DOES ANALYST STOCK OWNERSHIP AFFECT REPORTING BEHAVIOR?

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Abstract

An analyst who owns stock in the company she covers may be tempted to protect or enhance her personal interests. I examine how this conflict of interest affects the reporting of sell-side analysts. I identify and collect two samples. I obtain the first from SEC Form 144 filings, and the second from voluntary ownership disclosures. Ordered probit analyses show that owning-analyst recommendations are slightly more cautious than those of the control analysts. I find no robust evidence that stock ownership is associated with optimistic analyst reporting.

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1. Introduction

In this paper, my objective is to provide empirical evidence on how stock ownership by sell-side analysts affects their recommendations and earnings forecasts. A study of the effect of analyst stock ownership on analyst reporting provides an opportunity to examine a direct incentive for reporting bias. Thus, this setting could allow for stronger conclusions on the causal link between incentives and reporting bias.

Understanding the effect of incentives on analyst reporting behavior is important for three reasons. Analysts are agents of market intermediaries; analyst forecasts are a common proxy for the market's earnings expectations in academic research; and the need to understand the effect of incentives on reporting in general.

Various popular press interviews suggest that analyst ownership was both common and pervasive prior to various reforms undertaken in 2001 (Schack 2001; Cowan 2002). Historically, disclosure of analyst stock ownership has been boilerplate and nonspecific. Therefore, there is little evidence of the extent of analyst stock ownership.

However, in 2001 a Securities and Exchange Commission (SEC) inquiry into the nine brokerage firms that had underwritten the majority of the recent initial public offerings (IPOs) of technology and Internet companies found that 16 of 57 analysts held restricted stock in the companies that they covered. Restricted stock is an unregistered security that is issued by companies in non-public transactions; for example, prior to an initial public offering (IPO). These restricted stock holdings generated profits of between $100,000 and $3.5 million (Unger 2001). Therefore, stock ownership appears to be a common, and potentially major, financial incentive for sell-side analysts.

Although there is an extensive literature that shows the existence of an optimistic bias in analyst forecasts, providing an explanation for the bias continues to be an ongoing source of academic debate. Some research hypothesizes and supports an incentive explanation for the bias, whereas other research posits econometric or other rationales for the presence of the forecast bias.[1] Existing research also shows that other elements of analyst reports, in addition to the forecast, may be biased. For example, there is empirical evidence that some analyst recommendations are optimistic because of investment banking considerations. In particular, the recommendations of analysts associated with the lead underwriter, of both IPOs and Seasoned Equity Offerings (SEOs), are, on average, more optimistic than are the recommendations of other analysts (Lin and McNichols, 1998; Michaely and Womack, 1999). Because there is anecdotal evidence that analyst compensation is significantly influenced by their helpfulness to the investment banking group and its financing efforts, one interpretation of these results is that personal financial incentives motivate underwriter analyst optimism.

Recent government and regulatory investigations into potential analyst conflicts of interest cite analyst ownership of the stocks they cover as one potential problem. The SEC is currently pursuing a case against one analyst, alleging that he failed to tell investors that he owned stock in two public companies for which he issued bullish research reports. Recent regulatory changes now prohibit analysts from obtaining restricted shares, and many brokerage firms have adopted

[1] For incentive support, see: Francis and Philbrick (1993), Das, Levine and Sivaramakrishnan (1998) and McNichols and O'Brien (1997); for alternative explanations see, Keane and Runkle, (1998), Gu and Wu (2000), Abarbanell and Lehavy, (2002).

policies prohibiting analysts from owning the stocks that they cover. Clear and explicit disclosure of ownership is now required (NYSE Rule 472).

An analyst's financial interest in the stock on which she reports could have either a detrimental or a beneficial effect. I hypothesize that an analyst's earnings forecasts and recommendations on companies in which the analyst is a stockowner are optimistic relative to those of non-stock-owning analysts. Ideally, the economic significance of the stock relative to an analyst's wealth would be the incentive measure. However, given that personal financial data is unavailable, I am left with the existence of ownership as an incentive proxy.

I test the hypothesis based on two samples of analysts who provided research coverage on stocks they owned. Each sample has its own advantage. I identify the first sample (Form 144 sample) by matching analyst names to SEC Form 144 filings. (A Form 144 is required for the sale of restricted stock if the stock is sold within a specified timeframe.) These restricted-stock-owning analysts may not have otherwise disclosed their stock ownership; therefore market participants may not have been aware of the potential conflict of interest. This sample also provides a cross-section of owning analysts from different brokerage firms. I obtain the second sample (the disclosing sample) through analyst ownership disclosures in the written reports of one of the few brokerage firms that historically required such disclosures. This sample has the advantage of identifying all of the ownership positions of the disclosing analysts.

The results of my ordered probit analyses of analyst recommendations show that stock-owning analysts are more likely to issue a conservative recommendation, relative to other non-stock-owning analysts. This result is consistent for both samples and is supported by univariate

analysis. Based on a strategic financial incentive hypothesis, whereby an analyst's optimistic report maintains or enhances her personal wealth, this cautious behavior is surprising.

In univariate tests I find that stock-owning analyst earnings forecasts are optimistic relative to the non-stock-owning control analysts for both the Form 144 sample and the disclosing sample. However, the cross-sectional regression results offer conflicting evidence. In the Form 144 sample, stock-owning analysts' forecast optimism cannot be attributed to stock ownership. The disclosing sample results suggest otherwise. To reconcile the results, I perform additional tests. For the Form 144 sample, I investigate analysts' reporting behavior before and after their stock sale, since their incentives to be opportunistic may be the greatest at the time of a stock sale. Although I find weak evidence of optimism, I note the tests are limited to small subsamples. The evidence of forecast optimism in the disclosing sample's regression results is not robust either to the inclusion of a selection model or to alternative specifications.

Combined, the results suggest that analyst reputation concerns provide an effective check on the incentive effect of stock ownership. The effect of stock ownership could impact either or both of the primary outputs of a stock report. My results show that recommendations are not optimistically biased as a result of stock ownership. Since there are only five recommendation choices and, on average, in my samples the recommendations are a buy, perhaps it is too costly for an analyst to risk moving to the highest recommendation level. Alternatively, forecasts are a continuous variable. However, I am unable to conclude that stock ownership is associated with optimistic forecasts.

The results and the interpretation of the results in this paper are subject to several caveats. Selection bias could affect the sample. To the extent that the tests incorporated do not perfectly

address the bias, the results will be affected. Moreover, analyst stock ownership is not fully identified, which could result in the misclassification of control observations, potentially weakening the results.

The paper is organized as follows. Section 2 outlines the hypothesis. Section 3 contains the sample selection, some descriptive statistics and outlines the research design. Section 4 details the results. Section 5 concludes.

2. Hypothesis Development

Researchers and investors are uncertain about the objective function of analysts. There is some evidence that analyst compensation may be tied to brokerage firm revenues, including trading commissions and investment banking revenues (Michaely and Womack, 1999). Thus, one element of an analyst's objective function is their compensation. In addition, an analyst's personal stock portfolio would also affect her objective function. These personal financial considerations could affect an analyst's objectivity and misalign her interests from those of investors.

Another major contributing factor to analyst compensation is her perceived external reputation. Industry polls and analyst rankings, such as those found in *Institutional Investor* and the *Wall Street Journal,* affect an analyst's reputation. Stock-picking ability and forecast accuracy are two of the cited determinants of external analyst rankings. Analyst reputation concerns may help to align investor and analyst interests.

Stock ownership could signal an analyst's commitment to a stock. In particular, an analyst who is willing to own a stock may have more favorable expectations for that stock than would a non-owning analyst. This argument supports a nonstrategic bias. If an analyst who owns the

stock only reflects her inherent optimism about the company, then testing a sample of stock-owning analysts leads to self-selection issues. However, if demonstrating their commitment were a dominant explanation, then one would expect all stock-owning analysts to voluntarily and clearly disclose their ownership stakes, which is not the case.

