An Empirical Evaluation of Analysts’ Herding Behavior Following Regulation Fair Disclosure

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Following Regulation Fair Disclosure

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Abstract

This study examines whether analysts’ forecast revisions exhibited increased herding behavior following the adoption of Regulation Fair Disclosure. A recent model by Arya, Glover, Mittendorf, and Narayanamoorthy (2005) projects that one potential consequence of Regulation Fair Disclosure might be increased herding by financial analysts, although previous studies examining the economic consequences of Regulation FD have not found any averse consequence for investors. We examine financial analysts forecasting behavior before and after the adoption of Regulation FD in order to test the Arya et al. model. Our general finding is that increased herding behavior cannot be detected among either the firms most directly impacted by Regulation FD (those which used to hold closed press conferences), or those least affected (firms that did not hold such conferences).
I. Introduction

The U.S. Securities and Exchange Commission (SEC) issued Regulation Fair Disclosure (hereinafter Reg. FD) in October 2002, effectively prohibiting companies from making material disclosures selectively to certain financial analysts and institutional investors without making the information available to the general public at the same time. The regulation has raised a number of issues which have been actively debated and researched (Heflin, Subramanyam and Zhang 2003; Eleswarapu, Thompson and Venkataraman 2004; Irani and Karamanou 2004; Shane, Soderstorm and Yoon 2001; Bushee, Matsumoto and Miller 2004). For example, Bushee, Matsumoto and Miller (2004) provide evidence that “Reg. FD had some impact on firms’ disclosure policies regarding the use and timing of conference calls”, although the effects were small. They conclude that Reg. FD did not decrease the amount of information disclosed during the call period, and did not increase price volatility at the earnings announcement for closed-call firms as compared to open-call firms.

In a recent theoretical paper, Arya, Glover, Mittendorf, and Narayanamoorthy (2005) conclude that Regulation FD could potentially have the unintended consequence of increasing herding behavior among financial analysts in their forecasts of future earnings. Since no prior empirical study has specifically searched for the evidence of increased herding behavior of analysts’ forecasts in the post Regulation FD environment, this study fills this perceived void in the literature.

Herding behavior refers to a tendency for rational decision-makers to change their interpretation of their private information in order to be closer to some consensus belief held by colleagues. As argued by Arya et al. (2005), herding behavior by financial analysts can be detrimental to efficient markets because it limits the information available to the investor as
individual analyst partially or fully masks their private information in order to move closer to the forecasts of colleagues. Requiring all firms to publicly disclose their information then has the potential to render the capital markets less efficient that they might otherwise be.¹

In the sections which follow, we first discuss the literature on the incentives of analysts in updating forecasts and analysts’ herding behavior. This is followed by the empirical research on the effects of Regulation FD, and the contribution of this paper to this literature. Subsequently, we present our methodology and findings. The conclusions of the paper are presented in the final section.

2. Analysts’ Incentives for Herding and Regulation FD Effects

The literature on analysts’ incentives in preparing forecasts is extensive. However, several themes can be identified which suggest different ways in which analysts might revise their forecasts in response to new information. For convenience, we have grouped the incentives into two categories: (1) financial motivation incentive and (2) analysts’ herding behavior.²

The financial motivation incentive literature posits that financial motives such as the effect on the earnings of the analyst’s brokerage firm employer (including investment banking relationships) and the analyst’s personal compensation packages induce analysts to be optimistically biased in their earnings forecasts. This fairly extensive literature includes studies by Affleck-Graves et. al. 1990; Schipper 1991; Francis and Philbrick 1993; Lin and McNichols 1998; Maines 1995; and Dugar and Nathan 1995. The empirical findings generally support the optimistic bias in analysts and the relationship between the degree of this bias and the financial incentives facing analysts.
The ‘herding’ behavior literature posits that analysts are motivated to use public information (such as the consensus forecast of their peers) to modify their private beliefs and issue forecasts which do not deviate too much from the existing consensus. Both theoretical and empirical studies (Scharfstein and Stein 1990; Stickel 1990; Shiller 1995; Bannerjee 1992; Trueman 1994) document the logic and the existence of a practice whereby analysts issuing an forecast after other analysts tend to drift towards the consensus in order to conform. Thus, the herding behavior literature posits that analysts who issue forecasts after other forecasts have been issued may yield to a tendency to shade any extreme opinions to conform to the consensus.\footnote{3}

