The Impact of Security Analysts' Monitoring and Marketing Functions on the Market Value of Firms

Kee H. Chung; Hoje Jo

The Journal of Financial and Quantitative Analysis, Vol. 31, No. 4 (Dec., 1996), 493-512.

Stable URL:
http://links.jstor.org/sici?sici=0022-1090%28199612%2931%3A4%3C493%3ATIOSAM%3E2.0.CO%3B2-L

The Journal of Financial and Quantitative Analysis is currently published by University of Washington School of Business Administration.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at http://www.jstor.org/about/terms.html. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at http://www.jstor.org/journals/uwash.html.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact jstor-info@umich.edu.

http://www.jstor.org/
Thu Jan 15 14:47:56 2004

JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS VOL. 31, NO. 4, DECEMBER 1996

The Impact of Security Analysts' Monitoring and Marketing Functions on the Market Value of Firms

Kee H. Chung and Hoje Jo*

Abstract

In this study, we examine the impact of security analysts' monitoring and marketing functions on firms' market value. We postulate that security analysts' monitoring of corporate performance helps motivate managers, thus reducing the agency costs associated with the separation of ownership and control. We also argue that the information intermediary function provided by security analysts helps expand the breadth of investor cognizance. Consistent with these conjectures, this study finds that analyst following exerts a significant and positive impact on firms' market value. We also find evidence that security analysts have a stronger incentive to follow stocks of high quality companies, since such stocks are easier to market. Hence, the security analysis activities appear to be determined, in part, by the marketing considerations of brokerage companies.

I. Introduction

Security analysts are among the most important information intermediaries between firms and investors. Thousands of security analysts employed by brokerage houses and independent research services follow a large population of companies. Analysts routinely collect and process an enormous amount of information from corporate insiders/managers and subsequently disseminate this information to current and prospective investors. Indeed, many investors, both individual and institutional, rely on the information (e.g., corporate earnings forecasts and industry analysis) provided by financial analysts when they do portfolio selections/revisions.

Despite the pivotal roles played by security analysts in the financial market, the causes and ramifications of analyst following have not received much attention in the literature. Most previous studies of analysts' forecasts have focused on the *information content* of analysts' forecasts (see, e.g., Givoly and Lakonishok (1979), Dempsey (1989), Abarbanell (1991), and Stickel (1991)) or the *relative*

*Chung, Department of Finance, Fogelman College of Business and Economics, The University of Memphis, Memphis, TN 38152; Jo, Department of Finance, Leavey School of Business, Santa Clara University, Santa Clara, CA 95053. We are grateful to Ralph Walkling (the referee), Charles Lee, Patricia O'Brien, Roger Huang, Meir Statman, and seminar participants at the 1996 Western Finance Association conference for valuable comments. Jo acknowledges financial support from the Dean Witter Foundation, a Leavey Research Grant at the Leavey School of Business, and a Presidential Research Grant from Santa Clara University.

accuracy of analysts' forecasts vis-à-vis management or statistical forecasts (see, e.g., Brown and Rozeff (1978), Fried and Givoly (1982), Welch (1984), Brown et al. (1987), and Kross, Ro, and Schroeder (1990)). Brennan and Subrahmanyam (1995) points out that "security analysis is a costly activity whose social benefits remain largely unexplored."

In this study, we examine the impact of security analysts' monitoring and marketing functions on the market value of firms. Casual empiricism suggests that there exists a wide variation in analyst following among different firms. While some firms are continuously monitored by a large number of security analysts, others receive very little attention. Following Jensen and Meckling (1976), we argue that security analysis activities help reduce the agency costs associated with the separation of ownership and control. We maintain that these activities help discipline corporate managers, because their decisions are closely monitored and publicized through such activities.[1] As a result, the extent to which corporate assets are mismanaged is likely to be lower for firms that are closely monitored by numerous security analysts. Conversely, when such monitoring is absent, managers may be more likely to pursue activities that benefit themselves at the expense of shareholders.

Not only does security analysis activity affect firm value through its monitoring function, but it may also influence firm value through its impact on investor cognizance of securities. Assuming that investors trade only those securities that they know about, Merton (1987) shows that a firm's market value is positively associated with the fraction of all investors who know about the firm (i.e., the breadth of investor cognizance). To the extent that investors acquire their knowledge about securities through the information provided by financial analysts, the breadth of investor cognizance is likely to be greater for those stocks followed by a larger number of analysts. Hence, the positive impact of analyst following on firm value can also be postulated from the analysts' role as an information intermediary.[2]

While the main focus of our research is to examine the effect of analyst following on firm value, we also recognize the endogenous nature of analyst following. Bhushan (1989), Moyer, Chatfield, and Sisneros (1989), and Brennan and Hughes (1991) consider various firm/security characteristics that may influence either the demand or supply of analyst services. Notably, Bhushan and Moyer et al. finds that, other things being equal, analyst following is greater for larger and/or riskier firms. Brennan and Hughes finds that lower priced stocks are followed by more analysts. In this paper, we argue that analyst following is positively associated with "perceived firm quality," based upon the analysts' role as marketing aids for the brokers in their organizations. To reflect the endogeneity of analyst following, we employ a simultaneous equation model as the empirical representation of the relationship between firm value and analyst following.

[1] We believe that security analysts perform a monitoring function that is, in essence, analogous to that of bond rating agencies (see Wakeman (1981) and Fama and Jensen (1985)) or outside members of a firm's board of directors (see Fama (1980)).

[2] While this study focuses on the value implication of information collection/distribution activities performed by a third party (i.e., financial analysts), the production and distribution of information by insiders (i.e., managers) may also have similar effects. Botosan (1995), for example, finds that the cost of equity capital is negatively associated with the extent of voluntary information disclosure by the firm.

Our empirical results indicate that the security analysis activities indeed exert a strong positive impact on the market value of firms. Specifically, we find that after controlling for the effects of risk, firm size, R&D and advertising expenditures, and profitability, Tobin's q is significantly and positively associated with the number of analysts following the firm. There is a large body of evidence indicating that security analysis does not help increase portfolio returns.[3] That is, the security analysis activities of mutual funds and other institutional investors do not increase risk-adjusted portfolio returns over a naive random selection buy-and-hold strategy. Therefore, it has been claimed that the resources expended on such activities may be a social loss.[4] Empirical evidence documented in this study, however, suggests that such a claim may not be legitimate. In fact, empirical evidence favors Jensen and Meckling's view ((1976), p. 355) that

> to the extent that security analysis activities reduce the agency costs associated with the separation of ownership and control they are indeed socially productive. Moreover, if this is true we expect the major benefits of the security analysis activity to be reflected in the higher capitalized value of the ownership claims to corporations and *not* in the period to period portfolio returns of the analyst.

We also find that after controlling for firm size, share price, trading volume, and the variability of stock returns, analyst following is positively associated with various proxies of firm quality (i.e., Tobin's q, R&D and advertising expenditures, and NYSE listing). Empirical evidence thus corroborates our conjecture that security analysts have a stronger incentive to follow stocks of high quality firms, since such stocks are easier to market.

The paper is organized as follows. Section II describes our hypotheses on the interrelationship among analyst following, firm value, and various firm characteristics. Section III describes the data and Section IV presents the empirical results. Section V concludes.

II. Analyst Following: Causes and Consequences

A. Security Analysis and Firm Value

Many large U.S. firms are run by people who hold very little equity in them. Managers who hold little equity in a firm may deploy corporate assets to benefit themselves rather than shareholders. While the role of managerial ownership in reducing the agency costs associated with the separation of ownership and control has received significant attention in the literature,[5] an equally important role of security analysts as the monitors of managerial performance has been largely overlooked. We would expect that monitoring activities are performed by those parties who possess comparative advantages in these activities. Following Jensen and Meckling (1976), we argue that an important group of market participants who perform these monitoring activities is composed of the security analysts employed

[3] See, e.g., Jensen (1969), Brinson, Hood, and Beebower (1986), and Ippolito (1989).

