A Reexamination of Information Flow in Financial Markets: The Impact of Regulation FD and Decimalization

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We investigate the impact of Regulation FD on information flow in the equities market. Our analysis indicates that information flow around earnings announcements, proxied by abnormal return volatility around those announcements, of U.S. stocks increased in the first effective quarter of Regulation FD (the fourth quarter of 2000). The information flow of ADRs, which are exempt from Regulation FD, does not change. This supports the inference that Regulation FD, not general market conditions, caused the increase in volatility, but Regulation FD did not have a persistent impact on information flow. A multivariate regression analysis shows that our results are robust to controls that include decimalization, which was implemented concurrently with Regulation FD and has reduced return volatility. Our comparison of return volatilities across firm size indicates that small firms temporarily had larger return volatilities; thus, Regulation FD only temporarily had a differential impact on the information environment of small firms.

Introduction and Motivation

Corporate disclosure has long been a controversial and complicated issue. As the violations of insider trading laws over the years have shown, individuals occasionally profit from material corporate information that has not been disclosed publicly. In addition, many corporations (such as Enron and WorldCom) have not gone far

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enough in providing transparent data about their operations. Other corporations regularly release annual reports that are hundreds of pages in length and difficult for individual investors to assimilate.

In light of this continuing controversy, it is appropriate to explore the impact of a recent change in how corporations release information to the investing community. In October 2000, the Securities and Exchange Commission (SEC) started requiring companies to comply with Regulation Fair Disclosure (FD). This rule prohibits corporations from selectively disclosing material, non-public information to investment analysts or institutional investors. Regulation FD, in theory, should increase fairness in information access by requiring issuers to publicly release material information.

Analysts, however, argue that a level playing field may have resulted at the expense of lowering the quality and quantity of information provided to investors. Because the SEC does not provide specific guidelines on materiality, companies that are unable to classify information may tend to avoid releasing it at all rather than risk the legal liability associated with disclosing it informally or selectively.[1] Although the SEC has incorporated certain safeguards against inappropriate liability, this could still be a concern to companies, especially before legal precedents exist.

On the other hand, the quality of company announcements may be reduced if companies react to Regulation FD by releasing all information, whether material or not. Under this scenario, individual investors may be left to decipher the information before analysts can evaluate it and quantify its relevance. Prohibiting selective disclosure may cause corporate information to arrive less frequently and result in large changes in stock prices around earnings announcements. Releasing corporate data simultaneously to all parties may cause increased volatility as investors try to determine the true value of new data.

In this paper we examine the impact of Regulation FD on information flow, as proxied by abnormal stock return volatility, and investigate its differential effect on firms of different sizes. Other researchers (Heflin, Subramanyam, and Zhang, 2001b) analyze Regulation FD and return volatility. We offer a more methodologically sound approach to test the impact of Regulation FD on stock returns. Because Regulation FD does not apply to foreign companies, our design examines the relation between the return volatility of foreign issues, specifically American Depositary Receipts (ADRs) listed on the NYSE and NASDAQ, and U.S. issues around earnings announcements. Any difference between the average return volatility of the two samples should be attributed to Regulation FD, and an increase in return volatility would indicate that the earnings announcements have greater information content.

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[1] In *TSC Industries, Inc v. Northway, Inc.,* the U.S. Supreme Court stated that information is material when "there is substantial likelihood that a reasonable investor would consider it important in deciding how to [act]." The classification of materiality, however, also heavily depends on the circumstances of each case.

Our results indicate that the abnormal return volatility of firms increased in the first effective quarter of Regulation FD. The data, however, are consistent with this impact being only temporary. Our regression results show that decimalization, which occurred contemporaneously for many firms with the first effective date of Regulation FD, reduced stock return volatility and mitigated the temporary increase in return volatility associated with Regulation FD. The evidence indicates that the information flow from small firms is temporarily more sensitive to the new disclosure rules. This may be a result of these firms reducing information quantity or quality until they are able to copy the disclosure practices of larger companies.

Regulation FD

Regulation FD requires that public companies release material, non-public information through a news release or open conference call before it is discussed in a restricted-access forum with analysts or professional investors. If such information is selectively released in an unintentional manner, the company is required to disseminate the information within 24 hours by either issuing a press release or filing Form 8-K with the SEC. If the inadvertent disclosure occurs during a holiday or weekend, the official release must be made before the start of the next trading day.

Anecdotal evidence *prior* to the implementation of Regulation FD suggests that it may increase stock volatility. To investigate how corporations plan to react to the new regulation, the National Investor Relations Institute (NIRI) (2000) conducted a survey of 462 investor relations professionals from a broad cross section of companies. This survey showed that 42 percent of those professionals will probably limit communication practices and another 12 percent said they would limit their practices "significantly" should the SEC approve Regulation FD.

An NIRI survey (2001) conducted *after* the effective date of Regulation FD, however, suggests that companies are not as apprehensive about information releases following implementation. According to that survey, 27 percent of the 577 respondents indicate that they are providing more information to investors as a result of Regulation FD. Nearly one-half of analysts (48 percent) are issuing about the same amount of information, while 24 percent are disseminating less information than before the new rule went into effect.

Researchers are pursuing three different paths to investigate the impact of Regulation FD. First, a line of research examines the post-FD behavior of investment analysts. Through an analysis involving the first three quarters following the implementation of Regulation FD, Agrawal and Chadha (2002) conclude that sell-side analysts' earnings forecasts are less accurate and more dispersed without selective disclosure. Consistent with these results, Hutton (2002) examines a survey of 577 corporations regarding their corporate disclosure policies. She finds that analysts who receive guidance produce more accurate but more pessimistic forecasts before Regulation FD. She interprets management guidance as a quid pro quo where ana-

lysts get more accurate forecasts and managers get to beat earnings estimates.[2] This survey provides additional insight by revealing that 81 percent of the companies in the survey reviewed the draft earnings models of analysts, but 47 percent of these companies discontinued this practice in the post-FD environment.

In contrast to results presented by Agrawal and Chadha (2002), Heflin *et al.* (2001a) find no change in the bias, accuracy, or dispersion of analysts' forecasts. One limitation of their study is that it measures the average impact of Regulation FD. Therefore, it cannot reveal whether certain types of companies were helped or hurt by the abolishment of selective disclosure. Shane, Soderstrom, and Yoon (2001) also examine analyst forecast accuracy in the post-FD financial environment. The authors find that analysts gather more information between earnings announcements so that their forecasts are ultimately as accurate as before Regulation FD. This paper suggests that analysts have effectively compensated for the lack of selective disclosure by gathering company-specific data in alternative ways.

Zitzewitz (2002) focuses on the timing of analysts' forecasts to gauge the impact of Regulation FD. He examines the frequency of multi-forecast days, which occur when several analysts update their forecasts at the same time. Single forecasts days are assumed to represent private information gathered by an analyst, but multi-forecast days are more likely to result from publicly released data. Multi-forecast days made up 35 percent of the new information about earnings before Regulation FD, and this percentage doubled after Regulation FD.