Alternatively, a stock-holding analyst might personally benefit from attempts to boost the stock price prior to selling, or may sell prior to downgrading a recommendation or reducing an earnings forecast, which would represent a strategic bias.

Based on prior research relating investment banking affiliation and analyst reporting optimism, I expect the incentive effect to dominate analyst reputation concerns. I predict that stock-owning analysts will issue more favorable stock reports relative to non-stock-owning analysts.

3. Sample Selection, Descriptive Statistics, and Research Design

3.1. Sample Selection

To test the effect of stock ownership on analyst reporting behavior, I identify two samples of analysts that held stock in a company and also published research on that company. One sample is based on Form 144 filings and the other is based on disclosures of analyst ownership. The samples may be subject to a selection bias, since they include only analysts that choose to own the stock.

3.1.1. Form 144 sample

The Form 144 sample is based on name matches between Form 144 filings and the IBES database of analysts. Form 144 is filed with the SEC under Rule 144. An analyst must file a Form 144 if she sells restricted stock during the first year following the required holding period.

Prior to April 29, 1997, SEC Rule 144 required a two year holding period for restricted stock owners; after April 29, 1997 the required holding period is one year. Non-insiders, such as analysts, who sell after the mandated reporting period, have no obligation to file a Form 144 with the SEC.

These filings offer an ex-post indication of the incentives that existed when the analyst reported on the company, and about which, in many cases, the market was unaware. From a research perspective the filings also allow a cross-section of owning analysts, the majority of whom would not have otherwise disclosed their stock ownership.

Figure 1 depicts the timeline of critical events: the purchase and sale of restricted stock, the company IPO, and the required holding and Form 144 filing periods for a non-insider. The figure also shows the sample period which encompasses any report issued after the IPO, and on or before the date of the analyst's final disclosed stock sale.

I obtain a complete database of 144 filings from Thompson Financial. Based on available Form 144 filings for the period 1987 to 2001, I identify 51 instances in which an analyst owns restricted stock and appears in the IBES database as an analyst for that company. This sample represents 49 different companies and 43 analysts from 30 brokerage firms.

The median (mean) declared market value of the restricted stock sold is $65,000 ($388,000). Given that pre-IPO shares are generally purchased at prices well below the IPO price, analysts' profits could be a substantial percentage of the proceeds. Moreover, these amounts are

significant relative to the average analyst's compensation, which in 2002 was estimated to be $189,250 per year.[2]

Since a Form 144 filing can only be observed if a sale occurs in the first year after the mandatory holding period and meets the other reporting requirements, it is possible that analyst restricted stock ownership is not fully identified. Because there might be a misclassification between treatment and control groups, this possibility could weaken any cross-sectional tests that rely on comparisons to other analysts. However, given that most stocks are covered by several analysts, it is highly improbable that all, or even many, control analysts will also be stock owners, albeit undisclosed. To the extent that there is imperfect owner identification, the effectiveness of a selection model might be weakened. Therefore, I apply several techniques to address the self-selection issue.

3.1.2. Disclosing Sample

I collect the second sample (the disclosing sample) from ownership disclosures in analyst reports. Prior to recent regulatory changes, and in contrast to much of the industry practice at the time, one of the larger brokerage firms required explicit ownership disclosures.[3] IBES does not allow the revelation of the brokerage firm's name. I identify the 41 equity analysts in the employ of this disclosing firm during 1998 as those who issue earnings forecasts during the year, as reported on IBES.

[2] Regulation Analyst Certification, Proposed Rule, SEC, August 2002. Of course, analysts covering technology stocks during the 1990s may have been earning well above the industry average.
[3] A typical brokerage firm disclosure was as follows: "The firm and/or affiliates and employees have or may have a long or short position or holding in the securities, options on securities, or other related investments of issuers mentioned herein." ("Analyzing Analyst Recommendations", Securities and Exchange Commission, 7/13/2001.)

I review all the written reports of these analysts to identify instances and the period of ownership by the disclosing analyst. Investext is the source of analyst reports. The review covers approximately 8,000 reports spanning 1993 through 2001. There are 103 companies for which an analyst discloses ownership. These 103 analyst/company pairs comprise the disclosing sample. The 103 companies represent approximately 15% of the stocks that the analysts cover. Almost all of the analysts at the disclosing firm own at least one of the stocks that they cover.

I obtain all earnings forecasts and recommendations during the period of ownership for the sample from IBES. I limit all forecast and recommendation data to the time period for which reports are available on Investext. This restriction ensures a verifiable ownership status for the disclosing analysts.

3.2. Descriptive Statistics

Table 1 provides some descriptive statistics on the two samples. PANEL A compares the market value of equity of the 49 companies in the Form 144 sample to the Schrand and Verrecchia (2002) IPO sample. Market value of equity is the product of the IPO offering price and the number of shares outstanding immediately after the IPO. This comparison highlights that the stock-owning analyst sample may not comprise typical IPO companies given that, on average, the sample companies are bigger. In untabulated results I compare the sample company's excess returns in the first year after going public to the Schrand and Verrecchia (2002) IPO sample. I calculate the excess returns based on the IPO price and relative to the CRSP value-weighted index and the NASDAQ. On average, the excess returns are relatively high (0.56), but the range is quite large. The mean and median excess returns of the sample

companies (0.56 and 0.245 respectively relative to CRSP value weighted) are greater than the comparable returns for the larger IPO sample which are 0.144 and -0.062, respectively.

Although the IPOs of the sample companies are spread over many years, 55% of the companies went public in the years 1999 and 2000. The 49 companies represent 21 different four-digit SIC industry codes but are primarily concentrated in technology, Internet, or telecommunication companies.[4]

Table 1 PANEL B compares the yearly market value of equity of the disclosing sample companies to the entire Compustat database. In general, based on the medians and means of both groups, it is clear that the stock-owning analyst sample companies are larger than the average Compustat company. However, the size difference may not be unusual, in that previous research has shown that analyst coverage is generally concentrated in larger firms.

Eighty of the 103 companies undertake an IPO during the sample period, suggesting that analyst ownership is associated with IPOs. The sample companies are also quite active in the SEO market; so controlling for SEO underwriting incentives is appropriate. Most industry groups, based on one-digit SIC code, are present in the sample. However, approximately 40% of the sample is computer programming or software firms.[5]

Sample analyst characteristics are discussed in the results section (Section 4.2 and Table 3).

3.3. Research design

I test for the presence of bias in stock-owning analyst reporting by comparing their primary report outputs to those of non-stock-owning analysts who cover the same company. These

[4] Details available upon request.
[5] Details available upon request.

comparisons eliminate any idiosyncratic reporting differences across industries and companies, but fail to control for analyst characteristics. I use control variables to address possible reporting differences across analysts.

An alternative research design is to compare within-analyst. A within-analyst approach uses only owning-analyst reports (both those that she owns as well as those that she does not own) and compares the outputs across those two groups. Comparing within-analyst controls for individual analyst characteristics but ignores reporting differences across industry or company.

The primary research design emphasizes comparing across analysts within the same company for two reasons. In the Form 144 sample, a restricted stock-owning analyst in one stock may be more likely to be an owner in the other stocks he or she covers, and I may not observe that ownership in my sample. Therefore, the within-analyst approach would be more likely to miss the effect of stock ownership on reporting. Also, analyst forecast bias, either optimistic or pessimistic, varies widely across stocks. Given that there is little research to explain this cross-sectional variation, identifying appropriate control variables for a within-analyst approach is problematic. Subject to that caveat, I use the within-analyst approach for robustness testing in the disclosing sample because the disclosing analysts' ownership interests are fully identified.

3.3.1. Variables

Since my objective is to test for the existence and significance of bias in stock-owning analyst reports, my tests of reporting bias focus on earnings forecasts and recommendations, the

primary outputs of a research report.[6] The two dependent variables are forecast errors and the recommendation level.

