Analyst Institutional Client Catering and Reputation Tradeoff: Analysts' Strategic Timing of Recommendations

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Abstract

We examine whether analysts strategically time their positive recommendation on stocks that are part of institutional investors' portfolios. Using a sample of analysts' recommendations on U.S. firms, we document a pattern in analysts' recommendations and updates that are more optimistic in a month of the end of a quarter and less optimistic in a month of the beginning of a quarter. However, we do not find a clear pattern of recommendations' timing tied to the size of institutional holdings in the stock.

JEL classifications: G14, G24

Keywords: Financial analysts; Analyst recommendations; Institutional catering; Reputation

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1. Introduction

Agency problems and conflicts of interest of sell-side analysts have been of great attention to policymakers and academics. It is widely reported that analysts affiliated with investment banks issue more optimistic recommendations to attract future underwriting business (Dugar and Nathan,1995; Lin and McNichols, 1998; Michaely and Womack,1999). This controversy led to more regulation through the establishment of firewalls in the investment banks with a clear separation of the research and investment-banking divisions at (brokerage) firms. Analysts may also provide rosy recommendations to maintain a positive relationship with the management of the firms that are subjects of the recommendations (Francis and Philbrick,1993). Incentives to generate trading commissions are also linked to optimistic reports (Hayes,1998; Irvine, 2001; Jackson, 2005; Cowen, Groysberg, and Healy, 2006). Prior literature also documents that analysts provide overoptimistic biased recommendations on stocks held by mutual funds that have client status with the brokerage (Firth et al., 2013; Mola and Guidolin, 2009; Gu et al., 2013).[1]

However, such biased recommendations may create a cost for analysts in the form of a negative effect on analysts' reputation. For example, the market recognizes such catering activity with muted response to such recommendations (Mola and Guidolin, 2009). Existing literature shows that analysts' reputation is an important capital and that reputational concerns tend to reduce analysts' opportunistic behavior (Kreps and Wilson, 1982; Milgrom and Roberts, 1982; Fudenberg and Levine, 1989; Benabou and Laroque, 1992). Therefore, a tradeoff exists between catering to institutional clients through provision of optimistic recommendations and building up a reputation. Jackson (2005) finds that while optimistic analysts generate more short-term trading volume,

[1] Please see SEC Investor Publication for more discussion of Potential Conflicts of Interest related sell-side analysts' recommendations: https://www.sec.gov/tm/reportspubs/investor-publications/investorpubsanalystshtm.html

analysts that mislead investors have their reputation negatively affected. Even though reputation concerns reduce analysts' opportunistic behavior (Jackson, 2005), some studies, such as Stickel, 1992; Dugar and Nathan, 1995; Womack, 1996; Lin and McNichols, 1998; Michaely and Womack, 1999; Beyer and Guttman, 2011, show that, on average, analysts' reports are informative but optimistic. Thus, analysts may strategically choose how and when to release acquired information (Meng, 2015). For example, Morris (2001) argues that analysts' reputational concerns may discourage truthful communication when they try to avoid being perceived as being misaligned with investors.

This study directly measures the tradeoff between analysts' catering to institutional clients and analysts' reputation by examining analysts' strategic timing of recommendations. We investigate whether analysts strategically time their positive recommendation on stocks that are part of institutional investors' portfolios. We predict that due to agency problems of having corporate and institutional clients associated with a brokerage firm, financial analysts tend not to issue negative recommendations in the months when portfolio managers (hedge funds and mutual funds) report their performance not to produce a negative effect on portfolios' values of these managers. However, we expect that analysts reverse the course in the subsequent months and issue more truthful and less optimistic recommendations to preserve their reputation.

We document a pattern in analysts' recommendations and changes in their recommendations. They tend to be more optimistic in a month of the end of a quarter and less optimistic in a month of the beginning of a quarter. In the univariate analysis, raw and relative recommendations, on average, tend to be higher in the months of March, June, September, and December, and lower in the months of January, April, July, and October. The strong buy analysts' recommendations follow the same monthly pattern as raw recommendations, though the buy

recommendation pattern is not as volatile as the raw recommendation pattern. Downgrades by analysts follow a similar but more volatile pattern through the months of a year: The smallest downgrades occur in the months of March, June, September, and December, while the biggest downgrades happen in the months of February, May, July, and October. The occurrence of downgrades follows the same pattern as the size of the downgrades, with the least occurrence of downgrades in the months of March, June, September, and November, and most downgrades' events in the months of February, April, July, and October. The overall trend of downgrades throughout a year is upward with more downgrades at the end of the year than at the beginning. These patterns of analysts' recommendations and updates are similar between firms with institutional holdings in top and bottom quartile of the sample. However, we document a change in analysists' recommendations for firms with institutional holdings in bottom and top sample quartile across different time periods. In the period prior to 2001, firms with higher institutional holdings (top quartile) received higher percentage of Strong Buy and Buy recommendations, and lower percentage of Hold, Underperform and Sell recommendations, more upgrade and fewer downgrades than the firms with lower institutional holdings (bottom quartile). These differences reversed in the subperiod of 2001-2010, and even more so in 2011-2020 period. This finding can be an outcome of a number of regulations that happened around that time, such as Regulation of Fair Disclosure of 2001 and its amendment to remove exemption for Credit Rating Agencies of 2010.[2]

While we find the monthly patterns in analysts' recommendations and revisions, we do not confirm our expectation that such patterns would be more prevailing in the sample of firms with

[2] Links to Regulation Fair Disclosure https://www.sec.gov/rules/final/33-7881.htm and its amendment https://www.sec.gov/rules/final/2010/33-9146fr.pdf

higher institutional holdings. Such timing patterns are present across firms with both high and low institutional holdings, but the magnitude of the analysts' recommendations is more positive for lower institutional holdings firms, specifically for the period after 2000.