[4] See, e.g., Brinson, Hood, and Beebower (1986).

[5] See, e.g., Jensen and Meckling (1976), Morck, Shleifer, and Vishny (1988), and McConnell and Servaes (1990).

by institutional investors, brokers, and investment advisory services.[6] Jensen and Meckling conjectures that the security analysis activities may reduce the agency costs associated with the separation of ownership and control and, as such, they are socially productive. Notably, Jensen and Meckling suggests that the major benefits of security analysis activities are reflected in the higher capitalized value of the ownership claims to corporations. To the extent that the efficiency and effectiveness of monitoring increases with the number of analysts providing such monitoring, we can expect that the market value of a firm is positively associated with the number of analysts following that firm.

The positive effect of analyst following on firm value can also be posited from the security analyst's role as an information intermediary. In recent years, there has been considerable interest in the theory of market equilibrium in imperfect capital markets. Merton (1987) asserts that the asset pricing models that assume instantaneous dissemination of all publicly available information and immediate investor action on that information are likely to yield only limited insights into market activities and price formation. To develop a model of market equilibrium in imperfect capital markets, Merton considers an environment in which each investor knows only a subset of the available securities. Merton predicts that the market value of a firm is an increasing function of the breadth of investor cognizance (i.e., the fraction of all investors who know about the firm). To the extent that investors only invest in securities that they know about, and that this knowledge is provided by financial analysts, the breadth of investor cognizance is likely to be positively related to the number of analysts following the firm. Consequently, we expect that a firm's market value is positively related to the number of analysts following that firm.

In short, security analysts may play important roles as corporate monitors who help reduce agency costs, and as information intermediaries who help expand the breadth of investor cognizance. The implication we draw from these analysts' roles leads to the following hypothesis.

Hypothesis 1. The market value of a firm (proxied by Tobin's q) is an increasing function of the number of financial analysts following that firm.

B. Endogenous Determination of Analyst Following

While the main focus of this study is to examine the effect of analyst following on firm value, we also recognize the endogenous nature of analyst following in our empirical investigation. Consider the effect of Tobin's q on the number of analysts following the firm. Although our previous discussion suggests that greater analyst following causes firm value to rise, it is also possible that more analysts are enticed to follow firms with high q ratios. An important responsibility of those security analysts who are employed by brokerage houses is to help their organizations generate transactions with customers. There is considerable evidence that more analysts follow high quality firms than low quality firms because brokers find it

[6]Strictly speaking, security analysts are not monitors per se, since their main function is to collect, analyze, and disseminate information rather than to audit and reward or penalize managerial performance. We believe, however, that the very act of collecting and publicizing information tends to discipline managerial behavior, thus providing an indirect monitoring function.

easier to market stocks of high quality firms.[7] To the extent that Tobin's q and perceived firm quality are positively correlated, we can expect that high-q firms will be followed by more analysts than will low-q firms.[8] While this hypothesis also predicts a positive correlation between analyst following and q ratio, the direction of causality runs, in this case, from the latter to the former. Hence, we have:

Hypothesis 2. The number of analysts following the firm is an increasing function of Tobin's q.

C. Control Variables and Model Specification

To reduce the possibility of model misspecification due to missing variables, we control for additional variables in the regression. Bhushan (1989), Moyer, Chatfield, and Sisneros (1989), and Brennan and Hughes (1991) find that analyst following is positively associated with firm size, trading volume, and the variability of stock returns, and negatively associated with share price. Other variables likely to influence analyst following are the firm's R&D and advertising expenditures and exchange listing. R&D intensive firms are likely to be followed by more analysts, since these firms (which are typically viewed as industry leaders) are perceived as high quality firms. In addition, the value of private information may be higher for these firms, since for many R&D projects, the extent of information asymmetry between managers and outsiders is likely to be larger. Similarly, highly advertised and/or NYSE listed firms are likely to be followed by more analysts because these firms are better known and are perhaps perceived as high quality. Hence, we include firm size, trading volume, return variance, share price, R&D and advertising expenditure ratios, and a dummy variable representing the NYSE listing in the analyst following equation.

Numerous studies have documented that the market value (or Tobin's q) of a firm is positively associated with the firm's profitability and R&D and advertising expenditures, and negatively associated with risk and size (see, e.g., Hirschey (1982), Cockburn and Griliches (1988), Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), and Hall (1993)). Following these studies, we include the firm's return to capital, R&D and advertising expenditure ratios, the dispersion of analysts' forecasts, and firm size in the Tobin's q equation.[9] In addition, Merton (1987) predicts that a firm's market value is positively related to its investor base.

[7]For example, Gross (1982), in his sales manual, advises brokers that it is easier to generate transactions by selling stocks of high quality companies. Note that the effective marketing of a stock by a brokerage firm requires that security analysts employed by the firm follow the stock. Indeed, Chung, Jo, and Statman (1995) find that the number of analysts following a company is highly correlated with the Fortune magazine scores of company and managerial quality.

[8]Lang and Litzenberger (1989) show that an average q ratio greater than unity is a necessary condition for a firm to be at the value-maximizing level of investment, while an average q ratio less than unity is the sufficient condition for a firm to be overinvesting. In addition, Lang, Stulz, and Walkling (1989) and Servaes (1991) have used Tobin's q ratio as an empirical proxy for management quality in their analysis of tender offer gains. Further, Shefrin and Statman (1995) find that high quality companies generally exhibit a high market-to-book equity value ratio. The use of Tobin's q as a proxy for company quality, therefore, appears to be a reasonable empirical approximation.

[9]A number of researchers document empirical evidence that the dispersion of analysts' forecasts is the best proxy for ex ante risk. For example, Cragg and Malkiel (1982) and Farrelly and Reichenstein (1984) find that the dispersion of analysts' forecasts has a higher correlation with returns than any other measures of risk (e.g., beta, standard deviation of returns, or the Value Line safety measure).

Hence, we include the number of shareholders in the q equation as an empirical proxy for the investor base.

Based upon these considerations, we employ the following structural model for the empirical representation of the relationship among the number of analysts following the firm (NAF), Tobin's q, and other control variables. (The expected signs are noted over the top of each coefficient.)

$$
\begin{aligned}
(1)\quad \ln\left(\mathrm{NAF}_{i,t}\right) &= \alpha_0 + \overset{+}{\alpha}_1 \ln(q_{i,t}) + \overset{+}{\alpha}_2 \ln\left(\text{Return Variance}_{i,t}\right) \\
&\quad + \overset{+}{\alpha}_3 \text{Advertising Ratio}_{i,t} + \overset{+}{\alpha}_4 \text{R\&D Ratio}_{i,t} \\
&\quad + \overset{+}{\alpha}_5 \ln\left(\text{Trading Volume}_{i,t}\right) + \overset{+}{\alpha}_6 \text{NYSE Dummy}_{i,t} \\
&\quad + \overset{+}{\alpha}_7 \left(1/\text{Price}_{i,t}\right) + \overset{+}{\alpha}_8 \ln\left(\text{Firm Size}_{i,t}\right) + \epsilon_{i,t}, \\
(2)\quad \ln\left(q_{i,t}\right) &= \beta_0 + \overset{+}{\beta}_1 \ln\left(\mathrm{NAF}_{i,t}\right) + \overset{-}{\beta}_2 \ln\left(\text{Dispersion}_{i,t}\right) \\
&\quad + \overset{+}{\beta}_3 \text{Advertising Ratio}_{i,t} + \overset{+}{\beta}_4 \text{R\&D Ratio}_{i,t} \\
&\quad + \overset{+}{\beta}_5 \ln\left(\text{Number of Shareholders}_{i,t}\right) \\
&\quad + \overset{+}{\beta}_6 \text{Return to Capital}_{i,t} + \overset{-}{\beta}_7 \ln\left(\text{Firm Size}_{i,t}\right) + \epsilon_{i,t}.
\end{aligned}
$$

