“Did investors feel fairer after Regulation Fair Disclosure? Evidence from abnormal trading volume before earnings announcements”

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Did investors feel fairer after Regulation Fair Disclosure? Evidence from abnormal trading volume before earnings announcements

Abstract

This paper examines the impact of Regulation Fair Disclosure on the abnormal trading volume before earnings announcements. The authors show that after Regulation Fair Disclosure, the average abnormal trading volume over a period of eight days before earnings announcements is 4% lower than before. In addition, the paper shows that this lower abnormal trading volume is more pronounced in small firms and technology firms. The empirical results are consistent with Regulation Fair Disclosure inducing investors to perceive higher earnings-related information asymmetry before earnings announcements.

Keywords: trading volume, information asymmetry, Regulation Fair Disclosure, earnings announcements.
JEL Classification: G14, G18.

Introduction

Information asymmetry and its impact on trading volume have long been interesting to both financial economists and policy makers. For example, Admati and Pfleiderer (1988) and Foster and Viswanathan (1990) show that if uninformed investors perceive high information asymmetry before earnings announcement, trading volume will decrease. Related to policy making, the U.S. Securities and Exchange Commission (SEC) had long aimed to reduce unfair information asymmetry caused by selective disclosure. On October 23, 2000 SEC put into effect Regulation Fair Disclosure (hereafter simply referred to as RFD) to mandate that whenever a public company intentionally discloses material (i.e. market-moving) non-public information to any financial professionals who may trade on the information, it must do so publicly to all investors at the same time. Furthermore, all non-intentional selective disclosures must be publicly disseminated promptly (no later than 24 hours) after the issuer knows that the information disclosed was both material and non-public.

While RFD purports to "level the playing field" by reducing information asymmetry between informed and uninformed investors, it is still unclear whether or not RFD actually helps to reduce information asymmetry in the financial market. In this paper, we empirically study the abnormal trading volume over a period of eight days before earnings announcement before and after RFD to investigate the impact of RFD on information asymmetry.

Specifically, we examine a set of firms that are listed before and after RFD. Following Chae (2005), we calculate the abnormal trading volume on day i (i = 3, 4, …, 10) before earnings announcement as the difference between trading volume on day i and the average daily trading volume from day 40 to day 11 before earnings announcement. Chae (2005) and McNichols and Trueman (1994) argue that information asymmetry between informed and uninformed investors is most pronounced over a period of several days before earnings announcement. Thus, uninformed investors delay unnecessary trading and abnormal trading volume decreases before earnings announcement. If RFD helps to decrease or increase information asymmetry between uninformed and informed investors, then we can observe increased or decreased abnormal trading volume after RFD. Thus, the study of the abnormal trading volume before earnings announcement before and after RFD provides us with a good opportunity to investigate the impact of RFD on investors' perceived information asymmetry.

We show that the abnormal trading volume over eight days before earnings announcement after RFD is about 4 percent lower than before RFD. This indicates that RFD may make investors perceive higher information asymmetry before earnings announcement. The intuition for this finding is as follows. As pointed out by Thompson (2001), after RFD firms are less willing to disclose information to the public, because they want to limit potential litigations. In addition, small firms may eliminate or reduce public disclosure to avoid disclosure costs and high-tech firms may do the same to avoid proprietary costs. If no investors are willing to spend resource or cost to search for more information, then the information accessible to the public after RFD is less than before RFD. On the other hand, since firms are less willing to give information to analysts or the public, the search cost for the same level of information as before RFD increases. Thus, after RFD, only a smaller percentage of investors can afford to search for the same level of information as before. This leads to two results. First, the information asymmetry after RFD between informed and uninformed investors is

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increased, since the uninformed are more uninformed. Second, the percentage of informed investors after RFD is reduced. The latter tends to result in a less efficient stock price to keep the private information long lived and thus prevent a fast reveal of information to uninformed investors (see, for example, Holden and Subrahmanyam (1992) and Foster and Viswanathan (1996) for the discussion of the faster reveal of information when there are more informed investors). This tends to indirectly increase information asymmetry.

We also document the evidence that the increase in perceived information asymmetry is more pronounced in small firms and high-tech firms. The increased perceived information asymmetry for small firms may result from the coverage of fewer financial analysts after RFD, since the increase in search cost after RFD may induce analysts to focus on large firms. On the other hand, the increase in information asymmetry for high-tech firms may be caused by a higher proprietary cost after RFD (see Gomes, Gorton and Madureira, 2007; and Ahmed and Schneible, 2007 for similar results).

If investors curb trading before earnings announcements for fear of their information disadvantage, they may execute the postponed trading on or after earnings announcements. Consistent with this prediction, we document increased abnormal trading volume during and immediately after earnings announcements after RFD.

While previous studies also examine the impact of RFD on information asymmetry, our work is different from them in the following three aspects. First, our study is the first to use the pre-earnings announcement abnormal trading volume before and after RFD to examine the impact of RFD on information asymmetry. Investors' perception of information asymmetry change may be more directly reflected from investors' trading pattern change than from measures such as bid-ask spreads that reflect more of market makers' perception. To the extent that RFD is aimed to provide all investors a "level playing field", our analysis speaks more directly on the efficacy of RFD. Second, we examine a large population of more than 1100 firms but many previous studies often cover fewer than 100 firms. Third, our abnormal trading volume measure is more likely to be immune to macroeconomic factors that may change across the Pre- and the Post-RFD periods, so long as these factors do not affect firms differently over the pre-announcement period versus the benchmark period (day 40 to day 11 before announcement dates). For example, while the decimalization of stock trading may confound some studies on the post-RFD environment, our study is less likely to be affected because our test periods are very adjacent to the benchmark periods, providing good self-control[1].

