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Corporate Disclosure Policy and Analyst Behavior

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ABSTRACT: This paper examines the relations between the disclosure practices of firms, the number of analysts following each firm and properties of the analysts' earnings forecasts. Using data from the *Report of the Financial Analysts Federation Corporate Information Committee* (FAF Report 1985–89), we provide evidence that firms with more informative disclosure policies have a larger analyst following, more accurate analyst earnings forecasts, less dispersion among individual analyst forecasts and less volatility in forecast revisions. The results enhance our understanding of the role of analysts in capital markets. Further, they suggest that potential benefits to disclosure include increased investor following, reduced estimation risk and reduced information asymmetry, each of which have been shown to reduce a firm's cost of capital in theoretical research.

Key Words: *Financial analysts, Discretionary disclosure, Analysts' forecasts, Capital markets.*

Data Availability: *The FAF data used in this study are available from the authors on request.*

I. INTRODUCTION

Financial analysts are an integral part of the capital market, providing earnings forecasts, buy/sell recommendations and other information to brokers, money managers and institutional investors. Much of the information analysts use in their evaluations is

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provided directly by the firm.[1] Although all publicly traded firms must meet minimum disclosure requirements set by the SEC, firms vary substantially in the amount of additional information they provide to the capital markets. Even for mandatory disclosures, such as those found in annual financial statements, firms have substantial discretion in the informativeness of the disclosures and the amount of detail provided.[2] Discretion in disclosure is even more pronounced for press releases and direct contact with analysts. In this paper, we investigate the association between disclosure practices and the number of analysts following the firm and the properties of their forecasts. We document significant associations and interpret those associations to suggest that analysts respond to firms' disclosure practices. Our conclusions suggest that firms can attract analysts, improve the accuracy of market expectations, reduce information asymmetries and limit market surprises by adopting more forthcoming disclosure practices. Although not addressed directly by this study, theory indicates that such results may be associated with a lower cost of capital for firms adopting those strategies.

We use data from the FAF Report (1985–89) as a comprehensive measure of the informativeness of a firm's disclosure policy.[3] In the FAF report, analysts evaluate the complete range of a firm's disclosures, summarizing their evaluations by a score in each of three categories: annual published information, other published information (including quarterly filings, press releases and proxy statements) and investor relations. Our dependent variables are the number of analysts following the firm and the accuracy, dispersion and variability of their forecasts. We control for other variables that previous research has shown to be related to our variables of interest and find that, within their industry, firms with more forthcoming disclosure practices have a larger analyst following, more accurate analyst earnings forecasts, less dispersion among individual analyst forecasts and less volatility in forecast revisions. In addition, these results hold after controlling for potential simultaneity between firms' disclosure choices and analysts' following.

Overall, our results indicate that company-provided disclosure is an important determinant of analyst following and the characteristics of their forecasts. In addition, our finding that more analysts follow firms with more informative disclosure practices is consistent with the notion that firm-provided information is not a substitute for analyst services. Finding greater consensus among analysts for firms with more informative disclosure practices suggests that different analysts make different forecasts primarily because of differences in non-firm-provided information, rather than differences in interpretation of common information.

Nichols (1989) and Schipper (1991) suggest that the behavior of analysts provides insight into the activities and beliefs of investors that cannot be observed directly. To the extent that analysts may be viewed as either representing or influencing investor beliefs, our results also provide insight into the effect of disclosure on investor following and the characteristics of their

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[1] Based on surveys of financial analysts, Lees (1981) finds their sources of information, in order of importance, are: (1) interviews with company executives, (2) 10-Ks and other reports to the SEC, (3) annual and interim stockholders' reports, (4) management forecasts (if disclosed), and (5) formal presentations by company executives. Knutson (1992) also argues that companies are a primary source of information for analysts and identifies various communication channels.

[2] As an example, firms have discretion in the number of segments they report, how they aggregate operations into segments and whether they include segmental data in quarterly reports.

[3] We use the term "disclosure policy" to refer to the overall informativeness of a firm's discretionary disclosures, as measured by their score in the FAF Report. The FAF Report (1985–89) measures "the firm's effectiveness in communicating with investors" and the extent to which the firm provides information "so that investors have the information necessary to make informed judgments" across all types of disclosure. Section IV contains a more complete discussion of the data.

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beliefs.[4] The effects of enhanced disclosures are of interest to accounting professionals who are involved in preparing and attesting to firm-provided disclosures, corporate managers and regulators. Benefits described by the AICPA Special Committee on Financial Reporting (AICPA 1993), and echoed by investor relations authors Marcus and Wallace (1991) and Mahoney (1991), include reduced uncertainty, lower information asymmetry among stock market participants, fewer extreme earnings surprises and greater investor following. Theoretical research echoes similar benefits to disclosure, including increased investor following (Merton 1987), reduced estimation risk (Barry and Brown 1985), and reduced information asymmetry (Glosten and Milgrom 1985), each of which reduces the cost of capital. Our results suggest that increased disclosure is associated with increases in analyst following and forecast accuracy, reductions in forecast revision volatility and dispersion and which hence, may reduce the cost of capital.

In the next section we discuss the related literature, and in section III we present our hypotheses. In section IV, we present the data and empirical analysis and, in section V, summarize our results and conclusions.

II. RELATED LITERATURE

Our research is related to two streams of the extant literature: (1) research on determinants of analyst following, and (2) research on the determinants of forecast accuracy and dispersion. Most of the empirical research on the determinants of analyst following focuses on firm characteristics other than disclosure policy. In a cross-sectional study, Bhushan (1989) finds that the number of analysts following a firm is increasing in firm size, institutional ownership, and return variability. In a time-series study, O'Brien and Bhushan (1990) find that analyst following increases when a firm's return volatility has declined, increases more for firms with smaller prior analyst following, and increases more for firms in industries with more stringent disclosure requirements and increasing numbers of firms. Brennan and Hughes (1991) find that analyst following is greater for firms with lower share prices after controlling for size, return variability and past returns, and that the number of analysts increases after a stock split. Perhaps closest to our study, Byrd et al. (1993) document a short-term increase in analyst following after CEO presentations to analyst societies and Healy et al. (1994) find that firms in the top quintile of FAF ratings' changes over a 12-year period experience a significant increase in their analyst following, although the firms in the bottom quintile of ratings' changes do not experience a significant decrease in their analyst following. Healy et al. (1994) also find that the firms in the top quintile of FAF ratings' increases are more likely to experience management changes, undertake major business restructurings, access capital markets, repurchase stock and announce stock splits, making it difficult to attribute the increase in analysts solely to the increase in disclosure.

Although there is substantial literature on the properties of analyst forecasts (see Brown et al. 1985 and Brown 1993 for reviews), relatively few papers consider how discretionary disclosure affects analysts' forecasts. Baginski and Hassell (1990) and Jennings (1987) provide evidence that analysts revise their forecasts in response to management earnings forecasts, and Williams (1996) suggests that the magnitude of the adjustment is a function of the usefulness of

[4] Survey evidence in SRI International (1987) suggests that analyst reports are a primary source of information to buy-side investors, and Marcus and Wallace (1991) argue that analysts are an important source of information for individual investors, either directly or through brokers. This view underlies the use of analyst expectations as a proxy for investor expectations in a large body of capital markets research (see Brown (1993) for an overview).

