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The Impact of Regulation Fair Disclosure on Information Asymmetry and Trading: An Intraday Analysis

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Abstract

This study examines the impact of Regulation Fair Disclosure (FD) on liquidity, information asymmetry, and institutional and retail investors trading behavior. Our main findings suggest the following. First, we find that Regulation FD has been effective in improving liquidity and in decreasing the level of information asymmetry. Second, retail trading activity increases dramatically post earnings announcements whereas there is a significant decline in institutional trading surrounding earnings announcements, particularly in the preannouncement period. Lastly, our study further suggests that the decline in information asymmetry around earnings announcements is closely associated with a lower participation rate in the preannouncement period and more active trading of retail investors after earnings releases.

Keywords: Regulation Fair Disclosure, volatility, liquidity, adverse selection costs

JEL Classifications: G30/G34

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1. Introduction

On August 15, 2000, the Securities and Exchange Commission (SEC) approved the implementation of Regulation Fair Disclosure (Regulation FD). Regulation FD prohibits corporate issuers from releasing material nonpublic information to specific entities unless the issuer also simultaneously releases such information broadly to the public.¹ The purpose of Regulation FD is to promote full and fair disclosure of information by issuers and to enhance the fairness of the market.

Regulation FD became effective on October 23, 2000; nevertheless, the impact of the Regulation FD to the investment community is still the subject of an ongoing debate. Proponents argue that Regulation FD fosters wider and faster dissemination of market-moving information to retail investors than ever before (American Association for Individual Investors, 2001). Hence, it levels the playing field for all investors. In fact, prior to the passage of the Regulation FD, the SEC received nearly 6,000 letters, the majority of them from retail investors supporting the adoption of Regulation FD. The letters urged that, in the absence of Regulation FD, retail investors were placed at a severe disadvantage in the market because of the practice of selective disclosure.²

Since the implementation of Regulation FD, there has been little disagreement that a wider group of investors now has greater access to market-moving information, as companies increasingly open up analyst conference calls to the public and the media and broadcast the

¹ The types of information covered by Regulation FD include (a) earnings information; (b) mergers, acquisitions, tender offers, joint ventures, or changes in assets; (c) new products or discoveries, or developments; (d) changes in control or in management; (e) change in auditors or auditor notification; (f) events regarding the issuer's securities; and (g) bankruptcies or receiverships.

² The practice of selective disclosure has been discussed extensively prior to the adoption of Regulation FD. For example, a recent report by the SEC (2000) stated: "Many corporate issuers are disclosing important nonpublic information, such as advance warnings of earnings results, to securities analysts or selected institutional investors or both, before making full disclosure of the same information to the general public ... those who were privy to the information beforehand were able to make a profit or avoid a loss at the expense of those kept in the dark."

events on the web (Plitch, 2001). In fact, a recent survey conducted by National Investor Relations Institute reveals approximately 90% of sample companies allow full public access to their conferences calls in comparison to only 60% prior to Regulation FD. Hence, Regulation FD increases the level of openness in corporate communication to the investment community, especially to those investors who would otherwise be excluded.

Critics of Regulation FD, however, argue that fair disclosure can undermine the role of the financial analysts and press companies to be more cautious about the release of information. This can potentially result in a “chilling effect” in that the issuers are likely to limit the amount of information given out to the investment community, which is likely to induce higher market volatility when the information is eventually made public. For instance, the Security Industry Association (2001) expressed concern that Regulation FD restricts the flow of useful information to investors and severely limits transparency. A recent survey conducted by the Association of Investment Management Research (2001) reported that many believe that the quality and quantity of information released by companies have declined since the implementation of Regulation FD and that Regulation FD has contributed to market volatility.

Despite extensive disagreement on how Regulation FD has affected the financial community, several questions remain unanswered. Does the enforcement of fair disclosure reduce liquidity and increase the level of information asymmetry? Does Regulation FD affect the trading behavior of retail and institutional investors? Are the changes in information asymmetry related to changes in trading activities of investors?

Our study aims to provide empirical evidence on these questions. Our study is closely related to the works of Heflin, Subramanyam, and Zhang (2001, 2003), Eleswarapu, Thompson, and Venkataraman (2004), and Topaloglu (2001), which also examined the impact of Regulation

FD on the financial environment.³ Heflin, Subramanyam, and Zhang studied whether Regulation FD is associated with changes in the information environment prior to earnings announcements by comparing market activity in the pre- and post-Regulation FD periods. They find no significant increase in return volatility and no reliable evidence of changes in various aspects of analysts forecast bias, accuracy, and dispersion. Eleswarapu, Thompson, and Venkataraman examined the impact of Regulation FD on trading cost and information asymmetry. They found that adverse selection risk during information events has reduced significantly after Regulation FD. Topaloglu used a unique data set of Nasdaq and examined specifically the institutional trading activity around Regulation FD and reported that there is less informed trading.

The purpose of this study is to examine further the impact of Regulation FD on market liquidity, information asymmetry, and trading behavior of retail and institutional investors. First, we examine how Regulation FD affects trading activity and information asymmetry surrounding earnings announcements by forming matched samples including firms that have earnings announcements in both pre- and post-FD periods. Heflin, Subramanyam, and Zhang (2001, 2003) also used a similar matching method, however, their analysis is based on daily data, as opposed to the transaction data used in our study.⁴ Second, we examine the impact of Regulation FD by comparing the periods around information releases to a benchmark period to control for the effect of possible changes in the overall market environment.⁵ Third, we provide additional

³ Other studies of Regulation FD include Agrawal and Chadha (2001), Bellezza, Huang, and Spiess (2002), Sunder (2002), and Bailey, Li, Mao, and Zhong (2003).

⁴ Earnings announcements are associated with large and rapid price adjustments. Institutional as well as retail investors alter their trading strategies in real time on the releases of earnings information (e.g., Lee, 1992; Lee Mucklow, and Ready, 1993; Greene and Watts, 1996; Bushee, Matsumoto, and Miller, 2001; Bhattacharya, 2001). We use intraday data and precise announcement time (to the nearest minute for announcements made during trading hours) to compare liquidity in the post-FD to those associated with pre-FD period to closely examine investors' reactions to earnings information, which can be difficult to accomplish using daily measurements.

⁵ The use of a benchmark period is extremely important, considering decimal trading was also implemented during our sample period. See Chakravarty, Harris, and Wood (2001) for a discussion of decimalization and its market impact.

empirical evidence on how Regulation FD has affected the trading behavior of retail and institutional investors. Our study on a sample of NYSE firms complements Topaloglu (2001), which examined the same issue for Nasdaq firms only. Most important, we examine whether changes in information asymmetry are related to changes in trading intensity of retail and institutional investors.