The paper is organized as follows. The next Section discusses RFD and related empirical studies. Section 2 describes our sample. Section 3 reports empirical results and the last Section concludes.

1. Related empirical studies

The existing evidence on the impact of RFD on information asymmetry is mixed. Eleswarapu, Thompson and Venkataraman (2004) show that RFD has diminished the advantage of informed investors and thus reduces information asymmetry. Chiyachantana et al. (2004) and Gintschel and Markov (2004) also find that the playing field for analysts is leveled after RFD and this may decrease information asymmetry between informed and uninformed investors. Sunder (2002) uses bid-ask spreads as a proxy for the level of information asymmetry between informed and uninformed investors and shows that before RFD firms that use "restricted" conference calls to disclose information have higher bid-ask spreads than firms that use "open" conference calls. These differences do not exist after RFD, suggesting that RFD may reduce information asymmetry[2].

On the other hand, many researchers also document evidence that RFD may cause investors to perceive higher information asymmetry between informed and uninformed investors. For example, Lee, Rosenthal and Gleason (2004), Francis, Nanda, and Wang (2006), Straser (2002), and Sidhu et al. (2008) find an increase or no change in information asymmetry after RFD. In particular, Aslan (2004) documents that the probability of informed trading has increased for small firms, and Kofman, Michayluk, and Mathew (2005) report that market depth has declined and liquidity worsened after RFD. Janvrin and Kurtenbach (2006) find firms and investors perceive that selective disclosure practice still exists. Duarte et al. (2008) report that RFD has increased costs of capital for NASDAQ firms (prior work shows that the cost of capital is increasing in the level of information asymmetry). Clearly, these results indicate or imply that perceived information asymmetry increases after RFD.

[1] NYSE and AMEX trading was fully decimalized on January 19, 2001, and NASDAQ on April 9, 2001. Bailey et al. (2003) finds that a seemingly significant decline in return volatility at times of earnings announcements after the implementation of RFD is due to decimalization of stock trading rather than the adoption of RFD.

[2] Evidence of decreased information asymmetry *during* information events such as conference calls does not contradicts our finding that information asymmetry may increase *before* such events after RFD.

2. Sample

In this paper, we use the pre-earnings announcement abnormal trading volume before and after RFD to examine how RFD affects information asymmetry. Earnings announcements dates are merged from Standard & Poor's Compustat and Institutional Broker's Estimate System (I/B/E/S). To improve accuracy on announcement dates, some adjustment is made following DellaVigna and Pollet (2009). Our sample includes firms covered by the Center for Research in Security Prices (CRSP), which are listed on the NYSE, AMEX, or NASDAQ between 1996 and 2004[1]. The number of analysts following a firm is extracted from I/B/E/S. Daily trading volume, prices, and returns are from CRSP. Trading turnover is measured as the ratio of raw volume over outstanding shares. Trading volume is measured by the logarithm of the turnover[2]. To ensure that our results are not driven by sample differences over time, we require each firm to have data every year.

A benchmark volume is measured as the average log turnover during an estimation period, from day 40 to day 11 before earnings announcements[3]. To reduce the undue impact of prior earnings announcement on the benchmark volume, we require that the previous earnings announcement date be at least 10 days before the benchmark starting date. To reduce the excess noise in trading volume caused by the January effect, we also drop earnings announcements made in January[4]. Abnormal trading volume is the average log turnover in a test window minus the benchmark log turnover.

Since RFD was formally proposed by SEC on December 20, 1999, approved on August 10, 2000, and became effective on October 23, 2000, a firm-announcement observation is considered after RFD when the earnings announcement date falls between October 23, 2000 and October 22, 2004. During the period between the date that RFD was proposed and the date that it was adopted, some firms may have changed their disclosure policies in anticipation of the regulation (Ahmed and Schneible, 2007). Therefore, it is difficult to examine the impact of the regulation on information asymmetry, and we refer to this period as the transition period. The before-RFD sample contains about 16 quarters, from December 20, 1995 to December 19, 1999. The after-RFD sample is from October 23, 2000 to October 22, 2004. By doing so, we can make sure that each subsample has similar sets of fiscal quarters. This can ameliorate effects of potential seasonal differences in measured variables across fiscal quarters.

In the rest of the paper, for simplicity of exposition, the time window from day i to day j before an earnings announcement is simply written as from day i to day j, or ($-i$, $-j$), where $i > j \geq 0$ and the earnings announcement occurs on day 0.

3. Empirical results

3.1. Descriptive statistics. Table 1 summarizes firm characteristics and principal variables that we examine in our event study and cross-sectional regression tests before and after RFD. We have the same set of 1187 firms with non-missing earnings announcements across the two periods. Firm sizes range from $0.79 million to over $583 billion. Our sample appears comprehensive in that it includes both small and large firms. Because the sample covers the same firms before and after RFD, it is not surprising that the distributions of variables do not vary much between the two periods. One notable exception is that the median number of analysts has increased from 5 to 6. These results are similar to the ones reported in Bailey et al. (2003). The median analyst forecast dispersion has increased, consistent with existing studies that document an increase in analyst forecast dispersion and a decrease in forecast accuracy after RFD. The level of abnormal trading volume over the 8-day (day 10 to day 3) period is significantly negative both before RFD and after RFD, revealing that uninformed investors tend to curtail trading before earnings announcements for fear of their information disadvantage.