Regulation FD was issued by the Securities and Exchange Commission as a way to even the information playing field. Economic theory suggests that expanded disclosures can reduce information asymmetry arising between the firm and its shareholders or among potential buyers and sellers of firm shares, and benefit firms by correcting any firm misvaluation and increasing institutional interest and liquidity for firm’s stock (e.g., Diamond and Verrecchia 1991; Baiman and Verrecchia 1996). For example, Diamond and Verrecchia (1991) find that credible commitments by managers to improve disclosure (i.e., increase the precision of public information about firm value) result in higher current stock prices due to reduced information asymmetry and increased liquidity. Frankel, Johnson and Skinner (1999) empirically examine conference calls as a voluntary disclosure medium, and provide evidence that firms holding conference calls tend to be relatively larger, more profitable, and more heavily followed by analysts; they also access the capital markets more often than other firms. Bowen, Davis and Matsumoto (2002) provide evidence that regular use of earnings-related conference calls could present a selective disclosure problem if the public is not privy to these calls, even if conference calls tend to reduce both forecast errors and forecast dispersion.
The practice of selective disclosure that Regulation FD was intended to curb has its defense in the empirical literature. For instance, Tasker (1998) and Bushee and Noe (2000) find that firms with greater analyst following and greater institutional ownership are less likely to have conference calls that provide open access to all investors. Core (2001) reports evidence consistent with the intuition that informed investors prefer less disclosure, and that analysts and institutions produce information reducing information asymmetry and the need for conference calls.

However, other empirical studies have found problems with selective information disclosure. Sunder (2001) find that “restricted-call” firms face higher information asymmetry compared to “open-call” firms in the pre-Regulation FD period, while in the post-Regulation FD period, the differences in information asymmetry between two groups does not persist. Bushee, Matsumoto and Miller (2003) report that when firms provide additional information during conference calls, the precision of public information increases, resulting in enhanced analyst forecast performance.

The theoretical model by Arya, Glover, Mittendorf, and Narayanamoorthy (2005) posits that Regulation FD could have the unintended consequence of increased herding behavior among financial analysts. In brief, their theoretical argument can be summarized as follows. Given a setting where analysts have diverse private information, the selective disclosure of a firm’s private information will allow that analyst (provided he/she is not the first mover) to provide an estimate that may differ from the consensus estimate up to that point. The diversity of opinions among analysts may thus allow investors relying on analysts’ information to form their own judgment (and thus rely less on analysts). In contrast, if the firm’s private information were released publicly, the presumed greater credibility of the management disclosure may dissuade
analysts from relying on their own private information (if discordant with the publicly-released information). This may cause an information cascade to arise, with analysts following one another to converge on a consensus estimate. In the presence of consensus among analysts, investors are likely to discard their own beliefs and act according to the consensus among analysts.

Arya et al. (2005) cite early research to support their model results that increased herding among analysts is a potential consequence of Regulation FD. Indeed, according to the New York Times (12/29/2002), there was a clustering of analyst updates subsequent to the adoption of Regulation FD. Also, according to Jorion, Liu, and Shi (2005), investors in the immediate post-Regulation FD period placed greater weight on the announcements by credit rating agencies who are exempt from the requirements of Regulation FD. Furthermore, again in the immediate post-Regulation FD environment, surveys of practitioners found frustration with the decrease in information provided by firms (Securities Industry Association, 2001). Furthermore, Bushee, Matsumoto and Miller (2004) report a reduction in the number of conference calls made by previously closed-call firms one year after Regulation FD was implemented.

The issue of whether the decrease in information disclosures following the implementation of Regulation FD persisted over a longer horizon (say over two or three years) has not been addressed to our knowledge. Heflin, Subramanyan and Zhang (2003) and Bailey, Li, Mao and Zhong (2003) report that there was a significant increase in the number of voluntary earnings-related disclosures immediately after Regulation FD came into force. It is likely that this positive trend may have persisted. However, whether financial analysts herded their earnings forecasts in the post-Regulation FD period over a longer horizon has not been addressed
specifically in the prior literature. This paper thus fills a void in the literature which has important public policy implications.