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managements' previous forecasts. Similarly, Waymire (1986) finds that the accuracy of analyst earnings forecasts increases slightly after a management earnings forecast is released. While management earnings forecasts have the advantage of being concrete disclosure events, the FAF data represent a more comprehensive measure of firm disclosure by incorporating important aspects of disclosure which are difficult to quantify (e.g., new product announcements, management discussion and analysis, qualitative discussions with management) and reflect the perceptions of some of the primary users of financial statement data.[5] As an alternative to management earnings forecasts, Kross et al. (1990) use inches of print in the *Wall Street Journal Index* to test whether the accuracy of analyst forecasts increases as the amount of media coverage increases. However, media coverage captures the impact of exogenous events and editorial policy as well as the effect of disclosure policy.[6]

III. HYPOTHESES

We focus on two aspects of analysts' behavior—their choice of which firms to follow as measured by the number of analysts providing earnings forecasts for a firm, and characteristics of their earnings forecasts as measured by the forecast accuracy, the degree of dispersion among forecasts and the variability of forecast revisions during the year.[7]

Disclosure and Analyst Following

In Bhushan (1989), the equilibrium number of analysts is determined by the intersection of the aggregate demand and supply curves for analyst services. The model describes how various firm characteristics affect the intersection of these curves and, consequently, the equilibrium supply of analysts. Applied to our study, the issue is how firm-provided information affects the supply and demand for analyst services.

If it is less costly to receive information from the firm than to acquire it independently from other sources, increased disclosure will shift the analyst supply curve to the right, increasing aggregate supply. All else equal, this effect increases the equilibrium number of analysts.[8] The effect of additional disclosure on the demand for analyst services depends on the role that analysts play in the capital market. If analysts are primarily *information intermediaries*—the principle flow of information goes from the firm to the analysts, who process the information and transmit

[5] It is not clear whether management earnings forecasts are representative of other types of disclosure. The *ex post* accuracy of earnings forecasts is publicly validated or refuted in relatively short order while the validity of other types of disclosure is not as easily assessed. As a result, managers perceive more legal risk associated with earnings forecasts than with other types of disclosure (Lees 1981). Skinner (1994) suggests that concern about potential litigation creates incentives to issue earnings forecasts preempting bad earnings news; however, incentives for "softer" disclosure which is not validated as quickly or precisely are not as clear.

[6] In terms of mandatory disclosures, Brown and Han (1992) find that the consensus of analyst long-range forecasts increases around earnings announcements, and Swaminathan (1991) finds that consensus increases following the adoption of segmental reporting requirements. Baldwin (1984) finds that analysts' forecast accuracy increases for multisegment firms after the adoption of segmental reporting requirements. Brown and Rozeff (1979) find that analyst forecasts of annual earnings become more accurate following interim accounting reports, and Critchfield et al. (1978) find that forecast accuracy increases through the fiscal year but the dispersion among analysts' forecasts remains unchanged. Finally, Brown et al. (1987) show that forecast accuracy (relative to a random walk) is positively associated with firm size and negatively associated with the dispersion of analyst forecasts.

[7] By focusing on earnings forecasts, we ignore other functions of analysts such as issuing buy/sell recommendations and generating trades. It is unclear how analysts weight these different activities, but we assume that the choice of which firms to cover and what to forecast for earnings is a significant part of their job.

[8] In an investor relations context, Nichols (1989) describes how a lack of disclosure leads to a low supply of analyst services. He quotes Robert Dunlap of Irving Trust, "I don't follow Pullman because they won't tell you enough about their business to allow you to get a handle on it.... If they change and become more open with the street, there is no doubt that I'd take more of an interest in Pullman."

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it to the capital market—then an increase in firm-provided information means the analyst has a more valuable report to sell. In this case, increased disclosure increases aggregate demand for analyst services. This effect in isolation will increase the equilibrium number of analysts.[9] Consistent with this prediction, the analyst community has consistently come out in favor of increased firm-provided disclosure.[10]

However, if analysts are primarily *information providers* who compete with firm-provided disclosures made directly to investors, then an increase in firm-provided information will substitute for the analyst report. In this case, increased disclosure reduces the aggregate demand for analyst services. This effect in isolation will decrease the equilibrium number of analysts.

In sum, increased firm-provided disclosure is expected to increase the supply of analyst services, but it may either increase or decrease the demand for analysts, so the net effect depends on the relative importance of these potentially competing forces. An observed negative relation between disclosure levels and the number of analysts implies that analysts are primarily information providers, and firm-provided disclosure is a substitute for their services.[11] An observed positive relation implies that either analysts are primarily information intermediaries or else, if they are information providers, the effect of reduced information production costs outweighs the effect of reduced demand.

Since the direction of the effect of disclosure on analyst following is unclear, we test the following non-directional hypothesis (stated in the null form):

H1: The number of analysts following a firm is unrelated to the informativeness of the firm's disclosure policy.

The direction of causality between a firm's disclosure level and the number of analysts is debatable. Specifically, an observed positive relation could reflect either the fact that analysts are attracted to firms which disclose more or that analysts are able to apply pressure on firms which they follow for other reasons to increase their disclosure levels. Evidence presented in Section IV suggests that the direction of causality runs from disclosure policy to analyst following.

Disclosure Policy and Forecast Characteristics

In addition to affecting the number of analysts following the firm, additional disclosure is likely to affect the properties of analysts' earnings forecasts. We consider three characteristics—forecast dispersion, accuracy and volatility.

Dispersion

The effect of increased disclosure on the dispersion of analyst forecasts depends on whether differences in forecasts are due to differences in information or differences in forecasting models. If analysts have a common forecasting model and observe the same firm-provided disclosures but possess different private information, they will place less weight on their private information as the informativeness of firm-provided disclosure increases, increasing the consensus among their forecasts. Alternatively, if analysts have the same firm-provided and private information but

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[9] Fishman and Hagerty (1989) and Merton (1987) make similar predictions for investor following. In these models, investors can only follow a limited number of firms and prefer to follow firms that provide the most valuable information.

[10] Knutson (1992) and AICPA (1993), for example, discuss analysts' positions on increased disclosure.

[11] To the extent that firms have an incentive to increase analyst following (as they would in Merton (1987) and Fishman and Hagerty (1989)), it may seem unlikely that they would engage in discretionary disclosure that reduces analyst following. However, as discussed in the introduction, other incentives for disclosure exist (e.g., reductions in information asymmetry, risk, earnings surprises, etc.) which would be balanced in determining disclosure policy.

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differ in the weights they place on components of firm-provided disclosure in forecasting earnings, additional disclosure may increase the dispersion of analyst forecasts.[12]

Therefore, an observed negative relation between disclosure and forecast dispersion implies that analysts differ primarily in their private information. Observing a positive association implies that analysts have different forecasting models, so they draw different conclusions from the same observed disclosures and, as the disclosures become more precise, their forecasts become more dispersed. Since the direction of the effect of disclosure on dispersion in analyst forecasts is unclear, we test the following non-directional hypothesis (stated in the null form):

H2: The dispersion of analysts' earnings forecasts is unrelated to the informativeness of a firm's disclosure policy.

Accuracy

The likely relation between disclosure and forecast accuracy is more clear. To the extent that firm-provided disclosure is informative about future earnings, analysts' forecast accuracy will increase with the informativeness of a firm's disclosure policy. Although a firm's disclosures may be useful to analysts without providing information about next period's earnings, it is difficult to imagine scenarios (short of fraudulently misleading disclosures) in which additional disclosure systematically reduces the accuracy of analysts' earnings forecasts. However, the strength of the relation between firm-provided disclosures and the accuracy of analysts' forecasts is an empirical issue. This leads to the following hypothesis:

H3: The accuracy of analysts' earnings forecasts is positively associated with the informativeness of a firm's disclosure policy.