Our results can be summarized as follow. First, we find that market liquidity has improved during the preannouncement period post-FD in that lower spread and higher depth are observed, possibly due to the fact that information advantage is much more difficult to gain, resulting in lower information asymmetry. Second, complementing well with our findings on spread and depth, the adverse selection cost component derived from several spread decomposition models also shows that the enforcement of fair disclosure has been effective in decreasing the level of information asymmetry before earnings announcements and also, to some extent, in the days immediately after the announcements. Third, we find a significant decline in institutional investors' trading activities prior to earnings announcements. At the same time, there is also some evidence that retail trading activities increase after earnings announcements in the post-FD era. Finally, our results show that the decline in information asymmetry in the preannouncement period is closely associated with lower institutional trading. A higher participation of retail investors after announcements post-FD contributes to the lower information risk in the event period.

The remainder of this study is organized in five sections. Section 2 describes the development of hypotheses. Section 3 describes the data and our sample screening procedures. Section 4 describes methodologies used in the study. Section 5 reports the empirical results and discussion of findings, and Section 6 contains concluding remarks.

2. Development of hypotheses

The effectiveness of Regulation FD has been a question of substantial interest to the SEC, financial institutions, retail investors, and the media. We develop four hypotheses to test empirically the impact of Regulation FD on liquidity, asymmetric information, the behavior of retail and institutional trading, and the relation between trading and adverse selection cost.

The first hypothesis tests the impact of Regulation FD on market liquidity. Prior studies have shown negative correlations between the level of private information (e.g., information asymmetry) and market liquidity. Copeland and Galai (1983) and Glosten and Milgrom (1985) developed information models that suggest spreads are likely to be wider when there are more informed traders in the market. The theoretical work of Diamond and Verrecchia (1991) suggested that a greater level of corporate disclosures reduces asymmetry of information and increases the market liquidity. Welker (1995), Healy, Hutton, and Palepu (1999), and Leuz and Verrecchia (2000) provided empirical evidence in support of the hypothesis that a greater level of public disclosure of information reduces bid–ask spreads. Lee, Mucklow, and Ready (1993) studied both spread and depth surrounding earnings announcements and found that liquidity providers actively use both spread and depth to manage information asymmetry risks. An increase in bid–ask spread and a decrease in quoted depth are consistent with the perception of a higher degree of information asymmetry.

If Regulation FD prohibits firms from communicating material information about earnings to analysts before public releases, we expect the information set to be more homogeneous before earnings announcement; that is, we expect less adverse selection and fewer informed traders. When firms decide to provide guidance on their earnings, the information must

be simultaneously available to all investors, institutional and retail alike. The lack of private information or the increased level of public disclosure are expected to affect how institutions and retail investors trade in anticipation of earnings releases. In particular, one would expect institutions to trade less prior to announcements. Consistent with this altered pattern of information flow, dealers and specialists, expecting less informed trading prior to announcements, may find it less crucial to manage information asymmetry risk arising from trading against informed traders. As a result, spread (depth) in post-FD era can become lower (higher) compared with that of the pre-FD preceding earnings announcements (defined as preannouncement period in this study).

Hypothesis 1: Bid ask spreads are lower and depths are greater before earnings announcements in the post FD period than in the pre-FD period.

We also test directly the impact of Regulation FD on information asymmetry. Krinsky and Lee (1996) examined the adverse selection component of bid–ask spreads around earnings announcements. They found that even though there is no significant change in the overall level of the bid–ask spread, adverse selection cost increases significantly before and following announcements. If Regulation FD reduces the private information available to specific groups of investors who previously executed trades based on private information, we would expect the overall level of adverse selection cost to decrease prior to the release of earnings information.

The impact of Regulation FD on adverse selection cost following earnings releases is less certain. On one hand, the improvement in corporate disclosure practice—providing market participants greater access to earnings information that were usually only accessible by specific groups of investors before Regulation FD—could result in a lower level of information asymmetry. On the other hand, the opponents of the Regulation FD believe that the new rule

would likely increase volatility and asymmetric information in the market by depriving analysts of critical information and perhaps making firms reluctant to reveal information at all, even to the public, for fear of running afoul of Regulation FD. Therefore, we resort to empirical data to better understand the impact of Regulation FD on the information environment post earnings announcements.

Hypothesis 2a: The adverse selection component of the spread is expected to be lower before earnings announcements in the post-FD period than in the pre-FD period.

Hypothesis 2b: The adverse selection component of the spread is expected to be the same after earnings announcements in the post-FD period than in the pre-FD period.

The rationale of Regulation FD is that information flows from firms to institutions before being disseminated to the public is unfair to retail investors. If institutions had an information advantage, they would be expected to capitalize on it immediately prior to earnings announcements. There are many reasons why institutions carry out informed trading right before earnings releases. On one hand, when institutional traders do have private information long before scheduled announcements, adverse movements in the overall market could offset the gains associated with informed trades, thus they tend to wait until the last moment before anticipated large price movements to make their trades. On the other hand, often informed investors do not have information long before announcements, rather they acquire information just prior to announcements (Lee, Mucklow, and Ready, 1993). Expectation of imminent earning news can stimulate the search for information immediately prior to earnings releases (Kim and Verrecchia, 1991; Daley, Hughes, and Rayburn, 1995). Institutions have higher ability (and

resources) to search for information (compared with retail investors), thus there are typically significant increases in large trades prior to earnings announcements.⁶

In sum, prior to the implementation of Regulation FD, institutions would routinely adjust their positions based on their advanced information of upcoming earnings releases. In the post-FD period, institutions are expected to be less active prior to earnings announcements because they no longer have access to private information.

Researchers on the impact of information disclosure on the trading behavior of institutional investors (large traders) and retail investors (small traders) have generally agreed that retail investors, typically making smaller trades, are at an informational disadvantage. Lee (1992) used small and large trades as proxies of retail and institutional trading and found that the reaction of small trades to earnings announcements news is weaker and slower than that of the large trades. Frankel, Johnson, and Skinner (1999) investigated the effect of conference calls on trading activity.⁷ They found larger trade size, higher trading volume, and return variance during conference calls, suggesting that institutional investors trade based on information in real time whereas small investors are disadvantaged because of the lack of access to material information. Interestingly, Bushee, Matsumoto, and Miller (2001), by separating open and closed conference calls, found that open conference calls (i.e., open to all investors) are associated with an increase in the percentage of small trades, a phenomenon not observed for the sample of closed conference calls that are usually limited to analysts and large institutional investors. Hence, we

⁶ There can also be information leakage prior to earnings announcements and trading can follow the acquisition of the information accordingly.