The next research path investigates how Regulation FD affects information asymmetry. Eleswarapu, Thompson, and Venkataraman (2001) find no support for the assertion that Regulation FD increased trading costs or the probability of adverse selection during information events. In addition, their analysis of market model residuals shows that information flow remains unchanged with Regulation FD. Straser (2002) examines the 68 trading days after the implementation of Regulation FD and infers that companies reacted to the new regulation by providing a higher quantity, but lower quality of information to the public. She uses the probability of informed trading and the size of the adverse selection component of the bid-ask spread to proxy for information asymmetry.

A third line of research examines return volatility. Heflin *et al.* (2001b) explore the impact of Regulation FD and conclude that there is no deterioration of information flow into the market since Regulation FD took effect. Information quality is measured by return volatility around earnings announcements and by analyst forecast accuracy and dispersion. Heflin *et al.* (2001b) use a method of matching sample firms with a control firm both one quarter prior to Regulation FD implementation and the quarter one year prior to implementation. By looking at these two quarters, the matched-pair sample design attempts to minimize effects that may otherwise be

[2] Analysts are often compensated based on their accuracy in forecasting short-term earnings.

attributable to changes in the economic environment or comparison of unlike quarters. Heflin *et al.* admit to possible empirical design limitations: "… we have attempted to control for changes in economic factors that could affect our inferences, [however] we can never completely rule out the possibility that our results are driven by some other contemporaneous economic event unrelated to Regulation FD" (p. 5).

We believe that the Heflin *et al.* (2001b) methodology does not accurately isolate the effect of Regulation FD. One confounding factor that is not controlled for by this method is the gradual switch to decimalization by the AMEX, NASDAQ, and NYSE. Decimalization refers to quoting stock prices in decimals instead of fractions, and this pricing system allows a smaller bid-ask spread and a smaller minimum price change. As decimalization was implemented across securities and exchanges between August 2000 and April 2001, volatility measures during the final quarter of 2000 would reflect the effects of both decimalization and Regulation FD for some securities.

Research on the impact of decimalization indicates that it reduces price and return volatility. A recent study prepared by the NYSE Research Division (2001) examines price volatility by measuring how the execution of 3,000-, 5,000-, and 10,000-share trades affects the price before and after the execution of the transaction. After decimalization, the impact was "considerably lower." In their investigation of the first week of the March 26, 2001 decimalization pilot program, NASDAQ Economic Research (2001) finds an overall decrease in the intraday volatility of stocks involved in the program relative to securities trading at non-decimal prices. In his investigation of the impact of decimalization, Bessembinder (2002) reaches the following conclusion: "For the full sample of NYSE stocks median return volatility declined from 2.04 percent in the pre-decimalization sample to 1.56 percent post decimalization. For the full NASDAQ sample the decrease in median volatility is from 3.66 percent to 2.98 percent."

Data and Sample Selection

We examine the impact of Regulation FD on securities by measuring the abnormal return volatility around earnings announcements. Our sample, therefore, consists of quarterly earnings announcements subsequent to the implementation of the regulation. The First Call database provides earnings announcement dates for the fourth quarters of 1998-2000 and the first through third quarters of 2001. Actual and expected earnings per share data are obtained from the I/B/E/S detail history database. We obtain security returns data from the Center for Research in Security Prices (CRSP). We eliminate all observations for which the previous quarter's earnings per share are unavailable. We also eliminate observations for which returns are not available for a security for every day in the event window and for which more than 20 observations are missing during the market model estimation period. To avoid the possibility of extreme observations unduly influencing our results, we

eliminate observations for which any of the variables considered exceeds the 99th percentile of that variable's distribution.[3] This provides us with 2,937 earnings announcements by U.S. firms and 187 earnings announcements for ADR issuers over the four quarters.

Our sample of 187 ADRs are from 20 countries. Israel, where 28 firms are primarily located, is the most represented. We exclude companies headquartered in the United Kingdom from our ADR sample because they are already subject to regulations that prohibit selective disclosure. The United Kingdom Listing Authority, part of the Financial Services Authority, requires that price-sensitive information be released to the market as a whole (Financial Services Authority, 1996).

To construct our control we employ two methods. First, we compare abnormal return volatilities for all post-FD quarterly earnings announcements with abnormal return volatilities for three control quarters: the third quarter of 2000, and the fourth quarters of 1998 and 1999. Using the same procedure for eliminating observations as described above, we obtain 1,151 earnings announcements by U.S. firms and 137 earnings announcements for ADR issuers during these pre-FD quarters. Second, we employ quarter-to-quarter comparisons between each firm with sufficient information during one of the post-FD quarters and the same firm during one of the pre-FD quarters. Only firms with all necessary data in both the post-FD and pre-FD quarters being analyzed remain in the sample. This provides us with samples between 117 and 430 U.S. firms and between 30 and 46 ADRs depending on the pre-FD and post-FD quarters.[4]

Hypotheses and Methodology

Impact of Regulation FD on U.S. Issues

In our preliminary analysis, we examine the impact of Regulation FD on abnormal return volatility focusing specifically on U.S. common stocks. Although Regulation FD applies to most securities listed on U.S. exchanges, *it does not apply to all securities.* Specifically, foreign issues are currently exempt from Regulation FD. These issues are still required to comply with decimalization; thus, they provide a unique control sample to test the impact of Regulation FD.

Because our sample extends to the third quarter of 2001, we are able to measure the effect of the regulation over a longer period than Heflin *et al.* (2001a). If information flow has deteriorated post-FD, either in quality or quantity, we would expect to find greater abnormal return volatility around earnings announcements of U.S. issues subsequent to the implementation of the regulation. Our first hypothesis is as follows:

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[3] This restriction eliminates 33 U.S. and two ADR earnings announcements.

[4] Refer to Tables 1 and 2 for the specific number of observations in each comparison pertaining to this method of sample construction.

Hypothesis 1: Abnormal return volatility around earnings announcements by U.S. firms is insignificantly different in the pre-FD and post-FD periods.

Rejection of this hypothesis would imply that factors such as Regulation FD, decimalization, and general changes in market conditions are contributing factors to the change in abnormal return volatility from the pre-FD period to the post-FD period.

To test this hypothesis, we calculate abnormal return volatility (ARV) around quarterly earnings announcements for U.S. common stocks in each of the quarters subsequent to the implementation of Regulation FD for which data are available to us. These are the fourth quarter of 2000 to the third quarter of 2001 and represent our U.S. event samples. We only include securities listed on NYSE, NASDAQ, and AMEX to construct our control samples. Our control samples are abnormal return volatility around earnings announcements by our U.S. sample firms in (a) the third quarter of 2000, which provides us with the most recent control available, (b) the fourth quarter of 1999, which will control for comparison of unlike quarters, and (c) the fourth quarter of 1998. There has been anecdotal evidence that firms began reducing selective disclosure practices prior to October of 2000 in an attempt to prepare for the implementation of Regulation FD. By using the fourth quarter of 1998 as an additional control period, our results will be robust to these claims.

Abnormal return volatility around earnings announcements is measured as

$$ARV_{i,q} = \sum_{t=-m}^{+m} \left(R_{i,q,t} - E\left[R_{i,q,t}\right]\right)^2 \quad (1)$$

where $ARV_{i,q}$ is the abnormal return volatility for firm i in quarter q, over event windows of five days, -2 to +2, around the announcement.[5] $R_{i,q,t}$ is defined as the return for firm i in quarter q on day t, and the expectation $E[R_{i,q,t}]$ is calculated using the market model over a period of 100 trading days prior to the event window. Because our results may be sensitive to differences in the normal return volatility of each stock, we deflate the abnormal return volatility, which is defined in equation (1), by dividing ARV by each firm's average daily market model residual volatility during the market model estimation period.