Revision Volatility

The volatility of forecast revisions in the time period leading up to an earnings announcement is likely to be reduced by a more forthcoming disclosure policy. In assessing the informativeness of a firm's disclosure practice, the FAF considers the timeliness of information releases and firms that disclose information on an ongoing basis are judged to have more informative disclosure practices than those that withhold information until a mandatory disclosure is required. Over time, events occur with implications for the firm's future earnings. The firm has the option of disclosing them as they occur (with analyst revisions made after each announcement) or waiting and disclosing them all at once (with only one analyst revision). The latter will result in more extreme expectation revisions when the information is disclosed. The notion that more timely disclosure may be valuable in reducing the magnitude of forecast revisions is consistent with Mahoney (1991) who argues that disclosure is beneficial, in part, because it reduces the incidence of significant surprises for investors and analysts.[13] Our fourth hypothesis (stated in alternate form) is:

H4: The volatility of analyst earnings forecast revisions is negatively associated with a firm's disclosure policy.

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[12]Harris and Raviv (1993) and Kandel and Pearson (1995) present models in which investors differ in their interpretation of publicly-disclosed data, and in which additional disclosure can result in divergence of beliefs.

[13]Mahoney (1991) states that "surprises are anathema to analysts and investors, and thus to investor relations practitioners as well. They are to be avoided. How? By keeping analysts and investors informed..."

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IV. EMPIRICAL ANALYSIS

Disclosure Data

The informativeness of firms' disclosures is measured by FAF ratings. The analysis in the FAF Report (1985–89) is conducted by industry-specific subcommittees composed of leading analysts and contains evaluations of the informativeness of a firm's disclosures along three dimensions: annual published information, quarterly and other published information, and investor relations and related aspects.[14] The assessment factors include both the content of a firm's disclosure and its timeliness. Briefly, in the "Annual Published Information" category, analysts assess the clarity and candor of the financial highlights and president's letter, the amount of detail about the corporate officers, the corporation's goals and product and geographic segments, and the overall level of detail in the financial statements and footnotes. In the "Quarterly and Other Published Information" category, analysts consider the depth of coverage in quarterly reports and the availability and timeliness of other written material, such as press releases, proxy statements, summaries of the annual meeting proceedings and presentations to analyst groups, and statistical supplements. In the "Investor Relations" category, analysts assess how knowledgeable and responsive the company contact is to analyst questions, the accessibility of management and their candor in discussing corporate developments, and the frequency and content of presentations to analysts.

The industry subcommittees meet first to agree on the firms to be reviewed and the criteria and weights to be applied in evaluating companies in the industry. The larger firms in the industry are generally reviewed, and the set remains relatively constant over time. Individual committee members later complete evaluations of each firm, which are returned to the subcommittee chairperson. The subcommittees generally meet a second time to summarize the scores, prepare a written explanation and decide whether to recommend any companies for an "Award for Excellence in Corporate Reporting." Each subcommittee report is reviewed by the Corporate Information Committee for consistency and fairness, and a final report is prepared containing a detailed evaluation of each firm. The evaluation assigns a score in each category and a total company score which is a weighted combination of the three category scores. The report is mailed to all the firms surveyed, the FASB, the SEC and other interested parties. In many cases, the subcommittee meets individually with company representatives to discuss the results.[15] A typical year's report covers 460 firms in 27 industries, with an average of 13 analysts in each industry providing the evaluations.

Our primary sample of FAF ratings is taken from the 1985–89 FAF reports. For the investor relations, other publications and total score categories, we use these data as our measure of disclosure that took place during the company's fiscal year. However, the annual report is not

[14] A comparison of the analysts included on the subcommittees with those selected for the *Institutional Investor* All-American Research Team (1988) suggests a substantial overlap. For example, in 1988, 3 of the 5 airline subcommittee analysts and 10 of the 18 chemical subcommittee analysts were members of the 1988 All-American Research Team. In discussions with analysts, a primary motive for serving on a subcommittee is visibility and an indication of status in the analyst community.

[15] The stated goal of the evaluation process is to measure the forthcomingness and effectiveness of communicating with investors. The FAF's "Checklist of Criteria for Evaluating Financial Communications Effort" emphasizes that the evaluation is based on communication with both analysts and shareholders. However, since the evaluation is conducted by analysts (although both the buy and sell sides are included), the criteria may reflect the effectiveness in communicating with analysts more than with investors. Given that our dependent variables are based on analyst followings and characteristics of their forecasts, a disclosure measure which focuses on the ability of disclosure to satisfy analysts' needs is appropriate.

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released until after the company's fiscal year end, so for this disclosure category we use the FAF annual report ratings from 1984–1988, matching the analyst dependent variables for a fiscal year to the lagged disclosure data.[16] Descriptive statistics on the disclosure data are based on 1985–1989.

The FAF data represent a cross-section of industries, including service, manufacturing, financial, transportation and extraction.[17] Because approximately nineteen percent of the industry subcommittees (covering 38 percent of the firms) report only the overall company scores, the composition of the sample varies depending on whether the total score or individual category scores are used.[18] Re-estimating the results for the total score variable including only those industries with complete data on each of the disclosure components yields similar conclusions to those reported.

Although disclosure policy is likely to be correlated across the three categories, we include each separately, as well as the total score, because firms may vary in their choice of disclosure media and because the effect of disclosure policy may vary by the media employed.[19] For example, because much of the disclosure included in the investor relations category is targeted specifically at analysts, this category may have the most influence on the willingness of analysts to follow the firm but, to the extent that periodic press releases are important sources of information on material developments for the firm, the other publications category may be a more important determinant of forecast accuracy.

The FAF data contain a potential sample of 751 firms (732 with COMPUSTAT data) that are rated in at least one of the five FAF reports during 1985–1989. In total, there are 2272 firm-years in the sample, with each firm evaluated approximately three times in the five year period. Panel A of table 1 provides descriptive statistics for the three category scores and the total company score as a percentage of total available points. As seen in the table, each category has considerable variation; the difference between the 1st and 99th percentiles is highest for the investor relations variable (75 percent) and lowest for the annual report variable (58 percent), which may suggest that firms can more clearly differentiate their investor relations efforts than their annual report disclosures, perhaps because annual reports are more closely regulated.

A primary advantage of the FAF data is that the scores capture all aspects of disclosure which are viewed as important by analysts rather than focusing on a single aspect, such as the existence of a management earnings forecast. Further, the scores quantify qualitative disclosure (e.g., management's discussion and analysis) and disclosure which may not have been reflected in published financial statements or the media (e.g., conference calls to analysts). In addition, the measures are prepared by analysts who are primary users of financial statements, are familiar with the firms' disclosures through their use of them during the year and invest substantial time and effort in preparing the FAF reports.

A potential problem with the FAF data is that the scores reflect analysts' perceptions of firms' disclosure policies rather than the disclosure policies themselves. However, the FAF is clearly aware of this possibility and the FAF's evaluation process is specifically designed to enhance the objectivity of the evaluations in several ways. First, only summary measures for a subcommittee

[16]For example, we use the 1988 FAF annual report score and 1989 FAF investor relations, other publications and total scores as explanatory variables for 1989 analyst following and forecast characteristics.

[17]See table 1 in Lang and Lundholm (1993) for a summary of industries.

[18]Most prominently, the banking industry provides 20 percent of the total score observations, but this industry subcommittee does not report individual category scores. As a result, the banking industry affects the analysis of total scores, but not the individual disclosure categories.

[19]Marcus and Wallace (1991) and Mahoney (1991) discuss the relative advantages and disadvantages of various disclosure media.