⁷ Frankel, Johnson, and Skinner (1999) examined conference calls during the period from February 1995 to November 1995. As noted by the authors, the majority of participants of conference call are analysts and institutional investors. Moreover, conference calls provide certain information that are not available in associated press releases.

expect retail investors to trade more actively in the post-FD period given that they can access market-moving information at the same time as institutions.

Regulation FD limits the private information available to institutions, thus we expect them to trade less in the post-FD period than in the pre-FD period. In addition, because Regulation FD provides retail investors better access to market moving information, we expect to see a significant increase in trading activity of retail investors in the post-FD period than in the pre-FD period after the public announcements of information.

Hypothesis 3a: Compared to the pre-FD period, the post-FD period has a lower participation rate from institutions prior to earnings announcements.

Hypothesis 3b: Compared to the pre-FD period, trading activities from retail investors are heightened after earnings announcements.

If Regulation FD is effective in keeping a tight rein on private information available to institutions before earnings releases, institutions are likely to trade less in the preannouncement period post-FD. Therefore, information based trading is expected to decline as well. Theoretical research (e.g., Easley and O'Hara, 1987) has posited that large trades, presumably originated by institutions, are expected to be associated with greater adverse selection than small trades. Similarly, Grossman and Stiglitz (1980) argued that investors are likely to obtain a higher return if they are willing to spend time and resources to analyze and uncover new information. In a capital market in which information is heterogeneous and information collecting and processing are costly, it is generally believed that small traders with limited resources are likely to be noise (or uninformed) traders whereas investors trading large quantity of shares or institutional traders are more likely to possess private information.

The adverse selection component of the bid–ask spread is expected to be highly influenced by the types of traders with whom dealers/specialists conduct transactions: A smaller (larger) proportion of informed trades prompts the spread to narrow (widen) because of lower (higher) information asymmetry risk.

Hypothesis 4a: The change in adverse selection cost in the pre-announcement period post-FD is related to the change in institutional trading during the same period.

Hypothesis 4b: The change in adverse selection cost after earnings releases post-FD is related to the change in retail trading during the same period.

3. Data and sample screening procedures

The sample consists of all quarterly earnings announcements during an 18-month period. The study sample is divided into two periods. The first period is from November 1, 1999 to August 15, 2000 (defined as the pre-FD period) and the second period is from October 23, 2000 to July 31, 2001 (defined as the post-FD period).⁸

We use the following criteria for screening our sample. First, to be included, a stock must have at least one earnings announcement in Dow Jones News Service (DJNS) in each of the two periods (pre- and post-FD).⁹ The time of each announcement (to the nearest minute) is obtained from the Dow Jones News Service.¹⁰

Second, we exclude earnings announcements associated with subsequent trading halts, preferred stocks, convertible preferred stocks, closed-end funds, American Depository Receipts,

⁸ We exclude the period between approval and implementation date because firms could have used that period to adjust their disclosure policies to comply with Regulation FD.

⁹ There are 1,992 firms with earnings announcements in both pre- and post-FD periods.

¹⁰ Searching DJNS is a standard procedure to identify earnings announcements and, in particular, the time of an announcement. For instance, see Lee, Mucklow, and Ready (1993) and Greene and Watts (1996) for discussions on the use of DJNS.

Real Estate Investment Trusts, and foreign government and corporate issuers of common stocks.¹¹ After eliminating firms in the above categories, the number of firms in our sample drops to 1,598 from the original 1,992. Finally, we delete those firms that do not have information available in the NYSE's Trade and Quote (TAQ) database or CRSP databases. The final sample consists of 1,125 firms with an average of about three earnings announcements in each one of the two periods, totaling about 6,992 earnings releases.

The intraday data are obtained from TAQ. It includes prices of all trades and quotes time-stamped to the nearest second during a trading day. To eliminate possible data entry errors, we employ the following criteria. We use only best bid or offer eligible quotes. We exclude all trades and quotes before 9:30 a.m. and after 4:00 p.m. and the opening transaction prices. All quotes with missing values, with negative and zero spreads, and with quoted spreads greater than \$4 are also eliminated. We also exclude quotes associated with trading halts and designated order imbalances.

In addition, we follow Hasbrouck (1988) by adjusting time-stamped trades by 5 seconds to account for possible timing errors as quotes can be recorded earlier than trades even when trades precede the quotes.

4. Methodology

4.1. Periods of interest: Benchmark period, preannouncement period and event period

Our analysis of the impact of Regulation FD is based on comparisons, liquidity, information asymmetry, and trading activities of retail and institutional investors between pre- and post-FD periods. Although our sample is carefully matched by only including firms with at

¹¹ The original proposed Regulation FD applies to all foreign issuers. The final version of the Regulation FD, however, exempts foreign government and foreign private issuers.

least one announcement during the trading hours in each of the two periods, our results could be unduly influenced by events other than Regulation FD, for instance, shifts in market liquidity and investors trading behaviors related to changes in market mechanism. Specifically, considering decimal trading was also implemented during our sample period and researchers (Chakravarty, Harris, and Wood, 2001) have documented changes in trading costs and liquidity in the new decimal world, we need to properly control for the impact of changing market conditions in our study.¹² We follow a methodology proposed by Krinsky and Lee (1996).

For each of the sample firms, we consider three periods: the benchmark period, preannouncement period and event period. The benchmark period comprises 26 half-hour intervals 14 days prior to the announcement. The preannouncement period ($-26, \dots, -1$) and event period ($0, \dots, +25$) comprise 26 half-hour intervals before and after each earnings announcement, respectively.¹³

For each announcement, we compare preannouncement and event periods to the benchmark period. Further, to assess the impact of the Regulation FD, comparisons between pre- and post-FD are then studied by reporting the average and percentage differences.

The use of a benchmark period to account for other changes in the market can be problematic if the announcement is too close to Oct. 23, 2000 (the day Regulation FD was implemented) because we could have a benchmark period in the pre-FD era for a post-FD earnings announcement. In addition, if the announcement date is right after January 29, 2001 (the day all NYSE stocks were decimalized), the benchmark period may fall into a predecimal period. We check for the number of announcements affected; out of our sample of 6,992 earnings

¹² Eleswarapu, Thompson, and Venkataraman (2004) addressed the impact of decimalization through using two separate samples for the post-FD period.