Table 1. Descriptive statistics for the sample of 1187 firms before and after RFD

Variables	Mean	Median	Std. dev.	Minimum	Maximum
Pre-RFD (December 20, 1995 to December 19, 1999)					
Firm size ($mm)	4317.33	454.68	18179.60	1.60	479116.38
Number of analysts	6.516	5.000	5.709	1	44
Forecast dispersion	0.001	0.000	0.002	0	0.053
Return volatility (-1,1)	0.028	0.021	0.025	0	0.478
Return volatility (-10,-3)	0.021	0.017	0.016	0	0.521
Abnormal trading volume (-10, -3)	-1.340	-2.837	54.977	-363.433	350.770

[1] This choice of test periods is similar to Gomes et al. (2007).
[2] See Ajinkya and Jain (1989) and Chae (2005) for a justification for the use of log turnover. In sensitivity test, we replace log turnover with raw turnover and obtain similar results.
[3] This choice follows Chae (2005). We replicate our test using (-50, -11) and get similar results.
[4] The conclusion of RFD's effect is not altered when we include January announcements in the sample. Results are available upon request.

Table 1 (cont.). Descriptive statistics for the sample of 1187 firms before and after RFD

Variables	Mean	Median	Std. dev.	Minimum	Maximum
Post-RFD (October 23, 2000 to October 22, 2004)					
Firm size ($mm)	6251.85	679.89	24986.01	0.90	481505.61
Number of analysts	8.047	6.000	6.799	1	43
Forecast dispersion	0.002	0.001	0.004	0	0.196
Return volatility (-1,1)	0.030	0.022	0.029	0	1.075
Return volatility (-10,-3)	0.021	0.017	0.016	0.001	0.297
Abnormal trading volume (-10, -3)	-5.613	-6.801	49.556	-335.934	343.984
Transition period (December 20, 1999 to October 22, 2000)					
Firm size ($mm)	7726.53	597.47	35481.55	2.18	583883.68
Number of analysts	7.956	6.000	6.648	1	39
Forecast dispersion	0.001	0.001	0.003	0	0.077
Return volatility (-1,1)	0.037	0.028	0.032	0	0.519
Return volatility (-10,-3)	0.027	0.022	0.018	0.001	0.162
Abnormal trading volume (-10, -3)	-5.381	-7.660	50.204	-273.132	274.095

Notes: This Table reports descriptive statistics for 1187 firms that have earnings announcement dates information throughout the four years before Regulation Fair Disclosure (Pre-RFD) and the four years after (Post-RFD). Earnings announcement dates are merged from Compustat and IBES database. Return and trading volume data are from CRSP. Size is firm's market capitalization at the beginning of each year. Number of analysts is the number of analysts following a firm in a quarter. Forecast dispersion is the standard deviation of the most recent individual analyst forecasts on a firm's earnings per share, scaled by stock price at the beginning of a fiscal quarter. Return volatility is the average of daily absolute returns over the window indicated. Abnormal trading volumes are generated as the differences between average log turnover over the window indicated and the average log turnover from day -40 to day -11 before earnings announcements. Turnover is raw trading volume divided by number of shares outstanding. Abnormal trading volume is magnified by 100 times.

3.2. Univariate behavior of abnormal trading volume. We now examine how abnormal trading volume before earnings announcements differs before and after the adoption of RFD in October 2000. Before RFD, the mean (median) abnormal trading volume from day -10 to day -3 is -1.34% (-2.84%). This is very close to the -1.88% (-2.49%) reported in Chae (2005) for the time period from 1986 to 2000, indicating that, compared to historical levels of pre-announcement information asymmetry, our before-RFD period is not unusual. After RFD, however, the mean (median) of abnormal trading volume has tumbled to -5.61% (-6.80%). In the transition period the mean (median) of abnormal trading volume has dropped to -5.38% (-7.66%). It appears that, after RFD, investors are more likely to curtail trading before earnings announcements.

To verify that the decrease in abnormal trading volume after RFD is not distorted by result from any particular day or any particular calendar year, we report abnormal trading volume each day from day -10 to day -3 in panel A of Table 2 and each calendar year from 1996 to 2004 in panel B of Table 2. It is clear that after RFD the pre-announcement abnormal trading volume on each day (-10, -9,…, -3) is consistently lower than the corresponding daily result before RFD. The pre-announcement abnormal trading volume in the post-RFD period (2001 to 2004) is also mostly lower than that in the pre-RFD years (1996 to 1999). Interestingly, the difference is most dramatic between year 1999 (mean = -0.08%) and year 2001(mean = -9.88%), the year immediately before RFD and the year immediately after. The abnormal volume in the transition year of 2000 is also quite low (mean = -5.03%). This may be explained by the fact that many firms have stopped selective disclosure before the official adoption date of RFD.