Forecast errors (FE) are company actual quarterly earnings less individual analyst earnings forecasts. Since analysts forecast the results from continuing operations before extraordinary items, actual earnings often require adjustment to be comparable to analyst forecasts. I obtain actual earnings from IBES, because IBES performs the earnings adjustment. To reduce heteroskedasticity, I deflate forecast errors by the stock price one year prior to the forecast period ending date. For the first year of forecasts, after an IPO, I deflate the forecasts by the first price quoted on CRSP. To avoid FE measurement problems that could arise from small deflators, consistent with prior research, I delete the observations with price deflators that are less than $5. To reduce the effect of outliers, I winsorize the top and bottom percentile of forecast errors.

IBES converts analyst recommendations into an ordinal variable, one through five. A strong buy recommendation appears as a one in the database, a two is a buy, a three is a hold, a four is a sell, and a five is a strong sell. To enhance recommendation comparability, I match each stock-owning analyst report with all non-stock-owning analyst recommendations issued in the 60 days before and after the stock-owning analyst report.

To test for stock ownership bias, I include an ownership dummy variable (OWN) in all test specifications. Based on the stated hypothesis, I predict that the coefficient on the OWN variable will be negative. Negative forecast errors indicate optimism. For the recommendation

[6] Price targets are not available for many IBES firms.

specification, a negative coefficient arises because IBES assigns a lower number to more optimistic recommendations.

I use control variables to address known determinants of bias or error. These factors are: other incentives that could affect analyst reporting; analyst and company characteristics that previous research has shown to affect forecast errors, and which may affect analyst reporting in general; and forecast age. Because information arrives over time, forecast error should decline as the actual earnings announcement approaches.

I include underwriting dummy variables to differentiate an underwriting incentive from a stock ownership effect, (see Michaely and Womack, 1999; and Lin and McNichols, 1998) and code lead and co-lead underwriting firms as Lead underwriters.[7] Following Bradley, Jordan, and Ritter (2003), I include the co-manager variables as well. To control for average lower forecast error in companies with greater analyst coverage, I include the analyst following variable (Follow), which I define as the number of analysts who provide forecasts on a company during the quarter (See Lys and Soo, 1995).

Specific to the Form 144 sample I include the Disclose variable, because some stock-owning analysts in this sample clearly and explicitly disclose their ownership in their report. This disclosure could limit opportunistic behavior of a disclosing-owner analyst relative to those that do not disclose. Since only owning analysts disclose, the Disclose variable captures the interactive effect of disclosure and ownership.

[7] M&A fees might normally be considered as well but, given that most firms are relatively young public companies, it is likely a non-issue or relatively minor.

To control for the effect of individual analyst characteristics on their reports, I include three variables: experience, broker decile, and complexity (Clement, 1999; Lim, 2001). Experience measures the analyst's tenure as a sell-side analyst in years; a proxy for which is the number of years they appear in the IBES database. A learning hypothesis would imply that analyst performance improves with experience. Further, greater experience could indicate a better quality analyst, since she has retained her job longer in a competitive field. Both theories predict that forecast errors will decline with experience (Mikhail, Walther, and Willis, 1997; Jacob and Lys, 1999). I use Broker decile to differentiate large and small brokerage firms. Analysts at larger brokerage firms may have greater resources available to assist with their duties, resulting in better outputs. I assign all brokerage firms to deciles each year, based on the number of analysts at each firm. Complexity represents the number of companies an analyst covers. As an analyst covers more companies, I expect a decline in relative performance, due to work demands.

Another consideration for control variables is company-specific variables. In both samples, most companies are recent IPO companies. Therefore, earnings predictability is likely to be comparable. However, in the disclosing sample there is a mix of new and seasoned companies, so I include the volatility variable as my proxy for forecast difficulty (Das, Levine, and Sivaramakrishnan, 1998). Volatility is the standard deviation of the previous year's daily stock returns. Because Brown (1999) also finds that forecast errors differ between loss and profit companies, I include a dummy variable to control for forecast differences between profitable and non-profitable quarters.

I define forecast age as the difference in days from the analyst forecast date to the company's earnings announcement date (O'Brien, 1988).

To the extent that cross-sectional variation in analyst bias by company is related to the firm's industry, I use industry dummy variables to control for the average effect. Although the Form 144 sample companies represent 21 different four-digit SIC code industry groups, many are technology or Internet-related companies and the sample is small. Therefore, using Loughran and Ritter's (2002) definition of Technology Stocks, I use one industry control variable, labeled Internet. Thirty-four sample companies fall into this Internet category. For the somewhat larger disclosing sample, I define an industry based on one digit SIC codes.

I would like to include a proxy for analyst reputation in the regression testing. However, in the Form 144 sample only 5 of the 43 analysts are ranked by Institutional Investor. Including a dummy variable for being ranked does not alter the results. Of the 41 analysts in the disclosing sample, only 3 are ranked by Institutional Investor.

3.3.2. Exploiting the institutional setting – Form 144 Sample

The cross-sectional testing assumes that the stock-owning analyst's incentive is to be optimistic throughout her entire period of ownership. A stock-owning analyst's reporting may only be affected by her stock ownership during the period(s) when any effect on stock price is beneficial to the analyst, i.e., prior to the sale of her stock.

Rule 144 requires a holding period (See Figure 1). Therefore, an alternative way to investigate the effect of stock ownership on analyst reporting, and perhaps increase the power of the test with the Form 144 sample, is to compare stock-owner analyst reporting during the required holding period to reporting during the eligible sale period. Moreover, by comparing a change in behavior over time, I eliminate many of the self-selection issues of the cross-sectional testing.

3.3.3. Selection bias

Both samples are of analysts that choose to own stock. Therefore, where possible, I incorporate a selection model and differences-in-differences in the testing. My selection model is one in which I explicitly model the choice to own stock in one or more equations. The final equation uses the outcome of the prior equations' estimation to instrument for the fact that the variable of interest, ownership, is a choice variable.

Tests of differences-in-differences exploit time series data pre- and post-treatment of both a sample and a control group. This design compares subject outputs to their previous outputs, thus eliminating many sources of non-comparability between the sample and the control group.

4. Results

I obtain Form 144 filings from Thompson Financial; analyst forecasts and recommendations from IBES; stock prices from CRSP; IPO and SEO information from SDC; and analyst reports from Investext, Multex, and First Call.

4.1. Analyst recommendations

Table 2 provides the cross-sectional univariate and ordered probit analyses of the owning and control analyst recommendations. I reduce the sample by eliminating instances in which there are no recommendations issued by control analysts in the 120-day period centered on the date of the owning analyst's recommendation.

The univariate results of PANEL A show that on average, both stock-owning and non-stock-owning control analysts issue "Buy" recommendations (2=Buy) during the sample period.

In the Form 144 sample, owning analysts have a mean recommendation of 1.87. The control sample mean recommendation is 1.62 and is statistically different from the stock-owning sample

mean. The higher average recommendation level among stock-owning analysts suggests less optimism. The disclosing stock-owning analyst sample has a mean recommendation of 2.24 compared to the control sample mean of 2.14. These means are not statistically different at the conventional level. The stock-owning analysts do not issue a sell or strong sell recommendation in either sample, nor do the control analysts in the Form 144 sample.

PANEL B of Table 2 presents the multivariate analyses of the samples' recommendations. Analyst recommendations are a polychotomous variable that has a natural order. Therefore, I use an ordered probit to perform the analyses. A z-statistic indicates the significance of the probit coefficients. The Form 144 sample ownership variable (OWN) is positive and weakly significant at the 10% level. In the disclosing sample, the coefficient on the ownership variable is 0.32 and significant. These positive coefficients provide evidence that a stock-owning analyst has a greater probability of issuing a less optimistic recommendation than does a non-stock-owning control analyst.

However, for the ordered probit, the marginal effects of the regressors on the probabilities of each recommendation level are not equal to the coefficients. Only the signs of the changes in the two extreme outcomes are unambiguous; the effect on the middle cells is ambiguous (See Greene, 2000). In PANEL C, Table 2, I present the marginal effects of the ownership dummy variables on the probabilities of each recommendation. The magnitude of the marginal effects differs across samples, perhaps due to sample size differences. However, the result is the same, a rightward shift in the distribution toward more pessimistic recommendations. Note, in the disclosing sample the marginal effect is relatively small.