This paper generally contributes to the extant literature on analysts' forecasts and recommendations. It extends the literature on optimism and opportunistic behavior of analysts (Dugar and Nathan,1995; Lin and McNichols, 1998; Michaely and Womack,1999) and, more specifically on the client catering and incentives related to the generation of trading revenue by sell-side analysts (Hayes, 1998; Irvine, 2001; Jackson, 2005; Cowen, Groysberg, and Healy, 2006; Gasparino, 2002; Jackson, 2005). Our analysis of an effect of institutional investor ownership of stock on analysts' timing of optimistic recommendation of the stock is related to the work of Firth et al. (2013), Mola and Guidolin (2009), and Gu et al. (2013). These studies show that analysts provide more favorable recommendations to stocks held by affiliated mutual funds. Our study differs from the prior research by looking at the timing strategy of over-optimistic recommendations and not just the presence of those.

We also look at all institutional investors' holdings in the stocks covered by analysts, not just mutual funds. The over-optimistic recommendation can be recognized by market participants (Mola and Guidolin, 2009) and can hurt analysts' reputation (Jackson, 2005). Thus, the analysts' timing strategy can be an outcome of the tradeoff between catering to institutional clients and preserving analysts' reputation. Hence, our study also contributes to the literature on analysts' reputation. Overall, this study contributes to the literature by combining two strands of research on analysts: 1) studies on biased overoptimistic recommendations and 2) analysts' reputation. Even though some prior studies examine the strategic release of information by analysts (e.g., Scharfstein and Stein 1990; Trueman 1994; Morris, 2001; Guttman 2010; Meng, 2015), this is the

first study that examines analysts' strategies in the setting of institutional clients' relationships and reputation effect.

The rest of the paper is organized as follows: Section 2 develops hypotheses. Section 3 describes the data and sample selection. Section 4 reports the study's empirical results, while Section 5 concludes.

2. Hypotheses

Prior literature looks at timing of analysts' forecasts as an outcome of analyst's rational decisions to compete for clients' demand for their research. A couple of theories predict that more capable or informed analysts provide earlier forecasts, which are also linked to better quality reports. The reputation-herding theory argues that more capable agents act earlier and base their estimates on their private information, whereas less capable agents subsequently herd as they seek to hide their low ability (Scharfstein and Stein 1990; Trueman 1994). The tradeoff theory predicts that analysts with a higher precision of initial private information tend to forecast earlier, and analysts with a higher learning ability tend to forecast later (Guttman 2010). Several empirical studies confirm the theories' predictions that more capable or informed analysts issue their forecast earlier (Cooper et al., 2001; Shroff et al., 2013; Keskek et al., 2014).

However, these theories do not consider presence of conflict of interest between analysts and different clientele consuming their research as well as management of the firms that analysts follow. While sell-side analysts supply their research and recommendations to wide range of consumers, analysts rate hedge funds and mutual funds as their most important clients and retail brokerage clients as least important (Brown et al, 2014). These preferences come from additional services that brokerage houses that employ the analysts provide to institutional investors, such as

underwriting and trading businesses.[3] This suggests that most analysts focus on addressing the needs of large, institutional investors, rather than the needs of small, individual investors (De Franco et al., 2007).

Chiu et al (2021) add an institutional investor's attention to a firm as a factor influencing the timeliness of the analysts' forecasts for that firm. Their findings suggest that responsiveness to institutional attention (based on abnormal Bloomberg news search activity on earnings announcement days) influences the production of the analyst research and analysts' career outcomes.

Mola and Guidolin (2012) and Firth et al (2013) show that sell-side analysts cater to affiliated mutual funds by providing more coverage and more favorable and biased recommendations. They show that larger holdings by those institutional investors are associated with more optimistic stock recommendations from affiliated analysts. However, Firth et al. (2013) also show that this favorable recommendation bias toward a client's existing portfolio stocks is mitigated if the stock is highly visible to other mutual fund investors. At the same time, Mola and Guidolin (2012) show that analysts' optimism on stocks held by affiliated mutual funds declined after 2002. Thus, the conflict of interest between different agents consuming the analysts' reports (institutional versus retail investors) or agents providing information for those reports, i.e., firms,

[3] Even though industry reforms of early 2000s tried to separate underwriting and commission generating business of brokerages from activities of sell-side analysts of their employers in order to address agency problems between analysts and clients, some industry participants believe that the industry changed in form but not in substance. For example, Jack Grubman (2013) says that prior to reforms, an underwriting banker and a research analyst would have a single meeting with the management to generate underwriting business, and now, it would be two separate meetings.

Analysts' compensation is also tied to brokerage house's underwriting business or trading commissions. According to analysts' survey conducted by Brown et al. (2014), 44% of analysts say their success at generating those activities is very important to their compensation.

should prevent the analysts from continuously providing biased recommendations. According to Brown et al (2014) survey, most important determinants of analyst's career success (and compensation) are industry knowledge and analyst rankings or broker votes.[4] Thus, analysts need to walk a balancing act of pleasing their institutional clients and maintaining their professional integrity and reputation.

There is an anecdotal evidence that some fund managers get involved in the practice, known as "marking the close" or "portfolio pumping," which is a form of "window dressing" – a term for a variety of techniques employed by asset managers to make their results look better at the end of the quarter (Zweig and McGinty, 2012).[5] Analysts may address their affiliated institutional client desire to window dressing during reporting periods, i.e. the end of the quarter, by providing biased optimistic recommendations only during the last month of a quarter and reversing their recommendations to unbiased ones the flowing month.

