive (negative) sign and is statistically significant at the 0.01 level, revealing that recommendation revisions issued by analysts who have an accurate forecast record could provide more useful information to the market for evaluating the value implications of previously released earnings information (β'_3=0.7256; β'_4=-0.9420). Similarly with the results reported in Panel A, comparing the magnitude of β'_3 and β'_4 with that of β'_1 and β'_2 reveals that recommendation revisions issued by skillful analysts can alter the market's belief about the value implications of prior earnings to a greater extent as much as 110%.

As to results reported in Column 4 of Panel B, the coefficient on $SUPER_{t,j} \times REV_{t,i,j}$ is positive as predicted and statistically significant at 0.05 level, confirming that the market regards analysts who can forecast earnings accurately to issue more informative recommendations. Although not significant at the conventional level, β'_3 and β'_4 still have the predicted signs.

In summary, results reported in table 3 are evident that analysts exhibit differences in their abilities to process public information. Analysts who have exceptional performance in picking stocks and forecasting earnings are also more skilled at processing public information than their fellow analysts, although moderately skilled analysts still have advantage over the market in processing public information.

5.2.3 Information Complexity

This set of tests examines whether analysts' superiority over the market in processing public information is more or less significant when information complexity of earnings announcements increases. The estimated results of equation (7) are reported in

Table 4. In Column 3, the coefficient on $PER_{t,i,j} \times FERROR_{t,i}$ ($NPER_{t,i,j} \times FERROR_{t,i}$) is positive (negative) as predicted and statistically significant at the 0.01 level, consistent with the prediction of H1 that analyst information causes the market to reassess the value implications of previous earnings. The coefficient on $AVOL_{t,i} \times PER_{t,i,j} \times FERROR_{t,i}$ is positive and statistically significant at the 0.01 level (β''_3 = 0.4964, t = 3.73). The coefficient on $AVOL_{t,i} \times NPER_{t,i,j} \times FERROR_{t,i}$ is negative and statistically significant at the 0.05 level (β''_4 = -0.3692, t = -2.28). Therefore, β''_3 (β''_4) has the same sign as β''_1 (β''_2), suggesting that analysts' recommendation revisions can cause a greater extent of market's belief revision about the value implications of previous earnings when information complexity of earnings announcements increases. The extent of the market's belief revisions increases by about 130% (0.4964/0.3807) and 44% (0.3692/0.8309) for observations in Group 1 and 2 respectively.

[INSERT TABLE 4 HERE]

Column 4 reports similar results as those reported in Column 3. The coefficient on $AVOL_{t,i} \times PER_{t,i,j} \times FERROR_{t,i}$ is still positive and statistically significant at the 0.1 level. It means that when previous earnings is underweighed, analysts' recommendation revisions can cause the market to revise its assessment about the value implications of previous earnings upward to a greater extent when the market is more uncertain about the value implications during the announcements. Although the coefficient on $AVOL_{t,i} \times NPER_{t,i,j} \times FERROR_{t,i}$ is not statistically significant at the conventional level, it still has the negative sign. The coefficient on $REV_{t,i,j}$ is positive as expected and statistically significant at the 0.01 level. The coefficient on $AVOL_{t,i} \times REV_{t,i,j}$ is also positive and statistically significant at the 0.05 level. Overall, the results suggest that as the difficulties of analyzing publicly disclosed earnings information increases, analysts' guidance has become more valuable to the market for correctly assessing the value implications of announced earnings.

In conclusion, when information uncertainty of earnings announcements is high, analysts play a more important role in helping investors evaluate the long-term implications of released earnings. The extent of analysts' superiority increases significantly as the level of information complexity increases. It seems that analysts are capable of dealing with information that is difficult to process.

5.2.4 The Impact of Reg FD

In this set of tests, equation (8) is estimated to investigate whether analysts' expertise in processing public information has remained the same or declined after Reg FD, the results of which are reported in Table 5.

[INSERT TABLE 5 HERE]

In Column 3 of Panel A, the coefficient on $POST_{t,i} \times PER_{t,i,j} \times FERROR_{t,i}$ is negative and statistically significant at the 0.05 level (β'''_3= -0.2213, t = -2.23). The coefficient on $POST_{t,i} \times NPER_{t,i,j} \times FERROR_{t,i}$ is statistically significant at the 0.01 level

($\beta'''_4 = 0.5271$, t = 4.07). Therefore, after Reg FD, the magnitude of the coefficients on $PER_{t,i,j} \times FERROR_{t,i}$ and $NPER_{t,i,j} \times FERROR_{t,i}$ declines by 24.96% (0.2213/0.8866) and 42.89% (0.5271/1.2289) respectively, suggesting that the strength of the relation between returns to recommendation revisions and prior earnings innovations has been undermined. Therefore, on average, analysts' recommendation revisions provide less guidance to the market for reevaluating previous earnings and are not able to alter the market's belief about value implications as much as before. Results reported in Column 4 are also consistent with Column 3. Negative β'''_3 and positive β'''_4 indicate that after Reg FD, average revisions convey less information about earnings value implications than before.

However, the coefficient on $FERROR_{t,i}$ is still significantly different from zero after Reg FD, suggesting that analysts can still process public information better than the market. It is equal to 0.6653 ($\beta'''_1 + \beta'''_3$) for Group 1 and -0.7018 ($\beta'''_2 + \beta'''_4$) for Group 2 in the post-Reg FD period. Thus, analysts' information can still cause the market to revise its belief about earnings value implication significantly even after their access to inside information has been greatly impeded. Therefore, it seems that analysts are truly more skillful than the market in processing public information, although the decline in the extent of their superiority implies that they may also use the management's inside information to analyze public information.

