When Security Analysts Talk
Who Listens?

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Current Draft: August 2005

We appreciate the financial support of the Fuqua School of Business at Duke University, the Kellogg School of Management at Northwestern University, and the Freeman School of Business at Tulane University. Analyst stock recommendation data are from Zacks Investment Research; transaction data are from the Trade and Quote database; equity and debt offerings data are from Securities Data Corporation. Errors or omissions are our responsibility.
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ABSTRACT

Regulators' interest in analyst recommendations stems from the belief that small investors are unaware of the conflicts sell-side analysts face and may, as a consequence, be misled into making suboptimal investment decisions. We examine who trades on security analyst stock recommendations by extending prior research to focus on investor-specific responses to revisions. We find that both large and small traders react to recommendations; however, large investors appear to trade more in response to the amount of information contained in the analyst's recommendation and earnings forecast revision. By contrast, small investors tend to trade more than normal to the occurrence of a report, regardless of its informativeness. We also find that small investors do not fully account for analyst incentives, as captured by type of recommendation (i.e., upgrade versus downgrade or buy versus sell) or analyst affiliation. On average, we observe that small traders are net purchasers following recommendation revisions regardless of the type of the recommendation, while large traders tend to be net sellers following downgrades and sells. These findings are consistent with large investors being more sophisticated processors of information, and provide support for regulators' concerns that analysts may more easily mislead small investors.

JEL classifications: G11; G14; G24; G28; M41

Keywords: Security analysts; Stock recommendations; Trading volume; Investor sophistication

1. Introduction

We examine who trades on sell-side security analyst stock recommendations by extending prior research to focus on investor-specific responses to revisions. Regulators' current interest in analyst recommendations stems from the belief that investors, and in particular small or unsophisticated investors, are unaware of the potential conflicts analysts face and may, as a consequence, be misled into making suboptimal investment decisions.[1] While the impetus for regulators' concerns is the belief that small investors are harmed by biased research, little evidence exists documenting that small investors react to stock recommendations, or that small investors' reactions fail to reflect properly the incentives faced by analysts.[2] We examine whether the trading activities of small or large investors account for the abnormal volume and returns observed surrounding the release of security analyst recommendation revisions. We also examine whether individual investor responses to recommendation revisions vary conditional on the direction of the change (i.e., upgrade versus downgrade) or the level of the recommendation (i.e., buy versus sell). Finally, we investigate differences in individual investor responses to earnings forecast revisions when they accompany the recommendation revision.

Given analysts' reluctance to issue negative reports for the companies they cover (see, e.g., Opdyke, 2002; Santoli, 2001), we use the change in and the level of the recommendation as

[1] Ten Wall Street firms agreed to pay $1.4 billion and to provide their clients with an independent source of equity research to resolve charges that they promoted stocks and produced biased research reports during the late 1990s. New York Attorney General Eliot Spitzer stated that $400 million of the settlement would be used to create a restitution fund to reimburse losses suffered by "small investors lead astray" (Opdyke and Simon, 2003). Individual analysts have also been targeted. On December 21, 2002, Jack Grubman, the Citigroup telecommunication analyst, agreed to a fine of $15 million and a lifetime ban from the securities industry to settle probes into allegations he tailored his research to attract underwriting business for his employer.

[2] The 1990s bull market and the availability of low cost investing through online brokerage accounts greatly increased the level of small investor participation in the stock market and, hence, regulators' concerns. SEC Commissioner Laura Unger stated, "The ease of internet access, the unprecedented availability of on-line investment information and reduced transaction costs have empowered individual investors to enter the financial markets in record numbers." Approximately one-half of U.S. households invest in the securities markets and about 20% of this number trade online. The full text of Ms. Unger's speech is available at: http://www.sec.gov/news/speech/spch380.htm.

proxies for the credibility of analysts' reports.[3] Consistent with upgrades being less credible than downgrades, prior work has documented that the market reaction to upgrades is less pronounced than the market reaction to downgrades (see, e.g., Asquith, Mikhail, and Au, 2005; Hirst, Koonce and Simko, 1995; Jegadeesh, Kim, Krische, and Lee, 2004; Womack, 1996). Similarly, the level of the recommendation proxies for the credibility of the report because brokerages have adopted compensation plans that explicitly reward security analysts more for issuing buys than sells, regardless of the profitability of the recommendations (e.g., Dorfman, 1991). Consistent with these incentives, Barber, Lehavy, McNichols, and Trueman (2001) document that sell recommendations are rare.

Following prior research, we use trade size to distinguish between large ("sophisticated") and small ("unsophisticated") investors (see, e.g., Bhattacharya, 2001; Bhattacharya, Black, Christensen, and Mergenthaler, 2004; Lee, 1992; Lee and Radhakrishna, 2000). We use large traders' reactions to recommendation revisions as a benchmark against which to compare small traders' reactions. If regulators' concerns are founded, we expect to see significant differences between large and small traders in their reactions to recommendation revisions.

We first extend prior work by investigating the abnormal trading volume of small traders surrounding recommendation revisions relative to that of large traders. We next examine the association between abnormal trading volume and the change and level of the recommendation, our main proxies for analyst incentives, for each trader group. We then investigate which trader group accounts for the observed market reaction in the short window surrounding

[3] Analyst optimism has been attributed to several factors. First, an analyst's salary and bonus may be linked to quantifiable measures such as his or her firm's underwriting fees (see, e.g., Dugar and Nathan, 1995; Lin and McNichols, 1998). Second, an analyst relies on company management for information and thus has an incentive to maintain good relations with them (Francis and Philbrick, 1993). Third, brokerages whose analysts issue negative reports on potential or current clients may be excluded from lucrative advisory and underwriting engagements as retribution (see, e.g., Siconolfi, 1995; Solomon and Frank, 2003).

recommendation revisions. Finally, we examine the sensitivity of our results to an alternative proxy for analyst incentives, the affiliation status of the analyst, and to including the accompanying earnings forecast revision (when present).

We find that both large and small investors react to recommendation revisions; however, how they react differs. Specifically, while large investors trade more in response to the amount of information contained in the analyst's recommendation, small investors appear to trade more than normal in response to the *occurrence* of a recommendation, regardless of its informativeness. We also find that small investors trade more than large investors in response to upgrades and buys and their trading has a stronger association with the market reaction to upgrades and buys. In contrast, large traders account for more of the stock price reaction to downgrades and holds/sells. These findings are consistent with large traders better understanding analysts' disincentives to revise their recommendations down or to issue holds/sells. Supplementary analyses on a smaller sample using an alternative measure for analyst incentives, affiliation, generally confirm our full sample results for our returns test, although our findings for trading volume are inconclusive. For the subsample where an annual earnings forecast accompanies the recommendation revision, we find that the trading of small traders is unrelated to the earnings forecast revision; by contrast, large traders respond more to the information contained in both the recommendation revision and the earnings forecast revision.

Understanding individual investor responses to analyst reports is important for at least two reasons. First, the SEC's primary mission is "to protect investors and maintain the integrity of the securities markets."[4] We provide evidence on the extent to which small trader behavior differs from that of large, more sophisticated traders. This investigation speaks directly to the

motivation underlying the SEC's adoption of Regulation Analyst Certification (Securities and Exchange Commission, 2003, §1).[5] Second, we document systematic differences in the reaction to recommendation and earnings forecast revisions between large and small traders, consistent with Lee's (1992) findings for earnings announcements. Our evidence on trading responses to analyst reports provides further evidence regarding information dissemination and price formation in the capital markets.

In Section 2, we review prior research. Section 3 contains a discussion of methodological considerations and the sample. We present the empirical results in Section 4, followed by our conclusions in Section 5.

2. Prior research

Our paper is related to literature examining the market's reaction to stock recommendations and how different classes of traders react to information releases. Prior empirical research related to security analyst recommendations has generally focused on documenting the market response to recommendations. Stickel (1995) and Womack (1996), among others, find a significantly positive (negative) price reaction to upgrades (downgrades), with the market response to downgrades being more severe. Barber and Loeffler (1993) find significantly increased abnormal volume in response to buy recommendations published in the "Dartboard" column of *The Wall Street Journal*. Womack (1996) finds that event day trading volume is approximately double (triple) normal volume for stocks upgraded (downgraded) to strong buy (strong sell) for his sample of recommendations from large U.S. brokerage firms.

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[4] See the SEC's mission statement, located at: http://www.sec.gov/about/whatwedo.shtml.

[5] Regulation AC, effective April 14, 2003, requires stock analysts (and others) that issue a report on a security to include in their report a certification that the views expressed are accurate reflections of their personal views. Stock

Both these studies are consistent with analyst recommendations inducing trading volume immediately around the recommendation event date, but do not investigate which types of investors, small or large, are trading.

Other work studying stock recommendations investigates cross-sectional differences due to brokerage, analyst, and firm characteristics. Stickel (1995) establishes that the market reacts more positively (negatively) to upgrades (downgrades) from analysts working at larger brokerage houses or following smaller firms. Mikhail, Walther, and Willis (1997) find that the market's reaction to recommendation revisions varies conditional on analyst experience; revisions issued by more experienced analysts result in more significant abnormal returns. Similarly, Mikhail, Walther, and Willis (2004) document that abnormal returns surrounding the release of recommendation revisions are positively associated with the profitability of an analyst's previous recommendations. Lin and McNichols (1998) provide evidence on whether investors, on average, react differently to stock recommendations issued by affiliated and unaffiliated analysts. They document that the stock market reaction to affiliated and unaffiliated analysts' strong buy and buy recommendations is similar, but that the stock returns to affiliated analysts' hold recommendations are significantly more negative (see also Asquith, Mikhail, and Au, 2005). Michaely and Womack (1999) and Malmendier and Shanthikumar (2005) find that following affiliated analysts' recommendations leads to lower returns (on the order of 13% to 15% a year) than following unaffiliated analysts' recommendations.

Prior studies examining how different classes of traders react to new information have generally focused on earnings-related releases. For example, Lee (1992) documents that large and small traders exhibit an increase in volume in the period immediately surrounding earnings

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analysts must also disclose whether or not they receive compensation or other payments in connection with the views expressed in the report.

announcements, suggesting that both large and small traders react to earnings news. However, large traders' reactions are greater overall, and they tend to buy (sell) following good (bad) earnings news. By contrast, both good and bad news triggers unusually high buying activity for small traders (see also Shanthikumar, 2003a). This finding indicates that, in contrast to large traders, small traders do not condition their reaction on the information contained in the earnings release, consistent with small traders being less sophisticated users of information.