We use the log of NAF, Tobin's q, the dispersion of analysts' forecasts, the variance of stock returns, trading volume, firm size, and the number of shareholders. Following Brennan and Hughes (1991), we use the reciprocal of share price. Our model specification for the q equation closely follows that of Hirsh and Seaks (1993). In particular, Hirsh and Seaks suggests that the natural logarithm of q gives a better model specification than the raw q. Comparison of the degree of departure from normality of the residuals when raw variables are used to that when log-transformed variables are used also supports the use of log-transformed variables. Inspection of the order and rank conditions reveals that both equations (1) and (2) are exactly identified (see Judge et al. (1982) for the discussion of rank and order conditions). Subscripts i and t denote firm i and year t, respectively.

III. Data and Measurement of Variables

We obtain the number of analysts who follow Firm i in Year t ($\mathrm{NAF}_{i,t}$) from the Institutional Brokers Estimate System (I/B/E/S) tape. I/B/E/S reports detailed survey data on analysts' forecasts of corporate earnings from 400 leading brokerage firms on 10,000 publicly traded firms. For each firm, we obtain the number of analysts who, in July of each year, report a one-year earnings forecast. The dispersion of analysts' forecasts for Firm i in Year t ($\text{Dispersion}_{i,t}$) is measured by the coefficient of variation of earnings forecasts made by different analysts in July of Year t.[10]

[10]Because the calculation of the dispersion of analysts' forecasts requires at least two earnings forecasts, our sample includes firms that are followed by at least two analysts. Since there is a large group of firms that are either followed by a single analyst or completely neglected by analysts (NAF = 0), our sample selection procedure may induce certain bias in empirical results. As shown below, however, the extent of bias appears to be minimal.

Following Morck, Shleifer, and Vishny (1988), we measure the size-normalized market value of firms with Tobin's q:[11] Tobin's $q_{i,t}$ = Market Value of $\text{Firm}_{i,t}$/Replacement Cost of $\text{Assets}_{i,t}$. Tobin's q measures the capital market's valuation of a firm's assets relative to replacement costs. We posit that depending on the number of analysts following them, firms with similar assets (with respect to their replacement costs) may exhibit different q ratios. The data required for the calculation of Tobin's q are obtained from the Manufacturing Sector Master File compiled at the National Bureau of Economic Research (NBER).[12] Since the database contains data up to 1987, we restrict the sample period of this study to 1984–1987.

The R&D intensity of Firm i in Year t ($\text{R\&D Ratio}_{i,t}$) is proxied by the ratio of its annual R&D expenditures to total sales. Similarly, the advertising intensity of Firm i in Year t ($\text{Advertising Ratio}_{i,t}$) is measured by the ratio of its annual advertising expenditures to total sales. The rate of return to capital of Firm i in Year t ($\text{Return to Capital}_{i,t}$) is measured by the ratio of gross cash flow to the gross capital adjusted for inflation. Gross cash flow is the sum of the income before extraordinary items, depreciation, and interest income less the inventory valuation adjustment and the imputed income from short-term assets.[13] Firm size is proxied by the book value of total assets.

Data required for the calculation of the variance of returns, share price, and trading volume are obtained from tapes provided by the Institute for the Study of Security Markets (ISSM). To obtain the share price of Firm i in Year t ($\text{Price}_{i,t}$), we first calculate, for each day, the average of the midpoints of all quoted bid and ask prices. We then calculate the mean value of this daily average price during Year t. The variance of stock returns of Firm i in Year t ($\text{Return Variance}_{i,t}$) is calculated using daily returns.[14] The trading volume of Firm i during Year t ($\text{Trading Volume}_{i,t}$) is measured by the mean value of the daily dollar trading volume during the year. Lastly, we obtain the number of shareholders and exchange listings from the annual industrial Compustat tapes. A firm is included in the final sample only if complete data are available from all four data sources (I/B/E/S database, NBER Manufacturing Sector Master File, ISSM, and Compustat tapes) for the entire study period. In addition, since the majority of firms have fiscal years ending in December, we include only those firms in our final sample. In total, our final dataset comprises 972 time-series and cross-sectional observations.

[11] Recently, Tobin's q has been frequently employed as a proxy for firm performance. See, for example, Lang, Stulz, and Walkling (1989), McConnell and Servaes (1990), and Lang and Stulz (1994).

[12] The market value of a firm is measured by PREFST + VCOMS + LTDEBT + STDEBT − ADJ, where PREFST is the liquidating value of preferred stock, VCOMS is the price of the common stock times the number of shares outstanding at the close of the year, LTDEBT is the book value of long-term debt adjusted for its age structure, STDEBT is the book value of current liabilities, and ADJ is the book value of net short-term assets. The replacement cost of assets is measured by TOTASST − BKCAP + NETCAP, where TOTASST is the book value of total assets, BKCAP is the book value of net capital stock, and NETCAP is the inflation-adjusted net capital stock. See Hall (1990) for the computational details of these variables.

[13] See Hall (1990) for the computational details of these variables.

[14] The return on Day τ (R_τ) is calculated using the midpoint ($P_{\tau-1}$) of the last quoted bid and ask prices on Day $\tau - 1$ and the midpoint (P_τ) of the last quoted bid and ask prices on Day τ, i.e., $R_\tau = (P_\tau - P_{\tau-1})/P_{\tau-1} - 1$.

Table 1 presents descriptive statistics of the variables. For each variable, we provide the mean, standard deviation, median, and selected percentile values during the study period. The table shows that, on average, our sample of firms is followed by 16.8 analysts. The mean value of Tobin's q is 0.995; the median q is 0.851. Figure 1 shows mean values of Tobin's q for different levels of analyst following in each firm size quartile. After we control for firm size, Tobin's q and analyst following are strongly and positively correlated. Among firms in the smallest size quartile, the mean q ratio is 0.875 for the least followed firms, while the most followed firms exhibit the largest q ratio of 1.548. Similarly, for firms in the largest size quartile, the mean q ratio is 0.428 for the least followed firms, while the most followed firms exhibit the largest q ratio of 1.137. As expected, the larger the firm size, the lower the q ratio at all levels of analyst following. This suggests that after we control for the level of analyst following, smaller firms tend to have greater q ratios.