Thus, our main research question is whether due to agency problems of having corporate clients associated with a brokerage firm, financial analysts avoid issuing negative (or they issue more optimistic) recommendations in the last month of the calendar quarter when portfolio managers, such as hedge funds and mutual funds, report their performance, and reverse the course in the subsequent months. Our first formal hypothesis is about the intensity of the coverage with the increase of institutional holdings during the last month of a quarter isas following:

[4] The least important is the accuracy and timeliness of the analyst's earnings forecasts.

[5] Some forms of window dressing, such as selling losing stocks right before reporting quarter-end holdings to investors, are perfectly legal. However, regulators say marking the close violates prohibitions on deceptive trading in the federal securities laws.

Hypothesis 1. Brokerage analysts are more likely to provide coverage on seasoned stocks with larger holdings by institutional investors during the last month of a calendar quarter than other months.

Some may argue that it is naturally expected to have more analysts' coverage at the end of a reporting period as firms issue their financial statements. However, earnings announcements happen 30-45 days after the reporting period, while window dressing for portfolio managers happens before a quarter end. Therefore, we expect an increase in analysts' coverage before the quarter end.

Our second formal hypothesis addresses the content of analysts' reports related to timing of biased recommendations and is as following:

Hypothesis 2. Brokerage analysts are more likely to provide optimistic coverage on seasoned stocks with larger holdings by institutional investors during the last month of a calendar quarter than other months.

As analysts cater to different institutional clients with different reporting requirements and portfolio strategies, such as hedge funds, mutual funds, pension funds, endowments, and insurance companies, we expect variation in intensity of seasonal bias of analysts' recommendations. Given that analysts rank hedge funds as their top priority clients followed by mutual funds (Brown et al, 2014), we expect to observe more seasonal bias in analysts' recommendations for firms with more holdings by hedge funds and mutual funds than other categories of institutional investors, with the least effect for passive portfolio holdings, such as index funds and ETFs. Our next two hypotheses are hypotheses 1 and 2 modified for the type of institutional holdings and are as following:

Hypothesis 3. Brokerage analysts are more likely to provide coverage on seasoned stocks with larger hedge fund and mutual fund holdings than other portfolio managers' holdings, such as index funds and ETFs, especially in the last month of a calendar quarter.

Hypothesis 4. Brokerage analysts are more likely to provide optimistic coverage on seasoned stocks with larger hedge fund and mutual fund holdings than other portfolio managers' holdings, such as index funds and ETFs, especially in the last month of a calendar quarter.

3. Data and Sample

We construct the sample on the individual analyst level using data from I/B/E/S Academic, Thompson Refinitiv, Compustat, and CRSP databases. The I/B/E/S Detail Recommendations database covers the data on analysts' buy-sell-hold recommendations for a stock, identifying the analysts and the brokerage house the analysts work for. The I/B/E/S Detail Estimate database contains forecasts for U.S. and international firms' earnings, cash flows, and other critical financial items (Wharton Research Data Services). The entire sample contains 763,146 analyst-firm recommendations from November 1993 to December 2020. We focus our analysis on the U.S. firms.

The primary dependent variables used in the analysis include the analyst raw and relative recommendations, revisions, upgrades, and downgrades for a stock. Raw recommendations are recorded recommendations with an assigned numeric value from 1 (Strong Buy) to 5 (Sell). We reverse the numeric value of the recommendations to make the analysis friendlier to interpret. In other words, in our sample, raw recommendations ($Raw_{i,j,t}$) has a value of 1 for "Sell," 2 for "Underperform," 4 for "Buy," and 5 for "Strong Buy," as in Firth et al. (2013). Numeric value 3 (Hold) remains unchanged.

Relative recommendations measure analyst optimism compared to consensus recommendations ($Relrecom_{i,j,t}$). We calculate relative recommendations as the difference between the analyst's recommendation and the market consensus (Mola and Guidolin, 2009). Market Consensus refers to the average recommendation assigned by all analysts to stock j in a particular month t. We calculate the relative recommendation as the initial raw recommendation minus the market consensus and then reverse the result by multiplying by (-1). If a relative recommendation is positive (negative), the analyst reports more (less) optimistic recommendation compared to consensus.

We use the continuous value of a relative recommendations and construct two additional variables for relative recommendation, following Firth et al. (2013). We construct a three-level variable with the value of -1, 0, and 1 for the recommendations below, equal, and above consensus, respectively. In addition, we construct the dummy relative recommendation equal to one if the analyst recommendation is above the consensus and zero otherwise (as in Gu et al., 2013). The sample contains 747,913 relative recommendations after merging the initial sample of the analyst-level raw recommendations with the consensus recommendations.

As an alternative measure of recommendation, we use the revision ($Revision_{i,j,t}$), constructed as a three-level variable with the value of -1, 0, and 1. A revision is equal to -1 if the analyst downgrades the recommendation for the stock ($Raw_{i,j,t} < Raw_{i,j,t-1}$) or if the analyst reiterates "Sell." Similarly, a revision is equal to 1 if the analyst upgrades the recommendation for the stock ($Raw_{i,j,t} > Raw_{i,j,t-1}$) or if the analyst reiterates "Strong Buy." A revision is equal to 0 if the analyst reiterates his or her prior recommendation, except if the prior recommendation was "Strong Buy" or "Sell." The sample contains 487,194 analyst-firm-recommendation observations. Finally, we separately examine the subsamples with the upgrades (189,268 observations) and

downgrades (208,769 observations) as dependent variables. These variables are constructed as the difference between the current analyst recommendation and prior recommendation for a particular stock.

We proxy for the institutional clientele catering with the proportion of institutional holdings in the stock. The Thompson Refinitiv Institutional (13f) Holdings database is the source of our data on institutional ownership of U.S. firms, which provides the holdings data of institutions of different managers' types on quarterly frequency. The database assigns the managers into five types: (1) banks and trusts, (2) insurance companies, (3) investment companies, (4) professional investment advisors, and (5) other managers, such as pension funds and university endowments. In this paper, we test the hypotheses using the institutional holdings of all types of managers, as well as focusing on the holdings of actively managed mutual funds and hedge funds.