We test for differences in deflated abnormal return volatility (DefARV) across our sample-control pairs in two ways. First, we use a two-tailed t-test to examine the hypothesis that Regulation FD has no impact on return volatility and that the difference in volatility between the sample–control pairs is statistically insignificant. Second, we perform a multivariate regression similar to that employed by Heflin *et al.* (2001b).

[5] Event windows of one day (day -1 alone, and day 0 alone, respectively), two days (day -1 to day 0), threee days (day -1 to +1), and 11 days (day -5 to +5) were also used. The results, which are not presented, are not significantly different from the five-day window results.

$$ARV^{U.S.}_{i,q} = b_0 + b_1 PostFD_{i,q} + b_2 Loss_{i,q} + b_3 Mag_{i,q} + b_4 Trend_{i,q} + b_5 VAR_{i,q} + e_{i,q} \quad (2)$$

where $PostFD_{i,q}$ is a dummy variable taking on the value of unity if the observation is from the post-FD period and the value of zero otherwise. Related literature (Hayn, 1995; Freeman and Tse, 1992; Barth, Elliot, and Finn, 1999) has suggested that the sign of earnings, magnitude of unexpected earnings, and the earnings trend are significant determinants of the relationship between earnings and return. Thus, $Loss_{i,q}$, which is a dummy variable with value of unity if the earnings are negative and zero otherwise, $Mag_{i,q}$, the size of the unexpected component of earnings measured by the difference between actual earnings and mean expected earnings, and $Trend_{i,q}$, a dummy variable with the value of unity if quarter q's earnings are greater than that of quarter q's earnings in the previous year and zero otherwise, are included. Any cross-sectional differences in return volatility are controlled for by including $VAR_{i,q}$ in the regression model. This variable represents the average daily variance of the market model prediction errors. We perform additional testing of H1 concurrently with our testing of H4 below where we control for decimalization.

Impact of Regulation FD on ADRs

As ADRs are not subject to Regulation FD, we would expect these firms to exhibit similar return volatility patterns during the pre-FD and post-FD periods. To ensure that our findings for the U.S. firms are robust, and not generated by market-wide changes, we examine return volatility for ADRs across the same quarters used in our analysis of U.S. issues. Our second null hypothesis, therefore, is:

Hypothesis 2: Abnormal return volatility around earnings announcements by ADRs is insignificantly different in the pre-FD and post-FD periods.

Rejection of the hypothesis would imply that factors such as decimalization and general changes in market conditions are contributing factors.

In a similar manner to that described for equation (2), the abnormal return volatility is deflated by dividing by each ADR's average market model residual volatility to control for differences in the normal return volatility of each security. The two-tailed t-test is used to determine the significance of differences in deflated abnormal return volatility between sample and control. We also run a similar multivariate regression on our ADR sample.

$$ARV^{ADR}_{i,q} = b_0 + b_1 PostFD_{i,q} + b_2 Loss_{i,q} + b_3 Mag_{i,q} + b_4 Trend_{i,q} + b_5 VAR_{i,q} + e_{i,q} \quad (3)$$

where the independent variables are defined previously.

Differential Impact of Regulation FD on U.S. Issues and ADRs

In their multivariate regression model, Heflin *et al.* (2001a) find that the coefficient for $PostFD_{i,q}$ is significant and negative, and they conclude that there is no deterioration in the information quality based on this measure. But they do not provide an adequate control for changes in the securities markets. If Regulation FD significantly altered the information environment, we would expect a significant difference in post-FD abnormal return volatility between U.S. issues and ADRs, which are not subject to Regulation FD. This provides the basis for our next hypothesis.

Hypothesis 3: The abnormal return volatility around earnings announcements by U.S. firms is not significantly different from that of ADRs.

We test the hypothesis using our post-FD sample of firms (both U.S. issues and ADRs) and the following multivariate regression model:

$$ADR^{all}_{i,q} = b_0 + b_1 Loss_{i,q} + b_2 Mag_{i,q} + b_3 Trend_{i,q} + b_4 VAR_{i,q} + e_{i,q} \quad (4)$$

where $ADR_{i,q}$ takes a value of unity if firm i is an ADR and zero otherwise and all other variables are as defined previously. Significance of the $ADR_{i,q}$ variable would indicate that abnormal return volatility differs between U.S. firms and ADRs, and thus would lead us to reject hypothesis 3.

As an additional test of the differential impact of Regulation FD on U.S. issues and ADRs, we calculate the return volatilities for our U.S. issues sample and our ADR sample in each of the quarters analyzed. We then test whether there is a significant difference in deflated abnormal return volatility between our U.S. issues sample and our ADR sample for each quarter.

Impact of Decimalization on Return Volatility

Decimalization was implemented in stages on the NYSE, NASDAQ, and AMEX. The first stage was implemented in the fourth quarter of 2000 for a limited group of stocks, and the final group of firms was switched over by the end of April 2001. To determine whether introduction of decimalization played a significant role in abnormal return volatility around earnings announcements, we propose the following hypothesis.

Hypothesis 4: Decimalization has an insignificant effect on abnormal return volatility around earnings announcements.

To test our hypothesis, initially we employ the following multivariate regression model:

$$ARV^{NYSE}_{i,q} = b_0 + b_1 PostFD_{i,q} + b_2 Loss_{i,q} + b_3 Mag_{i,q} + b_4 Trend_{i,q} + b_5 VAR_{i,q} + b_6 DEC_{i,q} + e_{i,q} \quad (5)$$

where $DEC_{i,q}$ is unity if the earnings announcement for firm i occurs subsequent to decimalization for that security and zero otherwise. Significance of the decimaliza-

tion dummy variable would lead to rejection of hypothesis 4 and indicate that the concurrent implementation of decimalization was a confounding event in the measurement of ARV.

We also test hypothesis 4 by comparing the deflated ARVs of three subsamples of firms. Firms are placed in the above groups by comparing the earnings announcement dates to the dates of decimalization. The first subsample consists of firms that do not have decimalized trading in either the pre- or post-FD period. This group is used to isolate the effect of Regulation FD before decimalization. The second subsample contains firms that are not decimalized in the pre-FD period but are decimalized in the post-FD period. This group combines the effects of Regulation FD and decimalization, but allows for isolation of the effect of Regulation FD when comparing two post-FD quarters. The final subsample is composed of firms that are decimalized in both the pre- and post-FD periods; the ARVs of this class reflect the effect of Regulation FD after decimalization.

Differential Impact of Regulation FD on Small, Medium and Large Firms

The results of the PriceWaterhouseCoopers (2001) survey indicate that large firms better understand the requirements of Regulation FD than small firms. Furthermore, we expect that firm size is an indicator of the amount of resources that a firm can allocate toward ensuring that information released is compliant with Regulation FD. Therefore smaller firms may opt to release less information and create greater abnormal return volatility around earnings announcements.