Bhattacharya (2001), Bhattacharya, Black, Christensen, and Mergenthaler (2004), and Battalio and Mendenhall (2005) similarly document differences in the reliance on earnings-related information between large and small traders. Using trade size as a proxy for investor wealth and informedness, Bhattacharya (2001) documents that small traders' earnings expectations are positively associated with predictions from a seasonal random walk forecast model, but are unrelated to the generally more accurate analyst forecasts. In contrast, the abnormal trading volume for large traders is unrelated to the naïve seasonal random walk forecast error (see also Walther, 1997). Battalio and Mendendhall (2005) provide further evidence that small traders' net buying activity is associated with signed seasonal random walk forecast errors, whereas large traders' net buying activity is associated with signed analyst forecast errors. Bhattacharya, Black, Christensen, and Mergenthaler (2004) find that the abnormal trading response for small investors is significantly associated with the unsigned forecast error based on pro forma earnings, while large traders' reactions are not. Their evidence indicates that trading around pro forma earnings releases is primarily attributable to small traders. Given concerns expressed by regulators and the financial press that these pro forma earnings announcements are opportunistic and misleading, their results suggest that small traders

are less sophisticated and more subject to managerial manipulation (see also Bhattacharya, Black, Christensen, and Allee, 2003).

Together, these studies document differences in the reaction of, and the information used by, small and large traders.[6] These studies suggest that the initiators of small trades are individuals who are less sophisticated users of information whereas the initiators of large trades are institutions who are more informed and more rational in their use of earnings-related information. These findings support our use of large traders as a benchmark against which to compare how small traders react to recommendation revisions.

In a concurrent study, Malmendier and Shanthikumar (2005) examine the trade imbalance of large and small investors surrounding stock recommendations. They find that small investors have a greater trade imbalance following upgrades from affiliated analysts than unaffiliated analysts; the trade imbalance for large investors, however, is not significantly different. This finding is not consistent with large investors discounting recommendations from affiliated analysts and may be due to their small sample of affiliated analysts and/or their failure to control for other factors that may affect trading volume.

Our paper differs in four important ways relative to Malmendier and Shanthikumar (2005). First, we examine small and large traders' assessment of the informativeness of analysts' recommendation revisions in addition to their ability to recognize the incentive conflicts that analysts face. This analysis allows us to determine whether large and small investors react to the issuance of the recommendation, the information contained in the analyst report, or both. Second, we investigate whether large or small investors (or both) account for the stock price

[6] These differences in information used by large and small investors are not confined to current information. Shanthikumar (2003b) finds that small traders' reactions to a positive earnings surprise in the current quarter depend on whether the prior surprises were positive; large traders do not condition their reaction on the prior series.

reaction surrounding recommendation revisions, providing evidence of whether any inappropriate reaction to recommendation revisions has an economic effect (in terms of affecting returns). Third, we use a multivariate analysis in our tests of abnormal trading volume that allows us to control for other variables previously shown to affect investors' reactions to recommendation revisions. Failure to appropriately control for other factors that affect the propensity to trade increases the possibility of misinterpreting results. Finally, we examine small and large traders' reaction to the two key pieces of information contained in the analyst's report, the recommendation revision and the earnings forecast revision, for a subsample where both are present.

3. Sample and Descriptive Statistics

3.1. DATA

We obtain the dates and values of recommendations issued by individual analysts during 1993 to 1999 from the Zacks Investment Research database (Zacks). The sample period begins in 1993, the first year for which Trade and Quote (TAQ) data are available. The sample period ends in 1999, prior to the implementation of Regulation AC, to enhance our ability to detect any differences in small and large investor trading behavior. The Zacks database contains a unique analyst identifying code that allows us to follow an analyst through time, regardless of his or her employer. Using these analyst codes, we eliminate recommendations attributable to an unidentified individual, a brokerage house, or a broker merger. Further, we require the current and previous recommendation be available on Zacks to determine an analyst's revision or reiteration.[7] Because prior research (e.g., Mikhail, Walther, and Willis, 2004) documents an

[7] Zacks assigns each analyst's recommendation a value from 1.0 (strong buy) to 5.0 (strong sell), with a rating of 6.0 indicating that the analyst has initiated or discontinued coverage. If the analyst provides his or her recommendation

insignificant market response to reiterations, we eliminate them. All findings discussed in the next section hold if we include reiterations in our final sample (results not tabulated).

We gather transaction level data from TAQ. This database contains intraday trades and quotes for all securities listed on the New York and American Exchanges and the NASDAQ market. To ensure that the observed trading is attributable to the release of the recommendation, we eliminate recommendations with an earnings announcement or dividend announcement in the five-day window centered on the recommendation release date.

Using transaction level data, we follow prior research and use two methods to identify large and small traders. One method uses the number of shares traded; the second method uses the dollar value of shares traded. Lee and Radhakrishna (2000) find that the dollar value of the trade better discriminates between large and small traders because it is less sensitive to stock price changes. Therefore, we tabulate the results using the dollar denominated measure to categorize trades; all results hold using the alternative method. We assume that small trades (hereafter, "small traders") are executed by less sophisticated traders while large trades ("large traders") are executed by more sophisticated investors.

We consider three dollar value classifications to identify large and small traders. We define dollar trades greater (less) than (i) $30,000 ($7,000); (ii) $50,000 ($5,000); or (iii) $10,000 ($10,000) as large (small) trades. The first two methods are generally preferable; prior research concludes that eliminating medium-sized dollar trades increases the statistical power to distinguish between large and small traders (see, e.g., Lee and Radhakrishna, 2000) because informed traders may break up their trades to hide their information advantage. Chakravarty (2001) reports that 79% of institutional stealth trading occurs in medium size trades (see also

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to Zacks on a different scale, Zacks converts the recommendation to a five-point scale. We require that the previous recommendation be issued less than one year before the current recommendation.

Barclay and Warner, 1993). Thus, eliminating medium-sized trades reduces the possibility of misclassification. Regardless, our results are insensitive to the cut-offs used so we tabulate only the first approach.

After requiring CRSP and Compustat data to calculate our excess return measure and control variables (described below), our final sample contains 50,076 recommendation changes (22,538 upgrades and 27,538 downgrades) during 1993 to 1999 issued by 2,794 analysts covering 5,419 firms. The sample analysts have been included on the Zacks database for a mean (median) of 7.8 (6.0) years. The distribution of the sample recommendations is consistent with prior research: 58.2% of the revised recommendations are strong buy or buy; 35.6% are hold; 6.2% are strong sell or sell (see, e.g., Mikhail, Walther, and Willis, 2004).

Following Lee (1992), we use the firm's closing share price as of the end of the previous calendar year to calculate the largest number of round-lot (100) shares greater than or equal to $30,000 (less than or equal to $7,000); these trades represent large (small) trades. We eliminate observations with year-end share prices less than $1 and greater than $500 to reduce the influence of extreme observations on the empirical results. For each trader group we calculate abnormal volume as:[8]

[8] The TAQ database contains trade data; it does not indicate whether a trade was triggered by a buy or sell order. In unreported tests, we recalculate our measure of abnormal trading volume using the algorithm developed by Lee and Ready (1991) to infer trade direction. This algorithm seeks to infer whether a trade observation on the TAQ database was initiated by a buy or sell order (see also Lee and Radhakrishna, 2000). All our inferences are unchanged when we substitute abnormal buy and sell volume measures in our regressions.

$$AVOLUME^{j}_{i,k,t} = \left[\frac{\begin{array}{l}\text{Dollar trading volume for firm i in investor group j during } (t=-2,+2) \text{ window surrounding analyst k's recommendation revision at t}\end{array} - \begin{array}{l}\text{Average dollar trading volume for firm i in investor group j during } (t=-2,+2) \text{ non overlapping windows during the year}\end{array}}{\begin{array}{l}\text{Average dollar trading volume of firm i in investor group j during } (t=-2,+2) \text{ non overlapping windows during the year}\end{array}} \right] \times 100 \quad (1)$$

3.2 DESCRIPTIVE STATISTICS

Table 1 contains descriptive information on our sample. Panel A contains statistics for the abnormal volume measures and indicates that the median abnormal volume measure for small (large) investors, $AVOLUME^{SMALL}$ ($AVOLUME^{LARGE}$), is 62.52% (53.94%). Thus, during the five-day window surrounding a recommendation revision, both small and large investors tend to increase their trading volume by over 50% versus non-event periods. While the median abnormal volume measure for small investors is greater than that for large investors (Wilcoxon Z-statistic = 12.38, two-tailed $p < 0.01$), indicating that small investors generally trade more than large investors around revisions, the mean indicates the reverse (t-statistic = −2.61; two-tailed $p < 0.01$).

In our multivariate tests, we control for unusual market-wide movements in volume to separate investor trading in response to general abnormal market movements (attributable, for instance, to macroeconomic shocks) from the volume response to recommendations. We calculate abnormal market volume, AMKTVOL, as in Eq. (1) but use the total dollar volume of the NYSE/AMEX/NASDAQ. Statistics for this measure, tabulated in Panel A, indicate that both the mean and median AMKTVOL are statistically different from zero (two-tailed $p < 0.01$). This

finding indicates that, typically, there are unusual market-wide movements during the recommendation event windows in our sample, highlighting the need to control for market-wide effects. Because volume measures are positive, reflecting total dollar trading volume in a security on a given day, we measure the price response surrounding recommendations, ABS_BHAR, as the absolute value of the five-day buy-and-hold characteristic-adjusted portfolio return centered on the recommendation date.[9] The mean (median) ABS_BHAR is 6.55% (3.69%). Untabulated results indicate that the mean (median) value of the signed BHAR measure is 1.79% (0.89%) for upgrades and –4.00% (–1.80%) for downgrades. The stronger price response to recommendation downgrades is consistent with prior research (e.g., Asquith, Mikhail, and Au, 2005; Stickel, 1995).

Table 1, Panel B, contains descriptive information on the sample recommendations. Consistent with prior research (e.g., McNichols and O'Brien, 1997), the median number of days, #DAYS, between recommendation downgrades (121 days) is greater than that for upgrades (102 days; Wilcoxon Z-statistic = 14.83, two-tailed $p < 0.01$). Thus, analysts are slower to revise recommendations down than up (mean comparisons and differences in the mean/median number of days between buys and holds/sells yield similar inferences). We measure the magnitude of the recommendation change, ABSRCHG, as the absolute value of the difference between the new and old recommendation, both measured on a five-point scale. The mean (median) recommendation change, ABSRCHG, for the sample is 1.32 (1.00).