TABLE 1
Descriptive Statistics

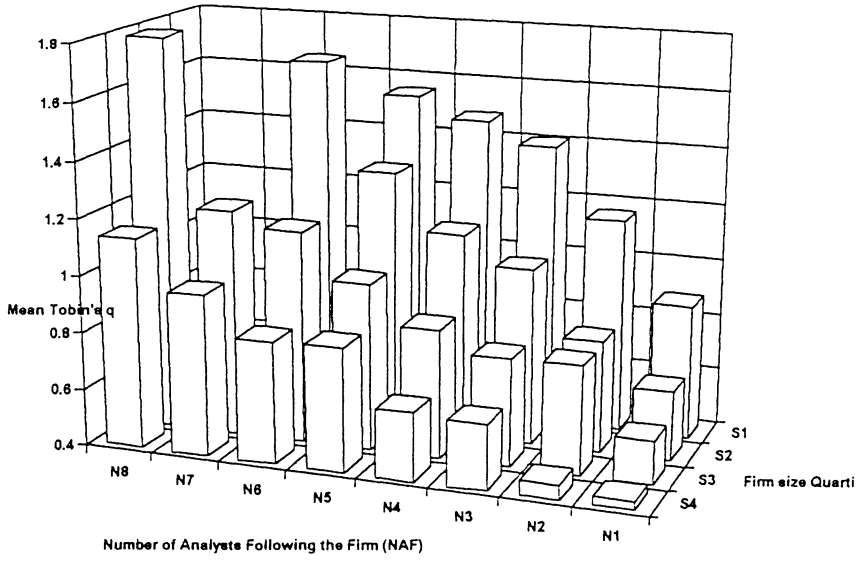
	Mean	Standard Deviation	Median	Percentile 5	Percentile 25	Percentile 75	Percentile 95
Tobin's q	0.995	0.545	0.851	0.423	0.650	1.169	2.037
Number of Analysts Following the Firm (NAF)	16.8	9.1	15	5	9	22	35
Variance of Returns	0.007	0.002	0.007	0.005	0.006	0.008	0.017
Dispersion of Analysts' Forecasts	0.182	0.430	0.065	0.016	0.033	0.132	0.680
Number of Shareholders[a]	49.3	120.8	15.7	2.2	5.7	40.4	209.0
Advertising Expenditure Ratio	0.014	0.029	0	0	0	0.017	0.074
R&D Expenditure Ratio	0.026	0.039	0.012	0	0	0.037	0.088
Share Price	39.9	28.2	34.4	11.8	24.9	48.8	77.8
Trading Volume[b]	7,567	15,654	2,749	121	717	8,718	29,805
Return to Capital	0.104	0.063	0.100	0.015	0.073	0.135	0.199
Firm Size[c]	4,560	8,605	1,865	142	566	4,305	19,945

Tobin's q is the ratio of the firm's market value to the replacement cost of its assets. NAF is the number of analysts reporting a one-year earnings forecast in July of each year. The variance of stock returns is calculated using daily returns. The dispersion of analysts' forecasts is measured by the coefficient of variation of earnings forecasts made by different analysts in July of each year. R&D and advertising activities are measured by the ratios of the annual R&D and advertising expenditures to sales. Share price is measured by the average of the midpoints of all quoted bid and ask prices. Trading volume is measured by the average daily dollar transaction volume. The rate of return to capital is measured by the ratio of gross cash flows (i.e., the sum of the income before extraordinary items, depreciation, and interest income less the inventory valuation adjustment and the imputed income from short-term assets) to the gross capital stock adjusted for inflation. Firm size is measured by the book value of total assets.
[a] In thousands.
[b] In thousands of dollars.
[c] In millions of dollars.

FIGURE 1

Mean Tobin's *q* for Different Levels of Analyst Following in Each Firm Size Quartile

The figure shows mean Tobin's *q* for different levels of analyst following in each firm size (measured by the book value of total assets), where *N*8 and *S*4 represent the largest NAF and firm size, respectively.



IV. Empirical Findings

A. Regression Results

Since an application of the ordinary least squares (OLS) method to a structural model may be subject to simultaneous equation bias (thus yield biased and inconsistent parameter estimates), we employ the three stage least squares (3SLS) regression to estimate the above structural model. To illustrate the potential errors likely to result from the failure to properly incorporate the simultaneous nature of the variable interactions in the model estimation, equations (1) and (2) are estimated separately via the OLS method.[15] The results presented below indicate that in the presence of simultaneous variable interactions, the differences in the results achieved by the two methods are by no means trivial. As such, the present study illuminates potential biases that might result when the *bidirectionality* of the variable interactions is ignored in the empirical estimation.

Table 2 presents the results of both 3SLS and OLS regressions. The 3SLS regression results show that the included variables jointly account for nearly 57 percent of the variation in analyst following and Tobin's *q*. The comparison of the estimated coefficients of the 3SLS regression with those of the OLS regression reveals that the two methods result in very different parameter estimates. For example, according to the OLS regression, the elasticity of Tobin's *q* with respect

[15] See Greene (1993) for a discussion of simultaneous equation bias.

to analyst following is 0.233, while according to the 3SLS regression, the estimated elasticity is 0.582. Similarly, while the OLS regression results suggest that both advertising and R&D expenditures exert a significant, positive impact on firm value, the 3SLS regression results show that their impact on firm value is not significant. Since the 3SLS regression presumably gives more accurate estimates of the structural model than does the OLS regression, we base our interpretation of the empirical results on the 3SLS regression.

As hypothesized, there is a significant, positive bidirectional relationship between analyst following and Tobin's q. The results show that analyst following exerts a significant, positive impact on firm value. Specifically, the estimated regression coefficient (β_1) suggests that a 1-percent increase in analyst following results in a 0.582-percent increase in Tobin's q. Similarly, we find that analyst following is positively related to Tobin's q ratio. The latter result provides empirical support for our hypothesis that security analysts have a stronger incentive to follow stocks of high quality firms because such stocks are easier to market. The positive effect of analyst following on Tobin's q is in line with the premise that firms followed by more analysts have lower agency costs (and broader investor cognizance), and thus have higher market values. Overall, our empirical results favor the Jensen and Meckling (1976) conjecture that the security analysis activities are socially productive, and that the major benefits of the activities are reflected in the higher capitalized value of ownership claims.

Table 2 shows that analyst following is positively associated with both the advertising and R&D expenditure ratios. To the extent that the advertising and R&D intensity affects the investor's perception of firm quality, these results also support the notion that security analysts have a stronger incentive to follow stocks of high quality firms. Similarly, we find that the NYSE listed firms attract more analysts. To the extent that the NYSE listing and perceived firm quality are positively correlated, this result also supports the marketing interpretation of analyst services. Consistent with the findings of previous studies (see Bhushan (1989), Moyer, Chatfield, and Sisneros (1989), and Brennan and Hughes (1991)), we find that analyst following is positively associated with firm size, trading volume, and the variability of stock returns, and negatively associated with share price.

Consistent with the findings of earlier studies, we find that Tobin's q is negatively associated with firm size, and positively associated with the return to capital (see, e.g., Hirschey (1982), Cockburn and Griliches (1988), Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990), and Hall (1993)). We also find that Tobin's q is significantly and negatively related to the dispersion of analysts' forecasts. This result supports our conjecture that firms facing greater ex ante uncertainty (i.e., greater dispersion of analysts' forecasts) have lower market values since, all things being equal, market capitalization rates are likely to be higher for such firms. Our results reveal, however, that the empirical association between Tobin's q and the number of shareholders is weak. One possible interpretation of this result is that the number of shareholders is a noisy proxy for the firm's investor base. That is, although the number of shareholders may reflect the breadth of investor cognizance, it may also reflect other attributes of a firm, e.g., its size, age, institutional holding, or ownership structure.