Furthermore, small firms may have provided analysts with selective disclosure in the pre-FD period to attract their coverage. If Regulation FD reduced analysts' incentives to cover small firms, we expect to see greater return volatility for smaller companies. Consistent with the argument that analyst coverage affects returns, Hong, Lim, and Stein (2000) document that trading strategies based on momentum are more profitable for firms with lower analyst coverage.

This leads to the following null hypothesis:

Hypothesis 5: Abnormal return volatility does not differ among various size firms.

To test this hypothesis we place firms in one of three categories based upon their total market capitalizations. We use the same size categories as the PriceWaterhouseCoopers (2001) survey (large firms have market capitalization above $5 billion; medium firms have market capitalizations from $1.0 billion to less than $5 billion; small firms have market capitalizations less than $1.0 billion) to classify firms by size and compare the deflated abnormal return volatility across various periods for each of the three size categories.

Results

U.S. Sample Versus ADR Sample

In Table 1 we report the abnormal return volatility deflated by the average market model residual volatility of U.S. firms across periods. These periods include the fourth quarters from one and two years prior, and from one quarter prior to three quarters after the effective quarter (Q4 2000 = 0) of Regulation FD. The comparison of period 0 and period –1 indicates that the DefARV increased imme diately follow-

Table 1—Deflated Abnormal Return Volatility Differences across Periods for U.S. Firms

This table presents the abnormal return volatility deflated by average market model residual volatility (DefARV) for U.S. common stock between fiscal quarter-end periods where the periods are defined as follows: 0 = Q4 2000, -1 = Q3 2000, -4 = Q4 1999, -8 = Q4 1998, +1 = Q1 2001, +2 = Q2 2001, +3 = Q3 2001. The ARV is measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. ARV is calculated as the cumulative abnormal return volatility where the expected return for each stock is calculated using market model parameters measured over a 100-day period prior to the event window. DefARV is ARV divided by the average market model residual volatility for each firm's earnings announcement. $DefARV_a$ represents the DefARV for the first of the two periods and $DefARV_b$ represents the DefARV for the second of the two periods. The statistical significance of the difference (a – b) is presented in brackets immediately below the respective difference.

Periods a b	$DefARV_a$	$DefARV_b$	Difference (a – b)	Observations
0 and -1	13.579	9.773	3.806 *	165
			(1.72)	
0 and -4	10.082	12.100	-2.018	134
			(-0.92)	
0 and -8	10.390	6.748	3.642 ***	117
			(2.50)	
1 and 0	8.744	10.309	-1.565	169
			(-0.99)	
2 and 0	8.279	12.541	-4.262 *	155
			(-1.92)	
3 and 0	8.279	11.820	-3.441 *	205
			(-1.87)	
1 and -1	8.275	10.800	-2.525 *	362
			(-1.84)	
2 and -1	8.560	10.202	-1.642	335
			(-1.60)	
3 and -1	8.873	10.220	-1.347	430
			(-1.17)	
1 and -8	6.453	7.111	-0.658	141
			(-0.70)	
2 and -8	8.280	6.519	1.761	135
			(1.35)	
3 and -8	8.504	7.296	1.208	172
			(1.11)	

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

ing the implementation of Regulation FD. The comparisons of similar quarters provide mixed results; DefARV in period 0 is higher than in period -8 but it is not significantly different from period -4. The analysis generally suggests that DefARV increased in the fourth quarter of 2000, and the data provide weak evidence to reject hypothesis 1.

Next, we examine whether this increase in return volatility was temporary. DefARV in periods 2 and 3 are less than DefARV in period 0, and this result is statistically significant at the 10 percent level. Furthermore, none of the comparisons of return volatility after period 0 to pre-FD periods suggest that the increase is persistent. Thus, the results in Table 1 are consistent with the impact of Regulation FD

Table 2—Deflated Abnormal Return Volatility Differences across Periods for ADRs

This table presents the abnormal return volatility deflated by average market model residual volatility (DefARV) for ADRs between fiscal quarter-end periods where the periods are defined as follows: 0 = Q4 2000, -1 = Q3 2000, -4 = Q4 1999, -8 = Q4 1998, +1 = Q1 2001, +2 = Q2 2001, +3 = Q3 2001. The ARV is measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. ARV is calculated as the cumulative abnormal return volatility where the expected return for each stock is calculated using market model parameters measured over a 100-day period prior to the event window. DefARV is ARV divided by the average market model residual volatility for each firm's earnings announcement. $DefARV_a$ represents the DefARV for the first of the two periods and $DefARV_b$ represents the DefARV for the second of the two periods.

Periods a b	$DefARV_a$	$DefARV_b$	Difference (a – b)	Observations
0 and -1	7.787	7.380	0.407	46
			(0.15)	
0 and -4	8.372	8.507	-0.135	37
			(-0.05)	
0 and -8	8.379	8.340	0.039	32
			(0.01)	
1 and 0	6.213	7.415	-1.202	41
			(-0.52)	
2 and 0	7.758	8.747	-0.989	39
			(-0.34)	
3 and 0	16.465	9.840	6.625	32
			(1.10)	
1 and -1	6.319	7.175	-0.856	46
			(-0.48)	
2 and -1	7.532	7.888	-0.356	43
			(-0.17)	
3 and -1	16.528	7.912	8.614	35
			(1.54)	
1 and -8	7.199	8.646	-1.447	33
			(-0.53)	
2 and -8	8.552	8.542	0.010	34
			(0.00)	
3 and -8	17.927	9.143	8.784	30
			(1.38)	

* Significant at the 10 percent level

on return volatility being only temporary and confined to the fourth quarter of 2000. In support of hypothesis 2, the analysis presented in Table 2 shows that none of the DefARVs for the ADR sample are statistically different. Because the ADRs are exempt from Regulation FD, this supports the inference that Regulation FD caused the temporary increase in return volatility for the U.S. stocks.

U.S. Firms Versus ADRs Quarter-by-Quarter

We present results in Table 3 for the difference in abnormal return volatility deflated by the average market model residual volatility (DefARV) between U.S. firms and ADRs. The deflated ARV is greater for the U.S. firms during the fourth quarter of 2000 (the first effective quarter of Regulation FD), and this provides additional evidence to reject hypothesis 1. If Regulation FD has permanently altered the information environment of U.S. firms, then the difference between DefARV for U.S. firms and ADRs should extend beyond the effective quarter of Regulation FD. It is confined, however, to only the first quarter that Regulation FD is effective.

Table 3—Deflated Abnormal Return Volatility Differences between U.S. Common Stocks and ADRs

This table presents the abnormal return volatility deflated by average market model residual volatility (DefARV), for U.S. common stock and ADRs listed on the NYSE, AMEX or NASDAQ exchanges. DefARV is measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. ARV is calculated as the cumulative abnormal return volatility where the expected return for each stock is calculated using market model parameters measured over a 100-day period prior to the event window. DefARV is ARV divided by the average market model residual volatility for each firm's earnings announcement. The difference between the DefARV for U.S. common stocks and ADRs and the statistical significance of this difference are also presented.