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TABLE 1
Descriptive Statistics for the Raw FAF Disclosure Scores, Analyst Dependent Variables and Control Variables

Panel A: Disclosure Variables

			percentile				
Variable	*n*	*mean*	*1%*	*25%*	*50%*	*75%*	*99%*
Annual Report	1324	.73	.37	.64	.75	.83	.95
Other Publications	1392	.70	.30	.60	.72	.83	.96
Investor Relations	1392	.74	.25	.64	.77	.87	1.00
Total Score	2272	.70	.32	.62	.72	.80	.95

Panel B: Dependent Variables

			percentile				
Variable	*n*	*mean*	*1%*	*25%*	*50%*	*75%*	*99%*
Number of Analysts	2175	17.6	2.4	9.9	16.7	24.3	39.8
Standard Deviation of Forecasts	2141	.014	.001	.003	.005	.010	.150
Accuracy	2164	−.042	−.619	−.025	−.008	−.003	.000
Revision Volatility	2211	.010	.000	.001	.002	.005	.137

Panel C: Control Variables

			percentile				
Variable	*n*	*mean*	*1%*	*25%*	*50%*	*75%*	*99%*
Market Value ($ millions)	2215	2438	33	433	1072	2538	20794
Std(Return on Equity)	2022	.021	.001	.005	.015	.028	.111
Return-Earnings Correlation	1952	.316	−.590	.090	.360	.590	.895
Earnings Surprise	2166	.076	.000	.009	.019	.044	.842
Percentage New Forecasts	2169	.267	.102	.208	.263	.318	.457

The four disclosure variables are the analysts' ratings of disclosure from the FAF report measured as the percent of possible points received in each category. The dependent variables, percentage of new forecasts and earnings surprise are all calculated from the IBES Summary Tape. Other control variables are from COMPUSTAT. In total there are 751 firms with at least one year of FAF data during the years 1985 through 1989.

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are presented, thereby reducing the opportunity for individual analysts to curry management's favor by providing a more positive evaluation than is warranted. Second, a primary motive for having subcommittee members meet both before and after the evaluation process is to reduce subjectivity and ensure that all members use the same basic criteria in their evaluations. Further, because each subcommittee report includes a written justification of each firm's score, and the report is frequently presented to the firm orally, subcommittee members cannot capriciously make their evaluations. Finally, the Corporate Information Committee's review of the subcommittee reports helps ensure fairness and consistency.

Because each industry is evaluated by a different set of analysts, we industry-adjust the dependent and independent variables. Therefore, the tests explain intra-industry variation in the number of analysts and their forecast properties by the intra-industry variation in the disclosure and control variables. This approach controls for potential cross-industry variation in scores due to differences in subcommittee composition, but ignores cross-industry variation in scores due to legitimate differences in disclosure policy across industries. The results for measures that are not industry-adjusted are consistent with those reported in the paper.[20]

Dependent Variables

All analyst data are taken from the IBES Summary Tape. The four dependent variables we consider are:

Number of Analysts	=	the number of analysts providing an annual earnings forecast;
Std. Dev. of Forecasts	=	the inter-analyst standard deviation of forecasts deflated by stock price;
Forecast Accuracy	=	the negative of the absolute value of the analyst forecast error, deflated by stock price (i.e., $-(\|EPS_t - AF_t\|)/P_t$, where EPS_t, AF_t and P_t are earnings per share, the median analyst forecast of earning per share and price per share in period t, respectively); and
Revision Volatility	=	the standard deviation of the changes over the fiscal year in the median forecast from the preceding month, deflated by the stock price as of the beginning of the fiscal year.

We deflate the forecast measures by the stock price to facilitate comparisons across firms. We define forecast accuracy as the negative of the (scaled) absolute forecast error so that more accurate forecasts are represented by higher values. The revision volatility measures the smoothness with which analysts' expectations change during the period.[21]

We are interested in assessing the impact of disclosure generally, rather than at a particular announcement date. Further, there is no single time during the year when one would expect investor relations or other publication disclosures to have the most significant effect on analysts. Even though the annual report is issued at a single point in time, it is difficult to identify the date

[20]A related concern is that the individual analysts in a subcommittee may vary across years so that scores may not be strictly comparable across years. The FAF formalizes the evaluation process in part to mitigate such variation. To the extent that it remains, it will add noise to the disclosure variables. Results are consistent when estimated on a year-by-year basis, suggesting that variation in committee composition over time is not of serious concern.

[21]Disclosure policies might also affect the bias in analyst forecasts. For example, analysts might bias earnings forecasts to reward firms who were particularly forthcoming. However, Lang and Lundholm (1993) provide evidence that positive forecast errors are associated with more disclosure. Although this result could imply that analysts bias their forecasts downward for firms who disclose more, a more likely explanation is that firms are more willing to report good news than bad news.

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on which the annual report information reaches the market, and the informativeness of the annual report will influence the forecast accuracy and other variables over the entire year. Consequently, the number of analysts, the standard deviation of forecasts and the forecast accuracy are computed as the simple average of the measure across the twelve monthly reporting periods on the IBES tape during the company's fiscal year. Revision volatility is computed as the standard deviation of forecast changes over the twelve months of the fiscal year. Each dependent variable is based on forecasts of annual earnings made during the fiscal year to which the forecasts pertain.[22] As a practical matter, results are robust to changes in the period over which the dependent variables are measured and are very similar using measures computed based on data for a single month computed at fiscal year-end or at six months prior to fiscal year-end.

Panel B of table 1 reports descriptive statistics on the dependent variables. The median firm-year in the sample is followed by 16.7 analysts, has a standard deviation of forecasts equal to 0.5% of its share price, has an analyst forecast error that is 0.8% of its share price and a standard deviation of forecast revisions equal to 0.2% of its share price. Each variable also exhibits considerable variation across the sample, as evidenced by the inter-quartile ranges.

Control Variables

The hypothesized relations between disclosure and the analyst variables are based on the assumption that other variables are held constant. In practice, however, other factors are likely to vary systematically with both the dependent variables and disclosure scores, creating the possibility of an omitted/correlated variable problem. For example, firm size has been shown to be related to both the number of analysts and a firm's FAF disclosure score. If we did not control for firm size in the regression, a significant relation between the number of analysts and disclosure could be observed even if size were the true explanatory variable. Therefore, in addition to simple correlations, we also estimate multiple regressions including five control variables which prior research suggests may affect analyst following and forecast properties, and may be correlated with the variables of interest.

For the analyst-following regression, we include firm size, the standard deviation of return on equity and the historical returns-earnings correlation as control variables. Bhushan (1989) and Brennan and Hughes (1991) provide empirical evidence of a positive association between the number of analysts following a firm and both firm size and performance variability. Waymire (1986) and Lang and Lundholm (1993) suggest that firm size and performance variability are also likely to be correlated with disclosure policy. King et al. (1990) argue that analyst following is likely to be positively associated with returns-earnings correlation because it is easier to predict future stock price based on earnings forecasts for those firms. Lang and Lundholm (1993) document a negative correlation between the level of return-earnings correlation and the firm's disclosure level, with the interpretation that a low returns-earnings correlation indicates that earnings does a relatively poor job of capturing valuation-relevant information, so additional forms of disclosure are necessary.

[22]For example, the number of analysts following a December 31 year-end firm for the 1985 observation is computed as the sum of the number of analysts providing forecasts of 1985 annual earnings at the IBES reporting date for each of the months January through December 1985, divided by 12. As a result, forecasts of 1985 earnings made prior to the announcement of 1984 results may not be strictly comparable with those made later in the year because, for example, some analysts may only begin forecasting 1985 earnings when 1984 results are known. However, the predicted relation between disclosure and analyst behavior holds regardless of whether the forecast variables are measured before or after 1984 results are announced.

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The control variables for the number-of-analysts regressions, computed from COMPUSTAT, are:

Market Value	=	the market value of the firm's equity at the beginning of the fiscal year;
Std. Dev. of ROE	=	the historical standard deviation of return on equity computed over the preceding ten years; and
Return-Earnings Correlation	=	the historical correlation between annual returns and earnings computed over the preceding ten years.