Table 1, Panel C, contains descriptive information on the sample analysts. We measure #FIRMS as the number of firms the analyst follows on Zacks during the year of the

[9] The characteristic-adjusted excess return is equal to the firm's compounded raw return minus the value-weighted compounded return on the characteristic-sorted benchmark portfolio to which the firm belongs in the year of the recommendation change (see Daniel, Grinblatt, Titman, and Wermers, 1997; Wermers, 2000).

recommendation, and #INDUSTRIES as the number of two-digit SIC codes to which the firms followed by the analyst during the year belong. BROK_SIZE is the number of analysts employed by the brokerage house during the year. These statistics indicate that the median analyst follows 22 firms in 6 industries, and works for a brokerage employing 41 analysts. The median market value of the followed firms, MKT_VALUE, is $1.060 billion. We measure PRIOR_PERF as the quintile ranking of the profitability of the recommendation revisions the analyst issued in the prior year (see Mikhail, Walther, and Willis, 2004 for details). PRIOR_PERF ranges from 0 (worst relative performance) to 4 (best relative performance); the median (inter-quartile range) of prior performance is 2.00 (2.00).

4. Empirical Analyses

4.1 INVESTOR TRADING IN RESPONSE TO ANALYST RECOMMENDATIONS

We examine investors' trading responses to analyst recommendation revisions, controlling for other factors correlated with trading volume, by estimating the following regression separately for large and small traders:

$$\begin{aligned} AVOLUME^{j}_{i,k,t} = {} & \alpha^{j}_{0} + \alpha^{j}_{1} ABSRCHG_{i,k,t} + \alpha^{j}_{2} FIRM\_SIZE_{i,t-1} + \\ & \alpha^{j}_{3} ABSRCHG_{i,k,t} * FIRM\_SIZE_{i,t-1} + \alpha^{j}_{4} BROK\_SIZE_{k,t-1} + \\ & \alpha^{j}_{5} ABSRCHG_{i,k,t} * BROK\_SIZE_{k,t-1} + \alpha^{j}_{6} PRIOR\_PERF_{k,t} + \\ & \alpha^{j}_{7} ABSRCHG_{i,k,t} * PRIOR\_PERF_{k,t} + \alpha^{j}_{8} AMKTVOL_{t-1} + \\ & \alpha^{j}_{9} ABSRCHG_{i,k,t} * AMKTVOL_{t-1} + \varepsilon^{j}_{i,k,t} \end{aligned} \qquad (2)$$

where:

$AVOLUME^{j}_{i,k,t}$ = Abnormal market volume for firm i by trader group j (j = small or large) associated with analyst k's recommendation revision at time t (Eq. (1));

$ABSRCHG_{i,k,t}$ = The absolute value of analyst k's recommendation revision for firm i at time t, calculated by subtracting the previous recommendation (on a scale of 1, strong buy, to 5, strong sell) from the current

recommendation;

$FIRM\_SIZE_{i, t-1}$ = Firm size, measured using the natural logarithm of the market value of equity for firm i at the end of the year preceding the recommendation revision;

$BROK\_SIZE_{k, t-1}$ = Brokerage size, measured as the number of analysts employed by analyst k's brokerage firm in the year prior to his or her recommendation revision;

$PRIOR\_PERF_{k, t}$ = Quintile ranking of analyst's k's prior relative performance (ranging from 0, worst, to 4, best), based on the prior year return to analyst k's portfolio of recommendation revisions over the event window t = –2 to t = +60, where t = 0 is the date of the recommendation revision on Zacks;

$AMKTVOL_{t-1}$ = Abnormal market volume in year t-1, calculated as total market volume surrounding recommendation revision t during t = –2 to t = +2 less average total market volume during this five-day observation window during year t-1; and

$\varepsilon^{j}_{i, k, t}$ = Error term.

Eq. (2) investigates whether investors trade in response to analyst recommendation revisions, a necessary precondition for our primary inquiry of whether market participants, and, in particular, small investors, trade as if they understand the conflicts analysts face. The intercept in Eq. (2) captures the mean abnormal trading volume by investor type after controlling for other factors correlated with volume. In the extreme, if investors ignore analyst revisions then the estimated intercept will be statistically indistinguishable from zero; such a finding would indicate trading behavior in line with typical levels and render our primary research question moot. If, however, investors respond to analyst recommendation changes then we predict that the intercept will be positive for both trader types.

The change in an analyst's expectations of firm performance is measured as the (unsigned) magnitude of his or her recommendation revision (ABSRCHG). If ABSRCHG captures the amount of information in the analyst's revision, as suggested by the findings in

Asquith, Mikhail, and Au (2005), then larger jumps in the recommendation change should reflect greater revisions in the analyst's expectations of firm performance and generate more trading volume. Although the relation between trading volume and the magnitude of a recommendation revision has not been examined, Mikhail, Walther and Willis (2004) find a positive relation between abnormal returns and the magnitude of revisions; this evidence supports a positive association between trading volume and the magnitude of recommendation revisions.[10] Thus, if investors respond to analyst recommendation changes, we predict ABSRCHG to be positively associated with abnormal trading volume for each trader type.

The remaining variables in Eq. (2) are control variables drawn from prior research. We predict that the coefficient estimates on FIRM_SIZE and ABSRCHG*FIRM_SIZE to be negative; large firms will have less abnormal trading volume given the increased availability of information for these firms (Stickel, 1995). In contrast, we predict that the coefficient estimates on BROK_SIZE and ABSRCHG*BROK_SIZE to be positive; larger brokerages will generate greater trading volume given enhanced marketing ability to disseminate the information to the capital markets (Stickel, 1995). Similarly, we expect prior performance (PRIOR_PERF) to be positively associated with abnormal volume; analysts with stronger records of making profitable stock recommendations are likely to exhibit persistence in this ability (Mikhail, Walther and Willis, 2004) and, hence, induce more trading volume. Our expectation for the coefficient estimate on ABSRCHG*PRIOR_PERF, however, is negative. The market is likely to negatively reassess an analyst's ability because a revision may reflect poorly on the tenability of his or her prior recommendation (see Trueman, 1990). Finally, we predict that the coefficient on abnormal

[10] For example, Mikhail, Walther, and Willis (2004) find that upgrade revisions to strong buy from buy (hold) recommendations generate 1.64% (2.13%) in excess returns while downgrade revisions to strong sell from buy (hold) generate –1.58% (–1.18%) in excess returns.

market volume (AMKTVOL) will be positive; firm abnormal trading volume will generally be higher when market volume is higher than normal (Bhattacharya, 2001).

We estimate Eq. (2) for small and large investors separately using seemingly unrelated regression. This technique allows us to perform statistical tests on coefficient estimates across the large and small investor samples. Further, in these, and all subsequent, estimations we correct for potential cross-sectional dependence in calculating all test statistics by using the Huber-White estimator (see Huber, 1967; White, 1980). This procedure addresses cross-sectional dependence caused by multiple recommendation revisions for a given firm by combining individual revisions for the same firm in estimating the variance-covariance matrix. Failure to control for cross-sectional dependence could lead us to overstate the significance of our results.

Table 2 provides the results from estimating Eq. (2). Consistent with large and small investors increasing their trading in response to analyst recommendation revisions, the estimated intercept is statistically positive for each investor class (two-tailed $p < 0.01$ in both cases). Controlling for other factors that affect trading volume, we find that small investors double their trading volume in response to recommendation revisions (Intercept = 100.6513) while large investors increase trading by approximately 70% (Intercept = 71.4572). This difference between small and large abnormal trading volume is statistically significant (χ^2-statistic = 5.73, two-tailed $p < 0.05$). Thus, small investors trade more, on average, than large traders do in response to the *occurrence* of recommendation revisions.[11]

[11] We consider alternative event windows surrounding the sample recommendation revisions. All inferences are unchanged using an 11-day (i.e., $t = -5$, $t = +5$ where $t = 0$ is the recommendation revision date) event window. We also investigate the possibility of "front running"—that sophisticated (large) trades might occur before the (publicly available) recommendation revision date. We find no evidence of "front running" in our sample. Specifically, there are no differences in abnormal trading volume between large and small traders in the 10 trading days preceding the recommendation revision dates.

The statistically positive coefficient estimate associated with ABSRCHG for each investor class (two-tailed $p < 0.01$) is consistent with more trading volume in response to larger revisions in analysts' expectations of firm performance.[12] For a given one-step increase or decrease in the assigned rating category, small (large) investor abnormal trading volume increases at the margin by 48.9% (67.9%). The observed difference in ABSRCHG across large and small traders is statistically significant (χ^2-statistic = 5.09, two-tailed $p < 0.05$). Given that Asquith, Mikhail, and Au (2005) find that analyst reports contain more arguments in support of a position in the presence of larger revisions, this result suggests that large traders respond more than small traders to the informativeness of the analyst's report. To quantify the economic significance of this finding, we note that the coefficient on ABSRCHG in response to a one-category revision is approximately 39% higher for large traders than for small traders.

Regarding the control variables, we highlight two results. First, we find that, while both large and small investors' trading volume responses to the information in the report are tempered as firm size increases (ABSRCHG*FIRM_SIZE), the effect is more modest for small investors (χ^2-statistic = 6.89, two-tailed $p < 0.01$). If size proxies for the amount of information available about a firm, as is commonly assumed, this result suggests that the difference in behavior between the two types of traders may be due, in part, to large investors' access to alternative sources of information. Second, both investor types rely on an analyst's prior performance in making trading decisions. This finding provides support for the newly adopted practice of including the history of the analyst's prior recommendations in his report. The coefficient

[12] If we exclude ABSRCHG*FIRM_SIZE, ABSRCHG*BROK_SIZE, ABSRCHG*PRIOR_PERF, and ABSRCHG*AMKTVOL from Eq. (2), the estimated coefficient on ABSRCHG remains statistically positive for large traders (9.2909, Z-statistic = 3.76, two-tailed $p < 0.01$), but becomes insignificantly positive for small traders (0.2803, Z-statistic = 0.13, two-tailed $p > 0.10$). The difference in ABSRCHG across large and small traders in this specification remains significant (χ^2-statistic = 27.02, two-tailed $p < 0.01$).

estimates on our other control variables are generally statistically significant and of the predicted sign; thus, we do not discuss them.

Based on Table 2, we conclude the following. Although large and small traders react to recommendation revisions, with small investors trading relatively more than large investors in response to the release, large investors appear better able to assess the significance as captured by the magnitude of a particular revision. Large investors trade more in response to the amount of information contained in the analyst's recommendation, rather than simply trading more than average in response to a revision irrespective of the arguments in support of it.