¹³ Lee (1992) showed that more than 90% of abnormal trading occurs within three full days after earnings announcements. Bhattacharya (2001) reported no abnormal trading during day three and four after an earnings announcement.

announcements, 138 announcements are associated with a benchmark period before decimalization whereas the announcements were after the decimalization, and 68 announcements with a benchmark period before Regulation FD and an event period after Regulation FD. Our empirical results reported in the later sections are very similar regardless of whether these 206 announcements are included in our sample.¹⁴

4.2. Liquidity

To examine the impact of Regulation FD on market liquidity we examine both spread and depth as follows:

1. Quoted spread = $A_{i,t} - B_{i,t}$,

2. Relative quoted spread = $\frac{(A_{i,t} - B_{i,t})}{\left(\frac{A_{i,t} + B_{i,t}}{2}\right)}$,

3. Effective spread = $2 \times |P_{i,t} - (A_{i,t} + B_{i,t})/2|$,

4. Relative effective spread = $2 \times |P_{i,t} - (A_{i,t} + B_{i,t})/2| / (A_{i,t} + B_{i,t})/2$,

5. Depth (# of shares) = share depth at ask price + share depth at bid price, and

6. \$ Depth = \$ depth at ask price + \$ depth at bid price

where $B_{i,t}$, $A_{i,t}$ and $P_{i,t}$ represent the best bid and offer, and transaction price, respectively, for firm i at time t . The quoted spread and relative quoted spread are time weighted and effective spread and relative effective spread are weighted by trading volume associated with each trade proportional to total trading volume. The time-weighted quoted spreads are calculated by multiplying each observed quoted spread by the amount of time elapsed before it is updated and

¹⁴ NYSE went through three phases of decimalization, and our sample excludes firms that participated in the first two phases of the decimalization.

sum across the 26 half-hour intervals for each ticker. Then the sum is further divided by the total trading time in each sample period. The volume weights for effective spreads are accomplished by multiplying each observed effective spread by the number of shares transacted and then dividing the sum of the products by the total trading volume in the sample period.

4.3. Decomposition of spread

Adverse selection costs have been the most frequently studied component of the bid–ask spread. To examine whether Regulation FD reduces information asymmetry, we need to be able to measure the adverse selection cost empirically. Several decomposition models have been developed over the years, notably, the estimation procedures of Glosten and Harris (1988), George, Kaul, and Nimalendran (1991), Lin, Sanger, and Booth (1995), Madhavan, Richardson, and Roomans (1997), and Huang and Stoll (1997), among others. Recently, Van Ness, Van Ness, and Warr (2001) examined the performance of five commonly used spread decomposition models. Their premise was that a model is only useful if the decomposed adverse selection cost is highly correlated with commonly accepted measures of asymmetric information including analysts’ earnings forecasts, growth measures of firms, research and development expenditures, intangibles assets, volatility, and leverage. Their empirical results suggest that the models of Glosten and Harris (1988) and Lin, Sanger and Booth (1995) yield relatively more accurate estimates of adverse selection cost. We choose to adopt these two models and, in addition, the model of George, Kaul, and Nimalendran (1991).

4.4. Retail and institutional trades

To examine the impact of Regulation FD on trading behavior around earnings announcements, we need to classify trades into retail and institutional trades. Because the TAQ database does not provide information on trade initiation, we rely on conventional methodologies to help classify trades.¹⁵

Two alternative proxies have been used to classify trades made by retail traders (small trades) versus institutional traders (large trades). Cready (1988), Cready and Mynatt (1991), and Seida and Wempe (2000) used share-based trade size to classify trades as retail or institutional initiated. They assume trades of less than or equal to 900 shares are retail trades and those greater than 900 shares are institutional trades.¹⁶

Lee (1992) proposed a firm-specific dollar-based trade size proxy to separate institutional and retail trades. The procedure involves two steps. First, obtain a firm's closing stock price at a given point.¹⁷ Second, compare the closing price to \$10,000 to determine the number of round-lot shares in \$10,000. Trades less than or equal to (greater than) the firm specific round-lot cutoff are classified as retail (institutional) trades.

Lee and Radhakrishna (2000) examined the validity of both methodologies using the Trades, Orders, Reports, and Quotes data set. They found that the dollar-based proxy is superior to the trade-size proxy in separating initiation of trades. Moreover, they recommend the use of "buffer zone" of medium-sized trades to obtain a cleaner separation of the trade initiations. For instance, trades of \$5,000 or less are classified as retail trades and trade of \$50,000 or more as institutional trades. To ensure that our results are robust across alternative classification rules, we repeat the analysis using the buffer zone cutoff.

¹⁵ Topaloglu (2001) accessed a unique proprietary database in which he identified the institutional trades directly; however, his study involved Nasdaq firms only, as opposed to the NYSE firms used in this study.

¹⁶ The limitation of the trade-size-based cutoff is that it does not reflect the differences in stock prices.

¹⁷ We use the closing price of October 31, 2000 in our study.

5. Empirical results

5.1. Summary statistics

Table 1 presents the summary statistics of trading activity surrounding earnings announcements for the sample firms. The benchmark period consists of 26 half-hour intervals (two trading days) starting from 16 days prior to announcements. The preannouncement period consists of two days (26 half-hour intervals) prior to announcements. Event period consists of two days (26 half-hour intervals) after announcements. We report empirical results for both the pre-FD period (November 1, 1999 to August 15, 2000) and the post-FD period (October 23, 2000 to July 31, 2001). To control for the possible changes in market environment, the results from preannouncement and event periods are compared to the benchmark period in both the pre- and the post-FD eras.

The summary statistics of trading activity for the pre-FD period indicate that trade frequency is higher during the preannouncement period in comparison with the benchmark period. In addition, we see that total share volume and dollar volume also increase significantly. The results for the event period also show that trade frequency, share volume, and dollar volume increase by 122.40 trades, 668,400 shares, and \$28,824,260, respectively, for pre-FD. The increased trading activities in the event period are likely due to more active participations from both institution and retail investors. Institutions continue to trade actively because they typically have better ability in processing earnings information (Kim and Verrecchia, 1994). Retail investors also trade more actively after announcements, given their access to the information on earnings releases.

For the post-FD period, because institutions no longer enjoy an information advantage, we expect less trading in the preannouncement period. Nevertheless, we continue to expect active trading during the event period because both institutional and retail investors participate in trading. Consistent with information advantage arguments, all three measures of trading activities decrease (increase) in the preannouncement (event) period.

5.2. Liquidity (Hypothesis 1)

In this section, we examine the impact of Regulation FD on market liquidity as measured by both spread and depth. The quoted spread is time-weighted and effective spread is weighted by trading volume associated with each trade. Results on spreads and depths are reported in Table 2. Consistent with prior research, quoted and relative quoted spreads in pre-FD increase during both the preannouncement and event periods, and the increases are statistically significant. Effective spread and relative effective spread also increase for both periods. Depth (number of shares) and dollar depth decrease dramatically prior to earnings announcements. Surprisingly, depth measures show an improvement in liquidity after earnings releases, suggesting that market makers rely on both spread and depth to mitigate the information asymmetry risk prior to announcements, however, only spread after announcements.