However, as discussed in Section 3, another potential factor, which may contribute to the decline of the extent of analysts' superiority, may be that after Reg FD, there is an increase in the number of recommendation revisions issued by analysts who lack the expertise to process public information. In order to investigate the possibility of this reason, first, I check whether earnings announcements have driven a greater number of recommendation revisions after Reg FD and then examine whether analysts who start issuing recommendation revisions following earnings announcements after Reg FD are less skilled at processing public information.

Panel B of Table 5 compares the number of recommendation revisions issued in the first trading week and the following five trading weeks before and after Reg FD. In the first trading week, there is a big increase in the number of recommendation revisions from 3,886 to 4,241. Considering that in the whole sample, there are around seven years before Reg FD and less than four years after Reg FD, the increase is 91% per year. For the next five trading weeks, the average number of recommendation revisions also ascends after Reg FD.[20] This upsurge in recommendation revisions, especially in the first trading week, indicates that after Reg FD, earnings announcements have driven more analysts to issue recommendation revisions.

The regression results reported in Panel B also provide some support for this explanation. In the first trading week, the magnitude of the coefficients on earnings innovations decreases significantly. Both β'''_3 and β'''_4 are statistically significant at the 0.01 level with a value equal to -0.5124 and 1.0226. In the second trading period, β'''_3 is not statistically significant at the conventional level, and the magnitude of β'''_3 and β'''_4 decreases significantly to 0.0681 and 0.3307. Since the growth in the number of recommendation revisions is much greater in the first trading period, the evidence suggests that when the number of recommendation revisions issued after earnings

[20] The number of recommendation revisions is 768 (5376/7) before Reg FD and 898 (3,590/4) after Reg FD on average for each year.

announcements increases, on average, their informativeness about value implications declines.

It is also shown in Panel B that in the first trading period, overall recommendation revisions become less informative after Reg FD. As revisions issued in the first trading period are more likely to contain information about analysts' interpretation of earnings information, this result also indicates that on average, analysts have less informational advantage in processing earnings information after Reg FD. The informativeness of recommendation revisions increases in the second trading period, which implies that analysts' non-earnings information may have become more valuable to the market after Reg FD.

In order to inspect whether new analysts who start issuing recommendation revisions following earnings announcements after Reg FD have less expertise to process public information than experienced analysts, I estimate the following equation only using observations of which the earnings announcement dates are post Reg FD:

$$
\begin{aligned}
CAR_{t,i,j} = {} & \gamma_0 + \gamma_1 PER_{t,i,j} \times FERROR_{t,i} + \gamma_2 NPER_{t,i,j} \times FERROR_{t,i} \\
& + \gamma_3 NEW_j \times PER_{t,i,j} \times FERROR_{t,i} + \gamma_4 NEW_j \times NPER_{t,i,j} \\
& \times FERROR_{t,i} + \zeta_{t,i,j}, \qquad (9)
\end{aligned}
$$

where NEW_j takes the value of one if the analyst j never issued any recommendation revision following earnings announcements within 30 trading days before the adoption of Reg FD. Since I predict that new analysts have less expertise to process public information, γ_3 is predicted to be negative while γ_4 is predicted to be positive.

In the sample, 3,663 recommendation revisions are issued by new analysts while 4,173 recommendation revisions are issued by experienced analysts. Table 6 reports the estimated results of equation (6), which are consistent with my conjecture. γ_3 (γ_4) is negative (positive) as predicted and statistically significant at the 0.1 (0.05) level. Therefore, recommendation revisions issued by new analysts are less valuable to the market for understanding the value implication of earnings information. The extent of the market's belief revisions caused by new analysts' recommendations is 28.51% (0.1606/0.5633) and 34.95% (0.2934/0.8395) smaller than that caused by recommendations from experienced analysts, suggesting that new analysts are less skilled at processing public information than experienced analysts.

[INSERT TABLE 6 HERE]

The above results provide evidence supporting that the decline in the extent of analysts' superiority is due to an increase in the number of recommendation revisions issued by analysts, who are not so skilled at processing public information. The evidence that earnings announcements have driven more recommendation revisions after selective disclosure is eliminated also suggests that these revisions are more likely the results of analysts' ability to interpret public information. Although on average, these revisions interpret less about the value implications of disclosed earnings after Reg FD, the large increase in the number of revisions might have helped accelerate the information dissemination of earnings announcements.

In order to further investigate whether analysts solely rely on inside information from the management to interpret public information, I examine the impact of Reg FD on upward and downward recommendation revisions separately. Prior studies document that the management have incentives to communicate good news to analysts or give an early peek to analysts when there is good news than bad news (Chambers and Penman, 1984; Brown, 2001; Ivkovic and Jegadeesh, 2002). Upward (downward) recommendation revisions reveal that analysts discover good (bad) news about the security. Therefore, examining whether Reg FD has a different impact on the informativeness of upward and downward revisions would shed some light on this issue. Since before Reg FD, the management tended to give analysts early access to good news rather than bad news, there would have been a greater reduction of good news than bad news from the management to analysts after Reg FD. Thus, if analysts' interpretation of public signals substantially benefits from the guidance of the management, then after Reg FD, the decline in the information content of analysts' upward revisions in terms of interpreting public information would be larger than that conveyed by downward revisions.

In order to test whether the extent of the market's belief revision caused by upward recommendation revisions has declined more than that caused by downward recommendation revisions, I split the sample into Group 1 and 2 as in Figure 1 and estimate the following equation separately for each subsample:

$$\begin{aligned} CAR_{t,i,j} = {} & \lambda_0 + \lambda_1 Upward_{t,i,j} \times FERROR_{t,i} + \lambda_2 Downward_{t,i,j} \times FERROR_{t,i} \\ & + \lambda_3 POST_{t,i} \times Upward_{t,i,j} \times FERROR_{t,i} + \lambda_4 POST_{t,i} \times Downward_{t,i,j} \\ & \times FERROR_{t,i} + \zeta_{t,i,j}, \end{aligned} \tag{10}$$

where $Upward_{t,i,j}$ ($Downward_{t,i,j}$) takes the value of one if the analyst recommendation is revised upward (downward) from her prior and otherwise zero. For Group 1 (2), λ_1 and λ_2 are expected to be positive (negative), and λ_3 and λ_4 are expected to be negative (positive) with $|\lambda_3| > |\lambda_4|$.