4.2 INVESTOR TRADING IN RESPONSE TO ANALYST RECOMMENDATIONS CONDITIONAL ON THE LEVEL OR CHANGE OF THE RECOMMENDATION

Our findings in Table 2 support the SEC's concern that small investors might be less able than large traders to discern the significance of revisions in analyst stock recommendations because small investors: (i) trade more surrounding revisions, in general; and (ii) trade less in response to the magnitude of the revision, our proxy for the report's informativeness. We probe these issues further by examining how the change in or the level of the recommendation differentially affects large and small investors' trading behavior. In particular, we investigate whether small investors trade more on average and rely less on the information in the report than large traders for upgrades or buys. Results consistent with each of these hypotheses would suggest that small traders do not understand analysts' incentives to issue upgrades or buys and may be more easily misled than large investors.

We choose the direction of the change in (i.e., upgrade) and level of (i.e., buy) the recommendation as our primary proxies for analyst incentives for the following reasons. First, prior studies (e.g., Asquith, Mikhail, and Au, 2005; Hirst, Koonce and Simko, 1995) find that the

stock market reaction to analyst reports and recommendations varies conditional on the sign of the revision. In particular, the market reaction to upgrades is less pronounced than that for downgrades, suggesting upgrades are less credible (e.g., Mikhail, Walther, and Willis, 2004). Consistent with upgrades being less lucrative than downgrades, Womack (1996) finds that size-adjusted returns to upgrades are insignificant in the six-month period following the revision while size-adjusted returns to downgrades are significantly negative, averaging –9.15%. Jegadeesh, Kim, Krische, and Lee (2004) also find that upgrades are unprofitable. They find that the quintile with the most favorable upgrades, based on consensus recommendation changes, earns a market-adjusted return of –2.5% in the six-month period following the month in which the revision occurs.

Second, given that analysts can generate higher trading commissions for their respective brokerages through positive recommendations (Irvine, 2004), investment banks have adopted compensation plans that explicitly reward security analysts more for issuing buys than sells, regardless of the profitability of the recommendations (e.g., Dorfman, 1991). Consistent with such performance evaluation, the incidence of analysts issuing sells is quite small; typically around 5% of all recommendations issued are sells (Barber, Lehavy, McNichols, and Trueman, 2001; Mikhail, Walther, and Willis, 2004).[13]

Third, the change in and level of an analyst's recommendations are salient components of his or her report, allowing investors to easily assess the report's credibility and increasing the power of our tests to detect any differences in trading behavior between large and small investors. We examine the sensitivity of our inferences in Section 4.4 when we consider an

[13] If brokerages' primary concern were maximizing the returns that investors generate following stock recommendations, we would expect compensation plans that reward downgrades more than upgrades. Asquith, Mikhail, and Au (2005) report that the average five-day return to downgrades is –6.6% while the average return to upgrades is 4.5%.

alternative proxy to capture analysts' incentive conflicts, whether the brokerage house employing the analyst has served as an underwriter in the recent past. Those results, for a significantly reduced sample for which underwriting data are available, generally confirm the findings reported next.

We modify Eq. (2) to include an indicator variable, INCENTIVE, to represent either the change in or level of the recommendation. We estimate the following model separately for each trader type:

$$\begin{aligned} AVOLUME^{j}_{i,k,t} = {} & \beta^{j}_{0} + \beta^{j}_{1} INCENTIVE_{i,k,t} + \beta^{j}_{2} ABSRCHG_{i,k,t} + \\ & \beta^{j}_{3} ABSRCHG_{i,k,t} * INCENTIVE_{i,k,t} + \beta^{j}_{4} FIRM\_SIZE_{i,t-1} + \\ & \beta^{j}_{5} ABSRCHG_{i,k,t} * FIRM\_SIZE_{i,t-1} + \beta^{j}_{6} BROK\_SIZE_{k,t-1} + \\ & \beta^{j}_{7} ABSRCHG_{i,k,t} * BROK\_SIZE_{k,t-1} + \beta^{j}_{8} PRIOR\_PERF_{k,t} + \\ & \beta^{j}_{9} ABSRCHG_{i,k,t} * PRIOR\_PERF_{k,t} + \beta^{j}_{10} AMKTVOL_{t-1} + \\ & \beta^{j}_{11} ABSRCHG_{i,k,t} * AMKTVOL_{t-1} + \xi^{j}_{i,k,t} \end{aligned} \tag{3}$$

where the variables not previously defined are:

$INCENTIVE_{i,k,t}$ = An indicator variable taking the value of 1 if analyst k upgrades his or her recommendation for firm j at time t, 0 otherwise (INCENTIVE = UPGRADE) *or* 1 if analyst k issues a buy/strong buy for firm j at time t, 0 otherwise (INCENTIVE = BUY); and

$\xi^{j}_{i,k,t}$ = Error term.

Given the inclusion of INCENTIVE, the estimated intercept in Eq. (3) captures the average level of abnormal volume in response to a recommendation downgrade (when INCENTIVE = UPGRADE) or a hold/sell recommendation (when INCENTIVE = BUY) after controlling for other factors correlated with volume. The estimated coefficient on INCENTIVE provides the incremental level of abnormal volume in response to recommendation upgrades (when INCENTIVE = UPGRADE) or buys (when INCENTIVE = BUY). If large traders

represent sophisticated investors who discount the information in upgrades and buys due to the inherent conflicts faced by analysts, then we expect large traders to react less to upgrades and buys than do small traders. Therefore, we predict that the estimated coefficient on the intercept plus INCENTIVE for large traders to be less than that sum for small traders. Similarly, ABSRCHG*INCENTIVE captures the incremental level of abnormal volume in response to recommendation upgrades (when INCENTIVE = UPGRADE) or buys (when INCENTIVE = BUY) conditional on the informativeness of the analyst's report. If large traders trade more than small investors in response to the informativeness of an analyst's report accompanying an upgrade or buy, then we expect that the estimated coefficient on ABSRCHG plus ABSRCHG*INCENTIVE for large traders will be greater than that sum for small traders.

Table 3 provides the results from estimating Eq. (3). We find that small investors trade more, on average, to upgrades than large investors; the sum of the intercept and UPGRADE is statistically larger for small traders (101.2065 + 11.2447 = 112.4512) than for large traders (74.3681 + 4.8994 = 79.2675; $\chi^2 = 7.12$, two-tailed $p < 0.01$). Moreover, the coefficient estimate on UPGRADE is statistically positive for small traders while the estimated coefficient on UPGRADE is insignificant for large traders. Thus, small traders' average response to upgrades is greater than their average response to downgrades, suggesting they do not fully understand analysts' incentives to issue upgrades. Although we do not formally make a prediction regarding trading behavior around downgrades (because regulators' concerns and popular business press accounts focus on upgrades), we find that the intercept for small traders (101.2065) is significantly greater than that for large traders (74.3681, $\chi^2 = 4.75$, two-tailed $p < 0.01$). Results for INCENTIVE = BUY (columns 4 and 5 of Table 3) yield similar inferences except that the

coefficient estimate on BUY is statistically positive for both small and large traders.[14] We continue to find, however, that small trader response to buys is greater than that for large traders (Intercept + BUY for small traders > Intercept + BUY for large traders, $\chi^2 = 4.88$, two-tailed $p < 0.05$).

Consistent with our expectation, the marginal response to the information contained in the upgrade (ABSRCHG + ABSRCHG*UPGRADE) is greater for large traders (70.0503 – 21.4416 = 48.6087) than for small traders (51.3204 – 20.2869 = 31.0335; χ^2-statistic = 4.23, two-tailed $p < 0.05$). Thus, large traders consider the information contained in the upgrade more than small traders. We also note that the estimated coefficient on ABSRCHG is statistically positive and greater for large traders (70.0503) than for small traders (51.3204, χ^2-statistic = 4.84, $p < 0.05$), consistent with large investors trading more in response to the informativeness of an analyst's downgrade. Results tabulated in columns 4 and 5 when INCENTIVE = BUY yield identical inferences. Thus, although small investors trade more in response to a downgrade or sell recommendation than large investors, large investors trade more in response to the information contained in a downgrade or sell recommendation. These findings are consistent with more sophisticated information processing on the part of large traders.

The negative estimated coefficient on ABSRCHG*INCENTIVE in both specifications is consistent with prior research. Asquith, Mikhail, and Au (2005) empirically demonstrate that investors are more likely to focus on the information contained in an analyst's report, such as its

[14] The statistically positive coefficient estimate on BUY for large traders appears counter to our results for UPGRADE. However, our sample contains 15,880 buy recommendations, of which 8,806 are downgrades from strong buy while 7,704 are upgrades from hold or sell. Therefore, the observed positive coefficient on BUY for large traders could result from large traders increasing trading in response to buy recommendations that are bad news. To investigate this possibility, we re-estimate Eq. (2), modified to include the indicator variable UPGRADE, using only the subsample of buy recommendations. In this analysis, the estimated coefficient on UPGRADE for large traders is –14.0356 (t = –4.07, two-tailed $p < 0.01$), which is consistent with large traders reacting less to buy recommendations that represent good news. This supports our conjecture that the positive coefficient on BUY in Table 3 for large traders is being driven by bad news revisions.

rationale, price target changes, and earnings forecast revisions, in response to a downgrade. Hirst, Koonce, and Simko (1995) provide similar results in an experimental setting. They also include a discussion of the psychological reasons why we might observe more emphasis on the information in bad news reports.

Overall, the findings in Table 3 indicate that, consistent with a failure to fully account for analyst incentives, small investors trade more, on average, than large investors in response to recommendation upgrades and buys. Further, small traders do not condition their response as much as large traders to the informativeness of the upgrade or buy. These findings are consistent with large investors being more sophisticated processors of information, and provide support for regulators' concerns that analysts may more easily mislead small investors with favorable recommendations. This conclusion assumes that the direction of trade (buy versus sell) is consistent with the information being released; specifically, it assumes that large investors are more likely to sell after downgrades or sell recommendations relative to small investors and less likely to purchase following upgrades or buy recommendations. The dependent variable in Eq. (3), however, is the abnormal trading volume which does not measure the direction of the trades being executed.

In order to examine whether large and small investors are more likely to buy or sell following certain types of recommendation revisions, we use the algorithm developed by Lee and Ready (1991) to classify each trade as buyer- or seller-initiated. Following Eq. (1), we then calculate abnormal buy and sell volume metrics for each trader type, and define NETBUY as abnormal buying less abnormal selling. Positive (negative) values of NETBUY indicate that the volume of abnormal purchases is greater (less) than the volume of abnormal selling. We find that the mean value of NETBUY is positive and statistically different from zero at two-tailed $p <$

0.01 for small traders regardless of the sign (upgrade versus downgrade) or the level (buy versus hold/sell) of the recommendation revision. Therefore, regardless of the news released, small traders tend to purchase stocks following recommendation revisions. In contrast, the mean value for NETBUY for large traders is significantly negative at two-tailed $p < 0.01$ for downgrades and hold/sell recommendations. Further, the average value of NETBUY for upgrades or buy recommendations is significantly greater for small traders than large traders at two-tailed $p < 0.01$, suggesting that large traders' purchases are more tempered following good news relative to small investors. These results are consistent with Lee (1992) who finds that small traders buy following both good and bad news earnings announcements, while large traders buy (sell) following good (bad) earnings news. These findings also support our conclusions that large traders are more sophisticated processors of the information released by security analysts and better understand the incentives these analysts face.