III. Tests for Herding Behavior Before and After Regulation FD

3.1 The measurement of analysts’ herding behavior

Herding behavior is manifested when financial analysts’ forecasts after a management forecast or interim financial report move consistently toward an emerging consensus. To evaluate such a movement, we relied partially on a methodology presented in Olsen (1996) blended with the “herding index” commonly used in the financial economics literature (see, for example, Lakonishok, Shleifer, and Vishny, 1992; Wylie, 2005). Essentially, the approach used here is based on the premise that analysts’ forecasts of a firm’s earnings will be roughly normally distributed. Thus, the proportion of the total forecasts for a given firm after a significant event (such as after quarterly earnings announcements) that fall outside a 95% percent confidence interval compared to what would be expected based on the normal distribution constitutes a measure of the degree of herding. More formally, the approach can be expressed as:

\[
DHI_j = 1.0 - \frac{\left[ L_{95\%} < \# \text{Forecasts} < U_{95\%} \right]_j}{\# \text{Analys}_j}
\]

(1)

where

\[
L_{95\%} = \bar{F}_j - 1.98 \sqrt{\frac{SD_{F_j}}{\# \text{Analys}_j}}
\]

= Lower limit of the 95% confidence interval;

\[
U_{95\%} = \bar{F}_j + 1.98 \sqrt{\frac{SD_{F_j}}{\# \text{Analys}_j}}
\]
= Upper limit of the 95% confidence interval;

\[\bar{F}_j = \text{Mean of the analysts’ annual earnings forecast for firm } j \text{ during an interval of interest;}\]

\[\text{SD}_j = \text{standard deviation of the forecasts;}\]

\[# \text{Forecasts}_j = \text{Total number of forecasts for firm } j \text{ meeting the criteria during the period;}\]

\[# \text{Analys}_j = \text{Total number of analysts’ forecasts for firm } j \text{ during the interval of interest.}\]

Thus, DHI is the percentage of analysts’ forecasts outside a 95% confidence interval. Thus, its maximum value is 1.0 representing the extreme case where none of the forecasts falls within a 95% interval. The minimum value is zero which represents the case where all the analyst forecasts fall within the 95% confidence interval. Thus, DHI is decreasing with respect to increased herding behavior.

Because most conference calls are held simultaneously or right after quarterly or annual earnings announcements, analyst behavior after earnings announcements provides the strongest test for the potential effect of Regulation FD. Thus, in our sensitivity tests, we examine the change in DHI around quarterly earnings announcements in the PRE and POST Regulation FD period.

3.2 Methodology of Study

To evaluate the effect of the adoption of Regulation FD on herding behavior, we use both univariate and multivariate approaches. Both approaches rely on differentiating between firms on the basis of how they were affected by the adoption of Regulation FD. The firms least affected by the regulation are those firms that either did not hold conference calls in pre-Regulation FD period (denoted as NCC or no conference call firms), or held open conference calls during this period (denoted as OPC, or open conference call firms). The firms which were most affected by
Regulation FD are those that held closed conference calls in the pre-Regulation FD period (denoted as CLC, or closed conference call firms) in this study.

Our univariate approach examines, using a generalized linear model approach, the statistical significance of the difference in means between the NCC, CLC and OPC firms in the PRE and POST periods. This approach ignores the possibility that any difference observed might have been caused by changes in other determinants unrelated to the adoption of Regulation FD.

Among these potential determinants, the most important are the following:

1. **Quarterly Interval Dates (DUM1 to DUM7):** Although we focus on the annual earnings forecasts, the accuracy of these forecasts increases as quarterly earnings announcements are made (Brown, 1997; Abdel-Khalik and Espejo, 1978). Thus, given steady improvements in the annual earnings forecasts, the degree of dispersion and herding of forecasts can reasonably be expected to be affected. There are seven intervals of interest, including the periods before the four quarterly earnings release dates (designated DUM1, DUM3, DUM5 and DUM7), and the periods immediately after the first three quarterly earnings release dates (designated DUM2, DUM4 and DUM6). The inclusion of six dummy variables to represent these intervals provides a means to control for this known effect.

2. **Number of Analysts (N_ANALY):** From a purely statistical standpoint, the reliability of the estimates of DHI is likely to be affected by the number of observations available for computing the measures. Since the number of analysts following different companies may change following in the years after the adoption of Regulation FD, it is reasonable to include as a control variable the number of analysts following the companies in the sample.