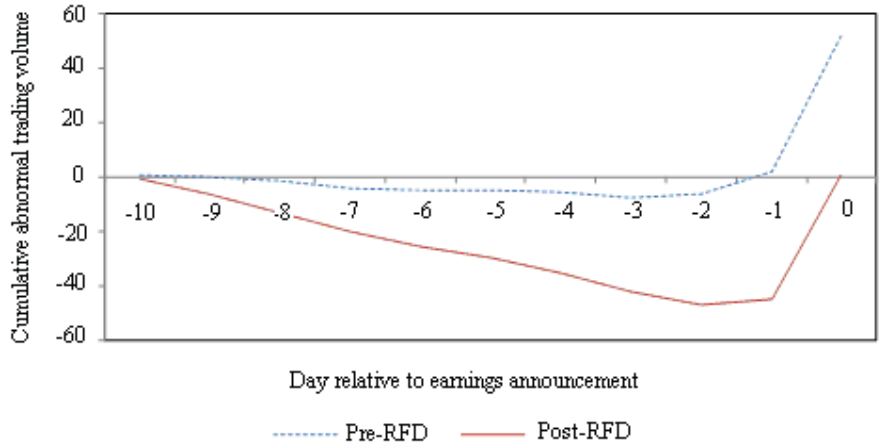
Table 2. Pre-earnings announcement abnormal trading volume before and after RFD

Panel A: Abnormal trading volume each day before earnings announcements						
	Pre-RFD			Post-RFD		
	Mean	t-stat	Median	Mean	t-stat	Median
-10	0.382	0.52	-0.058	-1.008	-1.67	-3.085
-9	-0.575	-0.78	-1.006	-5.174	-8.40	-5.429
-8	-1.489	-2.00	-2.405	-6.836	-11.10	-7.582
-7	-2.415	-3.29	-2.599	-7.203	-11.76	-8.691
-6	-0.525	-0.70	-2.632	-5.543	-8.97	-7.357
-5	-0.510	-0.68	-1.773	-3.848	-6.20	-4.493
-4	-0.525	-0.70	-1.093	-5.346	-8.45	-5.964
-3	-1.662	-2.21	-2.047	-7.022	-11.35	-7.720

Table 2 (cont.). Pre-earnings announcement abnormal trading volume before and after RFD

Panel A: Abnormal trading volume each day before earnings announcements						
	Pre-RFD			Post-RFD		
	Mean	t-stat	Median	Mean	t-stat	Median
-2	0.788	1.05	-0.704	-5.070	-8.03	-5.603
-1	8.698	11.45	6.970	2.280	3.66	1.342
0	49.347	61.71	44.767	45.422	63.68	40.516
1	49.883	61.89	45.036	51.684	72.47	45.374
Average (-10,-3)	-1.340	-3.15	-2.837	-5.613	-14.81	-6.801
Panel B: Average abnormal trading volume over (-10,-3) each year						
Year	Mean	t-stat	Median			
1996	-0.464	-0.47	-2.582			
1997	-3.412	-3.98	-3.672			
1998	-1.003	-1.21	-3.052			
1999	-0.082	-0.10	-1.782			
2000	-5.030	-5.59	-7.646			
2001	-9.881	-11.87	-10.304			
2002	-2.122	-2.69	-2.341			
2003	-5.880	-7.77	-7.765			
2004	-4.375	-6.06	-6.659			

Notes: This Table reports daily abnormal trading volume for 1187 firms that have information on earnings announcement dates throughout the Pre-RFD and the Post-RFD periods. Daily abnormal trading volume before each quarterly earnings announcement is the log turnover minus the stock's average log turnover in the benchmark period from day -40 to day -11. Turnover is the ratio of raw trading volume over shares outstanding. Abnormal trading volume is magnified by 100 times. "Average (-10, -3)" is the average of abnormal trading volume from day -10 to day -3. To summarize, we provide a plot of cumulative abnormal trading volume from day -10 to day 0 in Figure 1. Before RFD, abnormal trading volume decreases about 7.31% cumulatively before earnings announcements. In contrast, after RFD, cumulative abnormal trading volume tanks by 42.0%.



Notes: This plot shows cumulative abnormal trading volume from day -10 to day 0 before earnings announcements for 1187 firms in the four years before regulation fair disclosure (Pre-RFD) versus in the four years after (Post-RFD). Abnormal trading volume is daily log turnover minus the average log turnover in the benchmark period (day -40 to -11). Turnover is raw daily volume divided by shares outstanding. Abnormal trading volume is magnified by 100 times.

Fig. 1. Cumulative abnormal trading volume from day -10 to day 0 before and after RFD

In Table 3, we apply t-tests and sign tests to assess the significance of the mean and median within-firm change across pairs of before and after RFD comparison quarters. The results reveal a uniform pattern of decreases in pre-announcement abnormal volume after the adoption of RFD. In the whole sample, mean (median) differences are statistically significant at the better than 0.02 (0.01) levels for all pairs of comparison quarters. Investors on average trade about 4.3% less daily (p-value < 0.0001) prior to earnings announcements after RFD, compared to the before-RFD period. Interestingly, the trading volume decline seems stronger before earnings announcements made for the second and the fourth fiscal quarters than for the first and the third quarters. One possibility might be that investors reduce trading more when they put more weight on (and perceive higher information asymmetry from) the second and the fourth quarter earnings announcements, because the second quarter (semi-annual) and the fourth quarter (annual) results are usually audited while the first and the third quarter reports are not.