4.3 INVESTOR TRADING BEHAVIOR AND MARKET RETURNS

We extend our analysis of small and large traders by investigating which investor class accounts for the observed price reaction in the short window surrounding recommendations. Because we find in Table 3 that abnormal trading behavior varies with the change and level of the recommendation, we tabulate and discuss estimation results conditional on the change in or level of the recommendation by estimating the following regression:

$$
\begin{aligned}
ABS\_BHAR_{i,k,t} = {} & \delta_0 + \delta_1 INCENTIVE_{i,k,t} + \delta_2 AVOLUME^{LARGE}_{i,k,t} + \\
& \delta_3 AVOLUME^{LARGE}_{i,k,t} * INCENTIVE_{i,k,t} + \delta_4 AVOLUME^{SMALL}_{i,k,t} + \\
& \delta_5 AVOLUME^{SMALL}_{i,k,t} * INCENTIVE_{i,k,t} + \delta_6 ABSRCHG_{i,k,t} + \\
& \delta_7 ABSRCHG_{i,k,t} * INCENTIVE_{i,k,t} + \delta_8 FIRM\_SIZE_{i,t-1} + \\
& \delta_9 ABSRCHG_{i,k,t} * FIRM\_SIZE_{i,t-1} + \delta_{10} BROK\_SIZE_{k,t-1} + \\
& \delta_{11} ABSRCHG_{i,k,t} * BROK\_SIZE_{k,t-1} + \delta_{12} PRIOR\_PERF_{k,t} + \\
& \delta_{13} ABSRCHG_{i,k,t} * PRIOR\_PERF_{k,t} + \delta_{14} AMKTVOL_{t-1} + \\
& \delta_{15} ABSRCHG_{i,k,t} * AMKTVOL_{t-1} + \zeta_{i,k,t}
\end{aligned}
\tag{4}
$$

where the variables not previously defined are:

$ABS\_BHAR_{i,k,t}$ = The absolute value of the five-day ($t = -2$, $t = +2$ where $t = 0$ is the date of the recommendation revision issued by analyst i for firm k) buy-and-hold characteristic-adjusted excess return (in percent form); and

$\zeta_{i,k,t}$ = Error term.

We expect that abnormal volume for both trader types is positively associated with the absolute value of the stock market return for both upgrades and downgrades. Based on our findings in Table 3 suggesting that small investors do not understand analysts' incentives, we expect that large investors' trading volume will account for more of the stock price return than small investors' volume for downgrades or holds/sells ($AVOLUME^{LARGE} > AVOLUME^{SMALL}$). In contrast, we predict that small traders' reactions will account for more of the stock price return than large traders' reactions for upgrades or buys ($AVOLUME^{SMALL} + AVOLUME^{SMALL} * INCENTIVE > AVOLUME^{LARGE} + AVOLUME^{LARGE} * INCENTIVE$).

Table 4 provides the estimation results for Eq. (4). As expected, the estimated coefficients on $AVOLUME^{LARGE}$ and $AVOLUME^{SMALL}$ are statistically positive in both specifications (two-tailed p's < 0.01). Consistent with our predictions, the estimated coefficient on $AVOLUME^{LARGE}$ (0.0048) is greater than that on $AVOLUME^{SMALL}$ (0.0022; χ^2-statistic = 14.20, two-tailed $p < 0.01$) when INCENTIVE = UPGRADE. Estimation results for

INCENTIVE = BUY yield similar conclusions. Hence, large traders account for more of the stock market response to recommendation downgrades or sells, consistent with large traders better understanding analysts' disincentives to revise their recommendations down or to issue sells. We also find that large investor trading has a lower association with the market reaction for upgrades than for downgrades ($AVOLUME^{LARGE}$*UPGRADE = –0.0034, two-tailed $p < 0.01$) or for buys than for sells ($AVOLUME^{LARGE}$*BUY= –0.0022, two-tailed $p < 0.01$). In contrast, the effect of small investor trading on returns increases for upgrades ($AVOLUME^{SMALL}$*UPGRADE = 0.0017, two-tailed $p < 0.01$) and buys ($AVOLUME^{SMALL}$*BUY = 0.0016, two-tailed $p < 0.01$). Consistent with our predictions, we find that large investors account for less of the market reaction for upgrades (0.0048 – 0.0034 = 0.0014) than small investors (0.0022 + 0.0017 = 0.0039; χ^2-statistic = 25.43, two-tailed $p < 0.01$); results for buys yield the same conclusion (χ^2-statistic = 13.82, two-tailed $p < 0.01$). Thus, it appears that small investors' trading behavior is driving the price reaction to upgrades and buy recommendations.

Taken as a whole, the findings in Tables 3 and 4 support regulators' concerns that small investors do not properly consider analyst incentives when reacting to recommendations. In particular, small investors react more to upgrades or buys, on average, than large investors. By contrast, large investors consider the informativeness of the analyst report more than small investors, especially in the case of downgrades or sells. In turn, small investors' trading behavior has a stronger association with the market return to upgrades or buys, whereas large investors' trading behavior is more strongly associated with the market return to downgrades or sells.

4.4 SENSITIVITY ANALYSES

4.4.1 Analyst Affiliation

We examine an alternative proxy for the incentives that analysts face, whether or not the analyst is "affiliated." An affiliated analyst is employed by the covered firm's underwriter. While we can make general conjectures based on analyst incentives as captured by their report type (i.e., upgrade versus downgrade or buy versus sell), we can sharpen our predictions by further conditioning our analyses on the affiliation status of the analyst. For example, we might expect investors to react more strongly to downgrades or sells from affiliated analysts because these analysts would face more extreme consequences from issuing negative reports, including the loss of existing corporate business. Likewise, upgrades or buys from unaffiliated analysts may be more credible than those from analysts with a vested interest in the companies they cover. For example, Malmendier and Shanthikumar (2005) and Michaely and Womack (1999) find that following affiliated recommendations leads to lower returns (on the order of 13% to 15% a year) than following unaffiliated analysts. This difference further supports affiliation status as a reasonable indicator of an analyst's incentives.

For this analysis, we collect data on equity and debt underwriting and the identity of the lead and co-underwriters of these offerings from Securities Data Corporation (SDC). Following prior research, we define analysts as affiliated if a brokerage house that served as a lead or co-underwriter within one year before the date for which the recommendation for a particular firm is revised employs them.[15] Based on this definition, 1,123 of the 50,076 sample recommendation revisions correspond to affiliated analysts; thus, a potential disadvantage of this approach is the reduced sample size, weakening the power of our statistical tests.

[15] Our results are unchanged if we define affiliation based on a two-year window.

Consistent with Malmendier and Shanthikumar (2005), untabulated results indicate that, relative to unaffiliated analysts, affiliated analysts issue more upgrades (57.2% versus 54.9%) and more buy recommendations (70.8% versus 57.9%). Moreover, affiliated analysts also upgrade recommendations more quickly than unaffiliated analysts (a median of 84 versus 103 days; Wilcoxon Z-statistic = 4.75, two-tailed $p < 0.01$) and issue buy recommendations more quickly than unaffiliated analysts (a median of 101 versus 111 days; Wilcoxon Z-statistic = 2.62, two-tailed $p < 0.01$). While the median number of days before a downgrade or sell recommendation is higher for affiliated than unaffiliated analysts, suggesting that affiliated analysts are slower to downgrade and issue sells, the difference is not statistically significant (two-tailed p's > 0.10). Mean comparisons (not reported) yield similar results.

To investigate the effect of analyst affiliation on our findings, we estimate Eqs. (3) and (4) separately for the affiliated and unaffiliated subsamples. The second and third columns of Panel A (Panel B) of Table 5 presents the results for abnormal trading volume around recommendation upgrades (buys) issued by unaffiliated analysts. Consistent with Table 3, we find that small investors trade more, on average, to upgrades than large investors; the sum of the intercept and UPGRADE is statistically larger for small traders (103.5044 + 9.5062 = 113.0106) than for large traders (71.8530 + 2.9679 = 74.8209; $\chi^2 = 9.19$, two-tailed $p < 0.01$). Also, as observed in the overall sample, we note that the coefficient estimate on UPGRADE is statistically positive for small traders while the estimated coefficient on UPGRADE is insignificant for large traders. Thus, small traders' average response to upgrades is greater than their average response to downgrades for the subsample of unaffiliated analysts. The findings for buys, summarized in Panel B, are similar, except that BUY is statistically positive for both small and large traders (see footnote 14). Consistent with our Table 3 results, we also find that

the response to the information contained in the upgrade (ABSRCHG + ABSRCHG*UPGRADE) is greater for large traders (69.0076 – 19.5240 = 49.4836) than for small traders (47.4984 – 18.4997 = 28.9987; χ^2-statistic = 5.61, two-tailed $p < 0.05$). Results for buys in Panel B are identical. Thus, large traders consider the informativeness of the upgrade or buy more than small traders in the unaffiliated subsample.

Our findings for the affiliated sample, presented in the last two columns of Table 5 for upgrades (Panel A) and buys (Panel B), are inconclusive. The majority of our variables of interest are insignificant. One interesting result, however, is the emphasis on prior performance. In Panels A and B, both large and small investors place approximately three times the weight on prior performance for affiliated analysts as they do for unaffiliated analysts. This finding is consistent with both trader groups incorporating other information to assess credibility in situations where analysts face incentives to issue biased reports.