We also include the preceding control variables in the regressions examining the forecast dispersion, accuracy and revision volatility. Firm size, returns-earnings correlation and standard deviation of ROE are likely to affect forecast characteristics because, as argued above, they affect analysts' incentives to gather information about the firm and, consequently, are likely to affect their forecast characteristics.[23]

In addition to the control variables listed above, we include additional control variables, earnings surprise and the percent of new forecasts, in our forecast characteristic regressions. The earnings surprise, measured as the random walk forecast error deflated by price, controls for the fact that forecast characteristics are likely to be affected by the magnitude of the earnings information to be disclosed. Consider a firm's introduction of a major new product. Realized earnings are likely to deviate substantially from expected earnings, consensus among analysts is likely to be low, and there are likely to be significant revisions in analyst forecasts. Inclusion of a measure of earnings surprise as an independent variable should control for such factors.

The percentage of new forecasts mitigates the possible effect of stale IBES forecasts. Analyst forecasts which were not updated in a given month are still included in IBES's computation of summary statistics on analyst forecasts, and it is not possible to determine whether the forecast was not revised because it still reflected the analyst's best estimate or because the analyst opted to not reestimate earnings. As a partial control for cross-sectional differences in the staleness of forecasts, we include the average monthly percentage of new forecasts for the year. Controlling for the percentage of new forecasts should reduce any systematic variation across observations in the IBES forecast characteristics which is due solely to differences in the proportion of recently revised forecasts.[24]

We define earnings surprise and percent new forecasts as follows:

Earnings Surprise	=	the absolute value of the difference between the current year's earnings per share and last year's earnings per share, divided by the price at the beginning of the fiscal year; and
Percent New Forecasts	=	the number of forecasts revised during the month plus the number of first-time forecasts issued during the month divided by the number of forecasts at the month-end, averaged over the twelve months in the firm's fiscal year.

[23]We also performed three specification checks for alternative control variables in the number-of-analysts regressions. First, we included the number of institutional investors and the percent of shares outstanding held by institutions in 1987, reflecting Bhushan's (1989) evidence that analyst following is increasing in institutional ownership. Second, we included the firm's share price, based on Brennan and Hughes' (1991) result that the number of analysts is higher for firms with lower share prices. Finally, we included the other three dependent variables as independent variables in each regression. The results are not sensitive to any of these variations.

[24]We have also conducted the analysis for the quartile of observations with the highest percentage of new forecasts (where staleness should be less of an issue) and find consistent results. However, the possibility of stale forecasts cannot be dismissed entirely.

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Panel C of table 1 presents descriptive statistics on the control variables. The sample firms are generally large, as indicated by a median firm-year market value in excess of $1 billion; however, market value ranges from $33 million in the 1st percentile to over $20 billion in the 99th percentile.[25] For the median firm-year, the standard deviation of return on equity is 1.5%, the earnings/returns correlation is 36.0%, the absolute value of the change in earnings per share from the previous year is 1.9% of the share price, and 26.3% of the forecasts are new each month.

Simple Correlations

Because we do not predict a particular functional form for the relation between the dependent and independent variables, we base our analysis on ranked data. We rank the dependent and independent variables within their industry-year and convert the ranks to percentiles: (rank – 1)/(number of firms – 1). The conversion yields the percentile of the firm's rank within its industry-year, so the lowest-ranking firm receives a zero and the highest-ranking firm receives a one.

Table 2 presents correlations between pairs of independent variables after they have been converted into percentiles. As one would expect if firms coordinate disclosure policy across media, the three disclosure categories are positively correlated at levels ranging from 0.46 to 0.83. Disclosure categories have correlations that are considerably less than one, suggesting that different categories may capture different aspects of disclosure. The correlations among the control variables are relatively low, ranging from 0.28 to –0.25, as are the correlations between the disclosure variables and the control variables, suggesting that multicollinearity among disclosure and control variables is not likely to be a significant issue in the multiple regressions. As reported in Lang and Lundholm (1993), firms with higher disclosure scores are generally characterized by larger market values, lower standard deviations of past return on equity, and lower past return/earnings correlations. Further, higher disclosure scores are associated with a larger proportion of forecast revisions, suggesting that a more forthcoming disclosure policy is associated with more frequent forecast revisions.

Table 3 presents simple correlations between pairs of analyst variables, and between pairs of analyst variables and independent variables. Panel A displays the associations of primary interest in this study, the relations among analyst following and forecast characteristics and the disclosure variables. The associations are consistent across all three disclosure categories, with correlations significant at the 0.01 level. The number of analysts is positively correlated with the informativeness of a firm's disclosure practices, and firms with more informative disclosure practices have less dispersion in analyst forecasts, the forecasts are more accurate, and there is less volatility in the sequence of forecast revisions.

Table 3, panel B reports the correlations between the analyst variables and the control variables. The number of analysts is most closely associated with market value (0.70). The standard deviation of forecasts and the revision volatility are both highly positively correlated with the earnings surprise and the standard deviation of past return on equity suggesting that, for firm-years with high past and present uncertainty, there is more dispersion and volatility in analysts' forecasts. Similarly, forecast accuracy is negatively correlated with earnings surprise, suggesting that analysts are less accurate when there has been a significant change from last period's earnings.

[25]Because the sample firms are large on average, care should be taken in generalizing the results to other populations. Marcus and Wallace (1991) and Mahoney (1991) suggest that, because of the competition for analyst attention and limited alternate sources of information, disclosure policy is likely to have a greater impact for small firms than for large firms.

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TABLE 2
Correlations among the FAF Disclosure Score Variables and Control Variables

	Disclosure Variables			*Control Variables*				
	Other Pub.	*Inv. Rel.*	*Total Score*	*Mkt. Value*	*SD of ROE*	*R-E Corr*	*Earnings Surprise*	*Percent New*
Disclosure Variables:								
Annual Report	.622	.463	.825	.230	–.113	–.115	–.073	.048
	.0001	.0001	.0001	.0001	.0001	.0001	.0100	.0906
Other Publications		.494	.804	.169	–.079	–.106	–.017	.069
		.0001	.0001	.0001	.0050	.0002	.5451	.0121
Investor Relations			.737	.188	–.101	–.099	–.031	.009
			.0001	.0001	.0003	.0005	.2657	.7560
Total Score				.245	–.085	–.083	–.018	.031
				.0001	.0002	.0003	.4079	.1525
Control Variables:								
Market Value					–.247	–.113	–.125	.061
					.0001	.0001	.0001	.0050
Std. Dev. of ROE						.111	.186	.058
						.0001	.0001	.0099
Returns-Earnings Correlation							.126	.038
							.0001	.0949
Earnings Surprise								.275
								.0001

All variables are computed by ranking the unranked variables in table 1 within their industry-year and converting the ranks to percentiles: (rank – 1)/(number of firms – 1). Listed below each correlation is the p value. The number of observations ranges from 1047 to 2125.