For our baseline tests, we aggregate the institutional holdings for each firm for each quarter by summarizing the number of shares owned by each institution and dividing it by the total number of shares outstanding ($Institutional\ Holdings_{jt}$). All institutional holdings exceeding 100% are replaced with 100% ownership. In the analysis, we utilize institutional holdings lagged for one quarter. The change in institutional holdings is calculated as the change in aggregated number of shares in institutional ownership in the previous quarter to the total number of shares outstanding in that quarter ($Change_{jt}$). We expect a positive association between institutional holdings and the analyst optimism.

We examine the analysts' timing strategy to provide optimistic recommendations, which can be an outcome of the tradeoff between catering to institutional clients and preserving analysts' reputation. We argue that the institutional ownership significantly affects the optimism of

recommendations provided by the analysts, after controlling for the firm characteristics. However, institutional holdings of different manager's types may affect the analysts' timing strategy in a different manner.

We assume that the institutional ownership of index mutual funds and ETFs should not significantly affect the analysts' timing strategy. To check this assumption, we identify index mutual fund and ETF holdings using the CRSP Mutual Funds database. We follow Agapova and Kaprielyan (2022) to identify the index mutual funds and ETFs. The CRSP Mutual Funds database contains the identifier for index funds (INDEX_FUND_FLAG), with flag "D" identifying pure index funds. Additionally, we manually identify index funds based on the specific words in the fund names, based on the methodology of Schwartz (2012). We flag the fund as index if the fund name contains the following: "ind," "index," "idx," "s&p," "Russell 1000," "Russell 2000," "Nasdaq," "NYSE," "Dow," "Select 500," "Select 20," "Select 25," "Wilshire 2500," "Wilshire 4500," "1000," "5000," and "titans." We exclude the flag of index fund if the name contains the words "enhanced," "infl," or "managed" or the fund has INDEX_FUND_FLAG of "B" or "E."

The CRSP Mutual Funds database also contains the identifier for the ETFs and ETNs. In addition, we identify the ETFs if the fund contains the following in the name: "iShare," "SPDR," "ETF," "ETN," and "streettracks." Then, we follow the steps discussed above to identify the index ETFs. After identifying the index mutual funds and ETFs, we aggregate the number of shares of each firm (using PERMNO) held by index funds each quarter and subtract this volume from the total number of shares held by institutional investors in the Thompson S34 (13f) Holdings

database. The information on institutional holdings begins from 2001 in the CRSP Mutual Funds database, requiring us to reduce the sample to the period 2001 – 2020[6].

To test hypotheses 3 and 4, we identify institutional holdings of mutual funds, hedge funds, and other institutional types of managers in the paper using the TYPECODE variable in the Thompson Refinitiv CDA/Spectrum S34 (13f) Holdings database. The Thompson Refinitiv CDA/Spectrum S34 (13f) Holdings database contains information about the types of the managers filing the institutional stock holdings. The five types are: (1) banks and trusts, (2) insurance companies, (3) investment companies, (4) professional investment advisors, and (5) other managers, such as pension funds and university endowments. However, this information is not reliable starting the last quarter of 1998, where many types were identified as "endowments and others" (5).

To fix this issue, we follow Koijen and Yogo (2019) and manually identify correct manager types starting 1998. For managers available before the last quarter of 1998, we replace the incorrect code type after December 1998 with the correct one before this date. If the manager code type changes over time, we use the most recent one. For instance, it the manager existed prior to 1998 and changed the code type before December 1998, we identify the code type based on the most recent code type before December 1998. Similarly, if the manager did not exist prior to December 1998, we identify the code type based on the most recent one. We also assign the code 1 to all managers containing "bank" in their name, code 2 to all managers containing "insurance" in their

[6] The tests using the subsample with excluded holdings of index mutual funds and ETFs quantitatively the same results and are not reported in the paper for brevity.

name, and code 5 to all managers that we can identify as pension funds and university endowments based on the manager's name.

After manually correcting the manager's types, the banks and insurance companies are assigned to codes 1 and 2, respectively, and mutual funds and professional investment advisors to the codes 3 and 4. Pension funds, endowments, and other managers are assigned to type code 5. We identify the actively managed mutual fund holdings using the CRSP Mutual Funds database, after excluding holdings of index funds, ETFs, ETNs, and money market mutual fund holdings. We classify funds as money market funds if their NAV is equal to 1 and the CRSP's objective is IM, IMM, or IFM (Agapova and Kaprielyan, 2022). We proxy the institutional ownership of hedge funds by subtracting the aggregated ownership of mutual funds (including index funds) from the aggregated institutional holdings of the managers with type codes 3 and 4 identified in the Thompson Refinitiv CDA/Spectrum S34 (13f) Holdings database.

We control for the firm, brokerage house, and analyst characteristics in the analysis. The Compustat (quarterly and annual) and CRSP (monthly) databases are primary sources for the data on the firm-level controls. We exclude the firm observations with negative or missing total assets and negative sales and stockholders' equity. If the sales and net income data are not available on the quarterly basis, we use the annual values and "quarterize" them (divide by four).

Firm characteristics, such as the size, profitability, leverage, and the Tobin's Q ratio, affect the analyst recommendations (Mola and Guidolin, 2009; Firth et al., 2013). The firm size is measured with the natural logarithm of firm market value at the end of the quarter ($Mrkcap_{it}$). As an alternative proxy for the firm size, we use the accounting measure of the firm size calculated as

the natural logarithm of end-of-quarter total assets ($Size_{it}$). The results are quantitatively the same and are not reported for brevity.