TABLE 2

Regression Results of Simultaneous Equation Model of Analyst Following and Tobin's *q*

	OLS Estimates		3SLS Estimates	
	NAF	Tobin's *q*	NAF	Tobin's *q*
Intercept	0.426	−0.165	0.543	−0.247
	(1.47)	(−2.09*)	(2.24*)	(−3.07**)
Tobin's *q*	0.240		0.220	
	(8.49**)		(4.85**)	
Number of Analysts Following the Firm (NAF)		0.233		0.582
		(8.69**)		(5.67**)
Variance of Returns	0.149		0.158	
	(2.77**)		(3.50**)	
Dispersion of Analysts' Forecasts		−0.064		−0.064
		(−5.99**)		(−6.29**)
Advertising Expenditure Ratio	0.900	1.538	1.020	0.874
	(2.12*)	(4.02**)	(2.26*)	(1.88)
R&D Expenditure Ratio	3.167	1.820	3.072	0.429
	(9.51**)	(6.32**)	(9.13**)	(0.84)
Number of Shareholders		0.026		0.016
		(1.68)		(1.17)
Return to Capital		3.297		2.991
		(16.95**)		(13.24**)
Trading Volume	0.071		0.075	
	(6.31**)		(6.93**)	
NYSE Dummy	0.293		0.197	
	(3.31**)		(2.62**)	
1/Price	1.099		0.907	
	(3.04**)		(2.54*)	
Firm Size	0.274	−0.166	0.272	−0.265
	(22.07**)	(−9.90**)	(21.23**)	(−7.55**)
F-Value	233.20**	162.83**		
Adjusted-R^2	0.657	0.539		
Root MSE	0.359	0.319		
System-Weighted R^2			0.568	
System-Weighted MSE			1.614	

Tobin's *q* is the ratio of the firm's market value to the replacement cost of its assets. NAF is the number of analysts reporting a one-year earnings forecast in July of each year. The variance of stock returns is calculated using daily returns. The dispersion of analysts' forecasts is measured by the coefficient of variation of earnings forecasts made by different analysts in July of each year. R&D and advertising activities are measured by the ratios of the annual R&D and advertising expenditures to sales. Share price is measured by the average of the midpoints of all quoted bid and ask prices. Trading volume is measured by the average daily dollar transaction volume. The rate of return to capital is measured by the ratio of gross cash flows (i.e., the sum of the income before extraordinary items, depreciation, and interest income less the inventory valuation adjustment and the imputed income from short-term assets) to the gross capital stock adjusted for inflation. Firm size is measured by the book value of total assets. We use the log of NAF, Tobin's *q*, the dispersion of analysts' forecasts, the variance of stock returns, trading volume, firm size, and the number of shareholders. The numbers in parentheses are *t*-values.

**Significant at the 1-percent level; *significant at the 5-percent level.

As noted earlier, Tobin's q is significantly and positively associated with both advertising and R&D expenditures when analyst following is treated as an exogenous variable (i.e., OLS results). We find, however, that the effect of advertising and R&D on Tobin's q becomes considerably weaker when the endogeneity of analyst following is incorporated into the empirical estimation (i.e., 3SLS results). These results indicate that although both advertising and R&D affect firm value, they do so indirectly through analysts' services. Thus, it appears that analysts' services are the important channel through which information about advertising and R&D is impounded into firm value.

It is possible that if both variables are highly dependent on the firm's industry, then the relation between analyst following and q is spurious. For example, firms in certain industries (e.g., the high tech industry) may attract more analysts and also feature higher q ratios due to their industry characteristics (e.g., entry barrier), while firms in other industries (e.g., declining industry) may be neglected by security analysts and exhibit lower q ratios. To investigate whether our results are a spurious by-product of interactions among analyst following, q ratio, and industry, we repeat our regressions after adjusting all of our variables for their industry average. For this, we first calculate the industry average value of each variable for each three-digit SIC code. We then subtract this average from each observation of the variable.[16] The regression results, reported in Table 3, based upon these industry adjusted variables are qualitatively similar to those presented in Table 2. Hence, we conclude that the positive feedback relation between analyst following and Tobin's q is not driven by the industry effect.[17]

To further control for firm size in our regression analysis, we also run the regressions using observations belonging to each firm size quartile. The results are presented in Table 4. The results show that within each size group, analyst following exerts a significant and positive impact on q ratio. Similarly, Tobin's q exerts a significant and positive effect on analyst following. Overall, these results indicate that irrespective of firm size, there is a strong positive interactive relation between analyst following and Tobin's q.

B. Regression Results with Expanded Sample

Our analysis uses only firms that are included in the I/B/E/S tape for the entire study period. In addition, as noted earlier, we include in the final sample only firms that are followed by at least two analysts. Due to these restrictions, we drop a large number of firms from our database. For example, we do not include

[16]For example, to obtain the industry-adjusted Tobin's q, we first calculate, in each year, the mean value of Tobin's q of firms with the same three-digit SIC code in the NBER tape. We then subtract this industry mean from the q ratio of individual firms. The same procedure is employed for all other variables.

[17]Since our data include both time-series and cross-sectional observations, equations (1) and (2) are also estimated using the Fuller-Battese (1974) error component model, which assumes that the disturbance term is composed of three independent components—one component associated with time, another associated with the cross-sectional units, and a third that varies in both dimensions. The results of the Fuller-Battese estimation indicate that the variance components for cross-sectional and time-series units are negligible. As a result, the Fuller-Battese results are qualitatively similar to the OLS results. In addition, regression results using cross-sectional data for each year of our study period are also quite similar to the results with pooled data.

TABLE 3

Regression Results with Industry Mean-Adjusted Variables

	OLS Estimates		3SLS Estimates	
	NAF	Tobin's q	NAF	Tobin's q
Intercept	−0.072	−0.000	−0.027	−0.000
	(−1.11)	(−0.00)	(−0.55)	(−0.00)
Tobin's q	0.181		0.175	
	(5.93**)		(3.12**)	
Number of Analysts Following the Firm (NAF)		0.169		0.775
		(6.08**)		(4.07**)
Variance of Returns	0.076		0.102	
	(2.19*)		(2.96**)	
Dispersion of Analysts' Forecasts		−0.032		−0.032
		(−2.92**)		(−3.24**)
Advertising Expenditure Ratio	0.768	1.415	1.091	0.149
	(2.02*)	(3.49**)	(2.12*)	(0.27)
R&D Expenditure Ratio	4.184	2.288	4.085	0.663
	(7.53**)	(4.55**)	(7.28**)	(0.62)
Number of Shareholders		0.059		0.046
		(3.49**)		(2.48**)
Return to Capital		2.970		2.615
		(16.20**)		(10.82**)
Trading Volume	0.039		0.040	
	(3.98**)		(4.25**)	
NYSE Dummy	0.267		0.183	
	(2.76**)		(2.56**)	
1/Price	0.987		0.843	
	(2.88**)		(2.43**)	
Firm Size	0.258	−0.165	0.261	−0.322
	(21.82**)	(−8.95**)	(21.09**)	(−5.04**)
F-Value	149.97**	75.27**		
Adjusted-R^2	0.549	0.479		
Root MSE	0.283	0.250		
System-Weighted R^2			0.489	
System-Weighted MSE			1.811	

For each three-digit SIC code, we calculate the industry average value of each variable. This average is then subtracted from each observation of the variable. This table reports the regression results based upon these industry-adjusted variables.
**Significant at the 1-percent level; *significant at the 5-percent level.

a firm in the final dataset if data on analyst following are missing in any one year of the study period. In addition, we exclude all those firms in the NBER tape whose data are not available in the I/B/E/S tape. To utilize our data more fully, we invoke the working assumption that NAF = 0 for firms that are not reported in the I/B/E/S tape, and reestimate our regression models (1) and (2) using the 3SLS method.[18] Hence, in this case, we include in the final sample all those firms with

[18]Note that the log of zero is negative infinite. Hence, following Brennan and Subrahmanyam (1995), we use the log of (NAF + 1) in the regression analysis. Because the dispersion of analysts' forecasts cannot be used as an ex ante measure of risk for a large number of firms in the expanded sample, we use the variance of stock returns, instead of the dispersion of forecasts, as an empirical proxy for firm risk in the q equation.