3. **Age of Forecast (AGE):** It has been well-established in the literature that earnings forecast accuracy is in part dependent on the age of the forecast. Consequently, some of the
forecast dispersion (and related measures like DHI) are also likely to be affected by the age of the forecast aggregated to construct the measures.

4. **Changes in Historical Earnings Stability (HES):** Obviously, one factor that could affect changes in DHI is a change in the macroeconomic environment in which earnings are predicted by analysts. I/B/E/S computes and reports a Historical Earnings Stability (HES) measure that reflects the volatility (standard deviation) of quarterly earnings over the past five years.

Given the above reasoning, the multiple regression equation estimated to evaluate the effect of Regulation FD on analysts’ herding behavior can be written as:

\[
DHI_j = \alpha_{10} + \alpha_{1i} \sum_{i=1}^{6} DUM_{ij} + \beta_{1i} POST_{-FD} j + \beta_{12} OPC_j + \beta_{13} CLC_j + \beta_{14} (POST * OPC)_j + \beta_{15} (POST * CLC)_j + \beta_{16} (N_{-ANALY})_j + \beta_{17} (AGE)_j + \beta_{18} HES_j + e_j
\]

where

- **OPC** = a dummy variable for open conference call firms in the PRE Regulation FD period;
- **CLC** = a dummy variable for closed conference call firms in the PRE period;
- **POST_FDI** = Dummy variable for the POST Regulation FD period;
- **POST*CLC** and **POST*OPC** are interaction terms for both CLC and OPC firms in the POST Regulation FD period.

To evaluate whether Regulation FD had an effect on the herding index, the following three tests are performed:
Test 1: $\beta_{11} < 0 \rightarrow$ Existence of overall herding effect in the POST period compared to the PRE period. (Note that DHI is decreasing in the herding effect, so a negative coefficient indicates more herding in the POST period.)

Test 2: $\beta_{15} < 0 \rightarrow$ Incremental effect of Regulation FD on the previously CLC firms in the POST period.

Test 3: $\beta_{14} = 0 \rightarrow$ Regulation FD has zero effect on the previously OPC firms in the POST period.

Test 1 evaluates whether herding behavior among analysts was higher in the POST Regulation FD period. Tests 2 and 3 evaluate whether Regulation FD had a differential effect on both CLC and OPC firms in the POST period as compared to the PRE period. As argued earlier, the CLC firms should be most impacted by Regulation FD, assuming that they continued to hold conference calls which are now open to the general public. If these tests are all supported in the hypothesized directions, then the evidence supporting the theoretical results of Arya et al. (2005) would have been found. If not, then the potentially adverse effect of Regulation FD would be found not to have materialized.

3.3 Sample Selection

The sample used for this study consists of firms listed by Bestcalls.com in March 1999 as hosting conference calls open to individual investors. The firms listed on this site are identified as Open Conference Call (OPC) firms, and are regarded as a control group since Regulation FD (which came into effect in October 2000) is unlikely to have affected them. At around the same date in 1999, First Call Corporation has a listing of firms hosting conference calls. By cross-
matching those firms on the First Call list with those on the Bestcalls list, those cross-matched firms excluded from the Bestcalls list could be identified as Closed Conference Call (CLC) firms. Since these firms are those most directly affected by Regulation FD, we regard these firms as our treatment group.

To generalize the results as much as possible, we culled the IBES database for all firms with available analyst annual earnings forecasts from 1998 to 2004. Firms with available data which were not listed in either Bestcalls.com or First Call Corporation as having held conference calls in 1999 are included in the final sample and classified as No Conference Calls (NCC) firms. We acknowledge that this identification process may result in the misclassification of some firms which held conference calls in the prior years but not in 1999. Moreover, the conference-call status of these firms in the post Regulation FD environment is not known. In spite of these potential limitations, our classification procedure has value in that it allows the effect of Regulation FD on firms whose conference-call status was known to be evaluated in a cleaner fashion that would be the case otherwise.