Firm's profitability is the net income over the total assets (ROA_{it}) and the revenue-to-asset ratio, i.e., asset turnover ($Assetturn_{it}$). Leverage ratio is long-term debt divided by the book value of equity ($Leverage_{it}$). Tobin's Q proxies for the firm intrinsic value and is calculated as the ratio of total assets minus book value of equity plus market value of equity all over total assets ($Tobin_{it}$). Alternatively, we use market-to-book ratio as another proxy for the firm value. Stock turnover ($Turnover_{it}$), a proxy for stock liquidity, is the average daily trading volume of shares in the previous month, divided by the average of the total number of shares outstanding in that month. These data are from the CRSP Security Daily database. All firm characteristics are winsorized at a 1% and 99% level. All control variables are lagged by one period.

The levels of firm's systematic and idiosyncratic risk may affect the analyst coverage and sentiment about the stock. Therefore, we use beta, idiosyncratic volatility, and firm excess return (alpha) as controls in the analysis, which we calculate using the Beta Suite by WRDS. Beta represents the systematic risk of the firm, calculated for the period of one year preceding the month of interest ($Beta_{it}$). Firm's idiosyncratic volatility ($Ivol_{it}$) is calculated as the standard deviation of the error term from the market model, calculated for the period of one year preceding the month of interest (Agapova and Volkov, 2019). The excess return is the daily excess return from the CAPM model. To control for information asymmetry, we calculate the analyst forecast errors using the current-quarter EPS forecasts and the actual EPS available in the I/B/E/S database ($Frcsterr_{i,j,t}$). We follow Abarbanell and Lehavy's (2003) and find forecast errors as actual EPS minus the consensus current-quarter earnings forecast scaled by the previous end-quarter price and multiplied by 100. Forecast errors' data are highly skewed, and we winsorize the variable at a 1% level to

mitigate possible effect of outliers on the results. We also control for the number of analysts covering the stock in a given year ($Coverage_{i,j,t}$) as the logarithm of one plus the number of analysts covering the stock.[7]

The brokerage house characteristics used in the analysis include the brokerage firm size ($Broker\_size_{i,j,t}$) and the brokerage firm busyness ($Broker\_busyness_{i,j,t}$). We calculate a brokerage firm size as the number of analysts reporting in the brokerage firm during a calendar year and take the logarithm of one plus this value. A brokerage firm busyness is the number of analysts reporting in the brokerage firm each month scaled by the brokerage size in a given year. We standardize the brokerage firm busyness to mitigate the possible issues because of the skewness of the original variable.

We use the analyst seniority ($Senior_{i,j,t}$), concentration ($Concentration_{i,j,t}$), and analyst busyness ($Busyness_{i,j,t}$) to control for analyst characteristics. Analyst seniority is the number of quarters since the analyst first appeared in the I/B/E/S Detail Recommendations database (as in Firth et al., 2013). Analyst concentration is the number of different industries, measured as a two-digit SIC code, the analyst covers in each month. Analyst busyness is the number of different stocks the analyst covers each month. All analyst characteristics are normalized by taking the logarithms of one plus the value of the variable.

Panel A of Table 1 provides summary statistics of the analyst recommendations. We observe that analyst recommendations are on average optimistic, with the mean (median) of 3.647 (4). "Strong Buy" and "Buy" recommendations represent, on average, 52.465%, while

[7] In the unreported tests, we use the number of analysts covering the stock in a given month and quarter and get qualitatively similar results.

"Underperform" and "Sell" recommendations only 7.643%. These observations are in line with the existing research (e.g., Mola and Guidolin, 2009; Firth et al., 2012; Gu et al., 2013) on the analyst optimism.

Panel B of Table 1 details the summary statistics for the firm characteristics, including the size, profitability, leverage, liquidity, risk characteristics, and percentage of the institutional holdings. The average (median) institutional ownership of a stock is 0.567 (0.629). In our analysis, we use the percentage of the institutional holdings in the prior quarter to examine the timing of recommendations for the stock with large institutional holdings. In addition, we split the sample into quartiles based on the institutional ownership and examine whether the timing differs for the stocks in the first quartile vs. fourth quartile (institutional holdings of <= 0.318 vs. institutional holdings of >=0.835). Panel C of Table 1 reports the summary for the brokerage house and analyst characteristics. On average, an analyst covers 6.2 firms in a given month from 5.6 different industries (based on two-digit SIC code). An average analyst seniority is 22.22 quarters (5.6 years).

<Insert Table 1 here>

4. Empirical Analysis

4.1. Patterns in Analysts' recommendations – univariate analysis

Table 2 reports the univariate analysis on institutional holdings and analyst recommendations for the whole sample and subperiods of 1993 – 2000, 2001 – 2010, and 2011 – 2020. We examine differences in the means of main variables of interest for the first and fourth quartiles in institutional holdings. The difference in the means of all variables is significantly different from zero in the full sample. In the 1993 – 2000 subsample, analysts provide more optimistic recommendations for the stock with higher institutional ownership (4.048 vs. 3.872,

with the difference of 0.176, significant at the 1% level). However, the subsequent years show the reversed pattern, with the raw recommendation being less positive for the stocks with larger institutional holdings. An average raw recommendation for the stock with institutional holdings >= 0.835, top quartile (<= 0.318, bottom quartile) is 3.532 (3.579) in 2001 – 2010 and 3.525 (3.616) in 2011 – 2020, significant at the 1% level.

The table also documents that, on average, the percentage of recommendation upgrades (downgrades) are higher (lower) for the stocks with larger institutional holdings. This pattern holds for the 1993 – 2000 and 2001 – 2010 subperiods and reverses in the 2011 – 2020 subperiod. The same pattern is observed for the updates and revisions.