These results provide preliminary evidence that an analyst's reputation concerns may provide an effective check on the incentive effect of stock ownership. Final conclusions are subject to the forecast error testing. This evidence of cautious reporting by stock-owning analysts also reduces concerns of a self-selection bias inducing a finding of greater optimism.

Although the main result is consistent across samples, the sign and significance of the control variables differs by sample. The IPO underwriter variable is positive and significant in the Form 144 sample, but not in the disclosing sample. This finding contradicts the existing literature, but it is based on a small sample of IPO firms. The disclosing sample results show that three of the four underwriting coefficients are negative, including the IPO co-manager variable, which is also the only one of the four that is statistically significant. This finding is consistent with an underwriting incentive, as in Michaely and Womack (1999), but it suggests that the co-managers, not the lead underwriters, of IPOs provide optimistic recommendations. The lack of significance of the SEO underwriting variables is inconsistent with Lin and McNichols (1998). However, Lin and McNichols explore a much larger sample of SEOs, which could explain the different results.

For the Form 144 sample, the internet and broker decile variables are the only other statistically significant control variables. The coefficient on the Internet variable is positive, but the broker decile variable coefficient is negative. I do not calculate the marginal effects for the control variables, since they are not the focus of the paper. However, the general implications are that recommendations for Internet companies are less optimistic and recommendations issued by larger brokerage firms have a higher probability of being a strong buy.

The analyst following variable is the only other statistically significant control variable in the disclosing sample. The coefficient is positive, suggesting that more competition limits analyst optimism.

4.2. Univariate results – forecast errors

In both samples, the average forecast error is negative, suggesting overall optimism. The analyses of the two samples' forecast errors by stock-owning analysts relative to non-stock-owning analysts show statistically significant mean differences. Stock-owning analysts are more optimistic, with a mean forecast error of -0.003 compared to the control sample mean of -0.001, as shown in both PANEL A and B of Table 3.[8] In the Form 144 sample, four stock-owning analysts do not issue quarterly forecasts. These analysts are absent from the analysis.

I measure the loss, following, and volatility variables at the company level and therefore do not include them in either panel of Table 3. In the Form 144 sample, a loss occurs in approximately 71% of the quarterly observations. For the disclosing sample, a loss occurs in approximately 35% of the quarterly observations. The difference in loss frequency between the two samples is likely a function of the non-IPO companies in the disclosing sample. The mean (median) analyst following is 14.2 (11) and 13.3 (9) for the Form 144 sample and the disclosing sample, respectively. The mean and median volatility in the disclosing sample is 0.04.

In both samples, when I compare the owner sample to the control sample, I find that the control variables presented in Table 3 are significantly different in both mean and median, except for the median of the experience variable in the disclosing sample. The average forecast age (all

[8] Average forecast errors are likely smaller, in general, than most other studies, because other studies have larger, more general, sample populations. Also, studies that use annual forecasts have larger forecast errors, on average.

greater than 149 days) for the stock-owning and control groups is relatively high, considering that they represent quarterly forecasts, but the high average occurs because many analysts initially forecast all four quarters at the beginning of the year. On average, stock-owning analysts forecast earlier than do control analysts. Therefore, forecast age may, in part, explain their excess optimism.

It is also more common for a stock-owning analyst to be affiliated with the lead underwriter and/or underwriting co-manager than it is for a control-analyst, suggesting some relationship between underwriting and analyst stock ownership. On average, stock-owning analysts are also from slightly larger size brokerage firms. In the Form 144 sample, owning analysts have more years of experience as sell-side analysts, but in the disclosing sample, the opposite is true. In both samples, the number of companies for which a stock-owning analyst provides research coverage is greater than the control analyst group, on average. Ownership is disclosed for approximately 20% of owning analyst observations in the Form 144 sample.

4.3. Cross-sectional forecast error regression

Table 4 presents the results of the cross-sectional forecast error regressions, before incorporating a selection model. The pooled OLS results of the Form 144 sample show no evidence of analyst optimism attributable to stock ownership, as analyst ownership (OWN), the primary variable of interest, is positive but not significant. In the disclosing sample, OWN is negative and significant, but requires additional tests to be conclusive; for example, to address the ownership choice.

With the larger disclosing sample, to address problems arising from cross-sectional dependence in a pooled regression, I run separate quarterly regressions using ordinary least

squares for the entire sample period and present the mean of those quarterly regression coefficients. To test the hypothesis that the mean coefficients are statistically different from zero, I calculate adjusted t-statistics following the Fama and Macbeth (1973) procedure. Although not tabulated, the Fama-Macbeth results for the Form 144 sample are qualitatively similar to the pooled OLS results of Table 4.

The regression results for many of the control variables are consistent across the two samples. The underwriter variables are not statistically significant in the Form 144 sample. In the disclosing sample, the IPO co-manager variable is not statistically significant, but the three other underwriter variables are all positive and statistically significant. These findings suggest that with the exception of the IPO co-manager, underwriter forecasts are less optimistic, on average. The IPO co-manager recommendation optimism in Table 2, and the forecast findings above, show that IPO co-managers are optimistic, and more so than other underwriting participants.

In both samples the negative and significant coefficient on the forecast age variable supports greater optimism in early forecasts. Similarly, the negative coefficient on the loss variable suggests that analysts are poor at predicting losses and, in particular, that they are overly optimistic.

The coefficients for analyst following are positive and statistically significant, which suggests that greater analyst following reduces average analyst optimistic bias. In addition, in the larger disclosing sample, I interact the owner and the follow variable to determine if owner optimism is incrementally affected by the level of analyst following. The coefficient on the interaction term is positive and statistically significant, which indicates that analyst following not

only has a general effect on optimism, but also results in an incremental reduction in owner optimism.

The Internet industry dummy is positive and significant in the Form 144 sample. The remaining control variables are only significant in the disclosing sample. The experience variable is negative and significant, which suggests that, on average, analysts with more experience have higher forecast optimism. Volatility is positive and significant, which is surprising. Perhaps lagged volatility is a poor proxy for predictability, or perhaps companies with volatile returns in the previous year provide analysts with greater forecast guidance.

The remainder of this section addresses alternative research designs and tests to address the self-selection issue.

4.4. Selling period incentive – Form 144 sample

As outlined in Section 3.3.2, to compare the change in reporting behavior between the required holding period and the eligible sale period, I obtain a subsample of all stock-owning analysts who provide earnings forecasts in both periods, as well as the corresponding control analyst forecasts from the cross-sectional testing in Section 4.3. I report results only for earnings forecasts, as the existence of multiple period observations allows comparison across time. The sample does not provide sufficient recommendations from both periods to draw any reasonable conclusions.

Since the date of the analyst's stock purchase is unknown, I estimate the end of each analyst's required holding period as the earlier of, 60 days before the first disclosed sale (Form 144 filing), or the appropriate holding period (one or two years) after the IPO date. Any reports

published before this date are considered holding-period reports and any issued after this date are considered selling period or post-holding-period reports.

I supplement the regression specification of Table 4 with two additional variables. The first is a dummy variable, Post Holding Period, which takes on the value of one for observations issued after the end of the holding period, and zero otherwise. The second variable is an interactive variable, Post Holding * Own, which is the interaction of the analyst ownership variable and the Post Holding Period variable. This interactive variable measures the incremental change in stock-owning analyst forecast behavior after the required holding period (i.e., when the analyst is free to sell), relative to the holding period forecasts. A strategic bias would predict a negative coefficient on the interactive variable.

Table 5 presents the results of this analysis. Similar to the Table 4 Form 144 sample results, the coefficient on the OWN variable is positive, but not statistically significant. The Post Holding dummy variable and the interactive Post Holding * Own variable are both statistically significant. The Post Holding variable is positive, which supports an average decline in overall forecast optimism by all analysts in the post-holding period. This reduced optimism could be consistent with a general decline in optimism in the years following the IPO. The interactive variable Post Holding * Own is negative, which supports incremental owning-analyst forecast optimism during the period that analysts are free to sell their stock. This owner optimism is suggestive of strategic reporting behavior.