	U.S.		ADR		Difference
Period	DefARV	Obs	DefARV	Obs	(U.S. – ADR)
Q4 1998	7.056	279	12.982	35	-4.396
					(-0.34)
Q4 1999	11.761	282	7.733	40	4.028
					(1.38)
Q3 2000	9.987	590	7.568	47	2.419
					(1.25)
Q4 2000	12.274	303	8.303	42	3.971 **
					(2.02)
Q1 2001	6.604	866	6.066	44	0.538
					(0.50)
Q2 2001	8.390	700	6.902	43	1.488
					(1.10)
Q3 2001	9.628	1068	16.753	34	-7.125
					(-1.27)

**Significant at the 5 percent level

The combined results from Tables 1 through 3 are inconsistent with hypothesis 1, but the data support hypothesis 2. We conclude that Regulation FD temporarily

increased return volatility because the deflated ARV has increased in U.S. firms when compared to the ADR control sample. In the next sections we examine the robustness of our results by controlling for decimalization and firm size.

Regression Models with ADR and Decimalization Dummy Variables

Table 4 presents the results of the regression model shown in equation 2. This analysis is similar to that used by Heflin *et al.* (2001b), but it is extended to include additional time periods and dichotomous variables for ADRs and decimalization.

Table 4—Regression Results

In this table, the dependent variable is the abnormal return volatility (ARV) measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. Model 1 uses only U.S. common stocks and all pre-FD and post-FD quarters. Model 2 uses only U.S. common stocks and all pre-FD quarters and Q4 2000. Model 3 uses only ADRs and all pre-FD and post-FD quarters. Model 4, which includes an ADR dummy variable, uses all pre-FD quarters and the entire sample. Model 5, which also includes an ADR dummy variable, uses all post-FD quarters and the entire sample. Model 6 uses all U.S. stocks and all pre-FD and post-FD quarters in our sample and includes a DEC dummy variable. Model 7 uses all U.S. stocks and all pre-FD quarters and Q4 2000 in our sample and includes a DEC dummy variable. Independent variables are defined as follows: *Post-FD* is equal to 1 if the fiscal quarter end is subsequent to October 23, 2000, and zero otherwise. *Loss* is equal to 1 if the actual earnings is negative and zero otherwise. *Trend* is equal to 1 if the current period's actual earnings is greater than that of the previous period and zero otherwise. *Mag* is equal to the difference between the actual earnings and the consensus expected earnings. *Mktvar* is the average volatility during the market model parameters estimation period. *ADR* is equal to 1 if the security is an ADR and zero otherwise. *Dec* is equal to 1 if the earnings announcement occurred after the firm was required to decimalize and zero otherwise.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Sample Period	U.S. Pre & Post	U.S. Pre & Q4 2000	ADRs Pre & Post	U.S. & ADRs Pre	U.S. & ADRs Post	U.S. Pre & Post	U.S. Pre & Q4 2000
Post-FD	-0.00372***	0.00434**	-0.00178			0.00303	0.00382*
	(-4.44)	(2.15)	(-0.41)			(1.58)	(1.71)
Loss	0.00242**	-0.00430*	-0.01595***	-0.00336	0.00014	-0.00104	-0.00142
	(2.01)	(-1.76)	(-3.05)	(-1.40)	(0.09)	(-0.81)	(-0.91)
Trend	-0.0012	-0.00320**	-0.00334	0.00273	-0.00104	-0.00255***	-0.00390**
	(-1.40)	(-1.96)	(-0.70)	(1.46)	(-0.79)	(-2.79)	(-2.31)
Mag	0.00035	0.00056	0.00058	0.00031	0.00042	0.00048	0.00053
	(0.59)	(0.81)	(1.30)	(0.35)	(0.28)	(0.76)	(0.96)
Mktvar	0.4485***	0.51601***	1.14779***	0.82550***	0.51604***	0.51577***	0.57182***
	(22.02)	(13.67)	(11.10)	(16.09)	(15.89)	(23.96)	(14.87)
ADR				0.00290	0.00128		
				(1.09)	(0.48)		
Dec						-0.00799***	-0.00957**
						(-4.30)	(-2.25)
Adjusted R^2	0.3099	0.3498	0.3389	0.2321	0.1117	0.3046	0.3285
Deg. Of Freedom	3180	1074	239	996	2384	3216	1147

Table 4 Continued—Regression Results

Sample	Model 8 U.S.	Model 9 U.S.	Model 10 U.S.	Model 11 U.S.	Model 12 U.S.	Model 13 U.S.
Period	Q4 99 & Q4 00	Q4 99 & Q4 00	Q4 98 & Q4 00	Q4 98 & Q4 00	Q3 00 & Q4 00	Q3 00 & Q4 00
Post-FD	0.00160	0.00319*	0.00848***	0.00635**	0.00283	0.00377
	(1.49)	(1.95)	(2.70)	(2.16)	(1.08)	(1.40)
Loss	-0.00599**	-0.00580**	-0.004256**	-0.00443**	-0.00025	-0.00038
	(-2.22)	(-2.20)	(-1.75)	(-1.72)	(-0.67)	(-0.55)
Trend	-0.00630*	-0.001618*	-0.00464	-0.00452	-0.00279	-0.00271
	(-1.90)	(-1.88)	(-1.36)	(-1.34)	(-1.09)	(-1.07)
Mag	0.00047	0.00055	0.00068	0.00072	0.00089	0.00091
	(0.46)	(0.58)	(0.72)	(0.88)	(0.94)	(1.01)
Mktvar	0.69340***	0.68432***	0.48400***	0.47303***	0.56050***	0.56575***
	(8.69)	(8.55)	(6.78)	(6.61)	(9.27)	(9.34)
ADR Dec		-0.00915*		-0.01354**		-0.00961*
		(-1.69)		(-2.04)		(-1.77)
Adjusted R^2	0.3239	0.3283	0.2953	0.3015	0.3113	0.3170
Deg. Of Freedom	416	416	383	382	628	626

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

The first seven models are defined as follows. Model 1 uses only U.S. common stocks and all pre-FD and post-FD quarters. Model 2 uses only U.S. common stocks and all pre-FD quarters and Q4 2000. Model 3 uses only ADRs and all pre-FD and post-FD quarters. Model 4 uses all pre-FD quarters and the entire sample and includes an ADR dummy variable. Model 5, which is estimated using all post-FD quarters and the entire sample, includes an ADR dummy variable. Model 6 uses all NYSE and NASDAQ stocks in our sample and includes a decimalization dummy variable. Model 7 is identical to Model 6 but compares the pre-FD quarters only to Q4 2000. Models 8 through 13 provide results for models similar to those used by Heflin *et al.* (2001b) in that they do not combine all pre-FD quarters, but rather these models compare specific pre-FD quarters to Q4 2000. This allows for introduction of the decimalization dummy variable into models using data similar to Heflin *et al.* (2001b).

The results from Model 1 for the post-FD variable indicate that ARV decreases following the effective date of Regulation FD, but the opposite sign is found in Model 2 (all pre-FD quarters versus Q4 2000). In Model 4 (U.S. firms and ADRs during all pre-FD quarters) the ADR dummy variable is insignificant, as is the case for all post-FD quarters in Model 5. This leads us to accept hypothesis 3 and conclude that whether a firm is subject to Regulation FD (U.S. firms) or not (ADRs) does not affect the firm's ARV. This suggests that any effect of Regulation FD on return volatility is not permanent.