<Insert Table 2 here>

Figure 1 provides evidence of the non-monotonical analyst optimism during a calendar year, with more positive raw recommendations in May, June, and August and more negative in July and October. Revisions are also positive in May, June, and August for the stocks with the large institutional ownership and the most negative in October, November, and December.

<Insert Figure1 here>

Table 3 presents the descriptive statistics of the firm characteristics by the level of institutional holdings, top quartile versus bottom quartile, for the whole sample and subperiods of 1993 – 2000, 2001 – 2010, and 2011 – 2020. Most of firm characteristics significantly differ for the stock with large vs. small institutional ownership. We observe that the firms with larger institutional holdings are relatively larger in size, profitable, with better asset management (asset turnover is significantly larger), and more liquid (stock turnover is significantly higher). Firms with larger institutional holdings have significantly lower Tobin's Q and significantly higher

systematic risk, but significantly lower idiosyncratic risk. The latter indicates the lower level of private information driving the stock volatility.

<Insert Table 3 here>

Table 4 provides the difference-in-difference analysis of the main variables of interest: raw, recommendation, relative recommendations, revision, update, upgrade, and downgrade, in the months of the end of quarter versus the months of the beginning of quarter for the stock with large versus small institutional ownership. We observe significant differences in means of all variables between the end of quarter versus beginning of quarter for the large and small institutional holdings. The only exception is downgrades variable: there is no significant difference in downgrades for the stock with large institutional ownership in the beginning of quarter versus end of quarter. The difference between the end vs. beginning of quarter for the stock with large vs. small institutional holdings is significant for raw recommendations, revisions, and updates.

<Insert Table 4 here>

The results of the univariate analysis provide some support of the analysts timing their recommendations to be more optimistic around the time of fund managers' reporting on the performance. To control for confounding effects of firm, and analyst characteristics, we perform multivariate analysis in the next section.

4.2. Timing of analysts' recommendations – multivariate analysis

To examine whether the analysts time their optimistic recommendations for a stock with higher institutional ownership in the months of portfolio managers' reporting on their performance, we construct the end-of-quarter indicator equal to one if the recommendation is announced in March, June, September, and December and zero otherwise (End_qtr_t). Similarly, we construct the

beginning-of-quarter indicator equal to one if the recommendation is announced in January, April, July, and October and zero otherwise (*Begin_qtr*$_t$). The variables of interest are the interaction terms of these indicators with the institutional holdings for the prior quarter.

To test hypothesis 1 of whether brokerage analysts are more likely to provide coverage on seasoned stocks with larger holdings by institutional investors during the last month of a calendar quarter than other months we utilize the following logistic model, controlling for year fixed effects with robust standard errors:

$$Prob(Recommendation = 1 = f\left(\alpha + \beta_1 End_{qtr_t} + \beta_2 Begin_{qtr_t} + \beta_3 End_{qtr_t} * Insthold_{j,t-1} + \right.$$

$$\left.\beta_4 Begin_{qtr_t} * Insthold_{j,t-1} + \beta_5 InstHold_{j,t-1} + \theta X_{i,j,t-1} + \gamma_t + \varepsilon_{i,j,t}\right), \qquad (1)$$

where the dependent variable is a dummy equal to one if the recommendation on firm *j* occurs at time *t* and zero otherwise. Our variables of interest are the interaction terms of the end and beginning of quarter and institutional holdings in the prior quarter. $X_{i,j,t-1}$ are the firm-level characteristics, and γ_t are year-fixed effects. It is an empirical question whether, to reduce analysts' reputation damage coming from catering to their corporate clients, analysts become more optimistic around time of portfolio managers' reporting period and issue more recommendations overall and with more optimistic ones relative to all recommendations, or they become more silent and issue fewer negative recommendations, as well as fewer overall recommendations.

Table 5 reports results of the hypothesis 1 analysis. While the end of the quarter month (*end_qtr*) does not affect the likelihood of analysts' recommendations, the beginning of the quarter month (*begin_qtr*) has positive and highly significant association with the likelihood of analysts' recommendations for whole sample period and for 2011-2020. Additionally, in 2001-2010 period, *end-quarter* coefficient is negative and highly significant. This paints a picture that analysts are

more likely to become more silent before reporting period of firms and portfolio managers and reverse their action the following month. However, interaction terms of end-quarter and beginning-quarter with institutional holdings are both positive and significant for the whole sample period and subperiods of 1993-2000 and 2001-2010, with *begin_qtr_insthold* coefficient being larger than *end_qtr_insthold* coefficient. In 2011-2020, *begin_qtr_insthold* becomes negative. Institutional holdings are positively related to the likelihood of recommendations. The result indicates that with increase in institutional holdings, analysts release more recommendations in the end month of a quarter relative to the middle month, but the increase in recommendations is not as large as at the beginning of a quarter, which partially supports our timing of recommendations' hypothesis related to the tradeoff between catering to clients and keeping the reputation.

<Insert Table 5 here>

To test hypothesis 2 on strategic timing of analysts' recommendations for stocks held by institutional investors, we estimate the following baseline empirical model:

$$Y_{i,j,t} = \alpha + \beta_1 End\_qtr_t + \beta_2 Begin\_qtr_t + \beta_3 End\_qtr_t * Insthold_{j,t-1} + \beta_4 Begin\_qtr_t * Insthold_{j,t-1} + \beta_5 InstHold_{j,t-1} + \theta X_{i,j,t-1} + \delta Z_i + \varphi W_i + \gamma_t + \varepsilon_{i,j,t}, \quad (2)$$

where dependent variable $Y_{i,j,t}$ is the variables representing the analyst *i*'s stock recommendation on firm *j* at time *t*. We utilize several measures of the recommendations in the analysis: (1) raw recommendation, (2) relative recommendation, (3) revision, (4) update, (5) upgrade, and (6) downgrade. The variables of interest are the interaction terms of the end and beginning of quarter and institutional holdings in the prior quarter. $X_{i,j,t-1}$ are the firm-level characteristics, Z_i are brokerage house characteristics, W_i are analyst characteristics, and γ_t are year-fixed effects. In all regressions, the standard errors ($\varepsilon_{i,j,t}$) are robust.