The initial sample consists of 1,365 OPC, 17,252 CLC and 18,478 NCC firms. Of this total, 481 OPC, 1,094 CLC and 7,881 firms have continuous forecast data (for at least one quarter) from 1998 to 2004. The analyst forecast data, quarterly and annual earnings announcement dates, and the age of the forecast (measured with respect to the annual earnings announcement dates), and the historical earnings stability measures used are obtained or computed from the I/B/E/S individual analyst database. To ensure the meaningful computation of DHI, the minimum number of analyst following is set to 4. All firms are required to have non-missing quarterly IBES forecast data during the period (fiscal years ending in the calendar years 1998 to 2004).
After imposing these restrictions, the final sample consists of 7,022 firms (561 OPC, 1,122 CLC, and 5,339 NCC firms) in the PRE-FD period, and 7,113 firms (634 OPC, 1,363 CLC, and 5,116 NCC firms) in the POST-FD period. When the analyses are restricted to only the sub-sample of firms with continuous forecast data from 1998 to 2004, the sample is reduced to 182 OPC, 287 CLC, and 639 NCC firms (or a total of 1,108 firms). Because we measure the forecasts just before and after quarterly earnings announcements (excluding the post-fourth quarter announcements), each firm could potentially be represented seven times in the sample for each year. So the final observations used in the analyses are 126,216 firm-level observations, or 43,445 data points if the sample are restricted only to firms with continuous data. For the multiple regression equations where HES is added as a control variable, the sample size is reduced to 40,810 for the full sample, and 22,941 for the sub-sample of observations with continuous data.

IV. Results

4.1 Univariate Results

Table 1 presents summary statistics on the variables of interest in the study. Panel A of Table 1 presents the summary statistics for the full sample in the PRE period, and Panel B shows similar statistics in the POST period.

A comparison of the results in Panel A of Table 1 shows no significant differences between the NCC, OPC and CLC groups in terms of the average number of analysts following the firms 9.26, 11.87 and 10.05 respectively. Similarly, there are no noticeable differences among the three
groups with respect to the average age of the annual earnings forecast (AGE), the historical earning stability (HES) of the firms in the sample, or the degree of herding of the forecasts (DHI).

Similarly, a comparison of the results for Panel B of Table 1 shows similarities between the NCC, OPC and CLC groups. The average age of the forecast, the number of analysts following the firms, the historical earnings stability measure, and the degree of herding index all appear to be fairly close across the three groups.

Turning now to the comparison of DHI across the PRE- and POST-FD periods, we conduct formal statistical tests to see if there are significant differences across the two periods. Table 2 presents the results of these formal statistical tests.

Panel A of Table 2 presents the results obtained when all firms with data available are used in the analysis. Across all three classes of firms, the mean DHI is 54.4 percent in the PRE period, and 52.7 percent in the POST period. The row-wise 2-way mean comparison of means using the Bonferroni t-test shows a critical value of 1.96 which is significant at an alpha significance level of 0.05. This is further confirmed by the Type III ANOVA test which yielded an F-ratio of 17.22 and a significance level of less than 0.001. Thus, DHI is found to be significantly lower in the POST-FD period compared to the PRE-FD period. Since DHI is inversely related to the degree of herding behavior, this finding is consistent with the interpretation that, before controlling for the impact of the control factors, there appears to be higher herding behavior among analysts in the POST period compared to the PRE period.
Ancillary results reported in Table 2 relate to the relationship between the NCC, CLC and OPC categories. Across the PRE and POST period, NCC firms had a lesser degree of herding, since the DHI is 54.6 percent compared to 52.7 percent for CLC and 49.6 percent for OPC firms. The 3-way comparison of means across the columns indicates these differences to be significant, implying that there is lower herding of forecasts in the NCC group. However, the greatest herding of forecasts appears to occur in the OPC group, which is consistent with the intuition gained from the Arya et al. (2005) that openly available information from management might cause analysts to discount their own private information and move closer to the consensus forecast. In contrast, when there is no information available from management (NCC), or if information is disclosed selectively (NCC), analysts are apparently forced to rely more on their own private information.

Panel B presents results when the sample is restricted only to firms with continuous data over the entire period. These results are very close to the results reported for Panel A, so the findings reported earlier apply here as well. There appears to be less herding of analyst forecasts overall in the PRE period compared to the POST-Regulation FD period. Furthermore, across both periods, there is less herding in the NCC group and the most herding in the OPC group.4

4.2 Multivariate Results

Despite the rather interesting findings from the univariate analysis, the question still remains whether the tendency for financial analysts to herd their forecasts was greater following the adoption of Regulation FD. Because the univariate tests do not control for the influence of other extraneous factors, it is possible that the results found are driven by other factors other than
the adoption of Regulation FD. To evaluate this possibility, the multivariate model presented in
Equation (2) is estimated. The results are presented in Table 3 below.