Results reported in Table 7 are contrary to the predictions. For Group 1, the coefficient on $POST_{t,i} \times Upward_{t,i,j} \times FERROR_{t,i}$ even has the opposite sign as predicted and statistically significant at the 0.1 level. Therefore, the magnitude of the coefficient on $FERROR_{t,i}$ increases from 2.6787 (λ_1) to 3.6507 ($\lambda_1 + \lambda_3$) for upward recommendation revisions, suggesting that they have become more useful to investors for reassessing the value implications of previous earnings after Reg FD. In contrast, the coefficient on $POST_{t,i} \times Downward_{t,i,j} \times FERROR_{t,i}$ is negative and statistically significant at 0.1 level. Therefore, the magnitude of the coefficient on $FERROR_{t,i}$ decreases from 0.9720 (λ_2) to 0.4429 ($\lambda_2 + \lambda_4$) for downward recommendation revisions. Downward revisions convey less information about earnings value implication to the market after Reg FD.

[INSERT TABLE 7 HERE]

As to results estimated on Group 2, the evidence also conflicts with the predictions. The coefficients on both $POST_{t,i} \times Upward_{t,i,j} \times FERROR_{t,i}$ and $POST_{t,i} \times Downward_{t,i,j} \times FERROR_{t,i}$ are positive, indicating that the magnitude of the coefficient on $FERROR_{t,i}$ decreases for both upward and downward recommendation revisions after Reg FD (λ_3 =0.5640, λ_4 =1.3507). However, the magnitude of λ_3 is much smaller than that of λ_4 . Thus, the decline of the informativeness about earnings value implication is smaller for upward than downward recommendation revisions.

Therefore, both Column 3 and 4 do not report evidence supporting that analysts substantially rely on inside information to interpret public information. Otherwise, I would find a greater decline in the value of upward recommendations than that of downward recommendations in terms of interpreting public information.

Chapter 6:

Subsequent Earnings Announcements

Freeman and Tse (1989) show evidence that market reactions surrounding subsequent earnings announcements are still associated with prior period's earnings innovations, suggesting that investors use subsequent earnings announcements to adjust their assessment of the value implications of previous earnings. This study records that analysts' information plays an important role in helping investors reassess the implications of recently announced earnings. Therefore, it is expected that analysts would substitute subsequent earnings announcements as to clarify the implications of previous earnings for firms' future performance, if analysts truly possessed a superior ability to analyze earnings information. If so, then when analysts' information provides the same prediction as subsequent earnings announcements on whether previous earnings is underweighed or overweighed, subsequent earnings announcements should become less useful to the market for reinterpreting previous earnings. In order to test this conjecture, I estimate the following equation on a sample of first analysts' recommendation revisions issued after earnings announcements.

$$\begin{aligned} CAR_{t,i} = {} & a_0 + b_1 S_{t,i} \times \Delta EPS_{t-1,i} + b_2 NS_{t,i} \times \Delta EPS_{t-1,i} + b_3 CON_{t,i} \times S_{t,i} \times \Delta EPS_{t-1,i} \\ & + b_4 CON_{t,i} \times NS_{t,i} \times \Delta EPS_{t-1,i} + b_5 FERROR_{t,i} + \upsilon_{t,i}, \end{aligned} \tag{11}$$

where $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on period t's earnings announcements. $\Delta EPS_{t-1,i}$ is the difference between period t-1 and t-2's earnings per share deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i}$.[21] $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts. $FERROR_{t,i}$ is also deflated using the beginning price of the 3-day window to calculate $CAR_{t,i,j}$. Following Freeman and Tse (1989), the dummy variable $S_{t,i}$ takes the value of one if forecast errors in period t-1 and period t which are represented by $\Delta EPS_{t-1,i}$ and $\Delta EPS_{t,i}$ respectively, have the same sign and zero if they have opposite sign. The dummy variable $CON_{t,i}$ is equal to one if period t's earnings innovation confirms the analyst's recommendation revision that previous earnings is underweighed (overweighed).

When do these two sources of postannouncement information provide consistent predictions on the value implications of period t-1's earnings innovations? If $\Delta EPS_{t-1,i}$ is positive (negative) and the analyst's recommendation is revised upward (downward), then according to Figure 1, the persistence of the earnings increase (decrease) is greater than the market's prior assessment during the earnings announcement and if $\Delta EPS_{t,i}$ is also positive (negative), then according to Freeman and Tse (1989), it is confirmed that the earnings increase (decrease) is permanent since $\Delta EPS_{t,i}$ and $\Delta EPS_{t-1,i}$ have the same sign. If $\Delta EPS_{t-1,i}$ is positive (negative) and the analyst's recommendation is revised downward (upward), then my study predicts that the persistence of the earnings increase

[21] Following Freeman and Tse (1989), the period t-1's forecast error is calculated using the time-series RW model. Therefore, the forecast error is equal to the difference between period t-1's earnings per share and period t-2's earnings per share.

(decrease) is smaller than the market's prior assessment during the earnings announcement and if $\Delta EPS_{t,i}$ is negative (positive), then according to Freeman and Tse (1989), it is confirmed that the earnings increase (decrease) is transitory because $\Delta EPS_{t,i}$ and $\Delta EPS_{t-1,i}$ have the opposite sign.[22] Thus under these four scenarios, the subsequent earnings announcements confirm the prediction of the analyst's information on persistence of previous earnings. Since it is expected that subsequent earnings announcements become less valuable to the market in terms of helping it reevaluate prior earnings news when $CON_{t,i}$ = 1, b_3 and b_4 should have the opposite sign as b_1 and b_2. Therefore b_3 is predicted to be negative and b_4 positive.