To test Hypothesis 2, we perform the ordinary least squares (OLS) regression and several alternative estimation methods. When using a dependent variable of raw recommendations with the value range between 1 and 4, we use the ordered logit model. For a dependent variable of the relative recommendation, in addition to the OLS regression, we use the ordered logit model for the three-level choice variable of an analyst: issuing an investment rating that is below (-1), at (0), andabove (1) consensus. We also utilize a logit model for a dependent variable of relative recommendation, which equals to one for recommendation above consensus and zero otherwise. When testing the hypothesis for a revision, update, upgrade, and downgrade dependent variables, we use the OLS and the ordered logit models.

Next, we construct the dummy variables indicating institutional ownership of less or equal to 0.318 (the first quartile) and higher or equal to 0.835 (the fourth quartile) to examine the analyst optimism around the fund managers' reporting periods for the stock with small vs. large institutional ownership. The main variables of interest are the interaction terms or these dummies and end-of-quarter and beginning-of-quarter indicators. We estimate the following baseline empirical model:

$$Y_{i,j,t} = \alpha + \beta_1 End\_qtr_t + \beta_2 Begin\_qtr_t + \beta_3 End\_qtr_t * Insthold25_{j,t-1} + \beta_4 Begin_{qtr_t} *$$
$$Insthold25_{j,t-1} + \beta_5 End_{qtr_t} * Insthold75_{j,t-1} + \beta_6 Begin_{qtr_t} * Insthold75_{j,t-1} +$$
$$\beta_7 InstHold25_{j,t-1} + \beta_8 InstHold75_{j,t-1} + \theta X_{i,j,t-1} + \delta_i + \varphi_i + \gamma_t + \varepsilon_{i,j,t}, \quad (3)$$

where *Insthold25* is a dummy variable equal to one if institutional ownership is less or equal to 0.318 and zero otherwise. *Insthold75* is a dummy equal to one if institutional ownership is equal or higher than 0.835.

We assume that there is a nonlinear relation between the recommendations and the institutional ownership and add a squared institutional ownership ($Insthold2_{i,j,t-1}$) and the

interaction terms of $Insthold2_{i,j,t-1}$ with the end-of-quarter and begin-of-quarter indicators in model (2). We estimate the following empirical model:

$$Y_{i,j,t} = \alpha + \beta_1 End\_qtr_t + \beta_2 Begin\_qtr_t + \beta_3 End\_qtr_t * Insthold_{j,t-1} + \beta_4 Begin_{qtr_t} * Insthold_{j,t-1} + \beta_5 End_{qtr_t} * Insthold2_{j,t-1} + \beta_6 Begin_{qtr_t} * Insthold2_{j,t-1} + \beta_7 InstHold_{j,t-1} + \beta_8 InstHold2_{j,t-1} + \theta X_{i,j,t-1} + \delta_i + \varphi_i + \gamma_t + \varepsilon_{i,j,t}, \quad (4)$$

Table 6 reports results of analysts' recommendation timing strategies controlling for size of institutional ownership. Panel A contains models with dependent variables being raw (*Raw Rec*) and relative (*Rel Rec*) recommendations. Panel B contains models with dependent variables being recommendation revision indicator (*Revision*), revision continuous variable (*Revision cont*), and upgrade (*Upgrade*) and downgrade (*Downgrade*) of recommendations. Panels C and D contain models with the same dependent variables as Panels A and B, but with institutional holdings being proxied with indicator variables for top and bottom quartile, *Insthold75* and *Isthold25*, respectively (Panel C) and additional quadratic term for institutional holdings $Insthold^2$ (Panel D).

<Insert Table 6 here>

To test Hypotheses 3 and 4, we add to our model (2) explanatory variables of stock holdings by the type of institutional investors.

4.3. Market response to analysts' recommendations

If analysts issue biased estimates, then market may recognize that and have muted response to such recommendations. We examine market reaction to analyst recommendations upon report issuance measured with cumulative abnormal returns (CARs) for (-1, +1) days around the report release. We perform the analysis for the subsamples of the upgrades, reiterations, and downgrades examining whether the market recognizes the bias recommendations in the different periods around the fund managers' reporting. First, we conduct a difference-in-difference analysis of the

cumulative abnormal returns around the upgrades and downgrades to examine whether the market reaction around recommendations differs for the stock with institutional holdings of equal or less than 0.318 and equal or more than 0.835 and at the beginning and the end of the quarter. The results in Table 7 show that the market reacts significantly differently for the stocks with small and large institutional ownership and in the different parts of the quarter. The difference in market reaction on upgrades for the stock with large institutional holdings is 2.29% at the end of the quarter and 2.46% at the beginning of the quarter, with the difference of -0.169%, which is marginally significant (at 10% level). Market reaction to the downgrades for the stock with large institutional ownership is -2.894% at the end-of-quarter months and -3.924% at the begin-of-quarter months, with the difference of 1.017%, significant at a 1% level.

Generally, the market reacts more positively to the upgrades reported at the beginning of the quarter but less negatively to the downgrades reported at the end of the quarter, which may indicate that investors recognize biased recommendations at the end of a quarter with more muted response. The reaction on upgrades for the stock with a small institutional ownership (within the first quartile) is significantly higher than for large institutional ownership (2.877% vs. 2.459%) for recommendation reported at the beginning of the month, while lower and not significantly different (2.151% vs. 2.290%) at the end of the quarter. The market reaction on downgrades for the stock with small versus large institutional ownership show similar direction – at the beginning of the quarter, the reaction is less negative (-3.585% vs. -3.924%, significant at a 1% level), while is more negative at the end of the quarter (-3.572% vs. -2.894%).