The results for the post-FD period are in general consistent with the notion that liquidity prior to earnings announcements stays at about the same level or improves slightly compared with that in the benchmark period. On the contrary, liquidity measured by effective spread and dollar depth suggests that market makers continue to manage risk of information asymmetry through wider spread and smaller depth.

Our emphasis is on the comparison of liquidity before and after Regulation FD around earnings announcements. When comparing the changes in the pre- and post-FD, the results suggest that both quoted and effective spreads decrease, and, at the same time, depth increases before earnings releases post-FD due to less concern of informed trading under the newly regulated environment, consistent with the fact that the need for dealers to use spread and depth to protect their interests against informed traders is less compelling post-FD. This finding is clearly consistent with our first hypothesis, which states that bid–ask spreads are lower and depths are greater before earnings announcements post-FD than in the pre-FD period.

Liquidity measurements adjusted for the benchmark period are also reported for the event period post-FD. We observe that spreads are narrower with the exception of effective spread; nevertheless, depths are also narrower, an indication that dealers continue to use depth and depth alone to protect themselves against trading with investors who are considered to have superior ability in analyzing information. In sum, based on our observations of spread and depth, Regulation FD has resulted in a higher level of liquidity during the preannouncement period.

5.3. Adverse selection cost estimation (Hypotheses 2a and 2b)

Lee, Mucklow, and Ready (1993) and Krinsky and Lee (1996), among others, documented an increase in information asymmetry surrounding earnings announcements. They argued that liquidity providers adjust the spread and depth to compensate for possible loss from trading with informed traders. Specifically, the adverse selection component of the spread increases during the preannouncement period as a result of the greater probability of market makers facing informed traders with advance knowledge of earnings information. The active

trading immediately following the announcements is related to the superior ability of institutions in analyzing fundamental information.

If Regulation FD is effective, it should help to reduce information asymmetry. Thus, the first part of Hypothesis 2 states that the adverse selection cost component of spread decreases prior to earnings announcements post-FD, and the second part tests whether information asymmetry has changed post-FD in the event period.

Table 3 presents the results of adverse selection cost estimation using Lin, Sanger, and Booth (1995), George, Kaul, and Nimalendran (1991), and Glosten and Harris (1988) spread decomposition models. In the pre-FD period, the adverse selection cost component of bid–ask spread increases for both the preannouncement and event periods relative to the benchmark period with the exception of estimates from the Lin, Sanger, and Booth model. Overall, the results are consistent with prior findings suggesting that the adverse selection cost component of the spread increases around earnings announcements as a result of higher probability of informed trading prior to the release of nonpublic information and of superior ability of information processing immediately following earnings announcements.

We now consider the post-FD period. The results from all three models provide consistent results in that adverse selection cost in the preannouncement period is significantly lower relative to benchmark period. The changes in adverse selection are -3.806% , -4.056% and -5.460% for Lin, Sanger, and Booth (1995), George, Kaul, and Nimalendran (1991), and Glosten and Harris (1988) models, respectively. During the event period, the adverse selection costs are also mostly lower than that of the benchmark period. Overall, our comparison of adverse selection cost between post- and pre-FD supports the notion that the cost of information asymmetry has become lower since Regulation FD was implemented. Our results based on

spread decomposition models are also consistent with the finding reported in Eleswarapu, Thompson, and Venkataraman (2004), in which spread and price impact are used to measure information asymmetry.

5.4. Institutional and retail investors (Hypotheses 3a and 3b)

Regulation FD aims to provide retail investors better access to market-moving information. If the regulation is effective, we expect market participants, institutions and retail alike, to adjust their trading strategies to adapt to the new informational environment. This section examines the level of institutional and retail investors' trading activities surrounding earnings announcements. Without direct access to data detailing the owners of trading accounts, we need to empirically categorize trades to institution-initiated versus retail-initiated trades.

Table 4 reports results using 900 shares as the cutoff point to separate trades. Trades of less than or equal to 900 shares are considered as retail trades, and trades of greater than 900 shares are considered to be institutional trades. Institutional trading activity increases dramatically in both preannouncement and event periods before Regulation FD was implemented. During preannouncement period (event period), trade frequency, share volume, and dollar volume increase by 17.62 (80.30) trades, 110,440 (650,720) shares, and \$5,768,340 (\$27,983,060), respectively, over the benchmark period. The evidence suggests that institutional investors conduct their trades before the announcement likely due to private information and they trade following the earnings announcements due to their superior ability in analyzing earnings information (Krinsky and Lee, 1996; Kim and Verrecchia, 1994).

The lower half of Table 4 reports trading activity for retail investors. Although we observe some similarity to those of institutional investors, the magnitudes of trading activity

variables are much smaller. During the preannouncement period (event period), retail investors' trade frequency, share volume, and dollar volume increase approximately 13.12 (42.04) trades, 5,170 (18,220) shares, and \$366,680 (\$862,990), respectively.

Overall, our pre-FD results are consistent with Bamber (1986), Lee (1992), Lee, Mucklow, and Ready (1993) and Krinsky and Lee (1996) in that trading activities increase substantially before and following the releases of earnings information and that informed traders could have used the superior information to conduct their trades prior to the time of the information release. We also find evidence of greater participation by institutional investors than by retail investors in both the preannouncement period and the event period, similar to Frankel, Johnson, and Skinner (1999) and Koshi and Michaely (2000).

Considering the post-FD era, the results show strikingly different patterns. During preannouncement period, both institutional and retail trading activity decrease dramatically. The trade frequency, share volume, and dollar volume of institutional (retail) investors decrease by 8.05 (6.52) trades, 27,890 (2,590) shares, and \$1,410,000 (\$159,390), respectively. The results for the event period for both groups of investors show that trading is much more active after the earnings announcements, and retail investors' active participation is clearly indicated by an increase in the frequency of trades and a jump in their dollar trading volume.

To examine the impact of Regulation FD, we compare institutional and retail trading activity for pre- and post-FD periods. The level of institutional trading activity decreases significantly for the preannouncement period. The trade frequency is less frequent, an average decline of 25.68 trades over a two-day trading period. At the same time, trading volume (dollar volume) shows a drop of 138,330 shares (\$7,178,780) for the preannouncement period. The pattern for institutions trading during the event period is rather different. After adjustment for

benchmarks, trade frequency and volume show small declines, although only the drop in trade frequency is statistically significant.