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TABLE 3

Correlations Among the Dependent Analyst Variables and the FAF Disclosure Score Variables and Control Variables

	Dependent Variables			
	Number of Analysts	*Std. Dev. of Forecasts*	*Forecast Accuracy*	*Revision Volatility*
Panel A: Disclosure Variables				
Annual Report	.267	−.174	.081	−.142
	.0001	.0001	.0080	.0001
Other Publications	.228	−.095	.086	−.113
	.0001	.0005	.0018	.0001
Investor Relations	.267	−.177	.156	−.200
	.0001	.0001	.0001	.0001
Total Score	.331	−.123	.106	−.146
	.0001	.0001	.0001	.0001
Panel B: Control Variables				
Market Value	.701	−.255	.182	−.270
	.0001	.0001	.0001	.0001
Std. Dev. of ROE	−.190	.303	−.172	.267
	.0001	.0001	.0001	.0001
Return-Earnings Correlation	−.116	.152	−.128	.107
	.0001	.0001	.0001	.0001
Earnings Surprise	−.071	.454	−.458	.404
	.0009	.0001	.0001	.0001
Percent New Forecasts	.079	.407	−.475	.507
	.0002	.0001	.0001	.0001
Panel C: Dependent Variables				
Std. Dev. of Forecasts	−.149			
	.0001			
Forecast Accuracy	.131	−.615		
	.0001	.0001		
Revision Volatility	−.197	.764	−.670	
	.0001	.0001	.0001	

All variables are computed by ranking the unranked variables in table 1 within their industry-year and converting the ranks to percentiles: (rank − 1)/(number of firms − 1). Listed below each correlation is the p value. The number of observations ranges from 1047 to 2125.

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Table 3, panel C reports the correlations between the dependent variables. The highest correlation is between forecast revision volatility and standard deviation of forecasts (0.76) suggesting that forecast revisions tend to be more volatile in cases in which there is less consensus among analysts. Forecast accuracy is positively correlated with the number of analysts, possibly because the median forecast becomes a more accurate estimator as the number of observations increases.

Given the relatively high correlations among the analyst following and forecast characteristic variables, the control variables and the disclosure variables noted above, inference drawn from the simple correlations may be misleading. Specifically, our interest is in the marginal effect of disclosure on analyst following and forecast characteristics. In the next section, we assess the marginal effect of disclosure holding other variables constant.

Regression Results

Table 4 reports the results of regressions of the number of analysts on the control and disclosure variables.[26] With respect to H1, results for the total score category indicate a significant relation between disclosure policy and analyst following, suggesting that analyst following is a function of disclosure policy.[27]

To test whether each category has explanatory power incremental to that in the other categories, we estimate the regression including all three categories together. The collinearity among the disclosure variables discussed earlier can result in inflated sampling variances and unstable coefficient estimates. Nevertheless, when all three components of disclosure are included, coefficients on both the other publications and investor relations categories are significantly positive, while the coefficient on the annual report variable is insignificant.[28] The significant positive coefficients for the investor relations and other publications variables are consistent with Lees' (1981) survey finding that analysts rely heavily on direct contact with firms and with the notion that, although the securities laws prohibit disclosure of material nonpublic information to selective subsets of the analyst population, a firm's willingness to communicate with analysts is an important factor in their willingness to follow a firm.[29] The significant result when the annual report variable is included separately and the correlations across disclosure categories suggest that increased disclosure in the annual report is part of an overall disclosure strategy that increases analyst following. However, the fact that annual report loses significance when all three categories are included indicates that the other disclosure variables capture the

[26]Iman and Conover (1979) provide a discussion of rank regression. This ranking mechanism produces larger differences between percentiles for small industries than for large industries. For example, in an industry with only two firms, one will have a disclosure score of 1.0 and the other of 0.0 where, if those firms were in an industry with many firms, their values would probably be less extreme. As a result, observations in industries with fewer firms will tend to have slightly higher variances. We have re-estimated the regressions with unranked data and with data ranked across all firms (not adjusted for industry) with similar results to those reported in the paper, suggesting that this effect does not affect our conclusions.

[27]Significance levels should be interpreted with caution because some firms are included in the analysis for consecutive years, which may induce auto-correlation in the residuals. We have conducted specification checks which take first order auto-correlation into account with very similar results. As a more extreme check, we also conducted the analysis using only one observation per firm with very similar results. A firm appears in our sample on average three times, so at most the number of independent observations is overstated by a factor of three, causing the t-statistics to be overstated by at most a factor equal to the square root of 3. Unless otherwise stated, we refer to a result as "significant" if the p-value for a two-tailed test is less than 0.01.

[28]Collinearity between disclosure categories is an issue in all of the sets of regressions which follow. In every case, each disclosure category is statistically significant with a consistent sign in explaining forecast characteristics when included alone, but generally one or more are not significant when the other categories of disclosure are included.

[29]The fact that the coefficient on the total score is higher than that on any of the components reflects the fact that the relation tends to be stronger for the industries for which the subcommittees did not provide scores for the individual disclosure categories (principally banking).

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TABLE 4
Regression of the Number of Analysts Following the Firm on Disclosure Scores and Control Variables

$$Number\ of\ Analysts = \alpha + \beta_1 Annual\ Report + \beta_2 Other\ Publications + \beta_3 Investor\ Relations + \beta_4 Total\ Score + \beta_5 Market\ Value + \beta_6 Standard\ Deviation\ of\ ROE + \beta_7 Return\text{-}Earnings\ Correlation + \varepsilon$$

α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	N	R^2
0.11				0.17	0.66	–0.01	–0.02	1868	0.52
(6.2)				(10.1)	(38.6)	(–0.8)	(–1.5)		
0.17	0.02	0.07	0.10		0.59	–0.05	–0.06	998	0.45
(6.1)	(0.8)	(2.3)	(3.5)		(23.0)	(–1.8)	(–2.7)		

Regressions are estimated using ordinary least squares, with all variables ranked and then computed as percentiles within the industry-year. T-statistics are noted in parentheses below each coefficient estimate. Annual Report, Other Publications, Investor Relations and Total Score are the annual report, other publications, investor relations and total score, respectively, based on the FAF scores for each category of disclosure. Number of Analysts is the average number of analysts on IBES providing an estimate of annual earnings over the 12 months of the company's fiscal year. Market Value is the market value of outstanding equity at the beginning of the fiscal year. Standard Deviation of ROE is standard deviation of net income divided by shareholders' equity and Returns-Earnings Correlation is the correlation between annual returns and earnings, each calculated over the 10 years prior to the observation. N is the number of observations and R^2 is the adjusted R^2 for the regression.

effect of the disclosure strategy, and the score for the annual report does not have incremental explanatory power.[30]

The positive relation between the number of analysts and the FAF scores suggests that firm-provided disclosures complement rather than substitute for analyst activities. Consequently, information intermediation (processing firm-provided information) appears to be a significant aspect of the analyst function in capital markets. As argued earlier, if analysts were primarily information providers—in competition with firm disclosures provided directly to investors—then more firm-provided disclosures should diminish the value of analyst services and the number of analysts following the firm.

The coefficient on firm size is positive and significant, consistent with the results reported by Bhushan (1989). The standard deviation of past return on equity and the correlation between annual returns and earnings are significantly negative in the regression including all three categories of disclosure separately but are not significant in the regression including only the total disclosure score, providing weak evidence that analysts are more likely to follow firms with low performance variability and firms for which earnings are not highly correlated with returns. The negative coefficient estimate for performance variability in the regressions including all three

[30]The fact that we measure analyst following as an average over 12 months while the annual report is released at one point in time may bias against results for the annual report variable. However, results are not sensitive to time period over which the analyst-following variable (or other analyst variables) are measured.

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categories of disclosure is consistent with that documented by Bhushan (1989) and Brennan and Hughes (1991), but the negative association between analyst following and the return-earnings correlation runs counter to the intuition from King et al. (1990) that the incentives for private information acquisition will be greater when the returns-earnings correlation is high. The explanatory power of the regressions is substantial, with an adjusted R^2 of 0.52 for the regression including the total score and 0.45 for the regression including all three of the disclosure categories.

Direction of Causality

Our hypotheses assume firms choose their disclosure policies partly to influence the activities of analysts. Thus, we view the informativeness of disclosure as "causing" the observed level of analyst following. It is possible, however, that the direction of causality is the opposite (i.e., a larger analyst following causes the firm to increase its disclosures) or that analyst following and the informativeness of disclosures are simultaneously determined by other exogenous variables.