TABLE 4

Regression Results of Simultaneous Equation Model of Analyst Following and Tobin's *q* for Each Firm Size Quartile

First Quartile (Smallest)		
OLS Estimates	$\ln(NAF) = 0.160 \ln(q)$ + Control variables (2.93**)	Adjusted $R^2 = 0.449$
	$\ln(q) = 0.215 \ln(NAF)$ + Control variables (3.85**)	Adjusted $R^2 = 0.489$
3SLS Estimates	$\ln(NAF) = 0.190 \ln(q)$ + Control variables (2.54**)	System-Weighted $R^2 = 0.510$
	$\ln(q) = 0.480 \ln(NAF)$ + Control variables (3.28**)	
Second Quartile		
OLS Estimates	$\ln(NAF) = 0.239 \ln(q)$ + Control variables (4.60**)	Adjusted $R^2 = 0.399$
	$\ln(q) = 0.283 \ln(NAF)$ + Control variables (5.03**)	Adjusted $R^2 = 0.557$
3SLS Estimates	$\ln(NAF) = 0.227 \ln(q)$ + Control variables (3.00**)	System-Weighted $R^2 = 0.512$
	$\ln(q) = 0.663 \ln(NAF)$ + Control variables (3.55**)	
Third Quartile		
OLS Estimates	$\ln(NAF) = 0.239 \ln(q)$ + Control variables (4.49**)	Adjusted $R^2 = 0.396$
	$\ln(q) = 0.253 \ln(NAF)$ + Control variables (4.52**)	Adjusted $R^2 = 0.576$
3SLS Estimates	$\ln(NAF) = 0.178 \ln(q)$ + Control variables (2.27*)	System-Weighted $R^2 = 0.510$
	$\ln(q) = 0.398 \ln(NAF)$ + Control variables (3.31**)	
Fourth Quartile (Largest)		
OLS Estimates	$\ln(NAF) = 0.354 \ln(q)$ + Control variables (5.01**)	Adjusted $R^2 = 0.379$
	$\ln(q) = 0.228 \ln(NAF)$ + Control variables (4.82**)	Adjusted $R^2 = 0.604$
3SLS Estimates	$\ln(NAF) = 0.297 \ln(q)$ + Control variables (2.11*)	System-Weighted $R^2 = 0.435$
	$\ln(q) = 0.442 \ln(NAF)$ + Control variables (1.90*)	

This table reports the results when regression models (1) and (2) are estimated for each firm-size quartile. Tobin's *q* is the ratio of the firm's market value to the replacement cost of its assets. NAF is the number of analysts reporting a one-year earnings forecast in July of each year.

**Significant at the 1-percent level; *significant at the 5-percent level.

data available from the NBER, Compustat, and ISSM tapes. We assume NAF = 0 when a firm is not included in the I/B/E/S tape or data is missing.

As expected, the number of available observations (2,535) with this expanded database is significantly larger than that (972) of our original sample. Not surprisingly, the mean value of NAF (9.4) becomes significantly smaller compared to that (16.8) of the original sample. Although the fact that a firm is not reported in the I/B/E/S tape does *not* necessarily indicate that the firm is completely neglected by financial analysts (NAF = 0), empirical evidence based on this expanded sample

helps assess the robustness of our results with respect to the noisiness in the NAF data. The 3SLS estimates of regression models (1) and (2) are reported below.

$$\begin{aligned} \ln\left(\text{NAF}_{i,t}+1\right) &= \underset{(3.78^{**})}{0.456\ln\left(q_{i,t}\right)} + \text{Control variables}, \\ \ln\left(q_{i,t}\right) &= \underset{(13.27^{**})}{0.729\ln\left(\text{NAF}_{i,t}+1\right)} + \text{Control variables}, \\ \text{System-weighted } R^2 &= 0.453, \quad \text{System-weighted MSE} = 8.093. \end{aligned}$$

Notice that analyst following exerts a significant, positive influence on Tobin's q. Similarly, we find that analysts favor high-q firms. Our structural model explains about 45 percent of the variation in the system of equations. Overall, these results suggest that the positive, interactive relation between analyst following and Tobin's q is quite robust and not sensitive to the noise in the NAF measurement.

C. Test of Lagged Effect

Our analysis implicitly presumes that the interaction between analyst following and Tobin's q is *contemporaneous*. It is conceivable, however, that the level of analyst following may be influenced not only by the current q ratio, but also by past q ratios. Likewise, the effect of analyst following on firm value may not be strictly contemporaneous. To examine these possibilities, we regress NAF on both the lagged values of the same variable and the contemporaneous and lagged values of Tobin's q. Similarly, we regress Tobin's q on both the lagged values of the same variable and the contemporaneous and lagged values of NAF.

If the regression coefficients for Tobin's q in the NAF equation are positive and significant, then greater Tobin's q is said to cause greater NAF.[19] Similarly, if the regression coefficients for NAF in the q equation are positive and significant, then greater NAF is said to cause greater Tobin's q. The regression results, reported in Table 5, show that the one-year lagged value of the dependent variable is a very strong predictor variable in both equations. The one-period lagged value of NAF in the NAF equation is highly significant (t-statistic = 12.24), and the one-period lagged value of Tobin's q in the q equation is also highly significant (t-statistic = 10.10). These results should not come as a surprise, since changes in NAF and Tobin's q are usually gradual. More importantly, notice that while the contemporaneous term of Tobin's q is significant in the NAF equation, its lagged values show no signs of statistical significance. Similarly, only the contemporaneous term of NAF is significant in the q equation. Overall, these results suggest that the relation between NAF and Tobin's q is contemporaneous.[20]

[19]For a discussion of this method, see Geweke, Meese, and Dent (1983).

[20]We also use the instrumental variable approach to estimate the system of equations (1) and (2). The results, which are based upon both the level and change of the variables, are qualitatively similar to those presented here. In particular, the regression results based on the first difference of the variables indicate that the bidirectional relationship between Tobin's q and analyst following is quite robust. The results of the instrumental variable estimation are available from the authors upon request.

TABLE 5
Test of Lagged Effects

	$\ln(NAF_{i,t})$	$\ln(q_{i,t})$
Intercept	−0.076 (−1.12)	−0.212 (−3.29**)
$\ln(NAF_{i,t})$		0.152 (2.10*)
$\ln(NAF_{i,t-1})$	1.041 (12.24**)	−0.065 (−0.58)
$\ln(NAF_{i,t-2})$	−0.025 (−0.29)	−0.029 (−0.35)
$\ln(q_{i,t})$	0.161 (2.10*)	
$\ln(q_{i,t-1})$	−0.052 (−0.55)	0.741 (10.10**)
$\ln(q_{i,t-2})$	−0.046 (−0.60)	0.106 (1.45)
F-Value	393.26**	158.83**
Adjusted-R^2	0.916	0.813

Tobin's q is the ratio of the firm's market value to the replacement cost of its assets. NAF is the number of analysts reporting a one-year earnings forecast in July of each year. The numbers in parentheses are *t*-values.
**Significant at the 1-percent level; *significant at the 5-percent level.