The level of retail trading activity also declines in the preannouncement period, however, in the event period, there is a clear indication that retail investors increase participation in trading based on information related to earnings announcements. After adjustment for trading activities in a relatively noninformation benchmark period, our results show that retail investors trade more frequent (an increase of 13.42 trades), and have taken larger trading positions in terms of both share and dollar volume.

Our findings of a lower participation rate of institutions in the preannouncement period lend support to the notion that institutions are less active post-FD possibly because of the lack of private information they once had access to, consistent with part a of our third hypothesis. Accordingly, a higher participation rate of retail investors is indirect evidence that, with timely access to market-moving information, they are less concerned with being at informational disadvantage to institutions.

Because our analysis of trading activities is based on our classification of trade initiations, we further examine the issue using alternative classification scheme. Table 5 reports the level of institutional and retail trading activity using dollar-based cutoff. Specifically, trades less than or equal to (greater than) the firm specific round-lot cutoff are classified as retail (institutional) trades.

Our comparisons of trading activities between pre- and post-FD clearly continue to show that the trading activity of institutional investors during the preannouncement period declines

significantly in the post-FD, and, at the same time, trading activity of retail investors, on the other hand, increases dramatically during the event period.¹⁸

Collectively, our results provide empirical support to the notion that Regulation FD provides retail investors better access to the earnings information as evidenced by the increase in the level of participation of retail investors. In addition, less active trading of institutions are likely due to the fact that they are no longer supplied with private information pertinent to quarterly earnings.

5.5. The change in adverse selection costs and change institutional trading activities (Hypotheses 4a and 4b)

Having presented empirical evidence showing a significant decrease in adverse selection costs during the preannouncement period post-FD and a significant decrease in institutional trading activities during the same period, we now turn our attention to whether change in adverse selection costs is associated with change in institutional trading activity. Furthermore, because we also observe that retail investors show a higher participation rate during the event period post-FD, we examine whether this also leads to a reduction in information asymmetry in the event period post-FD.

The change in adverse selection component between pre-FD and post-FD computed using Glosten and Harris (1988) is our dependent variable. In addition to change in retail and institutional trades, we also include change in volatility and spread as our control variables. The changes in retail and institutional trading activities are measured using changes in number of

¹⁸ We repeat the analysis using medium-sized trades as the buffer zone. Lee and Radhakrishana (2000) recommended the use of a buffer zone to obtain a cleaner separation of the trade initiations. Specifically, trades of \$5,000 or less are classified as retail trades and trades of \$50,000 or more as institutional trades. The overall results are consistent with those reported in Tables 4 and 5.

trades, share volume, and dollar volume. The regressions are run for both the preannouncement period and the event period. Results are reported in Table 6.

Regardless of how trading activity is measured (i.e., numbers of trades, share volume, and dollar volume), we find consistent results that change in adverse selection cost has a significant positive correlation with the change in institutional trading activity. Because institutional trades have shown a decline in the preannouncement period post-FD, it suggests that the lower adverse selection costs is due to less informed trading from institutions, even after other determinants of the information asymmetry are controlled for.

Turning our attention to the regression results for the event period, we find that the adverse selection cost is negatively correlated with retail trading activities. Therefore, the significant increase in retail trades has helped to lower information-based trading and, in turn, the adverse selection component of the spread. Institutional trading continues to show a positive correlation with adverse selection cost, yet only when measured by number of trades is the relation significant.

Overall, our results suggest that institutions' trading has declined during the preannouncement period after Regulation FD was implemented, and this has led to a decline in adverse selection cost. In addition, retail investors have increased their trading frequency and volume after earnings announcements post-FD, leading to lower adverse selection costs in the event period as well.

5.6. Robustness checks

5.6.1. Positive versus negative earning surprises

Our pre-FD period covers a mixture of bullish and bearish months in the stock market. However, the market was mainly declining during our post-FD sample period. One possible alternative explanation of our findings is that, rather due to the impact of Regulation FD, the changes in liquidity, information asymmetry, and trading behavior are due to changes in earnings characteristics. Specifically, our findings could be confounded because of a greater proportion of negative earnings surprises in the post-FD period. To examine whether our results are sensitive to the direction of earnings surprises, we collect actual earnings numbers and forecasted earnings from Institutional Broker Estimate System and classify our sample into two groups: one with positive earnings surprises and the other with negative surprises. For brevity, the results are not reported in the paper. Our findings on spread, depth, and adverse selection costs are essentially unchanged. The only notable difference is that retail investors are more active in stocks that have positive surprises and more cautious in their trading in stocks that have reported disappointing earnings.

5.6.2. Trading hour versus nontrading hour earnings announcements

To ensure the robustness of our empirical findings, we repeat our analysis for two subsamples partitioned by the time of the earnings announcements: a sample with only nontrading hour earnings announcements and another with earnings released during trading hours only. This particular partition addresses the concern that results for earnings released during nontrading hours can be seriously influenced by the unusual volatility at the open and close of the market (Wood, McInish, and Ord, 1985; Stoll and Whaley, 1990), the different patterns of spread and depth for trading and nontrading hour announcements (McInish and Wood, 1992), and the differing timings and strategies in establishing quotes and trades used in

the price discovery process of market participants related to announcements arriving during trading versus nontrading hours (Greene and Watts, 1996). Our results for both trading and nontrading hours announcements show evidence consistent to the overall sample.

5.6.3. Alternative benchmarks

We also further test our hypothesis by excluding firms with an overlapping benchmark period from our sample. As we reported earlier, out of our original sample of 6,992 earnings announcements, 138 announcements were associated with a benchmark period before decimalization although the announcements were after the decimalization and 68 announcements with a benchmark period before Regulation FD and an event period after Regulation FD. Our empirical results maintain when these 206 announcements are excluded in our sample.

The use of a benchmark period of 14 days prior to the announcement effectively controls for changes that can occur in the macro environment. However, Heflin, Subramanyam, and Zhang (2003) showed that market characteristics changed post-FD. Therefore, the benchmark period is likely contaminated by FD's effect, too. To address this concern, we also examine all our hypotheses using the pre-FD benchmark as the basis for comparison for announcements occurred both pre- and post-FD. Our results are qualitatively the same.