The estimated results of equation (11) are reported in Table 8. Consistent with Freeman and Tse (1989), in Column 3, the coefficient on $S_{t,i} \times \Delta EPS_{t-1,i}$ ($NS_{t,i} \times \Delta EPS_{t-1,i}$) is positive (negative) and statistically significant at the 0.1 (0.05) level, suggesting that subsequent earnings announcements are useful to the market because they clarify the implications of previous earnings. In Column 4, the coefficients on $CON_{t,i} \times S_{t,i} \times \Delta EPS_{t-1,i}$ is negative as predicted and statistically significant

[22] The other four scenarios that the subsequent earnings announcements contradict the prediction of the analyst's information on persistence of previous earnings are: If $\Delta EPS_{t-1,i}$ is positive (negative) and the analyst's recommendation is revised upward (downward), then according to Figure 1, the persistence of the earnings increase (decrease) is greater than the market's prior assessment during the earnings announcement and if $\Delta EPS_{t,i}$ is also negative (positive), then according to Freeman and Tse (1989), it predicts that the earnings increase (decrease) is transitory since $\Delta EPS_{t,i}$ and $\Delta EPS_{t-1,i}$ have the opposite sign. If $\Delta EPS_{t-1,i}$ is positive (negative) and the analyst's recommendation is revised downward (upward), then my study predicts that the persistence of the earnings increase (decrease) is smaller than the market's prior assessment during the earnings announcement and if $\Delta EPS_{t,i}$ is positive (negative), then according to Freeman and Tse (1989), it is confirmed that the earnings increase (decrease) is permanent because $\Delta EPS_{t,i}$ and $\Delta EPS_{t-1,i}$ have the same sign.

at the 0.1 level. Therefore, the coefficient on $S_{t,i} \times \Delta EPS_{t-1,i}$ declines to almost zero ($b_1 + b_3 =$ 0.0001) when $CON_{t,i}$ =1. Although it is not statistically significant at the conventional level, the coefficient on $CON_{t,i} \times NS_{t,i} \times \Delta EPS_{t-1,i}$ still have the predicted sign.

[INSERT TABLE 8 HERE]

The results reported in Table 8 reveal that when analysts' information already correctly indicates that investors misestimate the persistence of previous earnings, subsequent earnings announcements become less useful to the market for the purpose of reexamining the implications of previous earnings. These results also confirm that analysts' information is valuable to the market for reevaluating public information.

Chapter 7:

Industry Analysis

H3 is developed to study how the extent of analysts' superiority in processing publicly released earnings information changes with the level of information complexity by using abnormal trading volume to measure information complexity. However, it is also expected that different industries may produce earnings information with a different degree of complexity, which may not be captured in the measure of abnormal trading volumes. The financial information produced by firms in certain industries may be more difficult to interpret than that in others. For example, the operation process of manufacturing companies is much more complex than that of service companies. While the products of service companies are usually consumed at the same time when they are produced, manufacturing firms make products to bring revenues in future periods, which incurs a greater amount of accruals in their earnings.

According to the firms' SIC code, I divide the whole sample into seven industries: Retail trade, Manufacturing, Whole sale trade, Mining, Service, Transportation and public utility and Construction and then estimate equation (4) without $REV_{t,i,j}$ separately for each industry. I exclude two industries (Finance and Public Administration) which only have less than 20 observations. The estimated results are presented in Table 9.

[INSERT TABLE 9 HERE]

As expected, analysts' information seems to be more useful to investors for reevaluating public information produced by firms in the manufacturing and retail industries. The magnitude of the coefficients on $PER_{t,i,j} \times FERROR_{t,i}$ and $NPER_{t,i,j} \times FERROR_{t,i}$ is larger for firms in those two industries than that in the other five industries, especially the transportation and public utility and construction industries. Therefore, analysts exhibit a different degree of superiority in processing publicly released earnings information among firms in different industries, which may be due to industry characteristics such as the complexity of business operation.

However, this difference across industries may have been resulted from other potential factors. For example, it is possible that analysts may have more knowledge about the business operation and profitability of manufacturing and retail firms rather than firms in other industries. Therefore, analysts can do a better job in analyzing their financial information. Also, factors such as the quality and quantity of the management's information disclosure may have an influence on how accurately investors can assess firms' performance and thus the extent to which, analysts' information can help clarify the implications of publicly disclosed earnings information. If the quality and quantity of the management's information disclosure varies among industries, then the extent of analysts' superiority may also differ among industries.

Therefore, a further exploration on the industry analysis, considering all the relevant factors, may help us better understand analysts' behavior and the value of their information to investors.

Chapter 8:

Conclusion

This paper investigates analysts' expertise over the market in processing public information. I find a statistical relation between price reactions to analyst recommendation revisions issued after earnings announcements and prior earnings innovations. It suggests that analysts convey useful information to the market for reassessing the value implication of previously released earnings information through these recommendation revisions. The extent of the market's belief revision about the value implications of previous earnings is significant, which is evident that analysts' expertise in processing pubic information is valuable to the market.

It is also found that the strength of the statistical relation between market reactions to revisions and prior earnings innovations is positively related to analysts' performance in forecasting earnings and picking stocks. Recommendation revisions issued by analysts with superior performance records can make the market revise its belief about value implications more than those issued by moderately skilled analysts. It seems that analysts' superiority in processing public information contributes to their performance as information intermediaries.

Another finding of this paper is that the extent of analysts' superiority increases with the level of information complexity. When information complexity of earnings announcements is higher, analysts' recommendation revisions are more valuable to investors for reassessing the value implication of previously released earnings signals.