D. Marginal Value of Analyst Following

Most economic activities exhibit diminishing marginal returns. We conjecture that the same principle may apply to the analyst following activity. That is, the marginal value of monitoring is likely to decrease as the number of analysts following the firm increases. Similarly, an increase in investor cognizance resulting from an increase in analyst following may decline as more analysts follow the firm. Overall, therefore, we expect that the elasticity of Tobin's q with respect to analyst following is smaller at the higher level of analyst following. To test this proposition, we employ the following specification for the q equation,

$$(3)\quad \ln\left(q_{i,t}\right) = \alpha_0 + \alpha_1 \ln\left(\mathrm{NAF}_{i,t}\right) + \alpha_2 \left\{\ln\left(\mathrm{NAF}_{i,t}\right) - \ln\left(\mathrm{NAF}^*\right)\right\} \mathrm{DUM}_1 + \text{Control variables}_{i,t} + \xi_{i,t},$$

where NAF^* is a threshold value of $\mathrm{NAF}_{i,t}$, DUM_1 equals 1 if $\mathrm{NAF}_{i,t} \geq \mathrm{NAF}^*$ and 0 otherwise, $\xi_{i,t}$ is the error term, and all other variables are the same as previously defined.[21] Notice that in equation (3), α_1 captures the relationship between Tobin's q and analyst following for less followed firms (i.e., $\mathrm{NAF}_{i,t} <$

[21] Since Table 1 suggests that much of the gain in Tobin's q is achieved when NAF reaches six, we use this as the threshold value of NAF. To examine the sensitivity of this arbitrary choice, we replicate the regression analysis with other threshold values (e.g., 7, 12, and the median value of 15). Although the magnitude of estimated elasticity changes when the different threshold values are employed, the sensitivity of a firm's market value with respect to the change in the firm's investor base is greater for less known firms.

NAF*), while $\alpha_1 + \alpha_2$ describes the relationship between these variables for highly followed firms (i.e., $\text{NAF}_{i,t} \geq \text{NAF}^*$). Using this approach, we can discern whether the value implication of analyst following is different between highly and less followed firms by inspecting the statistical significance of the α_2 estimate. That is, if the α_2 estimate is negative (positive) and significant, it indicates that the impact of analyst following on firm value is weaker (stronger) for highly followed firms.

The 3SLS regression results based on the structural model comprised of equations (1) and (3) are presented in column A, Table 6. The results show that the estimate of α_2 is negative and statistically significant at the 5-percent level, indicating that the sensitivity of the firm's market value to the change in NAF is greater for less known firms. Hence, our results suggest that the principle of diminishing marginal returns also applies to the analyst following activity.

We conjecture that the wealth gain achievable through security analysts' monitoring varies with the degree of uncertainty in a firm's operating environment. For firms that operate in a stable environment (e.g., stable technology, stable market shares, and so forth), managerial performance can be monitored at relatively low costs, and we can expect that extent of agency problems will be small. Conversely, for firms subject to a high degree of operating uncertainty, disentangling the effects of managerial behavior on firm performance from the corresponding effects of other exogenous factors is generally difficult and costly. Accordingly, we postulate that the wealth gain achievable through more effective monitoring of managerial performance is greater for those firms subject to a riskier operating environment. Following Cragg and Malkiel (1982) and Farrelly and Reichenstein (1984), we use the dispersion of analysts' forecasts as the empirical proxy for the ex ante uncertainty associated with the firm's operating environment, and estimate the following regression model,

$$\begin{aligned}(4) \qquad \ln\left(q_{i,t}\right) \;=\; & \alpha_0 + \alpha_1 \ln\left(\text{NAF}_{i,t}\right) + \alpha_2 \ln\left(\text{NAF}_{i,t}\right) * \text{DUM}_2 \\ & + \alpha_3 \ln\left(\text{Dispersion}_{i,t}\right) + \text{Control variables}_{i,t} + \xi_{i,t},\end{aligned}$$

where DUM_2 equals 1 if $\text{Dispersion}_{i,t} \geq \text{Dispersion}^*$ and 0 otherwise, Dispersion* is the threshold value (median value) of $\text{Dispersion}_{i,t}$, and all other variables are the same as previously defined.[22] Note that α_1 gives the elasticity of firm value with respect to analyst following for low risk firms (i.e., $\text{Dispersion}_{i,t} < \text{Dispersion}^*$) and $\alpha_1 + \alpha_2$ gives the elasticity for high risk firms (i.e., $\text{Dispersion}_{i,t} \geq \text{Dispersion}^*$). The 3SLS regression results based on the structural model comprised of equations (1) and (4) are presented in column B, Table 6. The results show that the estimate of α_2 is positive and statistically significant. Hence, our empirical results support the premise that the wealth gain achievable through the security analysts' monitoring of corporate performance is greater for those firms subject to a riskier operating environment.

[22]We take the median value of $\text{Dispersion}_{i,t}$ as Dispersion*. Again, because the selection of this threshold value is somewhat arbitrary, we replicate the regression analysis with other threshold values (e.g., 25, 75, 90, and 95 percentiles). The results are qualitatively identical to those presented in Table 5.

TABLE 6

Testing whether the Elasticity of Firm Value with respect to Analyst Following is Greater for Less Known or Riskier Firms

	Column A: Testing whether the Elasticity of Firm Value with Respect to Analyst Following is Greater for Less Known Firms		Column B: Testing whether the Elasticity of Firm Value with Respect to Analyst Following is Greater for Riskier Firms	
	NAF	Tobin's q	NAF	Tobin's q
Intercept	0.568	0.140	0.753	−0.288
	(2.26*)	(0.41)	(2.91**)	(−3.59**)
Tobin's q	0.423		0.250	
	(9.34**)		(5.27**)	
Number of Analysts Following the Firm (NAF)		1.110		0.464
		(3.06**)		(3.95**)
(NAF − NAF*) x DUM_1		−1.004		
		(−2.90**)		
NAF x DUM_2				0.082
				(2.91**)
Variance of Returns	0.163		0.226	
	(3.42**)		(4.74**)	
Dispersion of Analysts' Forecasts		−0.051		−0.078
		(−4.34**)		(−7.18**)
Advertising Expenditure Ratio	0.191	1.032	0.891	0.978
	(0.42)	(2.21*)	(1.97*)	(2.12*)
R&D Expenditure Ratio	2.564	0.006	2.966	0.885
	(7.50**)	(0.16)	(8.68**)	(1.61)
Number of Shareholders		0.009		0.014
		(0.59)		(1.00)
Return to Capital		2.496		3.118
		(11.32**)		(12.83**)
Trading Volume	0.059		0.083	
	(5.66**)		(7.56**)	
NYSE Dummy	0.159		0.254	
	(2.21*)		(3.21**)	
1/Price	0.719		1.266	
	(2.06*)		(3.36**)	
Firm Size	0.302	−0.289	0.273	−0.226
	(23.93**)	(−10.42**)	(20.34**)	(−5.73**)
System-Weighted R^2	0.655		0.570	
System-Weighted MSE	1.290		1.456	

Tobin's q is the ratio of the firm's market value to the replacement cost of its assets. NAF is the number of analysts reporting a one-year earnings forecast in July of each year. The variance of stock returns is calculated using daily returns. The dispersion of analysts' forecasts is measured by the coefficient of variation of earnings forecasts made by different analysts in July of each year. R&D and advertising activities are measured by the ratios of the annual R&D and advertising expenditures to sales. Share price is measured by the average of the midpoints of all quoted bid and ask prices. Trading volume is measured by the average daily dollar transaction volume. The rate of return to capital is measured by the ratio of gross cash flows (i.e., the sum of the income before extraordinary items, depreciation, and interest income less the inventory valuation adjustment and the imputed income from short-term assets) to the gross capital stock adjusted for inflation. Firm size is measured by the book value of total assets. We use the log of NAF, Tobin's q, the dispersion of analysts' forecasts, the variance of stock returns, trading volume, firm size, and the number of shareholders. DUM_1 equals 1.0 when NAF $\geq$ NAF*, and zero otherwise, where NAF* is the threshold value of NAF. Similarly, DUM_2 equals 1.0 when $\text{Dispersion}_{i,t} \geq$ Dispersion*, and zero otherwise, where DIV* is the threshold value of $\text{Dispersion}_{i,t}$. The numbers in parentheses are t-values.