Table 3. Univariate analysis of average abnormal trading volume from day -10 to day -3 before and after RFD

	Whole sample		Non-December fiscal year-end firms	
	Mean	Median	Mean	Median
All quarter				
Pre-RFD	-1.340	-2.836	-1.358	-3.026
Post-RFD	-5.613	-6.801	-6.456	-7.777
Change	-4.272	-3.965	-5.099	-4.751
P-value	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
First quarter				
Pre-RFD	-0.283	-2.147	0.515	-1.326
Post-RFD	-3.241	-6.177	-3.528	-5.205
Change	-2.958	-4.030	-4.043	3.879
P-value	(0.010)	(0.002)	(0.095)	(0.135)
Second quarter				
Pre-RFD	0.137	-0.907	-1.371	-2.292
Post-RFD	-7.018	-6.973	-8.048	-8.518
Change	-7.156	-6.066	-6.676	-6.226
P-value	(<0.0001)	(<0.0001)	(0.002)	(0.001)
Third quarter				
Pre-RFD	-2.116	-3.405	0.148	-2.683
Post-RFD	-4.703	-6.360	-7.948	-9.446
Change	-2.587	-2.955	-8.097	-6.763
P-value	(0.013)	(0.008)	(0.0002)	(0.0001)
Fourth quarter				
Pre-RFD	-3.185	-5.437	-3.662	-5.347
Post-RFD	-7.092	-7.617	-5.279	-6.695
Change	-3.907	-2.180	-1.617	-1.348
P-value	(0.003)	(0.007)	(0.412)	(0.473)

Notes: This Table reports univariate analysis of pre-earnings-announcement abnormal trading volume from day -10 to day -3 for 1187 firms (372 firms with non-December fiscal year-ends) that have information on earnings announcement dates throughout the Pre-RFD and the Post-RFD period. For measurement of daily abnormal trading volume, see notes in Table 1. "Change" measures the mean and median within-firm change after RFD adoption. P-values are two-sided, from t-tests for means, and from sign tests for medians.

3.3. Multivariate analysis of abnormal trading volume. In this subsection, we apply multivariate regression analysis to investigate the impact of RFD on information asymmetry. We control for several variables that can affect information asymmetry or trading volume before earnings announcements. These variables are firm size, analyst coverage, analyst forecast dispersion, contemporaneous absolute returns, return volatility around earnings announcements, and the punctuality of earnings announcements.

Firm size is related to information asymmetry since large firms are more likely to have better information environments than small firms. Thus, larger firms tend to have less information asymmetry and larger abnormal trading volume before earnings announcements. Firm size is defined as the logarithm of the market capitalization of the firm equity. Previous studies have shown that the more analysts cover a firm, the more information will be produced and the less information asymmetry will be between informed and uninformed investors. In our study, analyst coverage is measured as the number of analysts following a firm.

Analyst earnings forecasts provide investors with information about the fundamentals of firms. The more disperse the forecasts, the less information provided to investors. Thus, high analyst forecast dispersion tends to increase information asymmetry. Analyst forecast dispersion is measured as the standard deviation of analysts' most recent forecasts on the forthcoming earnings per share, scaled by the stock price.

Since trading volume is also affected by contemporaneous stock returns, to control for this effect, we include the average absolute daily return from day -10 to day -3.

Previous studies show that stock return volatility increases around earnings announcements. Larger return volatility may mean more negative effect for uninformed investors in the presence of information asymmetry and thus result in lower pre-announcement trading volume. We measure earnings announcement return volatility as the average absolute return over the 3-day window from day -1 to day 1. Since high turnover prior to an announcement could lead to a small price effect on the day of the announcement, to account for potential endogeneity, we follow previous studies to also include the stock return volatility during the previous earnings announcement.

The punctuality of earnings announcements may also affect pre-announcement trading volume. If a firm releases earnings news more punctually, investors can better anticipate the timing of the forthcoming earnings announcement and can curtail trading accordingly. If a firm's earnings announcement date is hard to predict, investors may not alter their trading decisions since they cannot predict the timing of earnings-related information asymmetry. To measure firm punctuality, we examine a firm's distribution of earnings announcement delay (advance) relative to the expected announcement date. Following Cohen et al. (2007), we use the median earnings announcement date as the expected date. Punctuality takes a value from 1 to 5 based on the distribution of announcement delay (advance) over the period from 1976 to 1995. We measure punctuality in this earlier period to avoid potential endogeneity between trading volume and earnings announcement timing. Firms with the narrowest (widest) distributions, based on an inter-quartile width, take a value of 5 (1).

Finally, to examine the impact of RFD on pre-announcement abnormal trading volume, we in-

clude a dummy variable, PostFD, which takes a value of 1 for earnings announcements made after RFD, 0 otherwise.

The regression results are reported in panel A of Table 4. As expected, the coefficients on firm size are statistically significant across different specifications. The number of the analysts following a firm is significant in one regression but becomes insignificant when other control variables are included. Forecast dispersion is significantly negatively associated with pre-announcement abnormal volume, so is return volatility during earnings announcements. Contemporaneous stock returns are positively associated with trading volume. Interestingly, we find that the punctuality variable has a significantly negative coefficient. This new finding indicates that investors curtail more trading when they can better anticipate earnings announcement dates.