By examining the impact of Reg FD on the extent of analysts' superiority, I try to investigate the sources of this superiority. The main purpose is to find out whether analysts are truly more skillful than the market in processing public information or they solely rely on inside information from the management to analyze the value relevance of public information. It is evident that although on average, the extent of analysts' superiority declines after Reg FD, it still remains significant. Actually, the reason of the decline is more likely due to the fact that analysts who are not highly skilled at processing public information are forced to issue recommendations based on their diligent research of material public information releases such as earnings announcements after Reg FD. Therefore, it seems that analysts indeed possess better skills in processing public information than the market.

My results also suggest analysts' information substitutes for other sources of postannouncement information in terms of providing guidance on the value implications of previous earnings. In addition, the industry analysis shows that analysts' information is particularly useful for helping investors interpret earnings reported by firms in the manufacturing and retail industries. A further investigation on these two issues may bring more insights on this topic.

Increase ($ERC^A > ERC$)	Group 1 (innovation +, revision +)	Group 1 (innovation -, revision -)
Decrease ($ERC^A < ERC$)	Group 2 (innovation +, revision -)	Group 2 (innovation -, revision +)

Figure 1: Groups of Observations with Increased or Decreased ERC

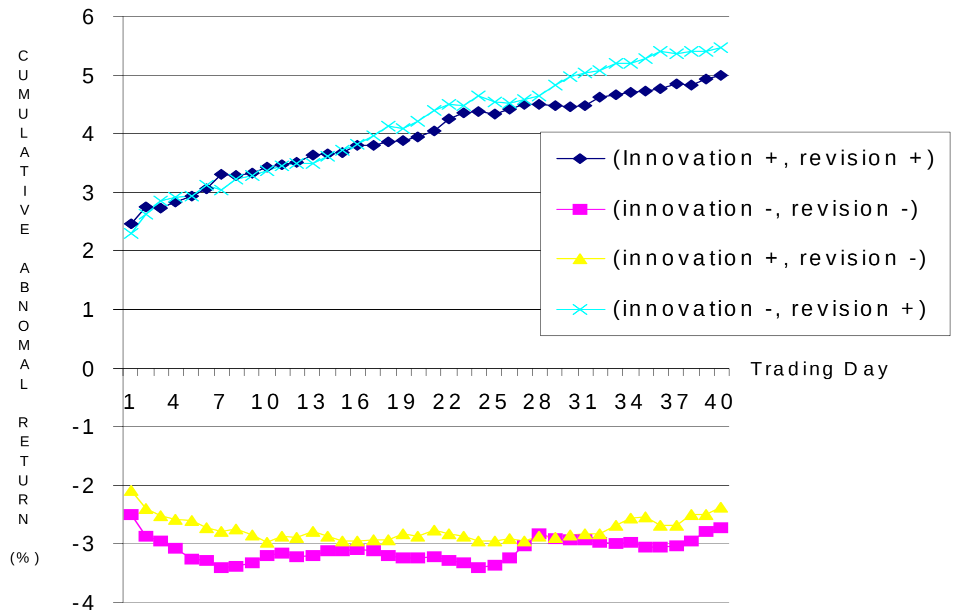

Figure 2: Daily Average Cumulative Abnormal Returns for each subgroups in Figure 1

from trading day 0 (the day of recommendation revisions) through trading day 40

Table 1

Sample Descriptive Statistics

This table presents descriptive statistics on a sample of 17,093 (4,553 firms) recommendation revisions issued after each year's annual earnings announcements within 30 trading days from 1993 to 2004. The variable $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on recommendation revision. The variable $REV_{t,i}$ is the analyst's recommendation revision for firm i's stock following earnings announcements. The variable $FERROR_{t,i}$ is the difference between announced earnings and its consensus analyst forecasts. $FERROR_{t,i}$ is deflated using the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$.

Panel A: Distribution of Revisions and Market Reactions

	Earnings Innovation	
Recommendation Revisions	Positive	Negative
Upward	Group 1 4,654	Group 2 3,406
Downward	Group 3 4,567	Group 4 4,448

Panel B: Percentiles of Key Variables for the Sample of Forecast Revision

	Mean	Max	75%	Median	25%	Min
$CAR_{t,i,j}$	-0.0048	0.3234	0.0355	-0.0007	-0.0379	-0.3828
$REV_{t,i}$	-0.0890	4	1	-1	-1	-4
$FERROR_{t,i}$	-0.0038	0.0422	0.0015	0.0001	-0.0026	-0.1699

Panel C: Pearson Correlations of Key Variables for the Sample of Forecast Revision

	$CAR_{t,i}$	$REV_{t,i}$	$FERROR_{t,i}$
$CAR_{t,i}$	1	0.3215(<.0001)	0.0309 (<.0001)
$REV_{t,i}$		1	0.0641 (<.0001)
$FERROR_{t,i}$			1

Table 2

Estimated Results of Belief Revision of Value Implication

This table reports the market's belief revision of earnings value implication caused by recommendation revisions driven by earnings announcement. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on recommendation revision. The variable $REV_{t,i}$ is the analyst recommendation revision for firm i's stock following earnings announcements within 30 trading days. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. $FERROR_{t,i}$ is deflated using the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group 1 (2) according to Figure 1 and zero otherwise. $PER1_{t,i,j}$ ($PER2_{t,i,j}$) takes the value of one if the observation falls into group 1 (2) according to Figure 1 and zero otherwise. $NPER1_{t,i,j}$ ($NPER2_{t,i,j}$) takes the value of one if the observation falls into group 3 (4) and zero otherwise. The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta_1 PER_{t,i,j} \times FERROR_{t,i} + \beta_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta_3 REV_{t,i,j} + \varepsilon_{t,i,j} \quad (4)$$

$$CAR_{t,i,j} = a + b_1 PER1_{t,i,j} \times FERROR_{t,i} + b_2 PER2_{t,i,j} \times FERROR_{t,i} + b_3 NPER1_{t,i,j} \times FERROR_{t,i} + b_4 NPER2_{t,i,j} \times FERROR_{t,i} + b_5 REV_{t,i,j} + \varepsilon_{t,i,j} \quad (5)$$