**Significant at the 1-percent level; *significant at the 5-percent level.

V. Summary

Although the theory of agency has been perhaps one of the most important tenets in the study of corporate finance during the last two decades, direct empirical evidence on the issue is scanty. In particular, there are only a few studies that examine the effect of monitoring on corporate value. In this study, we provide evidence on this important issue. Specifically, we find that security analysis activities have a significant, positive impact on the market value of firms. Our finding supports the notion that security analysts' monitoring of performance helps motivate corporate managers, thus reducing the agency costs arising from the separation of ownership and control. Empirical results also suggest that the marginal effect of analyst following on firm value is greater for less followed and/or riskier firms. Lastly, we find that analyst following is positively associated with various proxies of firm quality, suggesting that the supply of security analysis activities is, in part, determined by the marketing considerations of brokerage companies.

References

Abarbanell, J. "Do Analysts' Earnings Forecasts Incorporate Information in Prior Stock Price Changes?" *Journal of Accounting and Economics*, 14 (1991), 147–165.

Bhushan, R. "Firm Characteristics and Analyst Following." *Journal of Accounting and Economics*, 11 (1989), 255–274.

Botosan, C. "The Effect of Disclosure Level on the Cost of Equity Capital." Working Paper, Washington Univ. (1995).

Brennan, M., and P. Hughes. "Stock Prices and the Supply of Information." *Journal of Finance*, 46 (1991), 1665–1691.

Brennan, M., and A. Subrahmanyam. "Investment Analysis and Price Formation in Security Markets." *Journal of Financial Economics*, 38 (1995), 361–381.

Brinson, G.; L. Hood; and G. Beebower. "Determinants of Portfolio Performance." *Financial Analysts Journal*, 42 (1986), 39–44.

Brown, L., and M. Rozeff. "The Superiority of Analyst Forecasts as Measures of Expectations: Evidence from Earnings." *Journal of Finance*, 33 (1978), 1–16.

Brown, L.; R. Hagerman; P. Griffin; and M. Zmijewski. "Security Analyst Superiority Relative to Univariate Time-Series Models in Forecasting Quarterly Earnings." *Journal of Accounting and Economics*, 9 (1987), 61–87.

Chung, K.; H. Jo; and M. Statman. "Marketing Stocks." Unpubl. Manuscript, Santa Clara Univ. (1995).

Cockburn, I., and Z. Griliches. "Industry Effects and Appropriability Measures in the Stock Market's Valuation of R&D and Patents." *American Economic Review*, 78 (1988), 419–423.

Cragg, J., and B. Malkiel. *Expectations and the Structure of Share Prices*. Chicago, IL: The Univ. of Chicago Press (1982).

Dempsey, S. "Predisclosure Information Search Incentives, Analyst Following, and Earnings Announcements Price Response." *Accounting Review*, 64 (1989), 748–757.

Fama, E. "Agency Problems and the Theory of the Firm." *Journal of Political Economy*, 88 (1980), 288–307.

Fama, E., and M. Jensen. "Residual Claims and Investment Decisions." *Journal of Financial Economics*, 14 (1985), 101–119.

Farrelly, G., and W. Reichenstein. "Risk Perceptions of Institutional Investors." *Journal of Portfolio Management*, 10 (1984), 5–12.

Fried, D., and D. Givoly. "Financial Analysts' Forecasts of Earnings: A Better Surrogate for Market Expectations." *Journal of Accounting and Economics*, 4 (1982), 85–107.

Fuller, W., and G. Battese. "Estimation of Linear Models with Crossed-Error Structure." *Journal of Econometrics*, 2 (1974), 67–78.

Geweke, J.; R. Meese; and W. Dent. "Comparing Alternative Tests of Causality in Temporal Systems." *Journal of Econometrics*, 21 (1983), 161–194.

Givoly, D., and J. Lakonishok. "The Information Content of Financial Analysts' Forecasts of Earnings." *Journal of Accounting and Economics*, 1 (1979), 1–21.

Greene, W. H. *Econometric Analysis*. New York, NY: Macmillan Publishing Co. (1993).

Gross, L. *The Art of Selling Intangibles: How to Make Your Million($) by Investing Other People's Money*. New York, NY: Institute of Finance (1982).

Hall, B. *The Manufacturing Sector Master File Documentation: 1959–1987*. Stanford, CA: National Bureau of Economic Research (1990).

_____. "The Stock Market's Valuation of R&D Investment during the 1980's." *American Economic Review*, 83 (1993), 259–264.

Hirschey, M. "Intangible Capital Aspects of Advertising and R&D Expenditures." *Journal of Industrial Economics*, 30 (1982), 375–391.

Hirsh, B., and T. Seaks. "Functional Form in Regression Models of Tobin's *q*." *Review of Economics and Statistics*, 75 (1993), 381–385.

Ippolito, R. "Efficiency with Costly Information: A Study of Mutual Fund Performance." *Quarterly Journal of Economics*, 104 (1989), 1–24.

Jensen, M. "Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios." *Journal of Business*, 42 (1969), 167–247.

Jensen, M., and W. Meckling. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics*, 3 (1976), 305–360.

Judge, G; R. Hill; W. Griffiths; H. Lütkepohl; and T. Lee. *Introduction to the Theory and Practice of Econometrics*. New York, NY: John Wiley & Sons (1982).

Kross, W.; B. Ro; and D. Schroeder. "Earnings Expectations: The Analysts' Information Advantage." *Accounting Review*, 65 (1990), 461–476.

Lang, L., and R. Litzenberger. "Dividend Announcements: Cash Flow Signalling vs. Free Cash Flow Hypothesis?" *Journal of Financial Economics*, 24 (1989), 181–191.

Lang, L., and R. Stulz. "Tobin's q, Corporate Diversification and Firm Performance." *Journal of Political Economy*, 102 (1994), 1248–1280.

Lang, L.; R. Stulz; and R. Walkling. "Managerial Performance, Tobin's q, and Gains from Successful Tender Offers." *Journal of Financial Economics*, 24 (1989), 137–154.

McConnell, J., and H. Servaes. "Additional Evidence on Equity Ownership and Corporate Value." *Journal of Financial Economics*, 27 (1990), 595–612.

Merton, R. "A Simple Model of Capital Market Equilibrium with Incomplete Information." *Journal of Finance*, 42 (1987), 483–510.

Morck, R.; A. Shleifer; and R. Vishny. "Management Ownership and Market Valuation: An Empirical Analysis." *Journal of Financial Economics*, 20 (1988), 293–315.

Moyer, R; R. Chatfield; and P. Sisneros. "Security Analyst Monitoring Activity: Agency Costs and Information Demands." *Journal of Financial and Quantitative Analysis*, 24 (1989), 503–512.

Servaes, H. "Tobin's q and Gains from Takeovers." *Journal of Finance*, 46 (1991), 409–419.

Shefrin, H., and M. Statman. "Making Sense of Beta, Size, and Book-to-Market." *Journal of Portfolio Management*, (1995) 26–34.

Stickel, S. "Common Stock Returns Surrounding Earnings Forecast Revisions: More Puzzling Evidence." *Accounting Review*, 66 (1991), 402–416.

Wakeman, L. "The Real Function of Bond Rating Agencies." *Chase Financial Quarterly*, 1 (1981), 18–26.

Welch, P. "A Generalized Distributed Lag Model for Predicting Quarterly Earnings." *Journal of Accounting Research*, 22 (1984), 744–757.