I contrast the regression results for the control variables presented in Table 5 with those of Table 4. The forecast age and loss variables are negative and significant, similar to the previous analysis. The Internet and following variables are positive, but are no longer statistically

significant. The other significant change relative to the Table 4 results is that the complexity variable is now statistically significant. The signs of the coefficients on the Co-Manager and Disclose variables change relative to the prior analysis, but both are still not statistically significant.

To explore the robustness of this strategic owner optimism, I expand the test above to include the forecasts issued after the analysts' stock sale. In untabulated testing, the results show no change in forecast behavior by the stock-owning analysts after the sale of stock, relative to the post-holding period and the incremental optimism during the post holding period is no longer statistically significant. This finding suggests that the pre-sale optimism result may not be robust.

4.5. An alternative design – within-analyst analysis – disclosing sample

With the disclosing sample, ownership is fully identified. Therefore, I perform a within-analyst analysis (See Section 3.3) on the earnings forecasts of disclosing owning-analysts. In untabulated results, I find that analyst forecast optimism is greater in the stocks that they own, versus those that they do not own. However, the difference is not statistically significant; therefore the cross-sectional forecast optimism found in Section 4.3 could be unique to this sample of analysts. However, this methodology is also potentially problematic, given that there is little research that explains variation in analyst bias across companies; therefore, identifying appropriate control variables is difficult.

The remaining sections revisit the forecast error cross-sectional results to address the self-selection issue.

4.6. Differences-in-differences – Form 144 sample

Since the analyst's stock sale date is known for the Form 144 sample I apply a differences-in-differences test. Table 6 presents the results. Contrasting forecasts for the same quarter, made at different times, eliminates many other sources of forecast variability.

To obtain the most powerful test, I focus on the last disclosed sale for each stock-owning analyst. To allow only one forecast revision per owning-analyst/company pair, I select the last forecast period. One drawback of the differences-in-differences test is that not every stock-owning analyst forecasts earnings for the same forecast period, both before and after the stock sale. Missing time-series data reduces the sample size, including control observations, to 73. The inclusion of control observations ameliorates other potential explanations for forecast revisions.

PANEL A of Table 6 presents the univariate analysis. Although the stock-owning analyst mean revisions are positive and much larger than the non-stock-owning analyst mean, a test of means shows no statistical difference between the two groups. The change in forecast age is significantly greater for stock-owning analysts compared to the control group, which suggests less timely revisions by the stock-owning group. Stock-owning analysts provide coverage on a significantly greater number of companies (Complexity).

The other two control variables do not show any statistically significant difference in means, although the relations are similar to those shown in Table 3.

PANEL B of Table 6 presents the multivariate analysis. The dependent variable is the change in forecast error. The regression coefficient on the OWN variable is positive and statistically significant. The decline in stock-owning analysts' forecast optimism after the sale of

their stock holdings is statistically greater than other analysts' decline in optimism for the same forecast periods. This finding, in addition to the evidence of heightened optimism prior to the sale of an analyst's stock position in Section 4.4, supports a strategic bias by stock-owning analysts around the time of their stock sale.

My conclusions are subject to the caveat that I use only a small sample, due to data restrictions. Moreover, robustness tests of these results, using either the earliest forecast period for each owning analyst/company pair or all owning-analyst forecast revisions, are not statistically significant.

The change in forecast age is the only control variable that is weakly significant. The sign of the coefficient is positive. In the cross-sectional results, the forecast age is negative and significant. The two results are consistent. Forecast optimism declines as the actual earnings report date approaches.

4.7. Incorporating a selection model

The results of the forecast error treatment regression for the disclosing sample are presented on Table 7. To facilitate the implementation of the two stage model, it is run on a pooled basis. The first stage model is solved by maximum likelihood. A Wald test rejects the independence of the two equation's error terms, at a 10% significance level, thereby providing some support for the need to control for the fact that ownership is a choice variable.

To model the ownership decision, I include the experience variable and the underwriting variables. Early in a sell-side analyst's career, her personal risk appetite and wealth could limit investment activity. I include the underwriting variables because an analyst's early investment in a pre-IPO company may lead to that analyst's brokerage firm being chosen as an underwriter as a

result of the analyst's relationship with the company management. Alternatively, an analyst employed by an underwriter may be more likely to have preferential access to stock, either prior to or at the IPO, due to their significant relationship with the company as the underwriter. For an SEO, an analyst's stock ownership could signal to the company management the commitment and belief the analyst has in the company which, in turn, may influence the SEO underwriting assignment.

In the first stage probit (PANEL A), the four underwriter variables and the experience variable are all statistically significant. Experience and ownership are negatively related, which suggests that the less experienced analysts are more likely to own the stock that they cover. The underwriter results also strongly suggest that there is some association between stock ownership and underwriting involvement.

In the second stage regression (PANEL B), consistent with results shown in Table 4, the ownership variable is negative and significant. The significance of the coefficient, however, is likely overstated due to cross-sectional dependence, since there are multiple quarterly observations by the same analyst. The Table 7 regression results related to the control variables are similar in sign, and the z-statistics are of greater magnitude than the t-statistics of Table 4. The only exception is Complexity, the coefficient changes sign from Table 4 to Table 7; but it is not significant in Table 7. The greater statistical significance of most of the control variables is also likely a function of cross-sectional dependence. Note that the experience variable is excluded from the second stage regression to ensure identification.

The results of implementing a bivariate selection model on the forecast error equation for the Form 144 sample are inconclusive and untabulated. Although the significance of the owner

variable is unchanged after applying the selection model, the results indicate that the first stage of the selection model is a poor predictor of owning analysts.

The evidence to support an association between analyst forecast optimism and stock ownership in both samples appears to be weak.

4.8. Comparing forecasts - ownership and non-ownership periods – disclosing sample

The results of Section 4.5 suggest that in the disclosing sample the sample analyst's forecasts are optimistic regardless of ownership status. To further address this issue, in Table 8, I expand the disclosing sample to include forecasts by the stock-owning analysts during periods when they were not an owner, either before or after the stock ownership period. The forecasts are still restricted to the ownership stocks. I add corresponding control analyst forecasts as well.

I supplement the Table 4 regression specification with two additional dummy variables. The first, Non Owning Period, is an intercept term that controls for all forecasts during the non-stock-ownership period. The second, Owning analyst-non-owning periods, measures the owning analysts' average forecast bias during the non-treatment period (periods during which they do not own). By comparing the magnitude, sign, and significance of the two owner dummy variables (ownership and non-ownership), I assess whether stock ownership has an effect on analyst optimism.

Comparing the Table 4 and Table 8 results, it is clear that the magnitude and significance of all the variables are similar across the two tables. Moreover, although it is positive, the new intercept term that captures the incremental difference in bias during the non-stock-ownership period is not statistically significant.

The primary variables of interest are the two owner variables. As in Table 4, stock-owning analyst forecasts during the period that they own the stock are optimistic. The coefficient on the OWN variable is -0.0008 and is statistically significant. The contrast of interest is the forecast error for the period during which the analysts do not own the stock. The results show that the owning analysts are optimistic even during the period of non-ownership. The coefficient on the Owning-analyst – non-owning period variable is -0.0007, and is statistically significant. An F-test rejects that both coefficients are zero. However, a second F-test cannot reject that the two owner coefficients are equal.

The disclosing sample results of the within-analyst testing, the selection model results, and the results immediately above all suggest that the cross-sectional forecast optimism found in the initial regression on Table 4 may be the norm for this group of analysts and is not associated with their ownership status. However, the additional testing of the Form 144 sample around the analyst's stock sale provides some evidence, albeit weak, of optimistic forecasts prior to the stock sale.

5. Conclusion

In this paper I investigate the impact of stock ownership, a direct and known incentive to the analyst, on analyst reporting. Although the existence and extent of analyst ownership has been opaque to researchers and the market, by exploiting two available data sources, my study addresses the research question.