Models 6 and 7 include the decimalization dummy variable. The significance and negative sign of this variable leads us to reject hypothesis 4. When using all post-FD quarters and a decimalization dummy in our analysis (model 6), the post-FD dummy is insignificant. This suggests that the post-FD coefficient in model 1 is capturing the effect of decimalization. Additionally, the post-FD variable is significant when only the first effective quarter subsequent to the regulation is included (model 7). In conjunction with our finding of a lack of significance in the ADR variable in Model 5 and the post-FD variable in Model 6, these results are consistent with our conclusions from the analyses presented in Tables 1 through 3 that indicate the volatility-increasing effects of FD are not permanent.

In Models 8 through 13, we analyze the effect of the regulation and decimalization when including just one pre-FD quarter and Q4 2000 in each model rather than our entire pre-FD sample. For example, in Models 8 and 9 we include Q4 1999 as the pre-FD quarter and examine the effect of including a decimalization variable on the significance of the post-FD variable. We find that without the decimalization variable, when Q4 1999 or Q3 2000 is used as the pre-FD quarter, as in Heflin *et al.* (2001b), the post-FD variable is insignificant. The lack of significance of the post-FD variable in Models 12 and 13 (where the pre-FD quarter is Q3 2000) is consistent with firms having preemptively reduced selective disclosure prior to the effective date of Regulation FD. The decimalization variable is negative and significant in each of the models in which it is included. Because the data are consistent with decimalization having a significant impact of return volatility, we next provide a quarterly ARV comparison that includes decimalization categories.

Decimalized and Non-decimalized Subsamples

In Table 5 we present results for the three subsamples based upon decimalization. We compare pre-FD periods with post-FD periods and also compare the effective quarter of Regulation FD with the three following quarters. Column D indicates that firms decimalized in the pre- and post-FD periods have higher ARV in the quarter after Regulation FD compared to the quarter before Regulation FD, although all other quarter comparisons are insignificant. This appears to be a function of the small sample of firms trading in decimals in both periods. Fortunately there is sufficient sample size in the non-decimalized subsample to reach significant conclusions about the effect of Regulation FD by itself. Column A of Table 5 indicates that non-decimalized firms have higher ARV in the effective (0) quarter of Regulation FD when compared to one quarter before and eight quarters before Regulation FD, although the comparison to the period four quarters prior to Regulation FD is insignificant. These results indicate that Regulation FD increases ARV, leading us to reject hypothesis 1.

Table 5—Deflated Abnormal Return Volatility Differences for Decimalized and non-Decimalized Firms

This table presents the abnormal return volatility deflated by average market model residual volatility (DefARV) for the U.S. firms in our study partitioned by decimalization status of the firms. The non-Dec./non-Dec. sample represents firms that had yet to convert to decimalization in both comparison periods. The non-Dec/Dec sample represents firms that did not have decimalized trading in the earlier period but were trading in decimals in the later period. The Dec./Dec. sample represents firms that were trading in decimals in both comparison periods. The periods are defined as follows: 0 = Q4 2000, -1 = Q3 2000, -4 = Q4 1999, -8 = Q4 1998, +1 = Q1 2001, +2 = Q2 2001, +3 = Q3 2001. The ARV is measured over a 5-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. ARV is calculated as the cumulative abnormal return volatility where the expected return for each stock is calculated using market model parameters measured over a 100-day period prior to the event window. DefARV is ARV divided by the average market model residual volatility for each firm's earnings announcement. Diff (a – b) represents the difference in DefARV between the comparison periods where a (b) represents the first (second) period. $DefARV_a$ ($DefARV_b$) represents the DefARV for the first (second) of the two periods. The statistical significance of the difference is presented in brackets immediately below the respective difference.

	non-Dec./non-Dec.		non-Dec./Dec.				Dec./Dec.	
	Column A (Regulation FD Effect Only)		Column B (Decimalization Effect Only)		Column C (Combined Decimalization and Regulation FD Effects)		Column D (Regulation FD Effect Only)	
Periods a b	Difference (a – b)	Obs	Difference (a – b)	Obs	Difference (a – b)	Obs	Difference (a – b)	Obs
0 and -1	4.877 **	141			2.081	12	-0.477	2
	(1.97)				(0.47)		(-0.41)	
0 and -4	-0.1355	111			-15.049	15	-	0
	(-0.88)				(-1.01)			
0 and -8	4.262***	104			-4.516	9	-	0
	(2.86)				(-0.61)			
1 and 0	-5.257	15	-2.393*	124			-1.607	22
	(-0.83)		(-1.74)				(-0.50)	

The results in Column B separate the Regulation FD effect from the decimalization effect (something lacking in prior research), and the analysis indicates that firms that began to trade in decimals after their announcement date (and thus after the effective date of Regulation FD in this instance) experienced ARV declines, leading us to reject hypothesis 4 in favor of its alternative. This is consistent with prior research (Bessembinder, 2002) indicating that decimalization lowered return volatility and is consistent with our a priori belief that decimalization was a confounding event that possibly influenced the Heflin *et al.* (2001b) results. In fact, in Column C the comparison of quarters 1 and -1 shows that the combined effect of decimalization and FD produced a significant decline in ARV; thus, it appears that the volatility-reducing decimalization effect is stronger than the competing Regulation FD effect.

Table 5 continued—Deflated Abnormal Return Volatility Differences for Decimalized and non-Decimalized Firms

	non-Dec./non-Dec.		non-Dec./Dec.				Dec./Dec.	
	Column A (Regulation FD Effect Only)		Column B (Decimalization Effect Only)		Column C (Combined Decimalization and Regulation FD Effects)		Column D (Regulation FD Effect Only)	
Periods a b	Difference (a – b)	Obs	Difference (a – b)	Obs	Difference (a – b)	Obs	Difference (a – b)	Obs
2 and 0	-	0	-5.183**	128			-0.5547	21
			(-1.97)				(-0.23)	
3 and 0	-	0	-4.682***	180			4.1757	22
			(-2.42)				(0.98)	
1 and -1	-1.494	21			-2.938*	307	13.59**	9
	(-0.88)				(-1.93)		(1.96)	
2 and -1	-	0			-1.655	314	6.4778	8
					(-1.55)		(1.20)	
3 and -1					-1.414	418	1.4545	11
					(-1.22)		(0.16)	
1 and -8	-3.319	11			-0.377	120		
	(-1.24)				(-0.35)			
2 and -8					1.652	134		
					(1.26)			
3 and -8					1.251	169		
					(1.13)			

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Results by Firm Size

Table 6 provides tests for volatility differences across the three size categories, which are defined earlier in the paper. As shown in Panels A and B, the return volatility of small firms is statistically greater than the return volatility of medium and large firms in the first quarter of 2001 (the second effective quarter of Regulation FD).[6] In contrast, Panel C shows that medium and large firms do not have differing volatilities for any quarter. Our analysis leads us to reject hypothesis 5 that ARV does not differ among various size firms.

In presenting this hypothesis, we offered two explanations for why the return volatility of small firms may be more sensitive to Regulation FD. First, small firms may be more reluctant to incur the fixed costs associated with dealing with Regulation FD because these fixed costs will have a greater percentage impact on their overall profitability than for larger firms. These fixed costs may include legal

[6] We also considered the possibility that size might be closely related to decimalization, and replicated the results of Table 6 using the same three subsamples based upon decimalization status, as described in the preceding section. These results did not differ significantly from the results in Table 6, and are omitted for brevity.