Table 4. Multivariate analysis of abnormal trading volume from day -10 to day -3 before and after RFD

Panel A: Multivariate analysis									
Constant	Log Cap	Number of analysts	Dispersion	Absret	Punctuality	Labsret	Absolute return (-10,-3)	PostFD	Adj. R-square
-1.705								-1.403	0.0002
(0.0004)								(0.046)	
-44.996	2.158					-175.114	905.884	-3.522	0.074
(<0.0001)	(<0.0001)					(<0.0001)	(<0.0001)	(<0.0001)	
-15.931		0.358				-194.476	861.155	-3.120	0.069
(<0.0001)		(<0.0001)				(<0.0001)	(<0.0001)	(<0.0001)	
-13.413			-574.694			-182.346	885.714	-2.285	0.069
(<0.0001)			(<0.0001)			(<0.0001)	(<0.0001)	(0.001)	
-12.250				-115.265		-170.141	935.506	-2.373	0.069
(<0.0001)				(<0.0001)		(<0.0001)	(<0.0001)	(0.0005)	
-8.972					-1.582	-188.523	877.111	-2.622	0.067
(<0.0001)					(<0.0001)	(<0.0001)	(<0.0001)	(0.0001)	
-38.013	1.998	-0.074	-424.485	-96.203	-1.173	-146.611	990.222	-3.029	0.078
(<0.0001)	(<0.0001)	(0.353)	(<0.0001)	(<0.0001)	(0.003)	(<0.0001)	(<0.0001)	(<0.0001)	

Panel B: Additional specifications												
Constant	Number of analysts	Dispersion	Absret	Punctuality	Log Cap	Log Cap*PostFD	HT	HT*PostFD	Labsret	Absolute return (-10,-3)	PostFD	Adj. R-square
-44.995					2.158				-175.114	905.884	-3.522	0.074
(<0.0001)					(<0.0001)				(<0.0001)	(<0.0001)	(<0.0001)	
-36.793					1.573	1.238			-173.972	905.859	-21.197	0.074
(<0.0001)					(<0.0001)	(0.002)			(<0.0001)	(<0.0001)	(0.0002)	
-13.355							-2.592		-186.093	875.498	-2.644	0.066
(<0.0001)							(0.010)		(<0.0001)	(<0.0001)	(0.0001)	
-13.602							-1.249	-2.987	-185.652	877.267	-2.217	0.067
(<0.0001)							(0.345)	(0.102)	(<0.0001)	(<0.0001)	(0.003)	
-31.478	-0.095	-407.994	-94.990	-1.165	1.538	1.103			-145.538	990.073	-18.796	0.078
(<0.0001)	(0.236)	(<0.0001)	(<0.0001)	(0.003)	(<0.0001)	(0.005)			(<0.0001)	(<0.0001)	(0.001)	
-39.835	-0.051	-437.975	-90.183	-0.991	2.052		-1.755	-3.545	-138.714	1004.19	-2.690	0.079
(<0.0001)	(0.518)	(<0.0001)	(<0.0001)	(0.014)	(<0.0001)		(0.189)	(0.065)	(<0.0001)	(<0.0001)	(0.0003)	
-32.936	-0.073	-420.675	-88.823	-0.982	1.563	1.174	-1.607	-3.945	-137.444	1004.379	-19.407	0.079
(<0.0001)	(0.361)	(<0.0001)	(<0.0001)	(0.015)	(<0.0001)	(0.003)	(0.229)	(0.040)	(<0.0001)	(<0.0001)	(0.0007)	

Notes: This Table reports the results of regressions that examine the impact of RFD on pre-earnings announcement abnormal trading volume after controlling for various risk measures of the announcements. The dependent variable is the difference between average log turnover from day-10 to day -3 and average log turnover from day -40 to day -11. Abnormal trading volume is magnified by 100 times. "Absret" measures the average absolute return 3 days over an earnings announcement "Labsret" is the average absolute return 3 days over the previous earnings announcement "Log Cap" is the average log capitalization of the firm over day -40 to day -11, "Dispersion" is the standard deviation of analyst forecasts on the forthcoming earnings per share, scaled by stock price at the beginning of a fiscal quarter "Number of analysts" is the number of analysts covering a firm-quarter. "Punctuality" takes a value from 1 to 5 based on the distribution of announcement date less expected announcement date firms with the narrowest (widest) distributions, based on inter-quartile measure, take a value of 5 (1). Expected announcement dates are estimated using an algorism similar to Cohen et al. (2007) "PostFD" equals 1 for quarterly earnings events after RFD adoption, 0 otherwise, "HT" is a dummy variable equal to 1 if SIC code is between 2833 and 2836, 3612 and 3613, 3621 and 3629, 3651 and 3652, 3661 and 3669, 3671 and 3672, 4812 and 4822, 4832 and 4899, 7370 and 7379, equal to 3674 or 3695, and 0 otherwise. "HT*PostFD" is an interaction term between HT and PostFD, and "Log Cap*PostFD" is an interaction term between firm size (log capitalization) and PostFD. P-values based on two-sided tests are given in parentheses.

Even after controlling for all the variables discussed above, the dummy variable, PostFD, is still loaded with a significant negative coefficient. These regression results hence further show that the pre-announcement abnormal trading volume has become more negative after RFD.

3.4. Cross-sectional differences in the change of pre-announcement volume before and after RFD. In this subsection, we examine whether the increased perceived information asymmetry and thus the decreased abnormal trading volume before earnings announcements after RFD is caused by the chill effect, that is, after RFD, firms are less likely to disclose non-public information to investors due to the possible litigation or proprietary costs.

Previous studies show that small firms tend to have a larger chill effect. For example, in its survey study, the National Investor Relations Institute (2001) reports that investors believe that RFD has a greater impact on small firms than on large ones. The study by Lang and Lundholm (1993) shows that disclosure costs per unit of size are decreasing with firm size. Thus, the cost of public disclosure is higher for smaller firms. Without selective disclosure, analysts may abandon small firms because any gains from selling or trading on the private information produced cannot cover the costs of obtaining such information.