The data suggests that analyst ownership is relatively common and the amounts are sizable. In the disclosing sample most analysts own at least one stock they cover. The Form 144 sample reveals that the average market value of an analyst's stock ownership position is significant.

Based on the two samples of sell-side analysts who have a stock-ownership position and provide research coverage, I find that analysts who own stock are more cautious in their recommendations. The univariate analyses of analyst forecast errors shows that on average, owner analyst forecasts are more optimistic than are control analyst forecasts. The cross-sectional regression analysis of the two samples of analyst forecast errors offers conflicting evidence. Additional tests attempt to reconcile the results. Although there is weak evidence of optimistic forecasts by analysts around the time of their stock sale, the weight of evidence suggests that stock ownership does not affect earnings forecasts.

I conclude that analyst stock ownership has a modest but perhaps benign affect on their recommendations. However, analyst stock ownership may raise the risk of reporting opportunism around the time of sale. Whether regulators and brokerage firms acted appropriately in dealing with analyst stock ownership remains open to future research.

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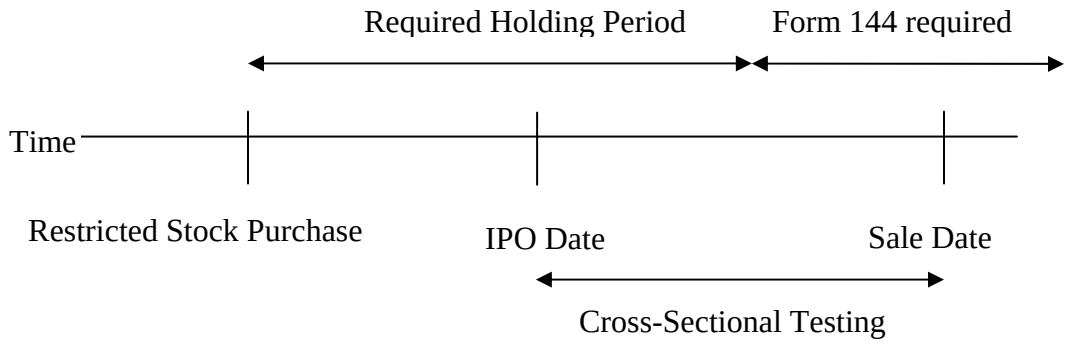
Figure 1
Form 144 time line for non-insiders



Restricted stock is an unregistered security issued by a company in a non-public transaction.

SEC Rule 144 requires filing Form 144 for non-insiders who sell their restricted stock in a public market during the 1st year after the required holding period.

Required Holding Period:
Pre April 29, 1997 – 2 years.
After April 29, 1997 – 1 year.

Table 1
Descriptive Statistics

PANEL A: Market Value of Equity at IPO – Form 144 Sample vs. Broad IPO sample

I construct the Form 144 sample by matching analyst names from IBES to SEC Form 144 filings from 1987 to 2001. The SEC requires Form 144 for the sale of restricted stock if the stock is sold within a specified timeframe. There are 51 instances in which an analyst owns restricted stock and appears as an analyst for that company in the IBES database. The sample represents 49 different companies and 43 analysts from 30 brokerage firms.

This panel compares market value of equity at the time of the IPO for the 49 companies versus a broad IPO sample, obtained from Schrand and Verrecchia (2002). Market value of equity is the product of the offering price and the number of shares outstanding immediately following the offering. Schrand and Verrecchia, 2002 (S&V) include firm commitment IPOs from 1990 to 1999 on SDC excluding non-ordinary shares, closed-end mutual funds, "penny stocks", financial firms, spin-offs and firms with data discrepancies. Owning analyst sample companies are also excluded from the S&V group. Respectively, superscripts a and b denote statistical significance between sample and comparison firms at the 5% and 1% level.

$ million	N	Mean	25th Percentile	Median	75th Percentile	Std. Dev.
Sample Companies	49	718[a]	149	312[b]	477	1,761
S&V Sample	2,490	191	65	112	203	273

PANEL B: Market Value of Equity: Compustat versus Disclosing sample companies

I obtain the Disclosing sample from analyst ownership disclosures in the written reports of one of the few brokerage firms that historically required such disclosures. I identify the 41 equity analysts employed at this disclosing firm as those that issued earnings forecasts during 1998, as reported on IBES. I review all reports written by these analysts, which are compiled by Investext and span 1993 through 2001, for ownership disclosures. There is analyst ownership for 103 companies included the sample.

This table compares the yearly market value of equity of the 103 companies (where appropriate) to the entire Compustat database. Superscript a denotes statistical significance between sample and comparison firms at the 5% level.

Year	Compustat		Sample companies	
	Mean	Median	Mean	Median
1993	865[a]	83[a]	4,724	428
1994	855[a]	78[a]	4,426	240
1995	1,034[a]	89[a]	6,158	406
1996	1,190[a]	100[a]	8,087	579
1997	1,533[a]	116[a]	10,215	467
1998	1,867[a]	98[a]	14,464	529
1999	2,615[a]	104[a]	21,036	1,117
2000	2,466[a]	84 [a]	23,118	651
2001	2,186[a]	93[a]	18,147	470

Table 2
Analyst Recommendations

This table compares owning-analyst recommendation levels to non-owning analyst recommendations. For the Form 144 sample, the owner sample represents all recommendations issued by owning analysts prior to the sale of their restricted stock and on IBES. The disclosing sample represents recommendations issued during the period of ownership and for which owning analyst reports are available on Investext and IBES. These disclosing analysts are employed by one of the few brokerage firms that historically required such disclosures. The control samples are all other analyst recommendations for the same company issued within 60 days of the owning analyst recommendation. A strong buy recommendation appears as a one, a two is a buy recommendation, a three is a hold, a four is a sell, and a five is a strong sell. Superscript a denotes statistical significance between sample and control observations at the 5% level.

PANEL A: Univariate Comparison

		Sample Group			**Control Group**		
Form 144 Sample		**Mean**		**Std. Dev.**	**Mean**		**Std. Dev.**
Recommendation Level		1.87		0.53	1.62[a]		0.58
Number of observations		38			101		
Disclosing Sample							
Recommendation Level		2.24		0.49	2.14		0.83
Number of observations		103			453		

Table 2, Analyst Recommendations - continued

PANEL B: Ordered Probit Results

This panel presents the ordered probit analysis of the owning and control analyst recommendations. **Recommendation** is an ordinal variable representing the analyst's stock recommendation (1 Strong Buy, 5 Strong sell). **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Disclose** is a dummy variable indicating whether the analyst is a restricted stock owner and whether their ownership was disclosed to the public, prior to the Form 144. **Internet** is a dummy variable indicating whether the company is in the group of four digit SICs as specified by Loughran and Ritter (2002) for technology stocks. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Industry** dummies are based on one digit SIC codes.
* Statistically significant at the 5% level or better.

Dependent variable: Recommendation

		Form 144 Sample				***Disclosing Sample***		
		Coefficient		**z-Statistic**		**Coefficient**		**z-Statistic**
Analyst Owner Dummy (OWN)		0.53		1.9		0.32	*	3.1
IPO Underwriter		0.65	*	2.0		-0.26		-1.4
IPO Underwriting Co-manager		0.13		0.5		-0.55	*	-3.3
SEO Underwriter		n/a		n/a		-0.32		-1.4
SEO Underwriting Co-manager		n/a		n/a		0.02		0.1
Broker Decile		-0.22	*	-2.5		0.04		1.0
Experience		0.00		0.0		0.01		1.3
Complexity		0.02		1.4		0.00		0.9
Disclose Ownership		-0.44		-1.0		n/a		n/a
Internet (Industry Dummy)		0.50	*	2.0		n/a		n/a
Follow						0.02	*	2.6
Industry Dummies (not reported)						YES		
Year Dummies (not reported)						YES		
Pseudo R square =				**9.2 %**				**2.5%**
Number of Observations		139				556		

PANEL C: Marginal Effect of Analyst Ownership on the probability of each recommendation

Form 144 Sample	**Prob(Rec=1)**	**Prob(Rec=2)**	**Prob(Rec=3)**	**Prob(Rec=4)**	**Prob(Rec=5)**
Change	-19	+13	+6	n/a	n/a
Disclosing Sample					
Change	0	0	-0.1	-1.4	+1.5

Table 3
Earnings forecasts – univariate statistics

PANEL A – Form 144 Sample

An owning analyst is a sell-side analyst that provides research coverage on a company and files a Form 144 with the SEC upon the sale of their restricted stock in that same company. The owner sample represents owning analyst quarterly earnings forecasts issued prior to the sale of their restricted stock. The control sample is non-owning-analyst earnings forecasts for the same companies and forecast periods as owning analyst forecasts. Respectively, superscripts a and b denote statistical significance between the sample and control group at the 5% and 1% level.