Table 6—Deflated Abnormal Return Volatility Differences for U.S. Common Stocks Across Firm Size Categories

This table presents the deflated abnormal return volatility (DefARV) for U.S. common stock listed on the NYSE, AMEX or NASDAQ exchanges partitioned by market capitalization. The firms are categorized using the following metric: Small – mkt cap < $1 billion, medium – $1 billion < mkt cap < $5 billion and large – mkt cap > $5 billion. Abnormal return volatility (ARV) is measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. ARV is calculated as the cumulative abnormal return volatility where the expected return for each stock is calculated using market model parameters measured over a 100-day period prior to the event window. DefARV is ARV divided by the each firm's average daily market model residual volatility. The difference in DefARV between the small and large firms for each period is presented in Panel A; The difference in DefARV between the small and medium-sized firms for each period is presented in Panel B; The difference in DefARV between the medium-sized and large firms for each period is presented in Panel C. $DefARV_S$ represents the DefARV for small firms, $DefARV_M$ represents the DefARV for medium-sized firms, and $DefARV_L$ represents the DefARV for large firms.

Panel A: Small vs. Large Firms

Period	$DefARV_S$	Obs	$DefARV_L$	Obs	Difference (S - L)
Q4 1998	7.456	131	7.679	51	-0.223
					(-0.13)
Q4 1999	12.946	136	9.568	57	3.579
					(1.51)
Q3 2000	9.850	296	9.273	92	0.577
					(0.43)
Q4 2000	13.547	151	9.999	58	3.548
					(1.36)
Q1 2001	7.469	490	5.689	106	1.780 **
					(2.27)
Q2 2001	8.079	393	8.772	101	-0.693
					(-0.56)
Q3 2001	8.919	698	9.849	113	-0.930
					(-0.76)

resources and a well-funded investor relations department. Thus, they may temporarily reduce the quantity or quality of their information disclosure until they can emulate the disclosure practices of larger firms that will invest in the resources to develop transparent policies to avoid legal liability.

The second possible reason is associated with their use of selective disclosure to attract analyst coverage. If investment analysts drop or reduce the quality of their coverage because they can no longer take advantage of selective disclosure, then the small firms would have a more persistent relative increase in their return volatility around earnings announcements. Because the difference between the return volatility of small and larger firms is only temporary, the evidence is consistent with small firms reducing information disclosure until they can copy larger firms.

Robustness Check for Economic Downturn

Because Regulation FD took effect during the early stages of the economic downturn, this may have contributed to the volatility increase that we have attributed

Table 6 continued—Deflated Abnormal Return Volatility Differences for U.S. Common Stocks Across Firm Size Categories

Panel B: Small vs. Medium-Sized Firms

Period	$DefARV_S$	Obs	$DefARV_M$	Obs	Difference (S - M)
Q4 1998	7.456	131	6.127	78	1.329
					(1.10)
Q4 1999	12.946	136	11.112	67	1.835
					(0.50)
Q3 2000	9.850	296	9.932	153	-0.082
					(-0.06)
Q4 2000	13.547	151	12.054	80	1.493
					(0.53)
Q1 2001	7.469	490	5.814	215	1.655 **
					(2.26)
Q2 2001	8.079	393	9.299	184	-1.220
					(-0.94)
Q3 2001	8.919	698	9.944	250	-1.025
					(-0.60)

Panel C: Medium-Sized vs. Large Firms

Period	$DefARV_M$	Obs	$DefARV_L$	Obs	Difference (M – L)
Q4 1998	6.127	78	7.679	51	-1.552
					(-0.93)
Q4 1999	11.112	67	9.568	57	1.544
					(0.44)
Q3 2000	9.932	153	9.273	92	0.659
					(0.41)
Q4 2000	12.054	80	9.999	58	2.056
					(0.94)
Q1 2001	5.814	215	5.689	106	0.125
					(0.16)
Q2 2001	9.299	184	8.772	101	0.527
					(0.39)
Q3 2001	9.944	250	9.849	113	0.095
					(0.05)

** Significant at the 5 percent level

to Regulation FD. We examine this potentially confounding effect by performing an industry-partitioned analysis similar to that employed by Agrawal and Chadha (2002). Specifically, for the first three post-FD quarters, we classify an industry as experiencing a downturn if the aggregated profits for firms in that industry decline by 10 percent or more compared to the same quarter in the previous year. If the economic downturn serves as an explanation for the volatility increase, then we would expect that industry downturns would coincide with volatility increases for firms within that industry. We employ the following regression model for this analysis.

$$ARV_{i,q} = \sum_{k=1}^{11}(b_{1k}Loss_{i,q} * IND_{i,k} + b_{2k}PostFD_{q} * IND_{i,k}) + e_{i,q}, \quad (6)$$

where $IND_{i,q}$ is an indicator variable that is equal to one if the firm belongs to a particular industry and zero otherwise. Industries are based on the two-digit SIG classification code. Other variables are as defined previously. All pre-FD quarters are used in this analysis.

Table 7 presents the results of this analysis, and Table 8 defines the industries. In Table 7, a "Y" indicates that the associated industry experienced a downturn in that quarter. In the interest of brevity, only the coefficients and test statistics that are

Table 7—Economic Downturn Analysis by Industry

This table presents an industry-partitioned analysis to determine whether the economic downturn provides some explanation for the increase in abnormal return volatility (ARV) Post-FD. *SIG* represents the two-digit industry classification code (associated industry names are provided in Table 8), *DT* is "Y" for industries that experienced a downturn in a specific post-FD quarter, where a downturn is defined as a 10 percent decline in profits from the same quarter in the previous year. The values represent the coefficients for the PostFD*IND interaction term from the following regression model ad their respective t-statistics.

$$ARV_{i,q} = \sum_{k=1}^{11}(b_{1k}Loss_{i,q} * IND_{i,k} + b_{2k}PostFD_{q} * IND_{i,k}) + e_{i,q}$$

where $ARV_{i,q}$ is the abnormal return volatility measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of firm i in quarter q, $PostFD_q$ is equal to 1 if the fiscal quarter end is subsequent to October 23, 2000, and zero otherwise. $Loss_{i,q}$ is equal to 1 if the actual earnings for firm i in quarter q is negative and zero otherwise, and $IND_{i,k}$ is 1 if firm i belongs to industry k and zero otherwise. The regression model uses all pre-FD quarters in our sample.