Firms in the high-tech sector also tend to have a large chill effect after RFD. These firms are characterized by intense price competition and volatile business conditions due to the fast pace of innovation. To better compete, these firms often are engaged in significant research and development activities and possess valuable proprietary information. Since revealing proprietary information to the public may be extremely costly for such firms, these firms will curtail information disclosure if selective disclosure is prohibited. Therefore, firms in high-tech industries are more likely to have high perceived information asymmetry and the decreased abnormal trading volume after RFD, due to the larger chill effect.

In panel B of Table 4, we run regressions of pre-announcement abnormal trading volume on the interaction terms of PostFD with size and PostFD with a high tech dummy HT. Following Ahmed and Schneible (2007), HT equals 1 if SIC code is between 2833 and 2836, 3612 and 3613, 3621 and 3629, 3651 and 3652, 3661 and 3669, 3671 and 3672, 4812 and 4822, 4832 and 4899, 7370 and 7379, or equal to 3674 or 3695, and 0 otherwise. Other control variables from panel A are also included. In all specifications, the interaction term of PostFD with size has a significant positive coefficient with p-value less than 0.01; the interaction term of PostFD with HT has a negative coefficient with significance at either 0.06 or 0.10 levels. These results indicate that the pre-announcement abnormal trading volume decreases more for small and high-tech firms after RFD.

In panel A of Table 5, we apply t-tests and sign tests to assess the significance of the mean and median within-firm change of pre-announcement abnormal volume for small, medium, and large firms before and after RFD. We sort the sample into three groups each year based on market capitalization. While the pre-announcement abnormal trading volume has decreased for both small and medium-sized firms, there is no significant change for large firms. Compared to large firms, small firms' mean (median) pre-announcement abnormal volume has decreased by 5.626% (6.537%). The difference is significant at the 0.002 (0.0002) level.

Table 5. The impact of RFD on firms of different sizes

Panel A: Abnormal trading volume over (-10, -3)								
	Small size firms		Medium size firms		Large size firms		Small minus large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Pre-RFD	-2.329	-3.741	-1.772	-3.632	-0.636	-2.008	-1.693	-1.733
Post-RFD	-8.940	-11.331	-8.390	-9.899	-1.622	-3.061	-7.318	-8.270
Change (Post-Pre)	-6.611	-7.590	-6.618	-6.267	-0.985	-1.053	-5.626	-6.537
p-value	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.245)	(0.242)	(0.002)	(0.0002)
Panel B: Proportion of firms covered by one or more analysts								
	Small size firms		Medium size firms		Large size firms		Small minus large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Pre-RFD	37.28%		64.66%		76.36%		-39.08%	
Post-RFD	35.23%		76.37%		90.56%		-55.33%	
Change (Post-pre)	-2.05%		11.70%		14.20%		-16.25%	
P-value	(0.294)		(<0.0001)		(<0.0001)		(<0.0001)	

Notes: This Table reports the impact of RFD on pre-earnings announcement abnormal trading volume and on analyst coverage for small, medium, and large firms. Firms are sorted into three groups each year based on their market capitalization at the beginning of each year. "Change" measures the mean and median within-firm change after RFD adoption. P-values are two-sided, from t-tests for means, and from sign tests for medians. For measurement of abnormal trading volume, see notes in Table 1.

If smaller firms are more likely to mute disclosures after RFD, then the relative cost of analysts who follow such firms should increase. Some analysts may discontinue the coverage of a firm if the perceived benefit shifts below the inflated costs. That is, there may be a reallocation of information-producing resources toward larger firms. The chill effect may manifest in thinner coverage on smaller firms and wider coverage on large firms. In panel B of Table 5, we report the proportion of firms covered by analysts for small, medium, and large firms. After RFD, the proportion of small firms covered by one or more analysts has decreased from 37.28% to 35.23%; in contrast, the proportion has increased from 76.36% to 90.56% for large firms. This result is also consistent with findings in Gomes, Gorton, and Madureira (2007).

3.5. Abnormal volume during earnings announcements before and after RFD. If investors curb trading before earnings announcements for fear of their information disadvantage, they may execute the delayed trading during earnings announcements. During public release of earnings information, firms can no long disclose material information to a selected audience after RFD. All investors have access to earnings release. Thus, they may become more confident to trade during this time window. Any trades that are postponed before scheduled announcements may be now submitted. Table 6 presents the results of cross-sectional regressions about abnormal trading volume during earnings announcements. We follow the specification in Bailey et al. (2003) and regress abnormal trading volume cumulated during earnings announcements on firm size, absolute returns during earnings announcements (representing return volatility), the PostFD dummy, and a slope dummy term that assesses changes in the relationship between trading volume and absolute returns after RFD.

Table 6. Analysis of abnormal trading volume during earnings announcements before and after RFD

	Panel A: Different measurement windows			Panel B: Different fiscal quarters (3 days)				Panel C: Immediately before versus immediately after		
	Day 0	3 Days (-1,0,1)	5 Days (-2 to 2)	First quarter	Second quarter	Third quarter	Fourth quarter	Day (-2 , -1)	Day (1, 2)	Day (1, 2) minus Day (-2,-1)
Constant	13.932	-24.164	-30.389	11.593	-83.332	-21.479	5.808	-44.390	-3.353	41.037
	(0.0003)	(0.003)	(0.014)	(0.507)	(<0.0001)	(0.140)	(0.762)	(<0.0001)	(0.599)	(<0.0001)
Log Cap	-0.269	2.221	2.521	-1.223	6.333	1.338	2.327	1.854	1.162	-0.692
	(0.315)	(0.0001)	(0.003)	(0.298)	(<0.0001)	(0.180)	(0.090)	(<0.0001)	(0.008)	(0.169)
Absret	1201.187	3288.816	4327.728	3395.49	3456.864	3254.529	3009.764	933.782	2184.227	1250.444
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Absret *PostFD	-334.271	-790.974	-958.317	-951.696	-1206.439	-976.825	-358.081	-330.641	-282.236	48.405
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.058)	(<0.0001)	(<0.0001)	(0.5217)
PostFD	9.234	18.914	16.316	37.466	23.108	33.069	-10.364	-0.544	7.759	8.303
	(<0.0001)	(<0.0001)	(0.001)	(<0.0001)	(0.0002)	(<0.0001)	(0.195)	(0.828)	(0.003)	(0.006)
Adj. R-square	8.8%	14.0%	11.5%	14.0%	13.8%	14.%	12.9%	2.1%	12.0%	4.29%