Forecast error is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Disclose** is a dummy variable indicating whether the analyst is a restricted stock owner and whether their ownership was disclosed to the public, prior to the Form 144.

	Owner Sample			**Control Sample**		
	Mean	**Median**	**Std. Dev.**	**Mean**	**Median**	**Std. Dev.**
Forecast Error	-0.003	0.0001	0.016	-0.001[a]	0.0002[a]	0.014
Forecast Age (days)	173	175	103	150[b]	126[b]	97.0
IPO Underwriter	0.354	0.00	0.479	0.101[b]	0.00[b]	0.301
IPO Co-manager	0.512	1.00	0.501	0.216[b]	0.00[b]	0.411
Broker Decile	9.62	10.0	1.02	9.20[b]	10.0[b]	1.44
Experience	7.83	7.00	4.65	6.33[b]	5.00[b]	4.73
Complexity	21.9	19.0	11.7	15.1[b]	14[b]	8.10
Disclose Ownership	0.195	0.00	0.397	0.000[b]	0.00[b]	0.000
Number of observations	359			2,812		

Table 3 - continued
Earnings forecasts – univariate statistics

PANEL B– Disclosing Sample

Owning analysts are identified as sell-side analysts that provide research coverage on a company and disclose ownership in that same company. These disclosing analysts are employed by of one of the few brokerage firms that historically required such disclosures. The sample represents forecasts issued and on IBES, during the period of ownership and for which owning-analyst reports are available on Investext. The control sample is all other analyst forecasts for the same companies and forecast periods as owning-analyst forecasts. **Forecast error** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year.

	Owner Sample			**Control Sample**		
	Mean	**Median**	**Std Dev.**	**Mean**	**Median**	**Std Dev.**
Forecast Error	-0.003	0.000	0.008	-0.001[b]	0.000[a]	0.005
Forecast Age (days)	187	181	103	173[b]	175[b]	104
IPO Underwriter	0.061	0.000	0.240	0.010[b]	0.000[b]	0.103
IPO Co-manager	0.102	0.000	0.302	0.022[b]	0.000[b]	0.146
SEO Underwriter	0.061	0.000	0.240	0.013[b]	0.000[b]	0.113
SEO Co-manager	0.108	0.000	0.311	0.034[b]	0.000[b]	0.183
Broker Decile	10	10	n/a	9.32[b]	10[b]	1.38
Experience	6.66	5.00	4.20	7.19[b]	5.00	5.11
Complexity	18.0	18.0	6.39	14.7[b]	13.0[b]	7.13
Number of obs.	1,253			12,085		

Table 4
Cross-sectional Forecast Error Regression

The Form 144 Sample are sell-side analysts that provide research coverage on a company and file a Form 144 with the SEC upon the sale of their restricted stock in that same company. The Disclosing Sample represents sell-side analysts that provide research coverage on a company and disclose ownership in that same company. **Forecast error** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Disclose** is a dummy variable indicating whether the analyst is a restricted stockowner and whether their ownership was disclosed to the public, prior to the Form 144. **Internet** is a dummy variable indicating whether the sample company belongs to one of the four digit SIC groups specified by Loughran and Ritter (2002) for Technology stocks. **Volatility (lagged)** is the standard deviation of daily stock returns for the preceding year. **Industry** is a dummy variable, one for each one digit SIC code. * Statistically significant at the 5% level or better.

Dependent variable: Forecast Error (FE).

		Form 144 Sample				***Disclosing Sample***		
		Coefficient (OLS)		**T-Statistic (OLS)**		**Coefficient (1)**		**T-Statistic (1)**
Intercept		0.0031		1.93		-0.0048	*	-2.26
Analyst Owner Dummy (OWN)		0.0003		0.36		-0.0013	*	-2.34
IPO Underwriter		0.0006		0.69		0.0018	*	1.96
IPO Co-manager		-0.0008		-1.15		0.0009		1.19
SEO Underwriter		n/a		n/a		0.0019	*	4.13
SEO Co-manager		n/a		n/a		0.0021	*	3.30
Forecast Age		-0.0000	*	-11.0		-0.0000	*	-8.74
Loss		-0.0051	*	-8.14		-0.0080	*	-5.90
Analyst Following (Follow)		0.0001	*	4.97		0.0001	*	6.13
Own x Follow		n/a		n/a		0.0000	*	2.06
Broker Decile		0.0000		0.46		0.0001		1.95
Experience		-0.0000		-0.39		-0.0001	*	-3.94
Complexity		-0.0000		-1.37		0.0000		1.24
Disclose Ownership		-0.0025		-1.34		n/a		n/a
Internet		0.0023	*	3.50		n/a		n/a
Volatility (lagged)						0.0756	*	3.22
Industry Dummies(not reported)						Yes		
Adj. R square =				**6.3 %**				
Number of observations		3,171				11,695		

(1) Fama-MacBeth Average Coefficients ($\bar{\gamma}$) and T-Statistics $T = \bar{\gamma} \Big/ \frac{S(\bar{\gamma})}{\sqrt{n}}$

Table 5
Forecast Error Regression – Holding Period / Free to Sell Period – Form 144 Sample

This analysis tests the subsample of all Form 144 owning analysts that provide earnings forecasts during both the SEC mandated holding period and the post-holding period. An owning analyst is a sell-side analyst that provides research coverage on a company and files a Form 144 with the SEC upon the sale of their restricted stock in that same company. SEC Rule 144 requires a restricted stock owner to hold the stock for at least one year (See Figure 1). **Forecast error** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Post Holding Period** is a dummy variable indicating whether the earnings forecast is issued after the Rule 144 required holding period. **Internet** is a dummy variable indicating whether the sample company belongs to one of the four digit SIC groups specified by Loughran and Ritter (2002) for Technology stocks. **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Disclose** is a dummy variable indicating whether the analyst is a restricted stockowner and whether their ownership was disclosed to the public, prior to the Form 144. * Statistically significant at the 5% level or better.

Dependent variable: Forecast Error (FE).

		Coefficient		**T-Statistic**
Intercept		0.0007		0.38
Post Holding Period		0.0016	*	2.40
Internet		0.0011		1.63
Analyst Owner Dummy (OWN)		0.0009		0.77
Forecast Age		-0.0000	*	-6.97
IPO Underwriter		0.0012		1.32
IPO Co-manager		0.0014		1.93
Loss		-0.0045	*	-8.04
Analyst Following (Follow)		0.0000		0.05
Broker Decile		0.0004		1.80
Experience		0.0001		0.97
Complexity		-0.0001	*	-3.24
Disclose Ownership		0.0002		0.06
Post Holding * Own		-0.0040	*	-2.18
Adj. R square = 7.3 %				
Number of observations		1,771		

Table 6
Differences-in-Differences – Form 144 Sample

This test compares owning-analyst forecast bias after the sale of their stock to the level of bias prior to the sale, where both forecasts are for the same fiscal quarter. An owning analyst is a sell-side analyst that provides research coverage on a company and files a Form 144 with the SEC upon the sale of their restricted stock in that same company. **ΔFE** is the difference between the forecast error (FE) from the earnings forecast issued after the sale of restricted stock and the FE of the forecast issued prior to the sale of the stock. (**FE** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price.) **Own** is a dummy variable indicating whether the analyst owns (or owned) the stock on which she issues a report. **Change Forecast Age** is the number of days between the post sale forecast and the pre-sale forecast. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. Superscript b denotes statistical significance between owner sample and control sample at the 1% level. * Statistically significant at the 5% level or better.