Panel A of Table 3 presents results for the full sample, and Panel B for the sub-sample of
firms with continuous data for the two periods. In both sets of results, the following results can
be observed. First, AGE and N_ANALY have significant positive influence on the DHI
observed. Thus, older forecasts and increases in the number of analysts covering the firm are
associated with an increase in DHI (i.e., less herding of forecasts). Second, after controlling for
AGE, the release of quarterly earnings tends to be associated with an increase in DHI. That is,
there is less herding after quarterly earnings are released over the course of the year. This is
shown by the increasing magnitude of the dummy variables representing the first quarter (DUM1
and DUM2), the second quarter (DUM3 and DUM4), and the third quarter (DUM5 and DUM6).

Third and most important, the adoption of Regulation FD had no statistically discernible
effect on the tendency of analysts to herd their annual earnings forecasts. This is shown by the
fact that neither POST_FD nor POST_OPC and POST_CLC have statistically significance
coefficients in either Panel A or Panel B of Table 3. Thus, the earlier finding from the univariate
analysis of the possible influence of Regulation FD on analysts’ herding behavior can be
attributed to the lack of control for extraneous influences between the two periods.

4.3 Robustness Tests

To evaluate the sensitivity of our results to changes in the assumptions, we reestimate
Equation (2) using a 90% confidence interval in place of the 95% interval used in Equation (1) to
derive the DHI measure. The results reported in Table 3 are not affected qualitatively, so the
detailed results are omitted.

In additional sensitivity tests, we separate the continuous-period sub-sample into three
groups based on the quarterly earnings. Thus, Quarter 1 represents the annual earnings revisions
around the first quarterly earnings announcements, Quarter 2 represents the revisions around the
second quarter’s earnings announcement, and so forth for the Quarter 3. We then estimate a
modified form of Equation (2) with the dummy variables (DUM1 – DUM6) omitted, and use
seemingly unrelated regressions technique to estimate the parameters. This approach allows
possible differences in analysts’ herding behavior over the course of the fiscal year to be more
closely observed. We have omitted the tabulated results for the sake of brevity, but they are
qualitatively the same as the findings reported earlier. Thus, the conclusion that Regulation FD
does not have any discernible impact on analysts’ herding behavior when other factors are
controlled appears to be fairly robust.

V. Conclusion

We have examined the hypothesis that Regulation Fair Disclosure could, theoretically at
least, impact the behavior of financial analysts by encouraging them to discard their own private
information and herd their annual earnings forecasts towards the consensus forecast. Although
our univariate tests appear to support this conclusion, our multivariate tests find that, after
controlling for other factors, Regulation Fair Disclosure does not appear to have had any
independent effect on analysts’ herding behavior in the POST-FD period.
The primary public policy implication of our findings is that the decision by the Securities and Exchange Commission to promulgate Regulation Fair Disclosure does not have the potential unintended consequence of inducing analysts to herd their forecasts. While this does not assuage the fear that Regulation FD could have other potential adverse consequences, at least with respect to analysts herding behavior, our results should lay that concern to rest.
References


Securities Industry Association, 2001. Regulation FD: how is it working? Research Reports 4,


Table 1
Summary Statistics of Variables of Interest in Pre and Post Regulation FD Periods