Notes: This Table reports analysis of abnormal trading volume during earnings announcements before and after RFD. The dependent variable is the difference between average log turnover over an earnings announcement, and average log turnover from day -40 to day -11, magnified by 100 times. "Absret" measures the average absolute return 3 days over an earnings announcement. "Log Cap" measures the average log capitalization of the firm from day -40 to day -11. PostFD equals 1 for quarterly earnings events after RFD adoption, 0 otherwise. P-values based on two-sided test are given in parentheses.

In panel A of Table 6, we measure abnormal trading volume over different windows of an earnings announcement, either day 0, day -1 to 1, or day -2 to 2. As shown there, the coefficient on the absolute return variable is positive and significant while the coefficient on the interaction term of PostFD with the absolute return is uniformly negative and significant. Thus, abnormal trading volume is positively related to the absolute return. Firm size is applied to control for factors related to general information environments. The coefficient on size is not significant for some specifications. The estimated coefficient on the PostFD dummy is positive and highly significant at better than 0.001 levels in all three regressions. These findings are consistent with those in Bailey et al. (2003). We interpret the positive coefficient on PostFD as evidence that investors are more likely to defer their pre-announcement trading orders toward the public earnings release.

In panel B, we present regression results for different fiscal quarters. The coefficient before PostFD is significantly positive for fiscal quarter one, two, and three at better than 0.001 level but not significant for the fourth quarter[1].

[1] Fourth quarter announcements are usually accompanied by the annual earnings announcements, which typically contain more disclosures that take more time for investors to process and interpret. Hence, discretional trading that is curbed before earnings announcement may be further delayed until the information becomes clear. When we change the earnings announcement window to (-1, 5), the coefficient on the PostFD dummy turns significantly positive for the fourth quarter regression.

If the increased trading volume during earnings announcement window represents postponed trades from investors who have perceived more information asymmetry after RFD, the increase should concentrate in one or two days immediately after firms release earnings news to the public. On the other hand, if the increased volume represents more speculative trades, we should observe some volume increase immediately before firms release earnings news. The result in panel C of Table 6 is consistent with the first explanation. The coefficient before PostFD is significantly positive for day (1, 2) and not significant for day (-2, -1).

3.6. Additional sensitivity analysis. Related to the measurement of abnormal trading volume, we have repeated our tests using several different measurement windows (e.g., day -13 to -3) and different benchmark windows (e.g., day-50 to day -15), the results (untabulated) are qualitatively similar. While our before- and after-RFD periods each contain four years, using other length such as one year or two year generates consistent (sometimes even stronger) patterns that the pre-announcement abnormal trading volume has significantly decreased after RFD. We also replace log turnover with raw turnover and obtain qualitatively similar results.

Earnings announcements may be clustered around certain calendar days in a year and this may complicate our inference of statistical significance. To address this concern, we examine firms with non-December fiscal year-ends. The distribution of earnings announcement dates for this sub-sample is more scattered in a calendar year. We identify 372 firms with non-December fiscal year-ends and include the change in pre-announcement abnormal trading volume in Table 3. The decrease in abnormal trading volume after RFD is still significant at the 0.0001 level, though the significance comes mostly from the second and the third fiscal quarters.

There could be other changes in the macroeconomic environment over time that may potentially confound our results. One important environmental change that occurred around the same time as RFD, pointed out by Bailey et al. (2003), is the switch to decimalization by the major exchanges. While our measure of abnormal trading volume is unlikely to be affected by the decimal change because it is difficult to imagine why the decimalization may affect a firm's benchmark period and pre-announcement period differently, we nonetheless recognize that any research on policy changes cannot totally rule out the possibility that observed changes in economic effects are due to confounding macroeconomic factors.

Conclusion

In this paper, we have used the abnormal trading volume over a period of eight days before earnings announcements to investigate the impact of RFD on investors' perceived change in earnings-related information asymmetry. We document two pieces of empirical evidence. First, after RFD, the average abnormal trading volume before earnings announcement decreases about 4%. This finding indicates that RFD may induce uninformed investors to perceive higher information asymmetry before earnings announcements, the cause for decreased trading volume. Second, this decreased trading volume after RFD is more pronounced in small firms and technology firms. While the focus of our study is to examine the impact of RFD on information asymmetry before earnings announcements, we also document some evidence that RFD increases trading volume during earnings announcements. This finding may imply that RFD reduces information asymmetry during earnings announcements, and is consistent with the elimination of selective disclosure. Our evidence thus suggests that while RFD may reduce information asymmetry *during* earnings announcements (*the level ground effect*), information asymmetry may increase *before* earnings announcements (*the chill effect*).

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