PANEL A: Univariate Results

	Owner Sample		**Control Sample**	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Change FE (**ΔFE**)	0.0158	0.0339	-0.0000	0.0026
Change: Forecast Age	177	85.9	118[b]	53.4
Broker Decile	9.31	1.54	9.23	1.36
Experience	9.06	5.37	7.35	5.07
Complexity	20.4	9.67	15.0[b]	7.52
Number of observations	16		57	

PANEL B: Regression Results

Dependent variable: Change in Forecast Error (ΔFE).

			Coefficient		**T-Statistic**
Intercept			-0.0113		-0.88
Analyst Stock Owner (OWN)			0.0111	*	2.24
Change: Forecast Age			0.0000		1.77
Loss			0.0044		0.92
Broker Decile			-0.0006		-0.40
Experience			0.0000		0.23
Complexity			0.0003		1.29
Number of observations	73				
Adj. R square	17.3 %				

Table 7
Forecast Error Pooled Treatment Regression – Disclosing Sample

This table analyzes the effect of analyst stock ownership on analyst forecast bias, controlling for the fact that stock ownership is a choice variable; by the use of a treatment regression (Table 4 ignores the self-selection issue). Owning analysts are identified as sell-side analysts that provide research coverage on a company and disclose ownership in that same company. **Forecast error (FE)** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Volatility (lagged)** is the standard deviation of daily stock returns for the preceding year. **Industry** is a dummy variable, one for each one digit SIC code. The z-statistics are based on Huber/White robust standard errors. * Statistically significant at the 5% level or better.

$$\mathbf{Own}^{*}=\gamma_0+\gamma_i\,\mathbf{Industry}_i+\gamma_i\,\mathbf{Year}_i+\gamma_1\,\mathbf{Experience}+\gamma_2\,\mathbf{IPO\ Underwriter}+\gamma_3\,\mathbf{IPO\ Co\text{-}Manager}+\gamma_4\,\mathbf{SEO\ Underwriter}+\gamma_5\,\mathbf{SEO\ Underwriter\ Co\text{-}Manager}+\mu$$

PANEL A - 1st Stage Probit

		Coefficient		**Z-Statistic**
Intercept		-1.19	*	-15.1
IPO Underwriter		0.460	*	2.54
IPO Co-manager		0.690	*	6.88
SEO Underwriter		0.759	*	6.58
SEO Co-manager		0.510	*	6.31
Experience		-0.007	*	-2.45
Year Dummies		Yes		
Industry Dummies		Yes		
Wald X^2=3.38		Prob. (X^2)=.066		

Table 7, continued
Forecast Error Pooled Treatment Regression – Disclosing Sample

This table analyzes the effect of analyst stock ownership on analyst forecast bias, controlling for the fact that stock ownership is endogenous; by the use of a treatment regression (Table 4 ignores the self-selection issue). Owning analysts are identified as sell-side analysts that provide research coverage on a company and disclose ownership in that same company. **Forecast error** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Volatility (lagged)** is the standard deviation of daily stock returns for the preceding year. **Industry** is a dummy variable, one for each one digit SIC code. The z-statistics are based on Huber/White robust standard errors.

$$\mathbf{FE}=\alpha_0+\alpha_i\,\mathbf{Industry}+\alpha_i\,\mathbf{Year}+\beta_1\,\mathbf{Own}+\beta_2\,\mathbf{IPO\ Underwriter}+\beta_3\,\mathbf{IPO\ Co\text{-}manager}+\beta_4\,\mathbf{SEO\ Underwriter}+\beta_5\,\mathbf{SEO\ Co\text{-}manager}+\beta_6\,\mathbf{Forecast\ Age}+\beta_7\,\mathbf{Loss}+\beta_8\,\mathbf{Follow}+\beta_9\,\mathbf{Broker\ Decile}+\beta_{10}\,\mathbf{Complexity}+\beta_{11}\,\mathbf{Volatility\ (lagged)}+\varepsilon$$

[where Own=1 if Own*>0 and Own=0 otherwise]

PANEL B - 2nd Stage Regression

		Coefficient		**Z-Statistic**
Intercept		-0.0080	*	-16.4
Analyst Owner Dummy (OWN)		-0.0004	*	-1.96
IPO Underwriter		0.0012		1.70
IPO Co-manager		0.0007		1.54
SEO Underwriter		0.0018	*	4.19
SEO Co-manager		0.0015	*	4.38
Forecast Age		-0.0000	*	-22.9
Loss		-0.0069	*	-30.2
Analyst Following (Follow)		0.0001	*	18.1
Broker Decile		0.0001	*	4.10
Complexity		-0.0000		-1.56
Volatility (lagged)		0.0755	*	14.6
Year Dummies(not reported)		Yes		
Industry Dummies(not reported)		Yes		
Number of observations		12,819		

Table 8
Forecast Error Regression – Owning Period / Non-Owning Period – Disclosing Sample

This table analyzes an expanded sample, by adding any forecasts related to stock owned by an analyst but issued before or after the ownership period for both owning and control analysts to the Table 3, Panel B sample. The purpose is to compare reporting behavior during the ownership period to behavior during a non-ownership period. Owning analysts are identified as sell-side analysts that provide research coverage on a company and disclose ownership in that same company. **Forecast error (FE)** is actual earnings for the quarter less the analyst's earnings forecast all deflated by lagged stock price. **Non-Owning period** is a dummy variable indicating that no analyst owns the stock during the forecast period. **Own** is a dummy variable indicating whether the analyst owns the stock on which she issues a report. **Owning-analyst – non-owning period** is a dummy variable indicating whether an analyst owns the stock during another quarter but does not own during the current quarter. **IPO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the IPO lead underwriter and the analyst report is issued within one year after the IPO. **IPO Co-manager** is defined in the same way. **SEO Underwriter** is a dummy variable indicating whether the analyst's brokerage firm is the SEO lead underwriter and the analyst report is issued within six months before and one year after the SEO. **SEO Co-manager** is defined the same way. **Forecast age** is the difference, in days, between the date of the analyst's forecast and the company's actual earnings announcement. **Loss** is a dummy variable indicating whether the current quarter's income is a loss or not. **Follow** is the number of analysts reporting earnings forecasts on the company during the quarter. **Broker Decile** is a decile size ranking of the analyst's brokerage firm, computed annually, and based on the number of analysts at each brokerage firm as reported by IBES. **Experience** is a measure of analyst tenure as a sell-side analyst, as of the current year (years in the IBES database is the proxy). **Complexity** is the number of companies the analyst covers during the year. **Volatility (lagged)** is the standard deviation of daily stock returns for the preceding year. **Industry** is a dummy variable, one for each one digit SIC code. * Statistically significant at the 5% level or better.

Dependent variable: Forecast Error (FE).

		Coefficient		**T-Statistic(1)**
Intercept		-0.0071	*	-6.07
Non Owning Period dummy variable		0.0001		0.27
Analyst Owner Dummy (OWN)		-0.0008	*	-2.59
Owning analyst – non-owning periods		-0.0007	*	-1.97
IPO Underwriter		0.0016	*	2.54
IPO Co-manager		0.0011	*	1.96
SEO Underwriter		0.0008	*	2.23
SEO Co-manager		0.0010	*	2.23
Forecast Age		-0.0000	*	-6.45
Loss		-0.0066	*	-7.65
Analyst Following (Follow)		0.0001	*	5.20
Broker Decile		0.0001	*	5.69
Experience		-0.0000	*	-3.36
Complexity		0.0000		1.24
Volatility (lagged)		0.0720	*	6.16
Industry Dummies(not reported)		Yes		
Number of observations		30,998		

(1) Fama-Macbeth Average Coefficients ($\bar{\gamma}$) and T-Statistics $T = \bar{\gamma} \Big/ \frac{S(\bar{\gamma})}{\sqrt{n}}$