SIG	DT	Q4 2000	DT	Q1 2001	DT	Q2 2001
1		-0.00383		-0.00831***	Y	-0.00839***
		(-0.52)		(-3.06)		(-2.58)
2		-0.00486		-0.00310		-0.00584
		(-0.74)		(-0.99)		(-1.66)
3		0.00272		-0.00384		0.00003
		(0.44)		(-0.85)		(0.00)
4	Y	0.00228	Y	-0.00267		-0.00253
		(0.65)		(-1.01)		(-0.95)
5		0.00289	Y	-0.00450	Y	-0.00568
		(0.33)		(-0.96)		(-1.13)
6		-0.00892		-0.00823**		-0.00779**
		(-1.10)		(-2.21)		(-2.24)
7		-0.00815	Y	-0.00534	Y	-0.00830
		(-0.70)		(-0.98)		(-1.50)
8		0.2780***	Y	0.01234***	Y	0.00492*
		(8.06)		(5.33)		(1.93)
9		-0.00288	Y	-0.00371	Y	-0.00661
		(-0.42)		(-1.03)		(-1.63)
10		0.00183		-0.00795**		-0.01043***
		(0.25)		(-2.35)		(-2.65)
11		-0.00789	Y	-0.00762*	Y	-0.00478
		(-0.79)		(-1.84)		(-0.79)

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Table 8—Industry Classifications

SIG	Industry
1	Finance
2	Health Care
3	Consumer Nondurables
4	Consumer Services
5	Consumer Durables
6	Energy
7	Transportation
8	Technology
9	Basic Industries
10	Capital Goods
11	Public Utilities

associated with the Regulation FD–industry interaction term are presented. A positive and significant coefficient for this term would indicate that there was an increase in ARV from the pre-FD period to the post-FD quarter for that particular industry. Our results indicate that the only industry that experienced a significant change in ARV in Q4 2000 was technology (SIG 8), which did not suffer from an economic downturn. Technology did experience a downturn in Q1 2001 and did have a significant increase in ARV in that quarter, but the other four industries with significant changes in ARV in Q1 2001 (Finance, Energy, Capital Goods, and Public Utilities) showed decreases in ARV, yet Public Utilities was the only one of those four to experience an economic downturn. The Q2 2001 results are the same as Q1, except Finance's downturn begins, and Public Utilities (whose downturn continues) no longer has a statistically significant change in ARV. Given the significant positive change in ARV present in these three quarters whether technology does or does not experience a downturn and given that the significant negative change in ARV for Finance, Energy, Capital Goods, and Public Utilities is independent of the economic downturn, we find no convincing evidence that the economic downturn is driving our ARV results.

Robustness Check for Country- and Firm-Level Effects

To control for the possibility that our panel regression is influenced by country-level or firm-level differences, we perform a fixed-effects regression. We add dummy variables to our model in equation (2) for each firm and country so that those effects are removed from the analysis and the Regulation FD effect is isolated. Both U.S. issues and ADRs are included in this analysis and all pre-FD quarters are used. The results are presented in Table 9. The significant positive coefficients on the Post-FD variable for only Q4 2000 and Q1 2001 are consistent with our earlier conclusion that Regulation FD temporarily increased abnormal return volatility. Our results are not driven by country-level or firm-level differences.

Table 9—Fixed Effects Regression Results

This table treats firm and country effects as fixed by including dummy variables for each firm and country so that the effect of Regulation FD is isolated. The dependent variable is the abnormal return volatility (ARV) measured over a five-day (-2 to +2) event window around the quarterly earnings announcements of the sample firms for each of the fiscal quarter-end periods in our analyses. Independent variables are defined as follows: *PostFD* is equal to 1 if the fiscal quarter end is subsequent to October 23, 2000 and zero otherwise. *Loss* is equal to 1 if the actual earnings is negative and zero otherwise. *Trend* is equal to 1 if the current period's actual earnings are greater than that of the previous period and zero otherwise. *Mag* is equal to the difference between the actual earnings and the consensus expected earnings. *Mktvar* is the average volatility during the market model parameters estimation period. All pre-FD quarters are used.

Post FD Period	Q4 2000	Q1 2001	Q2 2001	Q3 2001	Q4 2001
PostFD	0.00402**	0.00369*	0.00258	0.00061	0.00098
	(2.11)	(1.80)	(1.43)	(1.27)	(1.33)
Loss	0.00043	0.00730*	0.00021	0.00270	0.00125
	(1.03)	(1.91)	(0.94)	(1.63)	(1.05)
Trend	0.00300*	0.00208	0.00169	0.00010	0.00398*
	(1.72)	(1.34)	(1.15)	(0.42)	(1.92)
Mag	0.00331	0.00234	0.00341	0.00291	0.00199
	(0.68)	(0.54)	(0.77)	(0.33)	(0.37)
Mktvar	0.22964***	0.24961***	0.35595***	0.36689***	0.27853***
	(12.24)	(10.55)	(13.43)	(12.45)	(8.09)

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Conclusions

This paper provides a superior methodology for examining the effect of Regulation FD on information flow, as measured by abnormal return volatility around earnings announcements. Our analysis extends the work of Heflin *et al.* (2001b) in four ways. First, we compare the return volatility of U.S. firms to ADRs. ADRs serve as a valuable control; these securities are exempt from Regulation FD but are still affected by changing market conditions in the U.S. While disclosure practices do differ across countries, our analysis indicates that abnormal return volatilities around earnings announcements for ADRs do not differ from U.S. firms from the fourth quarter of 1998 to the third quarter of 2000. This may be an issue worthy of further examination in another paper. Second, our analysis includes the fourth quarter of 2000 to the third quarter of 2001, and this inclusion allows us to test the persistence of Regulation FD's impact. Heflin *et al.* (2001b) only examine the fourth quarter of 2000 in their study. Third, our analysis adjusts for the effect of decimalization on return volatility. Research has shown that the switch to decimal pricing, which was concurrent with the implementation of Regulation FD, significantly lowered return volatility. Fourth, our study investigates the impact of Regulation FD on different size companies. We incorporate several robustness checks of our results.

Our analysis indicates that the abnormal return volatility around earnings announcements increased in the first effective quarter of Regulation FD (the fourth quarter of 2000). The data do not suggest that Regulation FD has a persistent impact

on return volatility. This conclusion is supported by a comparison of firm volatility differences across quarters for our sample of U.S. firms and ADRs. Furthermore, a multivariate regression analysis shows that our results are robust to controls that include decimalization and to using like quarter comparisons used by Heflin *et al.* (2001b). Our study indicates that stock return volatility is reduced by decimalization, and this makes it difficult to discern the true impact of Regulation FD. Our comparison of return volatilities between firms of different sizes indicates that small firms had larger return volatility increases, but the difference was only temporary.

One possible explanation for our results is the limited enforcement by the SEC. Firms may have initially reduced the quantity or quality of information provided to investors, but after learning the extent of enforcement they returned to their old practices. At a SEC conference in April 2001, a SEC commissioner indicated that Regulation FD was not currently being aggressively enforced (Glasner, 2001). Furthermore, the SEC also indicated that it would publish additional clarifications of what constitutes material information. Companies may be interpreting this as an indication that the regulation will not be enforced until further guidelines are made public. Additionally, Arthur Levitt, the SEC chairman who backed the implementation of Regulation FD, left his position on February 9, 2001. He was replaced by Laura Unger, a Republican who opposed the regulation.

There is another possible reason why Regulation FD did not result in persistently higher return volatility around earnings announcements. Corporations may have made their disclosure practices less selective prior to the implementation of the regulation. A survey of senior investor relations officers that was conducted in February 2000 is consistent with this assertion (NIRI, 2000). A substantial portion of the companies was conducting conference calls, and 82 percent of those that did allowed access to individual investors. This was up substantially from the 29 percent of firms that indicated they were providing these services in a survey conducted in 1998. The survey found that 48 percent of companies were providing real-time access to their conference calls via webcasting, while virtually none of the companies were doing this one year earlier. In addition, approximately half of the companies using webcasting for conference calls were also either broadcasting or considering broadcasting other types of meetings of investor interest.

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