Panel A: Estimated Results of Equation (4)

Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.0038 (-5.56)***	-0.0028 (-4.25)***
$PER_{t,i} \times FERROR_{t,i}$	+	0.7605 (15.87)***	0.2174 (4.53)***
$NPER_{t,i} \times FERROR_{t,i}$	-	-0.8421 (-13.76)***	-0.2072 (-3.40)***
$REV_{t,i}$	+		0.0191 (38.85)***
Adj. R^2		0.026	0.105

Panel B: Estimated Results of Equation (5)			
Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.0042 (-5.51)***	-0.0034 (-4.48)***
$PER1_{t,i,j} \times Ferro_{t,i}$	+	2.6548 (12.07)***	0.5128 (2.10)**
$PER2_{t,i,j} \times Ferro_{t,i}$	+	0.6557 (13.10)***	0.1474 (4.42)***
$NPER1_{t,i,j} \times Ferro_{t,i}$	-	-2.2662 (-10.83)***	-0.2956 (-2.14)**
$NPER2_{t,i,j} \times Ferro_{t,i}$	-	-0.7026 (-10.78)***	-0.2622 (-3.71)***
$REV_{t,i}$	+		0.0199 (38.04)***
Adj. R^2		0.034	0.106

Table 3
Estimated Results of Stock Picking Ability and Forecasting Ability

This table reports the effect of analysts' ability to forecast earnings and pick stocks on the market's belief revision of value implication caused by analyst recommendation revision following earnings announcement. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on the recommendation revision. The variable $REV_{t,i}$ is the analyst recommendation revision for firm i's stock following earnings announcements within 30 trading days. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. $FERROR_{t,i}$ is deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group 1 (2) and zero otherwise according to Figure 1. The dummy variable $SUPER_{t,i}$ takes the value of one if the analyst's mean absolute forecast error of the past three years has a low rank or the analyst's recommendation revision earned high excess returns in the past year. The t-scores are in parentheses. **,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta'_1 PER_{t,i,j} \times FERROR_{t,i} + \beta'_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta'_3 SUPER_{t,j} \times PER_{t,i,j} \times FERROR_{t,i} + \beta'_4 SUPER_{t,j} \times NPER_{t,i,j} \times FERROR_{t,i} + \beta'_5 REV_{t,i,j} + \beta'_6 SUPER_{t,j} \times REV_{t,i,j} + \xi_{i,t,j} \quad (6)$$

Panel A: Stock Picking Ability

Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.0041 (-4.69)***	-0.0029 (-3.50)***
$PER_{t,i} \times FERROR_{t,i}$	+	0.3755 (7.09)***	0.1556 (3.02)***
$NPER_{t,i} \times FERROR_{t,i}$	-	-0.3976 (-5.54)***	-0.1190 (-1.69)*
$SUPER_{t,i} \times PER_{t,i} \times FERROR_{t,i}$	+	0.5400 (5.59)***	0.1135 (1.28)
$SUPER_{t,i} \times NPER_{t,i} \times FERROR_{t,i}$	-	-0.7893 (-6.43)***	-0.2279 (-1.96)**
$REV_{t,i}$	+		0.0154 (18.18)***
$SUPER_{t,i} \times REV_{t,i}$	+		0.0145 (11.81)**
Adj. R^2		0.030	0.132
Num. of Obs.	12,332		

Panel B: Earnings Forecasting Ability			
Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.0034	-0.00251
		(-4.94)***	(-3.77)***
$PER_{t,i} \times FERROR_{t,i}$	+	0.6183	0.2432
		(12.34)***	(4.82)***
$NPER_{t,i} \times FERROR_{t,i}$	-	-0.6060	-0.2156
		(-10.14)***	(-3.63)***
$SUPER_{t,i} \times PER_{t,i} \times FERROR_{t,i}$	+	0.7256	0.1358
		(10.14)***	(1.11)
$SUPER_{t,i} \times NPER_{t,i} \times FERROR_{t,i}$	-	-0.9420	-0.1512
		(-6.05)***	(-0.97)
$REV_{t,i}$	+		0.0177
			(25.21)***
$SUPER_{t,i} \times REV_{t,i}$	+		0.0019
			(1.93)**
Adj. R^2		0.031	0.107
Num of Obs.	16,232		

Table 4

Estimated Results of the Effect of Information Complexity

This table reports the effect of information uncertainty on the market's belief revision of earnings value implication caused by recommendation revisions driven by earnings announcements. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on the recommendation revision. The variable $REV_{t,i}$ is the analyst recommendation revision for firm i's stock following earnings announcements within 30 trading days. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. The variable $FERROR_{t,i}$ is deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group 1 (2) and zero otherwise according to Figure 1. The variable $AVOL_{t,i}$ is the abnormal trading volumes during the 3-day window centered on the announcement. The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta''_1 PER_{t,i,j} \times FERROR_{t,i} + \beta''_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta''_3 AVOL_{t,i} \times PER_{t,i,j} \times FERROR_{t,i} + \beta''_4 AVOL_{t,i} \times NPER_{t,i,j} \times FERROR_{t,i} + \beta''_5 REV_{t,i,j} + \beta''_6 \times AVOL_{t,i} \times REV_{t,i,j} + \varsigma_{t,i,j} \quad (7)$$

Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.00088 (-1.34)	-0.0002 (-0.38)
$PER_{t,i} \times FERROR_{t,i}$	+	0.3807 (5.38)***	0.0372 (0.52)
$NPER_{t,i} \times FERROR_{t,i}$	-	-0.8309 (-8.79)***	-0.4048 (-4.24)***
$AVOL_{t,i} \times PER_{t,i} \times FERROR_{t,i}$	?	0.4964 (3.73)***	0.2397 (1.78)*
$AVOL_{t,i} \times NPER_{t,i} \times FERROR_{t,i}$	?	-0.3692 (-2.28)***	-0.1320 (-0.81)
$REV_{t,i}$	+		0.0112 (16.50)***
$AVOL_{t,i} \times REV_{t,i}$	?		0.0020 (2.07)**
Adj. R^2		0.021	0.080
Num of Obs.	15,913		