The results from estimating Eq. (4) separately for the affiliated and unaffiliated subsamples are presented in Table 6. Columns 2 and 3 present the results for the unaffiliated subsample. Consistent with our Table 4 results, when INCENTIVE = UPGRADE, the estimated coefficient on $AVOLUME^{LARGE}$, large investor trading volume associated with downgrades, is statistically positive (0.0047, two-tailed $p < 0.01$). Similarly, the estimated coefficient on $AVOLUME^{LARGE}$ is greater than that on $AVOLUME^{SMALL}$ (χ^2-statistic = 11.31, two-tailed $p < 0.01$). Hence, large traders account for more of the stock market response to recommendation downgrades, consistent with large traders better understanding analysts' disincentives to revise their recommendations down. The results when INCENTIVE = BUY, reported in the third column, are similar. Further, we find that large investor trading has a lower association with the market reaction for upgrades than for downgrades ($AVOLUME^{LARGE}$*UPGRADE = –0.0021,

two-tailed $p < 0.01$) or sells ($AVOLUME^{LARGE}*BUY = –0.0017$, two-tailed $p < 0.01$). In contrast, the effect of small investor trading on returns is insignificant for upgrades ($AVOLUME^{SMALL}*UPGRADE = –0.0000$, two-tailed $p > 0.10$), but statistically positive for buys ($AVOLUME^{SMALL}*BUY = 0.0014$, two-tailed $p < 0.05$).

The last two columns in Table 6 present the results for the affiliated subsample. As expected, we find that investors vary their response to recommendation revisions conditional on analyst affiliation. The coefficient on $AVOLUME^{LARGE}$, representing large investors' trading contribution to the observed market reaction for downgrades or sells, is approximately double that for affiliated versus unaffiliated analysts. Similarly, $AVOLUME^{LARGE}*INCENTIVE$ is more negative for affiliated versus unaffiliated analysts. While large investors exhibit a moderate response for upgrades or buys issued by unaffiliated analysts, their trading volume accounts for none of the market reaction in response to affiliated analysts' upgrades ($AVOLUME^{LARGE} + AVOLUME^{LARGE}*UPGRADE = 0.0089 – 0.0092 = –0.0003$, two-tailed $p > 0.10$) or buy recommendations ($AVOLUME^{LARGE} + AVOLUME^{LARGE}*BUY = 0.0109 – 0.0111 = –0.0002$, two-tailed $p > 0.10$). Small investors are less discerning. Their response to downgrades from affiliated analysts is only marginally significant while their response to holds/sells is not statistically different from zero. Moreover, small investors exhibit a significant response to upgrades ($AVOLUME^{SMALL} + AVOLUME^{SMALL}*UPGRADE > 0$, F-statistic = 33.24, two-tailed $p < 0.01$) and buys ($AVOLUME^{SMALL} + AVOLUME^{SMALL}*BUY > 0$, F-statistic = 28.27, two-tailed $p < 0.01$).

4.4.2 Investor Trading in Response to Analyst Recommendations and Earnings Forecasts

In the preceding analyses, we limit our focus to the stock recommendations contained in the analysts' reports. For a subset of our sample, the recommendation revision is accompanied by an annual earnings forecast. In this section, we examine how large and small traders react to these two key pieces of information contained in the analysts' reports when both are present.

We gather the annual earnings forecast from the Zacks database that the analyst issues for the firm on the same day that he or she issues the recommendation. We require a prior annual earnings forecast issued by that analyst for that firm in order to calculate the earnings forecast revision. For 21,613 observations in our sample, the analyst issues a recommendation revision and an annual earnings forecast revision for the firm on the same day.[16] We define the absolute value of the analyst's earnings forecast revision (ABSFCREV) as the analyst's current annual earnings forecast minus the analyst's prior annual earnings forecast, deflated by share price ten trading days before the release of the revised forecast. We require that the prior forecast be issued no more than 365 calendar days before the current forecast. We further eliminate observations for which the share price is less than $10 to minimize the effects of a small denominator on ABSFCREV. In this subsample, the mean (median) value of ABSFCREV is 0.0062 (0.0023, results not tabulated).

We examine investors' trading responses to analyst recommendation revisions and earnings forecast revisions, controlling for other factors correlated with trading volume, by estimating the following regression separately for large and small traders:

[16] There are 24,070 observations for which the analyst issues an annual earnings forecast revision within two days of the recommendation revision; the results provided in Table 7 are qualitatively similar using this larger sample.

$$
\begin{aligned}
AVOLUME^{j}_{i,k,t} = {} & \lambda^{j}_{0} + \lambda^{j}_{1} ABSRCHG_{i,k,t} + \lambda^{j}_{2} ABSFCREV_{i,k,t} + \\
& \lambda^{j}_{3} FIRM\_SIZE_{i,t-1} + \lambda^{j}_{4} ABSRCHG_{i,k,t} * FIRM\_SIZE_{i,t-1} + \\
& \lambda^{j}_{5} ABSFCREV_{i,k,t} * FIRM\_SIZE_{i,t-1} + \\
& \lambda^{j}_{6} BROK\_SIZE_{k,t-1} + \lambda^{j}_{7} ABSRCHG_{i,k,t} * BROK\_SIZE_{k,t-1} + \\
& \lambda^{j}_{8} ABSFCREV_{i,k,t} * BROK\_SIZE_{k,t-1} + \\
& \lambda^{j}_{9} PRIOR\_PERF_{k,t} + \lambda^{j}_{10} ABSRCHG_{i,k,t} * PRIOR\_PERF_{k,t} + \\
& \lambda^{j}_{11} ABSFCREV_{i,k,t} * PRIOR\_PERF_{k,t} + \\
& \lambda^{j}_{12} AMKTVOL_{t-1} + \lambda^{j}_{13} ABSRCHG_{i,k,t} * AMKTVOL_{t-1} + \\
& \lambda^{j}_{14} ABSFCREV_{i,k,t} * AMKTVOL_{t-1} + \psi^{j}_{i,k,t}
\end{aligned}
\tag{5}
$$

where the variables not previously defined are:

$ABSFCREV_{i,k,t}$ = The absolute value of analyst k's annual earnings forecast revision for firm i at time t, calculated as the current earnings forecast minus the previous earnings forecast, deflated by price;

$\psi^{j}_{i,k,t}$ = Error term.

Table 7 provides the results from estimating Eq. (5). Consistent with large and small investors increasing their trading in response to analyst recommendation and earnings forecast revisions, the estimated intercept is statistically positive for each investor class (two-tailed $p < 0.10$ in both cases). Consistent with the findings in Table 2, the average small abnormal trading volume is almost twice as great as the average large abnormal trading volume (χ^2-statistic = 3.23, two-tailed $p < 0.08$). Thus, small investors trade more, on average, than large traders do in response to the occurrence of recommendation and earnings forecast revisions.

As in Table 2, we find a statistically positive coefficient estimate associated with ABSRCHG for each investor class (two-tailed $p < 0.05$), consistent with more trading volume in response to larger revisions in analysts' expectations of firm performance. For a given one-step

increase or decrease in the assigned rating category, small (large) investor abnormal trading volume increases at the margin by 33.4% (57.1%). The observed difference in ABSRCHG across large and small traders is statistically significant (χ^2-statistic = 4.21, two-tailed $p < 0.05$).

We find no evidence that small investors respond to the information contained in the earnings forecast revision; the estimated coefficient associated with ABSFCREV for small traders is insignificantly different from zero (two tailed $p > 0.10$). By contrast, and consistent with our expectations, the estimated coefficient associated with ABSFCREV is statistically positive for large traders (two-tailed $p < 0.06$) and statistically greater than the estimated coefficient for small traders (χ^2-statistic = 13.30, two-tailed $p < 0.01$). Thus, large traders consider the information contained in the earnings forecast revision that accompanies the recommendation revision in responding to analyst reports.

Overall, these findings reinforce those in Table 2, and further indicate that small traders do not consider the information contained in the annual earnings forecast revision in responding to analyst reports. The fact that small traders react to the magnitude of the recommendation revision but not to the magnitude of the earnings forecast revision suggests that while they are able to incorporate the information in a coarse and easily interpreted signal (the recommendation revision), they do not appear able to extract the information in the more complex signal, the earnings forecast revision, for the firm's future stock price performance.

5. Conclusion

Using trade size as a proxy to separate institutional from individual trading behavior, we investigate small and large investors' trading responses to recommendation revisions. We find that both trader types respond to recommendation revisions. Our results suggest, however, that

large traders consider the informativeness of the analyst's report more than small traders, as captured by the magnitude of the recommendation revision and the magnitude of the earnings forecast revision (when present). By contrast, small traders tend to react more to the mere occurrence of a recommendation. These findings are consistent with large traders being more sophisticated processors of information.

Further, we investigate whether large and small traders condition their reaction to incentives faced by analysts. We document that small investors trade more, on average, than large investors in response to upgrades and buys. Large investors, however, consider the informativeness of the analyst report more than small investors, especially in the case of downgrades and sells. Small investors' trading accounts for more of the stock price reaction surrounding recommendation upgrades and buys, whereas large investors' trading behavior has a greater effect on the market return to downgrades and sells. These findings generally hold if the analysis is conditioned on the analyst's affiliation status.

Overall, our research supports regulators' concerns that small investors do not properly consider analyst incentives when reacting to recommendations. Our analysis is based on recommendations issued prior to the passage of Regulation AC, which requires analysts to disclose whether or not they receive compensation or other payments in connection with the views expressed in the report. It remains an open question whether these disclosures are effective in mitigating small investors' apparently suboptimal investment decisions.

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TABLE 1
Sample Descriptive Statistics

Variable	Mean	Median	First Quartile	Third Quartile
Panel A: Trade Size and Volume Measures				
$AVOLUME^{SMALL}$	169.70%	62.52%	–2.20%	183.74%
$AVOLUME^{LARGE}$	188.28%	53.94%	–17.46%	197.17%
AMKTVOL	0.17%	–1.28%	–6.80%	6.02%
ABS_BHAR	6.55%	3.69%	1.58%	7.94%
Panel B: Recommendations				
# DAYS	131.93	113.00	53.50	199.00
Upgrades	125.60	102.00	47.00	189.00
Downgrades	137.12	121.00	58.00	207.00
Buys	130.49	111.00	50.00	198.00
Holds and Sells	133.94	117.00	57.00	200.00
ABSRCHG	1.32	1.00	1.00	2.00
Upgrades	1.30	1.00	1.00	2.00
Downgrades	1.34	1.00	1.00	2.00
Buys	1.20	1.00	1.00	1.00
Holds and Sells	1.48	1.00	1.00	2.00
Panel C: Analyst and Firm Characteristics				
# FIRMS	26.18	22.00	17.00	31.00
# INDUSTRIES	7.14	6.00	4.00	9.00
BROK_SIZE	57.01	41.00	19.00	82.00
MKT_VALUE ($MM)	6,716.93	1,060.09	291.43	4,229.23
PRIOR_PERF	1.94	2.00	1.00	3.00

Notes to Table 1:
This table provides descriptive statistics on the sample, which consists of 50,076 observations during 1993 to 1999. Panel A provides trade size and volume measures for all observations in the sample. $AVOLUME^{SMALL}$ ($AVOLUME^{LARGE}$) is the abnormal dollar volume for small (large) traders in the five-day window centered on the recommendation release date (see Eq. (1)). AMKTVOL is the abnormal market volume during this five-day window. ABS_BHAR is the absolute value of the five-day characteristic-adjusted buy-and-hold excess return. Panel B provides information on the sample recommendations for the overall sample, separately for upgrades and downgrades, and separately for buy and hold/sell recommendations. #DAYS is the number of calendar days between the issuance of the new recommendation and the prior recommendation. ABSRCHG is the absolute value of the difference between the new recommendation and prior recommendation, both measured on a five-point scale. Panel C provides analyst and firm characteristic measures. # FIRMS (#INDUSTRIES) is the number of firms (two-digit SIC codes) the sample analysts follow during the year. BROK_SIZE is the number of analysts employed by the sample brokerage houses during the year. MKT_VALUE is the market value of equity of the sample firms. PRIOR_PERF is the sample analysts' quintile ranking based on the relative profitability of their stock recommendation revisions (long in upgrades; short in downgrades) issued in the prior year.