<table>
<thead>
<tr>
<th></th>
<th>Panel A: In PRE Regulation FD Period</th>
<th>Panel B: In POST Regulation FD Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard Mean Deviation Minimum Maximum</td>
<td>Standard Mean Deviation Minimum Maximum</td>
</tr>
<tr>
<td><strong>NCC Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N_ANALY</td>
<td>9.26 6.40 4.00 63.00</td>
<td>10.12 7.19 4.00 85.00</td>
</tr>
<tr>
<td>AGE</td>
<td>185.81 71.45 1.00 364.83</td>
<td>182.53 86.20 -8.00 365.00</td>
</tr>
<tr>
<td>HES</td>
<td>0.46 1.91 0.01 29.61</td>
<td>3.50 26.21 0.01 356.85</td>
</tr>
<tr>
<td>DHI</td>
<td>0.55 0.20 0.00 1.00</td>
<td>0.54 0.19 0.00 1.00</td>
</tr>
<tr>
<td><strong>OPC Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N_ANALY</td>
<td>11.87 8.39 4.00 63.00</td>
<td>10.00 9.40 4.00 70.00</td>
</tr>
<tr>
<td>AGE</td>
<td>201.83 69.60 6.53 349.50</td>
<td>188.11 81.13 1.00 361.09</td>
</tr>
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<td>HES</td>
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<td>DHI</td>
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<td>0.50 0.21 0.00 1.00</td>
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<tr>
<td><strong>CLC Group</strong></td>
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<td></td>
</tr>
<tr>
<td>N_ANALY</td>
<td>10.05 6.84 4.00 54.00</td>
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<td>AGE</td>
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<td>HES</td>
<td>0.38 3.24 0.00 116.59</td>
<td>0.61 3.45 0.01 141.27</td>
</tr>
<tr>
<td>DHI</td>
<td>0.54 0.21 0.00 1.00</td>
<td>0.52 0.20 0.00 1.00</td>
</tr>
</tbody>
</table>

DHI = Degree of herding index defined as the ratio of forecasts lying outside a 95% confidence band to the total number of forecasts.

DUM1 to DUM7 = Dummy variable representing annual earnings forecasts outstanding just before and just after quarterly earnings announcements. (DUM1 = Pre-Q1, DUM2 = Post_Q1, etc.)

POST_FD = Dummy variable for the period after the issue of Regulation FD in October 2000.

OPC = Dummy variable for firms which held open conference calls in the periods before Regulation FD was adopted.

CLC = Dummy variable for firms which held closed conference calls in the periods before Regulation FD.
N_ANALY =  
Total number of annual earnings forecasts outstanding for a firm at the periods represented by DUM1 to DUM7.

AGE =  
Average age of the forecasts for a given firm at the periods represented by DUM1 to DUM7.

HES =  
Historical earnings stability, a proxy for the inherent instability of quarterly earnings as measured by I\B\E\S.
Table 2
Univariate Analysis of DHI by Class and Period
in PRE and POST Regulation FD Periods

<table>
<thead>
<tr>
<th></th>
<th>Panel A: All Firms With Available Data</th>
<th>Panel B: Firms with Continuous Data for 1998-2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLASS</td>
<td>Row-wise means</td>
</tr>
<tr>
<td></td>
<td>NCC</td>
<td>OPC</td>
</tr>
<tr>
<td>PRE Regulation FD Period</td>
<td>55.3%</td>
<td>50.5%</td>
</tr>
<tr>
<td>Number of observations</td>
<td>39,322</td>
<td>6,161</td>
</tr>
<tr>
<td>POST Regulation FD Period</td>
<td>53.9%</td>
<td>49.0%</td>
</tr>
<tr>
<td>Number of observations</td>
<td>41,132</td>
<td>9,985</td>
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<tr>
<td>Column-wise means</td>
<td>54.6%</td>
<td>49.6%</td>
</tr>
</tbody>
</table>

Column-wise mean comparison (3-way)
Dispersion in NCC>CLC>OPC
Error mean square | 0.040
Critical value of t (Bonferroni) | 2.39
Probability | 0.05

Row-wise mean comparison (2-way)
Dispersion in PRE-FD Period > POST-FD Period
Error mean square | 0.040
Critical value of t (Bonferroni) | 1.96
Probability | 0.05

Type III ANOVA Tests

<table>
<thead>
<tr>
<th></th>
<th>Error Mean Square</th>
<th>F-ratio</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST_FD</td>
<td>1 0.154</td>
<td>17.22</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CLASS (NCC, OPC and CLC)</td>
<td>2 0.031</td>
<td>3.47</td>
<td>0.0312</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Error Mean Square</th>
<th>F-ratio</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST_FD</td>
<td>1 4.007</td>
<td>97.57</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>CLASS (NCC, OPC and CLC)</td>
<td>2 4.876</td>
<td>118.72</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>
\( \text{POST}_{\text{FD}}{^*}\text{CLASS} \) (Interaction) \[ \begin{array}{cccccc}
3 & 0.007 & 0.74 & 0.4771 & 2 & 0.118 & 2.86 & 0.0572
\end{array} \]