6. Conclusion

This study examines the impact of Regulation FD on information asymmetry and institutional and retail investors trading behavior. Critics of Regulation FD claim that the new regulation limits information released to the investor community, which is likely to cause volatilities to increase when the information is made public. Advocates of Regulation FD support

the notion that it provides retail investors better access to market moving information and levels the playing field for retail investors. Using a matched sample of companies with quarterly earnings announcements during the period of November 1, 1999 to July 31, 2001, we investigate whether the enforcement of Regulation FD has any significant impact on the trading behavior of retail and institutional investors, liquidity, and, in particular, information asymmetry. Our empirical results can be summarized as follow. First, we find that that Regulation FD has been effective in improving liquidity in that narrower spreads and wider depths are observed. Second, Regulations FD has been effective in decreasing the level of information asymmetry in the days both immediately prior to and after the releases of earnings. Third, retail trading increases following the announcements of earnings information whereas institutional investors trade much less during preannouncement period post-FD. Lastly, our results show that the decline in information asymmetry in the preannouncement period is closely associated with lower institutional trading. A higher participation of retail investors after announcements in the post-FD era contributes to the lower information risk in the event period.

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Table 1

Summary statistics of trading activities around earnings announcements

This table presents summary statistics of the sample. The pre-FD period is from November 1, 1999 to August 15, 2000. Post-FD covers a period from October 23, 2000 to July 31, 2001. The benchmark period consists of 26 half-hour intervals (two trading days) starting from 16 days prior to an announcement. The preannouncement period consists of 26 half-hour intervals prior to an announcement (information on earnings announcements are obtained from Dow Jones News Services). Event period consists of 26 half-hour intervals after an announcement. Share price is the average of bid and ask prices. Trade Frequency is the sum of total number of trades for all 26 half-hour intervals. Total Share Volume and Total Dollar Volume are the numbers of shares and dollar volume over all 26 half-hour intervals.

	Benchmark Period	Preannouncement Period	Event Period	Differences	
				Preannouncement Less Benchmark	Event Less Benchmark
Share Price					
Pre-FD	28.99	28.95	29.07	-0.04	0.08
Post-FD	28.82	28.88	28.99	0.05	0.16*
Difference between Post-FD and Pre-FD	-0.17	-0.07	-0.08	0.10	0.09***
Trade Frequency					
Pre-FD	474.13	504.95	596.52	30.83***	122.40***
Post-FD	716.18	702.03	821.29	-14.15***	105.10***
Difference between Post-FD and Pre-FD	242.06	197.08	224.76	-44.98***	-17.29***
Total Share Volume (in thousands)					
Pre-FD	978.01	1093.46	1646.45	115.44***	668.44***
Post-FD	1348.92	1320.45	1999.16	-28.47	650.23***
Difference between Post-FD and Pre-FD	370.91	227.00	352.70	-143.91***	-18.21***
Total Dollar Volume (in thousands of \$)					
Pre-FD	42057.61	48188.51	70881.87	6130.91***	28824.26***
Post-FD	50955.20	49462.42	74560.63	-1492.77	23605.44***
Difference between Post-FD and Pre-FD	8897.59	1273.91	3678.77	-7623.68***	-5218.82***

*** Indicates statistical significance at the 0.01 level (one-tailed t tests).

* Indicates statistical significance at the 0.10 level (one-tailed t tests).

Table 2

Spread and depth

This table reports spread and depth surrounding earnings announcements. Quoted spread (\$) is calculated as the difference between bid and ask prices, and relative quoted spread is the quoted spread (\$) relative to the quoted midpoint. Effective spread (\$) is calculated as two times the absolute value of the difference between the trade price and the quoted midpoint, whereas relative effective spread is the effective spread (\$) relative to the quoted midpoint. The quoted spread (relative quoted spread) is time weighted and effective spread (relative effective spread) is weighted by trading volume associated with each trade proportional to total trading volume. Depth (Number of shares) and depth (\$) is the average of quoted depths and dollar quoted depths across all quotes.

	Benchmark Period	Preannouncement Period	Event Period	Differences	
				Preannouncement Less Benchmark	Event Less Benchmark
Quoted Spread (in cents)					
Pre-FD	13.587	13.757	13.991	0.169**	0.404***
Post-FD	9.957	9.604	9.940	-0.353*	-0.018
Difference in Post-FD and Pre-FD	-3.630	-4.153	-4.052	-0.523***	-0.421***
Relative Quoted Spread (%)					
Pre-FD	0.826	0.839	0.844	0.013*	0.018**
Post-FD	0.760	0.702	0.729	-0.059*	-0.032**
Difference in Post-FD and Pre-FD	-0.066	-0.138	-0.116	-0.071***	-0.049**
Effective Spread (in cents)					
Pre-FD	14.181	14.547	15.532	0.365***	1.350***
Post-FD	11.050	10.659	12.428	-0.392*	1.378***
Difference in Post-FD and Pre-FD	-3.131	-3.888	-3.103	-0.757***	0.028***
Relative Effective Spread (%)					
Pre-FD	0.870	0.903	0.942	0.034***	0.072***
Post-FD	0.838	0.861	0.879	0.023*	0.040*
Difference in Post-FD and Pre-FD	-0.031	-0.042	-0.063	-0.011***	-0.032***
Depth (Number of Shares)					
Pre-FD	9968.82	9731.79	10487.30	-237.03***	518.47**
Post-FD	8098.65	8072.75	7507.48	-25.90***	-591.17
Difference in Post-FD and Pre-FD	-1870.18	-1659.04	-2979.82	211.14***	-1109.64***
Depth (\$)					
Pre-FD	209587.05	208321.51	229473.83	-1265.54***	19886.78***
Post-FD	156417.78	165198.13	174672.44	8780.35***	18254.66***
Difference in Post-FD and Pre-FD	-53169.27	-43123.38	-54801.39	10045.89***	-1632.12***

*** Indicates statistical significance at the 0.01 level (one-tailed t tests).

** Indicates statistical significance at the 0.05 level (one-tailed t tests).

* Indicates statistical significance at the 0.10 level (one-tailed t tests).

Table 3

Adverse selection costs around earnings announcements

This table presents the adverse selection costs estimated using the spread decomposition models of Lin, Sanger, and Booth (1995; LSB), George, Kaul, and Nimalendran (1991; GKN) and Glosten and Harris (1988; GH).

	Benchmark Period	Preannouncement Period	Event Period	Differences	
				Preannouncement Less Benchmark	Event Less Benchmark
LSB					
Pre-FD	45.95	46.65	41.04	0.702	-4.916***
Post-FD	47.13	43.33	43.68	-3.806***	-3.453***
Difference in Post-FD and Pre-FD	1.180	-3.328	2.643	-4.508***	1.464***
GKN					
Pre-FD	25.57	29.30	31.93	3.726***	6.356***
Post-FD	29.95	25.89	31.52	-4.056***	1.569*
Difference in Post-FD and Pre-FD	4.375	-3.407	-0.412	-7.782***	-4.787***
GH					
Pre-FD	70.50	71.00	71.48	0.502*	0.977***
Post-FD	73.86	68.40	73.82	-5.460*	-0.038
Difference in Post-FD and Pre-FD	3.357	-2.604	2.343	-5.961***	-1.015***

*** Indicates statistical significance at the 0.01 level (one-tailed t test).

* Indicates statistical significance at the 0.10 level (one-tailed t test).