TABLE 2

Abnormal Trading Volume in Response to Recommendation Revisions

	Trader Type			
Variable	Large		Small	
Intercept	71.4572	***	100.6513	***
	(4.43)		(6.90)	
ABSRCHG	67.8792	***	48.8644	***
	(5.89)		(4.86)	
FIRM_SIZE	1.6373		–2.6164	
	(0.82)		(–1.44)	
ABSRCHG*FIRM_SIZE	–9.0715	***	–6.4842	***
	(–6.53)		(–5.37)	
BROK_SIZE	0.2148	***	0.2173	***
	(2.57)		(2.92)	
ABSRCHG*BROK_SIZE	0.3005	***	0.2293	***
	(4.47)		(3.91)	
PRIOR_PERF	13.4561	***	16.6182	***
	(5.00)		(6.61)	
ABSRCHG*PRIOR_PERF	–5.0621	***	–7.4783	***
	(–2.74)		(–4.45)	
AMKTVOL	1.9327	***	2.1767	***
	(5.50)		(6.94)	
ABSRCHG*AMKTVOL	–0.2072		–0.2690	
	(–0.82)		(–1.20)	
R^2	2.43%	***	2.77%	***
	(84.94)		(99.13)	
$\chi^2(1)$: Intercept	5.73	**		
$\chi^2(1)$: ABSRCHG	5.09	**		

Notes to Table 2:

This table provides the results from estimating Eq. (2) using seemingly unrelated regression techniques. The dependent variable is the abnormal volume for large or small traders over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (2), the estimated coefficient is presented. The Z-statistic is provided in parentheses below the estimated coefficient; the Z-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The χ^2 statistic tests whether the specified coefficients are equal across the large and small investor estimations. FIRM_SIZE is the natural logarithm of the market value of equity at the end of the year preceding the recommendation revision. All remaining variables are defined in the notes to Table 1.

*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.

TABLE 3

Abnormal Trading Volume in Response to Recommendations
Conditional on the Change in or Level of the Recommendation

	INCENTIVE = UPGRADE				INCENTIVE = BUY			
Variable	Large		Small		Large		Small	
Intercept	74.3681	***	101.2065	***	54.9194	***	79.0414	***
	(4.55)		(6.84)		(3.34)		(5.26)	
INCENTIVE	4.8994		11.2447	**	50.4519	***	53.4825	***
	(0.82)		(2.14)		(7.76)		(9.10)	
ABSRCHG	70.0503	***	51.3204	***	76.9368	***	59.4955	***
	(6.01)		(5.02)		(6.59)		(5.79)	
ABSRCHG*INCENTIVE	–21.4416	***	–20.2869	***	–37.1296	***	–34.0076	***
	(–5.15)		(–5.52)		(–8.37)		(–8.50)	
FIRM_SIZE	1.1205		–3.1981	*	0.4078		–3.7490	**
	(0.56)		(–1.78)		(0.21)		(–2.10)	
ABSRCHG*FIRM_SIZE	–8.2017	***	–5.7286	***	–8.0189	***	–5.6159	***
	(–5.96)		(–4.78)		(–5.84)		(–4.68)	
BROK_SIZE	0.2045	**	0.2060	***	0.2113	**	0.2202	***
	(2.44)		(2.75)		(2.53)		(2.96)	
ABSRCHG*BROK_SIZE	0.3120	***	0.2410	***	0.3094	***	0.2353	***
	(4.62)		(4.07)		(4.58)		(3.99)	
PRIOR_PERF	13.9566	***	16.7811	***	13.0720	***	15.9842	***
	(5.19)		(6.69)		(4.86)		(6.37)	
ABSRCHG*PRIOR_PERF	–5.3737	***	–7.5730	***	–4.8630	***	–7.1240	***
	(–2.92)		(–4.51)		(–2.64)		(–4.25)	
AMKTVOL	1.9604	***	2.1917	***	1.9081	***	2.1797	***
	(5.56)		(6.98)		(5.44)		(6.96)	
ABSRCHG*AMKTVOL	–0.1989		–0.2700		–0.1780		–0.2684	
	(–0.78)		(–1.20)		(–0.70)		(–1.20)	
R^2	2.69%	***	2.93%	***	2.55%	***	2.92%	***
	(73.71)		(85.46)		(73.11)		(87.41)	
$\chi^2(1)$: Intercept	4.75	**			3.73	*		
$\chi^2(1)$: Intercept + INCENTIVE	7.12	***			4.88	**		
$\chi^2(1)$: ABSRCHG	4.84	**			4.16	**		
$\chi^2(1)$: ABSRCHG + ABSRCHG*INCENTIVE	4.23	**			2.80	*		

Notes to Table 3:

This table provides the results from estimating Eq. (3) using seemingly unrelated regression techniques. The dependent variable is the abnormal volume for large or small traders over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (3), the estimated coefficient is presented. The Z-statistic is provided in parentheses below the estimated coefficient; the Z-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The χ^2 statistic tests whether the specified coefficients are equal across the large and small investor estimations. All variables are defined in the notes to Tables 1 and 2.

*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.

TABLE 4

Abnormal Price Reaction in Response to Recommendations
Conditional on the Change in or Level of the Recommendation

Variable	INCENTIVE = UPGRADE		INCENTIVE = BUY	
Intercept	5.5049	***	5.3983	***
	(17.96)		(17.27)	
INCENTIVE	0.1405		0.4348	***
	(1.05)		(3.20)	
$AVOLUME^{LARGE}$	0.0048	***	0.0047	***
	(16.68)		(14.26)	
$AVOLUME^{LARGE}$*INCENTIVE	–0.0034	***	–0.0022	***
	(–10.08)		(–6.07)	
$AVOLUME^{SMALL}$	0.0022	***	0.0023	***
	(4.94)		(4.20)	
$AVOLUME^{SMALL}$*INCENTIVE	0.0017	***	0.0016	***
	(2.88)		(2.72)	
ABSRCHG	1.6091	***	1.6432	***
	(7.36)		(7.45)	
ABSRCHG*INCENTIVE	–0.3886	***	–0.5070	***
	(–4.66)		(–5.68)	
FIRM_SIZE	–0.3377	***	–0.3388	***
	(–9.20)		(–9.25)	
ABSRCHG*FIRM_SIZE	–0.1952	***	–0.1979	***
	(–7.51)		(–7.59)	
BROK_SIZE	–0.0095	***	–0.0100	***
	(–6.30)		(–6.50)	
ABSRCHG*BROK_SIZE	0.0113	***	0.0113	***
	(9.12)		(9.02)	
PRIOR_PERF	0.4837	***	0.4879	***
	(9.57)		(9.64)	
ABSRCHG*PRIOR_PERF	–0.0293		–0.0301	
	(–0.80)		(–0.82)	
AMKTVOL	0.0316	***	0.0318	***
	(5.17)		(5.19)	
ABSRCHG*AMKTVOL	–0.0101	**	–0.0102	**
	(–2.17)		(–2.20)	
R^2	29.31%	***	29.02%	***
	(252.38)		(281.60)	
F: $AVOLUME^{LARGE} = AVOLUME^{SMALL}$	14.20	***	7.90	***
F: $AVOLUME^{LARGE} + AVOLUME^{LARGE}$*INCENTIVE = $AVOLUME^{SMALL} + AVOLUME^{SMALL}$* INCENTIVE	25.43	***	13.82	***

Notes to Table 4:

This table provides the results from estimating Eq. (4). The dependent variable is the absolute value of the characteristic-adjusted buy-and-hold excess return (in percent form) over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (4), the estimated coefficient is presented. The t-statistic is provided in parentheses below the estimated coefficient; the t-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The F-statistic tests the specified constraints. All variables are defined in the notes to Tables 1 and 2.

*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.

TABLE 5

Abnormal Trading Volume in Response to Recommendations
Conditional on the Change in or Level of the Recommendation and Analyst Affiliation

	Unaffiliated				Affiliated			
Variable	Large		Small		Large		Small	
Panel A: INCENTIVE = UPGRADE								
Intercept	71.8530	***	103.5044	***	181.8697		43.7753	
	(4.35)		(6.91)		(1.41)		(0.49)	
INCENTIVE	2.9679		9.5062	*	98.0920	*	65.9749	*
	(0.50)		(1.81)		(1.94)		(1.69)	
ABSRCHG	69.0076	***	47.4984	***	23.7891		111.3131	
	(5.88)		(4.63)		(0.26)		(1.59)	
ABSRCHG*INCENTIVE	–19.5240	***	–18.4997	***	–88.7020	***	–67.1576	**
	(–4.69)		(–5.09)		(–2.57)		(–2.23)	
FIRM_SIZE	1.7961		–3.1732	*	–32.2029		–9.8662	
	(0.90)		(–1.75)		(–1.42)		(–0.56)	
ABSRCHG*FIRM_SIZE	–8.2944	***	–5.4604	***	13.6756		–2.2283	
	(–6.03)		(–4.54)		(0.78)		(–0.16)	
BROK_SIZE	0.1775	**	0.1976	***	0.8510		0.2040	
	(2.13)		(2.67)		(0.91)		(0.33)	
ABSRCHG*BROK_SIZE	0.3095	***	0.2258	***	0.4362		0.7294	
	(4.60)		(3.88)		(0.55)		(1.36)	
PRIOR_PERF	13.0949	***	15.9546	***	47.6550	**	50.2632	***
	(4.86)		(6.34)		(2.51)		(3.49)	
ABSRCHG*PRIOR_PERF	–4.9303	***	–6.9778	***	–33.4331	***	–37.3261	***
	(–2.65)		(–4.13)		(–2.62)		(–3.42)	
AMKTVOL	1.8565	***	2.1535	***	6.3300	*	2.0622	
	(5.26)		(6.87)		(1.91)		(0.92)	
ABSRCHG*AMKTVOL	–0.1332		–0.2536		–2.9735		–0.2075	
	(–0.53)		(–1.14)		(–1.31)		(–0.13)	
R^2	2.56%	***	2.79%	***	4.82%	***	7.53%	***
	(68.13)		(79.97)		(4.46)		(4.90)	
$\chi^2(1)$: ABSRCHG	6.18	**			1.88			
$\chi^2(1)$: ABSRCHG + ABSRCHG*INCENTIVE	5.61	**			2.48			