Table 5

Estimated Results of the Impact of Reg FD

This table reports the effect of Reg FD on the market's belief revision of earnings value implication caused by analyst recommendation revision driven by earnings announcements. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on the recommendation revision. The variable $REV_{t,i}$ is recommendation revisions for firm i's stock following earnings announcements within 30 trading days. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. The variable $FERROR_{t,i}$ is deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group1 (2) according to Figure 1 and otherwise zero. The dummy variable $POST_{t,i}$ takes the value of one if the revision date is after the effective date of Reg FD (10/23/2000). The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta'''_1 PER_{t,i,j} \times FERROR_{t,i} + \beta'''_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta'''_3 POST_{t,i} \times PER_{t,i,j} \times FERROR_{t,i} + \beta'''_4 POST_{t,i} \times NPER_{t,i,j} \times FERROR_{t,i} + \beta'''_5 REV_{t,i,j} + \beta_6''' POST_{t,i} \times REV_{t,i,j} + \zeta_{t,i,j} \quad (8)$$

Panel A: Main Effect of Reg FD

Independent Variable	Predicted Sign	Without $REV_{t,i}$	With $REV_{t,i}$
Intercept		-0.0037 (-5.46)**	-0.0026 (-4.02)***
$PER_{t,i} \times FERROR_{t,i}$	+	0.8866 (10.60)***	0.2307 (2.73)***
$NPER_{t,i} \times FERROR_{t,i}$	-	-1.2289 (-11.12)***	-0.4273 (-3.87)***
$POST_{t,i} \times PER_{t,i} \times FERROR_{t,i}$	?	- 0.2213 (-2.23)**	-0.0338 (-0.34)
$POST_{t,i} \times NPER_{t,i} \times FERROR_{t,i}$	?	0.5271 (4.07)***	0.2551 (1.98)**
$REV_{t,i}$	+		0.0169 (24.98)***
$POST_{t,i} \times REV_{t,i}$	?		0.0046 (4.69)***
Adj. R^2		0.028	0.107
Num. of Obs.	17,052		

Panel B: Results of Different Time Periods		
Num. Observations	Pre Reg FD	Post Reg FD
(0, 5)	3,886	4,241
(6,30)	5,376	3,590

Independent Variable	Predicted Sign	(0, 5)		(6, 30)	
Intercept		-0.0088 (-7.19)***	-0.0070 (-6.11)**	-0.0007 (-0.81)	0.0001 (0.17)
$PER_{t,i} \times FERROR_{t,i}$	+	1.0904 (7.89)***	0.1338 (0.99)	0.5181 (5.96)***	0.1742 (1.97)*
$NPER_{t,i} \times FERROR_{t,i}$	-	-1.6818 (-8.46)***	-0.4769 (-2.48)***	-0.9147 (-8.32)***	-0.4966 (-4.47)***
$POST_{t,i} \times PER_{t,i} \times FERROR_{t,i}$	?	-0.5124 (-3.34)***	0.0643 (0.43)	-0.0681 (-0.63)	-0.0223 (-0.20)
$POST_{t,i} \times NPER_{t,i} \times FERROR_{t,i}$	?	1.0226 (4.35)***	0.5172 (2.28)**	0.3307 (2.51)***	0.21945 (1.65)*
$REV_{t,i}$	+	0.0304 (23.83)***		0.0107 (14.07)***	
$POST_{t,i} \times REV_{t,i}$	?	-0.0017 (-1.00)***		0.0043 (3.54)***	
Adj. R^2		0.028	0.150	0.023	0.070

Table 6

New Analysts v.s. Experienced Analysts

This table reports the belief revision of value implication caused by recommendation issued by new analysts versus experienced analysts after Reg FD. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on the recommendation revision. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. The variable $FERROR_{t,i}$ is deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group1 (2) according to Figure 1 and otherwise zero. The dummy variable $NEW_{t,i}$ takes the value of one if the analyst only starts to issue recommendation following earnings announcement after Reg FD and zero otherwise. The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta'''_1 PER_{t,i,j} \times FERROR_{t,i} + \beta'''_2 NPER_{t,i,j} \times FERROR_{t,i} + \beta'''_3 NEW_j \times PER_{t,i,j} \times FERROR_{t,i} + \beta'''_4 \times NEW_j \times NPER_{t,i,j} \times FERROR_{t,i} + \beta'''_5 \times REV_{t,i,j} + \beta_6''' \times NEW_j \times REV_{t,i,j} + \zeta_{t,i,j} \quad (9)$$

Independent Variable	Predicted Sign	Equation (9)
Intercept		-0.0076 (-7.32)***
$PER_{t,i,j} \times FERROR_{t,i}$	+	0.5633 (8.81)***
$NPER_{t,i,j} \times FERROR_{t,i}$	+	-0.8395 (-8.62)***
$NEW_j \times PER_{t,i,j} \times FERROR_{t,i}$	-	-0.1606 (-1.76)*
$NEW_j \times NPER_{t,i,j} \times FERROR_{t,i}$	-	0.2934 (2.14)**
Adj. R^2		0.028