Table 4

Institutional and retail trading activities using share-based classification

This table reports institutional and retail trading activities. Institutional trades are trades of greater than 900 shares, and retail trades consist of trades of less than 900 shares. Trade Frequency is the sum of trades for all 26 half-hour intervals. Total Share Volume and Total Dollar Volume are the sum of total share volume and dollar volume for all 26 half-hour intervals.

	Benchmark Period	Preannouncement Period	Event Period	Differences	
				Preannouncement Less Benchmark	Event Less Benchmark
<i>Panel A: Institutional</i>					
Trade Frequency					
Pre-FD	192.47	210.09	272.76	17.62***	80.30***
Post-FD	257.42	249.37	302.78	-8.05***	45.36***
Difference between Post-FD and Pre-FD	64.95	39.28	30.02	-25.68***	-34.93**
Total Share Volume (in thousands)					
Pre-FD	884.22	994.66	1534.95	110.44***	650.72***
Post-FD	1198.51	1170.61	1801.61	-27.89	603.11***
Difference between Post-FD and Pre-FD	314.28	175.95	266.66	-138.33***	-47.62
Total Dollar Volume (in thousands of \$)					
Pre-FD	37508.91	43277.24	65491.97	5768.34***	27983.06***
Post-FD	44634.33	43223.89	66644.30	-1410.44	22009.97***
Difference between Post-FD and Pre-FD	7125.42	-53.36	1152.33	-7178.78***	-5973.09
<i>Panel B: Retail</i>					
Trade Frequency					
Pre-FD	282.00	295.12	324.03	13.12***	42.04***
Post-FD	459.52	453.00	514.97	-6.52***	55.46***
Difference between Post-FD and Pre-FD	177.52	157.88	190.94	-19.64***	13.42**
Total Share Volume (in thousands)					
Pre-FD	94.73	99.90	112.94	5.17***	18.22***
Post-FD	153.77	151.18	189.80	-2.59***	36.03***
Difference between Post-FD and Pre-FD	59.04	51.28	76.85	-7.76***	17.81**
Total Dollar Volume (in thousands of \$)					
Pre-FD	4586.64	4953.32	5449.64	366.68***	862.99***
Post-FD	6443.38	6284.00	7982.17	-159.39***	1538.79***
Difference between Post-FD and Pre-FD	1856.74	1330.68	2532.53	-526.06***	675.79***

*** Indicates statistical significance at the 0.01 level (one-tailed *t* tests).

** Indicates statistical significance at the 0.05 level (one-tailed *t* tests).

Table 5

Institutional and retail trading activities using dollar-based classification

This table reports institutional and retail trading activities using dollar-based cutoff. Trades less than or equal to (greater than) the firm specific round-lot cutoff are classified as retail (institutional) trades. Trade frequency is the sum of trades for all 26 half-hour intervals. Total Share Volume and Total Dollar Volume are the sum of total share volume and dollar volume for all 26 half-hour intervals.

	Benchmark Period	Preannouncement Period	Event Period	Differences	
				Preannouncement Less Benchmark	Event Less Benchmark
<i>Panel A: Institutional</i>					
Trade Frequency					
Pre-FD	336.07	365.09	443.00	29.02***	106.93***
Post-FD	477.80	466.25	537.75	-11.55	59.94***
Difference between Post- and Pre-FD	141.73	101.16	94.75	-40.57***	-46.98
Total Share Volume (in thousands)					
Pre-FD	949.21	1067.90	1612.37	118.69***	663.16***
Post-FD	1309.06	1281.54	1899.53	-27.52	590.48***
Difference between Post- and Pre-FD	359.84	213.64	287.16	-146.21***	-72.68
Total Dollar Volume (in thousands of \$)					
Pre-FD	41384.21	47666.40	70137.99	6282.19***	28753.77***
Post-FD	50173.37	48666.24	72751.11	-1507.13	22577.74***
Difference between Post- and Pre-FD	8789.16	999.84	2613.12	-7789.32***	-6176.03
<i>Panel B: Retail</i>					
Trade Frequency					
Pre-FD	142.60	145.93	158.32	3.33***	15.73***
Post-FD	245.46	241.78	287.85	-3.68***	42.39**
Difference between Post- and Pre-FD	102.87	95.86	129.53	-7.01***	26.66*
Total Share Volume (in thousands)					
Pre-FD	30.62	31.21	36.39	0.59	5.77
Post-FD	52.43	51.12	107.93	-1.31***	55.51**
Difference between Post- and Pre-FD	21.81	19.91	71.54	-1.90***	49.74***
Total Dollar Volume (in thousands of \$)					
Pre-FD	738.94	764.42	835.93	25.48	96.99**
Post-FD	1248.28	1244.09	2061.45	-4.19***	813.17**
Difference between Post- and Pre-FD	509.34	479.66	1225.51	-29.68***	716.18***

*** Indicates statistical significance at the 0.01 level (one-tailed t tests).

** Indicates statistical significance at the 0.05 level (one-tailed t tests).

* Indicates statistical significance at the 0.10 level (one-tailed t tests).

Table 6

Regression analysis of adverse selection costs and trading activities

The change in adverse selection component between pre-FD and post-FD computed using Glosten and Harris (1988) is our dependent variable. In addition to change in retail and institutional trades, we also include change in volatility and spread as our control variables. The changes in retail and institutional trading activities are measured using changes in number of trades, share volume, and dollar volume. The regressions are run for both the pre-announcement period and the event period.

Regression Variables	Preannouncement Period	
	Coefficients	Event Period Coefficients
Intercept	-0.001	-0.045
Change in Retail Number of Trade	0.032	-0.073**
Change in Institutions' Number of Trade	0.100***	0.086***
Change in Volatility	0.004	0.011
Change in Spread	0.118***	0.060**
Intercept	-0.003	-0.048
Change in Retail Share Volume	0.020	-0.096***
Change in Institutions' Share Volume	0.114***	0.030
Change in Volatility	0.009	0.016
Change in Spread	0.112***	0.064**
Intercept	0.297***	0.186*
Change in Retail Dollar Volume	0.001	-0.060**
Change in Institutions' Dollar Volume	0.089***	0.008
Change in Volatility	0.008	0.030
Change in Spread	0.117***	0.066**

*** Indicates statistical significance at the 0.01 level (one-tailed t tests).

** Indicates statistical significance at the 0.05 level (one-tailed t tests).

* Indicates statistical significance at the 0.10 level (one-tailed t tests).