One approach to investigating the direction of causality is to examine the association between changes in disclosure scores and changes in the lead and lag number of analysts. There are several problems with this approach. First, while the FAF attempts to maintain consistency from year to year, the evaluation process is designed to make comparisons among firms at a point in time, rather than comparisons of the same firm through time. The composition of the industry subcommittees and the specific criteria and weights vary from year to year, so changes in disclosure scores may reflect changes in subcommittees or criteria over time. Second, the disclosure policy of a firm and the number of analysts following it are likely to change only slowly over time because of the fixed costs to a firm of substantially changing disclosure policies or the fixed cost to an analyst of adding or deleting a firm. Therefore, we include changes computed over time periods of up to four years. However, because a given firm may have been evaluated in only a subset of the sample years, the number of observations for longer intervals is significantly reduced.

We compute the rank-order correlations between changes in disclosure scores and changes in both lead and lag analyst following. The change in lead (lag) analyst following is the change in the number of analysts following the firm computed over the time period following (preceding) the period over which the change in disclosure is computed. If changes in the number of analysts following the firm *precede* changes in disclosure policy, then the correlation between changes in disclosure and changes in the lagged number of analysts should be positive; if changes in the number of analysts *follow* changes in disclosure policy, then the correlation between changes in disclosure and changes in the lead number of analysts should be positive. As seen in table 5, all but one of the correlations for the lagged number of analysts are negative (although many are not significant), rejecting the hypothesis that changes in the number of analysts precede changes in disclosure. In addition, all the correlations for the lead number of analysts are positive, (although only a subset are significant) supporting the hypothesis that changes in the number of analysts follow changes in disclosure. Although a chronological ordering of events does not conclusively establish causality, these results provide limited evidence that disclosure policy changes cause changes in the number of analysts; we observe no evidence that causality runs in the opposite direction.

An alternate approach is to estimate a simultaneous equations model to investigate whether a firm's disclosure score and the number of analysts following the firm are jointly determined by a set of exogenous variables. The simultaneous equations approach potentially controls for bias in the OLS estimates when the error term is correlated with the independent variables, as is the case when a truly endogenous variable is treated as an exogenous (independent) variable. To implement this model, we estimate a first stage regression of FAF scores on a set of instrumental

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TABLE 5
Correlations between Changes in FAF Disclosure Score Variables and Lag 1 and Lead 1 Changes in the Number of Analysts Following the Firm, Computed over Window Lengths of 1 to 4 Years

		4 Year Window			
	ΔAnnual Report	*ΔOther Pubs*	*ΔInvestor Relations*	*ΔTotal Score*	
Δ in lead 1	0.11908	0.29018	0.11076	0.23833	*correlation*
# of analysts	0.1494	0.0003	0.1802	0.0001	*p value*
	148	148	148	265	*number of obs.*
Δ in lag 1	–0.00767	0.05087	–0.13693	–0.01944	
# of analysts	0.9270	0.5435	0.1005	0.7569	
	145	145	145	256	
		3 Year Window			
	ΔAnnual Report	*ΔOther Pubs*	*ΔInvestor Relations*	*ΔTotal Score*	
Δ in lead 1	0.02421	0.14201	0.04560	0.05948	
# of analysts	0.6578	0.0083	0.3985	0.1594	
	337	345	345	561	
Δ in lag 1	–0.04320	–0.02268	–0.11085	–0.08039	
# of analysts	0.4300	0.6751	0.0399	0.0607	
	336	344	344	545	
		2 Year Window			
	ΔAnnual Report	*ΔOther Pubs*	*ΔInvestor Relations*	*ΔTotal Score*	
Δ in lead 1	0.11373	0.17181	0.05293	0.07938	
# of analysts	0.0091	0.0001	0.2135	0.0171	
	525	554	554	902	
Δ in lag 1	–0.03703	–0.01245	–0.10952	–0.05556	
# of analysts	0.3972	0.7708	0.0102	0.0999	
	525	550	550	878	
		1 Year Window			
	ΔAnnual Report	*ΔOther Pubs*	*ΔInvestor Relations*	*ΔTotal Score*	
Δ in lead 1	0.05136	0.06131	0.00597	0.02076	
# of analysts	0.1461	0.0715	0.8608	0.4361	
	802	865	865	1409	
Δ in lag 1	–0.04702	–0.02555	–0.03657	–0.03731	
# of analysts	0.1846	0.4561	0.2861	0.1680	
	798	853	853	1367	

ΔAnnual Report, ΔOther Pubs, ΔInvestor Relations and ΔTotal Score are the changes in the annual report, other publications, investor relations and total disclosure scores from the FAF data. Δ in lead 1 # of analysts and Δ in lag 1 # of analysts are the changes in the number of analysts over the period following and over the period preceding the window over which the change in disclosure scores is computed respectively. The window over which both variables are computed is noted at the top of each panel.

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variables; we then use the predicted value from this regression in place of the actual disclosure score in the number-of-analysts regression. Whether the coefficient estimates from this approach are more or less biased than the OLS estimates depends on whether the instrument variables are indeed exogenous (i.e., independent of the error term) and the portion of the variation in disclosure score that is captured in the first stage regression (Bound et al. 1993). In the context of our analysis, the difficulty is identifying instrumental variables that are highly correlated with FAF scores, but are uncorrelated with the error from the number of analysts regression.

Our source of instruments is Lang and Lundholm (1993), who model disclosure scores as a function of the firm's structural environment (market value and standard deviation of past return on equity), performance (market-adjusted returns and analysts' earnings forecast errors) and activity in the public capital market (security offering in the current or following two years). While the explanatory variables are statistically significant, the resulting first-stage regressions have very low adjusted R^2s, ranging from 0.05 to 0.09, which suggests that significant measurement error may have been introduced in the first stage of the analysis.

To assess statistically whether the two equations are simultaneously determined, we apply the Hausman test (Hausman 1978). We regress the number of analysts on the exogenous variables (i.e., the control variables), the instrument for disclosure score (i.e., the predicted value from the first-stage regression) and the actual disclosure score. If the disclosure score is truly exogenous, the coefficient on the instrumented disclosure score will equal zero. The results from this test fail to reject the hypothesis that the coefficient is zero for all four disclosure score variables, suggesting that simultaneity is not an issue. The p-value for two-tailed t-test is 0.19 for the annual report, 0.18 for other publications, 0.62 for investor relations and 0.77 for the total score.

Results from estimating the second-stage regressions using the instruments estimated in the first stage (not reported) are consistent with those reported earlier. While the statistical significance of the disclosure scores is reduced somewhat relative to the results in table 4, all remain significant at less than the 0.10 level. The reduced significance may reflect the effects of simultaneity, but it also likely reflects the low R^2 in the first-stage regressions.

In summary, the analysis for number of analysts suggests a significant relation between the firm's disclosure policy and the number of analysts following the firm. Further, there is limited evidence that changes in firms' disclosure policies cause changes in analyst following; there is no evidence of the opposite direction of causality.[31]

Forecast Dispersion and Disclosure

Table 6, panel A provides evidence on H2 with respect to the relation between forecast dispersion and disclosure. In the regression including the total disclosure score, the coefficient on the total score is significantly negative, suggesting that more forthcoming disclosures decrease dispersion among analyst forecasts. This result is consistent with additional disclosure reducing the divergence of beliefs across analysts by increasing the precision of their shared information. In the regression including all three categories of disclosure, coefficients on both the annual report and investor relations variables are significantly negative, but the other publications variable is not significant.