TABLE 5, CONTINUED

Abnormal Trading Volume in Response to Recommendations
Conditional on the Change in or Level of the Recommendation and Analyst Affiliation

	Unaffiliated				Affiliated			
Variable	Large		Small		Large		Small	
Panel B: INCENTIVE = BUY								
Intercept	52.4787	***	81.5933	***	219.3170		28.3240	
	(3.15)		(5.37)		(1.53)		(0.31)	
INCENTIVE	46.7480	***	50.3405	***	89.4388		92.9301	*
	(7.18)		(8.61)		(1.34)		(1.90)	
ABSRCHG	75.7589	***	55.7868	***	5.4160		118.9502	*
	(6.44)		(5.40)		(0.06)		(1.70)	
ABSRCHG*INCENTIVE	–34.4127	***	–31.6731	***	–84.5029	**	–78.1619	**
	(–7.74)		(–8.01)		(–2.15)		(–2.36)	
FIRM_SIZE	1.1495		–3.6594	**	–35.6861		–10.1473	
	(0.58)		(–2.02)		(–1.55)		(–0.58)	
ABSRCHG*FIRM_SIZE	–8.1345	***	–5.4015	***	15.1827		–2.6879	
	(–5.91)		(–4.48)		(0.86)		(–0.19)	
BROK_SIZE	0.1878	**	0.2151	***	0.7931		0.1659	
	(2.25)		(2.92)		(0.84)		(0.26)	
ABSRCHG*BROK_SIZE	0.3068	***	0.2195	***	0.4830		0.7697	
	(4.55)		(3.77)		(0.60)		(1.42)	
PRIOR_PERF	12.6143	***	15.2784	***	44.6493	**	49.4903	***
	(4.68)		(6.07)		(2.28)		(3.43)	
ABSRCHG*PRIOR_PERF	–4.6003	**	–6.5775	***	–32.1096	**	–36.8065	***
	(–2.47)		(–3.90)		(–2.46)		(–3.37)	
AMKTVOL	1.8811	***	2.1683	***	6.2006	*	2.0088	
	(5.33)		(6.92)		(1.86)		(0.89)	
ABSRCHG*AMKTVOL	–0.1545		–0.2664		–2.8743		–0.1382	
	(–0.61)		(–1.19)		(–1.26)		(–0.08)	
R^2	2.45%	***	2.80%	***	4.43%	***	7.49%	***
	(68.04)		(82.02)		(4.16)		(4.88)	
$\chi^2(1)$: ABSRCHG	5.31	**			2.82	*		
$\chi^2(1)$: ABSRCHG + ABSRCHG*INCENTIVE	3.96	**			3.01	*		

Notes to Table 5:

This table provies the results from estimating Eq. (3) separately for the observations corresponding to unaffiliated and affiliated analysts using seemingly unrelated regression techniques. Panels A and B provide the results using UPGRADE and BUY, respectively, as the proxy for analyst incentives (INCENTIVE). The dependent variable is the abnormal volume for large or small traders over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (3), the estimated coefficient is presented. The Z-statistic is provided in parentheses below the estimated coefficient; the Z-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The χ^2 statistic tests whether the specified coefficients are equal across the large and small investor estimations. All variables are defined in the notes to Tables 1 and 2.

*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.

TABLE 6

Abnormal Price Reaction in Response to Recommendations
Conditional on the Change in or Level of the Recommendation and Analyst Affiliation

	Unaffiliated		Affiliated	
Variable	UPGRADE	BUY	UPGRADE	BUY
Intercept	5.6349 ***	5.5879 ***	–2.3313	–0.5276
	(18.26)	(18.00)	(–0.96)	(–0.20)
INCENTIVE	0.2069	0.3869 ***	2.1325 **	0.4129
	(1.58)	(2.85)	(2.05)	(0.35)
$AVOLUME^{LARGE}$	0.0047 ***	0.0046 ***	0.0089 ***	0.0109 ***
	(16.09)	(14.06)	(6.88)	(6.67)
$AVOLUME^{LARGE}$*INCENTIVE	–0.0021 ***	–0.0017 ***	–0.0092 ***	–0.0111 ***
	(–5.14)	(–4.87)	(–7.11)	(–6.76)
$AVOLUME^{SMALL}$	0.0023 ***	0.0024 ***	0.0030 *	0.0026
	(4.91)	(4.20)	(1.68)	(1.07)
$AVOLUME^{SMALL}$*INCENTIVE	–0.0000	0.0014 **	0.0018	0.0022
	(–0.12)	(2.37)	(0.96)	(0.84)
ABSRCHG	1.4924 ***	1.4676 ***	8.2505 ***	7.2439 ***
	(6.82)	(6.77)	(4.20)	(3.53)
ABSRCHG*INCENTIVE	–0.3938 ***	–0.4755 ***	–1.6912 **	–0.6609
	(–4.66)	(–5.34)	(–2.10)	(–0.82)
FIRM_SIZE	–0.3532 ***	–0.3583 ***	0.5691	0.6697 *
	(–9.55)	(–9.80)	(1.42)	(1.66)
ABSRCHG*FIRM_SIZE	–0.1817 ***	–0.1786 ***	–1.1116 ***	–1.2150 ***
	(–6.96)	(–6.92)	(–3.19)	(–3.56)
BROK_SIZE	–0.0098 ***	–0.0100 ***	–0.0123	–0.0068
	(–6.42)	(–6.59)	(–0.82)	(–0.45)
ABSRCHG*BROK_SIZE	0.0115 ***	0.0112 ***	0.0203	0.0167
	(9.21)	(8.97)	(1.53)	(1.27)
PRIOR_PERF	0.4851 ***	0.4756 ***	0.7476 *	0.5925
	(9.50)	(9.28)	(1.85)	(1.58)
ABSRCHG*PRIOR_PERF	–0.0333	–0.0244	–0.1387	0.0338
	(–0.90)	(–0.66)	(–0.44)	(0.11)
AMKTVOL	0.0311 ***	0.0310 ***	–0.0204	0.0419
	(5.09)	(5.05)	(–0.31)	(0.70)
ABSRCHG*AMKTVOL	–0.0095 **	–0.0101 **	0.0358	–0.0102
	(–2.05)	(–2.19)	(0.65)	(–0.20)
R^2	29.55% ***	29.01% ***	44.73% ***	42.77% ***
	(259.51)	(267.88)	(26.75)	(32.97)
F: $AVOLUME^{LARGE}$ = $AVOLUME^{SMALL}$	11.31 ***	6.93 ***	4.13 **	4.42 **
F: $AVOLUME^{LARGE}$ + $AVOLUME^{LARGE}$*INCENTIVE = $AVOLUME^{SMALL}$ + $AVOLUME^{SMALL}$*INCENTIVE	0.35	5.16 **	33.24 ***	28.27 ***

Notes to Table 6:
This table provides the results from estimating Eq. (4) separately for the observations corresponding to unaffiliated and affiliated analysts. The dependent variable is the absolute value of the characteristic-adjusted buy-and-hold excess return (in percent form) over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (4), the estimated coefficient is presented. The t-statistic is provided in parentheses below the estimated coefficient; the t-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The F-statistic tests the specified constraints. All variables are defined in the notes to Tables 1 and 2.
*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.

TABLE 7

Abnormal Trading Volume in Response to Recommendation and Earnings Forecast Revisions

	Trader Type			
Variable	Large		Small	
Intercept	43.1072	*	73.4017	***
	(1.70)		(3.41)	
ABSRCHG	57.1019	***	33.4387	**
	(3.26)		(2.20)	
ABSFCREV	1696.3633	*	−106.8334	
	(1.87)		(−0.14)	
FIRM_SIZE	1.8832		−1.6425	
	(0.62)		(−0.64)	
ABSRCHG*FIRM_SIZE	−5.8977	***	−3.2252	*
	(−2.90)		(−1.82)	
ABSFCREV*FIRM_SIZE	−172.7126		−8.6984	
	(−1.44)		(−0.09)	
BROK_SIZE	0.0603		0.0700	
	(0.50)		(0.66)	
ABSRCHG*BROK_SIZE	0.3042	***	0.2434	***
	(3.31)		(2.96)	
ABSFCREV*BROK_SIZE	−4.4975		−1.2777	
	(−1.22)		(−0.43)	
PRIOR_PERF	22.1327	***	20.0303	***
	(5.71)		(6.13)	
ABSRCHG*PRIOR_PERF	−10.1143	***	−10.0045	***
	(−3.83)		(−4.45)	
ABSFCREV*PRIOR_PERF	473.1459	***	381.4317	***
	(3.49)		(4.00)	
AMKTVOL	1.2067	**	1.2945	***
	(2.41)		(3.07)	
ABSRCHG*AMKTVOL	0.2641		0.2709	
	(0.72)		(0.85)	
ABSFCREV*AMKTVOL	9.9733		−13.3102	
	(0.53)		(−1.06)	
R^2	2.91%	***	2.87%	***
	(21.91)		(23.69)	
$\chi^2(1)$: Intercept	3.23	*		
$\chi^2(1)$: ABSRCHG	4.21	**		
$\chi^2(1)$: ABSFCREV	13.30	***		

Notes to Table 7:
This table provides the results from estimating Eq. (5) using seemingly unrelated regression techniques. The dependent variable is the abnormal volume for large or small traders over (t = –2, +2) (t = 0 is the date of the recommendation revision). For each variable in Eq. (5), the estimated coefficient is presented. The Z-statistic is provided in parentheses below the estimated coefficient; the Z-statistics are computed using the Huber-White estimator. The F-statistic is provided in parentheses below the R^2. The χ^2 statistic tests whether the specified coefficients are equal across the large and small investor estimations. ABSFCREV is the absolute value of the analyst's earnings forecast revision, defined as the analyst's current annual earnings forecast less the analyst's prior annual earnings forecast, deflated by price. All remaining variables are defined in the notes to Table 1 and 2.
*, **, *** Statistically different from zero at two-tailed $p < 0.10$, 0.05, and 0.01, respectively.