Table 7

Estimated Results of the Impact of Reg FD on Good News v.s. Bad News

This table reports the effect of Reg FD on the market's belief revision of earnings value implication caused by analyst recommendation revision driven by earnings announcements. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on the recommendation revision. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. The variable $FERROR_{t,i}$ is deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $Upward_{t,i,j}$ takes the value of one if the analyst's recommendation is revised upward from her prior and otherwise zero. The dummy variable $Downward_{t,i,j}$ takes the value of one if the analyst's recommendation is revised downward from her prior and otherwise zero. The dummy variable $POST_{t,i}$ takes the value of one if the revision date is after the effective date of Reg FD (10/23/2000). The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta'''_1 Upward_{t,i,j} \times FERROR_{t,i} + \beta'''_2 Downward_{t,i,j} \times FERROR_{t,i} + \beta'''_3 POST_{t,i} \times Upward_{t,i,j} \times FERROR_{t,i} + \beta'''_4 POST_{t,i} \times Downward_{t,i,j} \times FERROR_{t,i} + \zeta_{t,i,j} \tag{10}$$

Independent Variable	Predicted Sign	Group 1	Predicted Sign	Group 2
Intercept		-0.0045 (-4.24)***		-0.0084 (-7.31)***
$Upward_{t,i,j} \times FERROR_{t,i}$	+	2.6786 (7.84)***	-	-1.2713 (-10.49)***
$Downward_{t,i,j} \times FERROR_{t,i}$	+	0.6197 (7.56)***	-	-2.0715 (-5.95)***
$POST_{t,i} \times Upward_{t,i} \times FERROR_{t,i}$	-	0.9720 (2.07)*	+	0.5640 (3.83)***
$POST_{t,i} \times Downward_{t,i} \times FERROR_{t,i}$	-	-0.1728 (-1.89)*	+	1.3507 (3.72)***
Adj. R^2		0.036		0.031
Num. of Obs.		9,096		7,997

Table 8

Subsequent Earnings Announcements

This table reports the industry analysis on market's belief revision of earnings value implication caused by recommendation revisions driven by earnings announcement. $CAR_{t,i}$ is the cumulative 3-day size-adjusted abnormal returns centered on the earnings announcements of period t. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts. $FERROR_{t,i}$ is deflated using the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The variable $\Delta EPS_{t-1,i}$ is the difference between period t-1 and period t-2 's reported earnings and deflated by the beginning price of the 3-day window used to calculate $CAR_{t,i}$. The dummy variable $S_{t,i}$ takes the value of one if forecast errors in period t-1 represented by $\Delta EPS_{t-1,i}$ and period t represented by $\Delta EPS_{t,i}$ have the same sign and zero if they have opposite sign. The dummy variable $CON_{t,i}$ is equal to one if period t's earnings innovation confirms analysts' recommendation revision that previous earnings is underweighed or overweighed. The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$\begin{aligned} CAR_{t,i} = a_0 &+ b_1 S_{t,i} \times \Delta EPS_{t-1,i} + b_2 (1 - S_{t,i}) \times \Delta EPS_{t-1,i} + b_3 CON_{t,i} \times S_{t,i} \times \Delta EPS_{t-1,i} \\ &+ b_4 CON_{t,i} \times (1 - S_{t,i}) \times \Delta EPS_{t-1,i} + b_5 FERROR_{t,i} + \upsilon_{t,i} \end{aligned} \quad (11)$$

Independent Variable	Predicted Sign	Model 1	Model 2
Intercept		0.0037 (5.15)***	0.0037 (5.12)***
$S_{t,i} \times \Delta EPS_{t-1,i}$	+	0.0365 (1.45)*	0.0788 (2.14)**
$NS_{t,i} \times \Delta EPS_{t-1,i}$	-	-0.0461 (-1.92)**	-0.0604 (-1.74)**
$CON_{t,i} \times S_{t,i} \times \Delta EPS_{t-1,i}$	-		-0.0777 (-1.57)*
$CON_{t,i} \times NS_{t,i} \times \Delta EPS_{t-1,i}$	+		0.0278 (0.58)
$FERROR_{t,i}$	+	0.5766 (7.57)***	0.5856 (7.66)***
Adj. R^2		0.008	0.009
Num. of Obs.	8,350		

Table 9

Industry Analysis

This table reports the industry analysis on market's belief revision of earnings value implication caused by recommendation revisions driven by earnings announcement. $CAR_{t,i,j}$ is the cumulative 3-day size-adjusted abnormal returns centered on recommendation revision. The variable $FERROR_{t,i}$ is the difference between reported earnings and its consensus analyst forecasts within the revision period. $FERROR_{t,i}$ is deflated using the beginning price of the 3-day window used to calculate $CAR_{t,i,j}$. The dummy variable $PER_{t,i}$ ($NPER_{t,i}$) takes the value of one if the observation falls into group 1 (2) according to Figure 1 and zero otherwise. The t-scores are in parentheses. ***,**,* represents statistical significance at 0.01,0.05 and 0.1 levels respectively.

$$CAR_{t,i,j} = \alpha + \beta_1 PER_{t,i,j} \times FERROR_{t,i} + \beta_2 NPER_{t,i,j} \times FERROR_{t,i} + \varepsilon_{t,i,j} \quad (12)$$

	Num. of Obs.	Intercept	$PER_{t,i,j} \times FERROR_{t,i}$	$NPER_{t,i,j} \times FERROR_{t,i}$	Adj. R^2
Retail Trade	1,155	0.0068 (3.26)***	1.2050 (4.73)***	-1.5256 (-2.87)***	0.024
Manufacturing	6,057	-0.0018 (-1.76)**	0.9860 (9.11)***	-1.4358 (-10.28)***	0.030
Wholesale trade	475	0.0036 (0.93)	0.6400 (1.87)**	-1.3922 (-2.13)**	0.013
Mining	1,010	0.0050 (3.03)***	0.9762 (4.34)***	-0.4859 (-2.23)***	0.021
Service	3,966	-0.0015 (-1.43)*	0.7455 (5.84)***	-0.8052 (-4.85)***	0.014
Transportation & pub. utility	1,201	-0.0049 (-2.42)***	0.2778 (2.98)***	-0.3722 (-2.73)***	0.011
Construction	141	0.0079 (1.04)	0.2540 (1.72)**	-0.2488 (-0.48)	0.009

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