The relation between the standard deviation of analyst forecasts and market value is negative, indicating that analyst dispersion is lower for larger firms. The relations between the standard

[31]We do not control for simultaneity of other dependent variables because forecast characteristics in a given period are unlikely to affect contemporaneous disclosure ratings (e.g., firms are unlikely to increase disclosure because analyst forecasts are very accurate). It is possible that analysts' perceptions of disclosure are affected by forecast characteristics, but the FAF designs the evaluation process to mitigate this bias.

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TABLE 6
Regression of Forecast Characteristics on Disclosure Scores and Control Variables

$$\textit{Forecast Characteristics} = \alpha + \beta_1 \textit{Annual Report} + \beta_2 \textit{Other Publications} + \beta_3 \textit{Investor Relations} + \beta_4 \textit{Total Score} + \beta_5 \textit{Market Value} + \beta_6 \textit{Standard Deviation of ROE} + \beta_7 \textit{Returns-Earnings Correlation} + \beta_8 \textit{Earnings Surprise} + \beta_9 \%\ \textit{New Forecasts} + \varepsilon$$

Panel A: Standard Deviation of Analyst Forecasts

α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	N	R^2
0.19				–0.07	–0.18	0.17	0.06	0.31	0.33	1850	0.38
(8.7)				(–3.6)	(–9.1)	(8.8)	(3.3)	(15.9)	(17.4)		
0.28	–0.08	0.01	–0.06		–0.25	0.18	0.07	0.27	0.33	989	0.42
(8.6)	(–2.7)	(0.2)	(–2.2)		(–9.2)	(6.7)	(2.6)	(10.5)	(13.0)		

Panel B: Forecast Accuracy

α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	N	R^2
0.79				0.06	0.14	–0.03	–0.05	–0.33	–0.40	1858	0.38
(35.4)				(3.4)	(7.2)	(–1.4)	(–2.5)	(–17.0)	(–20.6)		
0.73	–0.01	0.06	0.07		0.19	–0.02	–0.03	–0.32	–0.41	994	0.38
(21.4)	(–0.4)	(1.9)	(2.3)		(6.5)	(–0.7)	(–1.2)	(–12.2)	(–15.7)		

(*Continued*)

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TABLE 6 (*Continued*)

Panel C: Volatility of Forecasts Revisions

α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	N	R^2
0.24				–0.09	–0.21	0.12	0.02	0.23	0.45	1858	0.41
(11.0)				(–5.1)	(–10.8)	(6.6)	(1.0)	(12.0)	(24.5)		
0.33	–0.03	0.01	–0.10		–0.27	0.12	0.02	0.19	0.44	994	0.42
(9.9)	(–1.1)	(–0.4)	(–3.4)		(–9.9)	(4.5)	(1.0)	(7.6)	(17.5)		

Panel title indicates the forecast characteristic dependent variable in the regression. Regressions are estimated using ordinary least squares, with all variables ranked and then computed as percentiles within the industry-year. T-statistics are noted in parentheses below each coefficient estimate. N is the number of observations and R^2 is the adjusted R^2 for the regression.

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deviation of forecasts and the standard deviation of past ROE, the past returns-earnings correlation, earnings surprise and the percentage of new forecasts are all significantly positive, suggesting that the dispersion among analysts is higher when the past earnings series is volatile and strongly related to past returns, and when there is a large earnings surprise and frequent forecast revisions. The proportion of variation explained in the regressions is substantial, with adjusted R^2s of 0.38 for the regression including total score and 0.42 for the regression including all three disclosure categories.

Forecast Accuracy and Disclosure

Table 6, panel B presents results from the regressions of forecast accuracy on the disclosure scores, providing evidence on H3. The coefficient on the total disclosure score is significantly positive when it is included as an explanatory variable, confirming that firm disclosure is an important determinant of the accuracy of analyst forecasts. When all three disclosure categories are included, coefficients on both the other publications and investor relations categories are significantly positive, consistent with the notion that ongoing communication with companies is an important source of information to analysts in forecasting earnings.

Accuracy is positively associated with market value, suggesting that analysts' forecasts are relatively more accurate for larger firms. The coefficients on the standard deviation of past return on equity are negative but insignificant. The standard deviation of past forecasts was significantly negatively correlated with accuracy in the simple correlations, so it appears that inclusion of other measures of uncertainty such as earnings surprise and market value have rendered this variable insignificant. Coefficients on the earnings-return correlation, earnings surprise and percent of new forecasts are generally significantly negative, suggesting that forecasts tend to be less accurate in cases when there is a large earnings surprise, when analysts are frequently revising their forecasts and when the past association between returns and earnings is low. The significant negative coefficients on the percent of new forecasts suggest that its inclusion is, at best, a partial control for stale forecasts. The regression explains a significant proportion of the variation in forecast accuracy, with adjusted R^2s of 0.38 for both the regression with total score and the regression including all three categories of disclosure.

Volatility of Forecast Revisions and Disclosure

Table 6, panel C presents evidence on H4 from the regression of forecast revision volatility on disclosure scores. The coefficient on the total score is significantly negative when it is included in the regression. When all three disclosure categories are included, only investor relations is significant, consistent with the notion that a firm can reduce the likelihood of large revisions in analysts' expectations through its investor relations effort.

The volatility of forecast revisions is decreasing in market value, suggesting that there are fewer extreme expectation revisions for large companies. The relation between variability of forecast revisions and the standard deviation of past ROE, earnings surprise and percentage of new forecasts are all positive, suggesting that revisions in expectations tend to be volatile when there is a large earnings surprise, there are frequent forecast revisions and the past earnings series is volatile. The coefficient on the correlation between returns and earnings is insignificant, suggesting that the past relation between returns and earnings is not a significant determinant of forecast revision volatility. The explanatory power of the regressions is high, with adjusted R^2s of 0.41 for the regression with the total disclosure score and 0.42 for the regression including all three categories of disclosure.

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V. CONCLUSIONS

The results of this paper indicate that, after controlling for size, the earnings surprise and other attributes of the information environment, firms with more forthcoming disclosures in their industry have a greater analyst following, more consensus among analysts' earnings forecasts, more accurate forecasts and less variable forecast revisions. Of the three categories of disclosure considered, investor relations is consistently a significant determinant of analyst behavior even after controlling for other categories of disclosure, confirming existing survey and anecdotal evidence that direct contact with the company is a primary source of information for analysts.

Overall, these results are consistent with the view that more forthcoming disclosure policies, particularly in the investor relations area, attract more analysts, either because these disclosures increase the demand for analyst reports or because they reduce analysts' costs of supplying them. The fact that an increase in firm-provided information increases analyst following suggests that analysts are not in direct competition with firm disclosures provided directly to investors. The results are also consistent with the view that analysts possess both firm-provided and privately-acquired information, but that increases in disclosure and timeliness reduce the weight analysts place on other information in their forecasting models and smooth the forecast revision process by expediting the resolution of uncertainty.

To the extent that the behavior of analysts captures that of investors more generally, these results are consistent with motivations for disclosure given in the investor relations literature and have implications for management as it sets disclosure policy, for the SEC and Congress as they establish securities laws and for the FASB as it proceeds with its project on "Disclosure Effectiveness." While there has been a great deal of discussion about the costs of increased disclosure, potential benefits have received less attention.[32] Although the evidence is indirect, this study finds relationships between firms' disclosure policies and factors that have been linked to a reduced cost of capital. The results for analyst following suggest that firms that disclose more have a larger pool of potential investors; the results for forecast accuracy suggest that their investors have more accurate beliefs about future performance; the results for forecast dispersion suggest that there is less asymmetry in investors beliefs about their performance; and the results for revision volatility suggest that investor expectations about their earnings change more smoothly over the year.

[32]The FASB laments in SFAS No. 1 that, "the benefits from financial information are usually difficult or impossible to measure objectively, and the costs often are."

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