- **DHI** = Degree of herding index defined as the ratio of forecasts lying outside a 95% confidence band to the total number of forecasts.
- **POST\_FD** = Dummy variable for the period after the issue of Regulation FD in October 2000.
- **OPC** = Dummy variable for firms which held open conference calls in the periods before Regulation FD was adopted.
- **CLC** = Dummy variable for firms which held closed conference calls in the periods before Regulation FD was adopted.
Table 3
Results of Regression of DHI on Hypothesized Determinants in Pre and Post Regulation FD Periods

<table>
<thead>
<tr>
<th></th>
<th>Panel A: All Firms With Available Data</th>
<th>Panel B: Only Firms with Continuous Data for 1998-2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>T-value</td>
<td>Probability</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.292</td>
<td>44.54</td>
</tr>
<tr>
<td>DUM1</td>
<td>0.012</td>
<td>1.72</td>
</tr>
<tr>
<td>DUM2</td>
<td>0.012</td>
<td>1.70</td>
</tr>
<tr>
<td>DUM3</td>
<td>0.025</td>
<td>4.74</td>
</tr>
<tr>
<td>DUM4</td>
<td>0.025</td>
<td>4.76</td>
</tr>
<tr>
<td>DUM5</td>
<td>0.036</td>
<td>9.62</td>
</tr>
<tr>
<td>DUM6</td>
<td>0.034</td>
<td>9.78</td>
</tr>
<tr>
<td>POST_FD</td>
<td>0.002</td>
<td>0.33</td>
</tr>
<tr>
<td>OPC</td>
<td>-0.003</td>
<td>-0.51</td>
</tr>
<tr>
<td>CLC</td>
<td>-0.011</td>
<td>-1.91</td>
</tr>
<tr>
<td>POST_OPC</td>
<td>-0.006</td>
<td>-0.87</td>
</tr>
<tr>
<td>POST_CLC</td>
<td>0.005</td>
<td>0.64</td>
</tr>
<tr>
<td>N_ANALY</td>
<td>0.013</td>
<td>112.40</td>
</tr>
<tr>
<td>AGE</td>
<td>0.0001</td>
<td>4.80</td>
</tr>
<tr>
<td>HES</td>
<td>-0.0001</td>
<td>-0.39</td>
</tr>
<tr>
<td>Adjusted R-square</td>
<td>0.246</td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>40,841</td>
<td></td>
</tr>
</tbody>
</table>

DHI = Degree of herding index defined as the ratio of forecasts lying outside a 95% confidence band to the total number of forecasts.

DUM1 to DUM7 = Dummy variable representing annual earnings forecasts outstanding just before and just after quarterly earnings announcements. (DUM1 = Pre-Q1, DUM2 = Post_Q1, etc.)

POST_FD = Dummy variable for the period after the issue of Regulation FD in October 2000.

OPC = Dummy variable for firms which held open conference calls in the periods before Regulation FD was adopted.

CLC = Dummy variable for firms which held closed conference calls in the periods before Regulation FD was adopted.

N_ANALY = Total number of annual earnings forecasts outstanding for a firm at the periods represented by
DUM1 to DUM7.

AGE= Average age of the forecasts for a given firm at the periods represented by DUM1 to DUM7.

HES= Historical earnings stability, a proxy for the inherent instability of quarterly earnings as measured by I\B\E\S.
Arya, et al. (2005) also developed a second proposition that Regulation FD could potentially reduce the level of disclosures made by firms. Since empirical research by (2004), and (2003) have shown that this effect did not occur, that issue is not pursued in this study.

We have ignored a third set of studies dealing with cognitive style of information processing as having no direct bearing on this study. The literature on the effect on different styles of cognitive processing on the accuracy of forecasts has tended to attribute differences in accuracy among analysts to a combination of experience and cognitive processes such as information search and retrieval strategies (Anderson, 1988; Biggs, 1984; Bouwman et al., 1987; Hunton and McEwen, 1997). Hunton and McEwen (1997), for example, found that analysts who employ a directive information search strategy tended to be more accurate that those who use a sequential information search strategy.

Human herding behavior has an extended literature spanning both economics (e.g., Scharfstein and Stein 1990), and finance (e.g., Trueman, 1994; Graham, 1999).

One notable difference from the Panel A results is that, in the TypE II ANOVA tests, the interaction between PERIOD and CLASS is significant, whereas this was not significant in Panel A. Comparing the results in Panels A and B of Table 2, the lower DHI results across all three groups in the POST period stand out.