<Insert Table 7 here>

The difference-in-difference analysis does not account for the characteristics of the firm, as well as analyst characteristics. Therefore, next, we perform the analysis using the following OLS model, controlling for year fixed effects with robust standard errors:

$$CAR_{i,j,t} = \alpha + \beta_1 End\_qtr_t + \beta_2 Begin\_qtr_t + \beta_3 End\_qtr_t * Insthold_{j,t-1} + \beta_4 Begin_{qtr_t} *$$

$$Insthold_{j,t-1} + \beta_5 InstHold_{j,t-1} + \theta X_{i,j,t-1} + \delta Z_i + \varphi W_i + \gamma_t + \varepsilon_{i,j,t}, \quad (5)$$

where $CAR_{i,j,t}$ is CAR(-1, + 1) around the upgrades or downgrades. Table 8 Panel A provides the results for the market reaction around upgrades and downgrades using model (5). In Panel B of Table 8, we replace the continuous variable for institutional ownership with two dummies for the small and large institutional holdings and the interaction terms with end-of-quarter and beginning-of-quarter months (as in model (3) above). The results indicate that market response to analysts' upgrades and downgrades are lower for all stocks at the end of quarter, but significantly higher for stocks with high institutional holdings.

<Insert Table 8 here>

5. Conclusions

Using a sample of analysts' recommendations on U.S. firms, we document a pattern in analysts' recommendations and updates that are more optimistic in a month of the end of a quarter and less optimistic in a month of the beginning of a quarter. However, we do not find clear pattern of recommendations' timing tied to the size of institutional holdings in the stock.

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Figure 1 Monthly analysts' recommendations and revisions by top and bottom quartile of institutional holdings

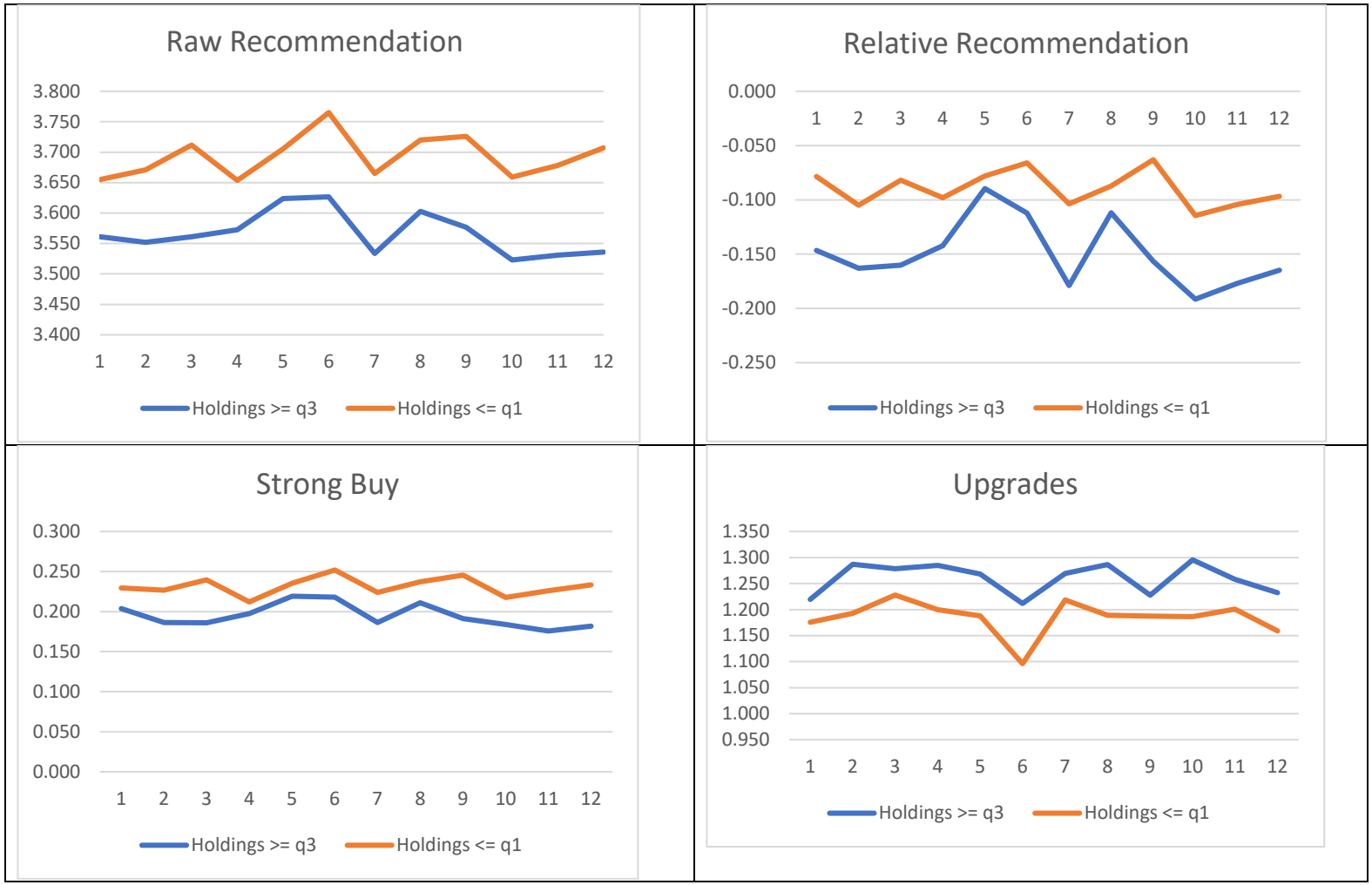

Figure 1 Cont'd

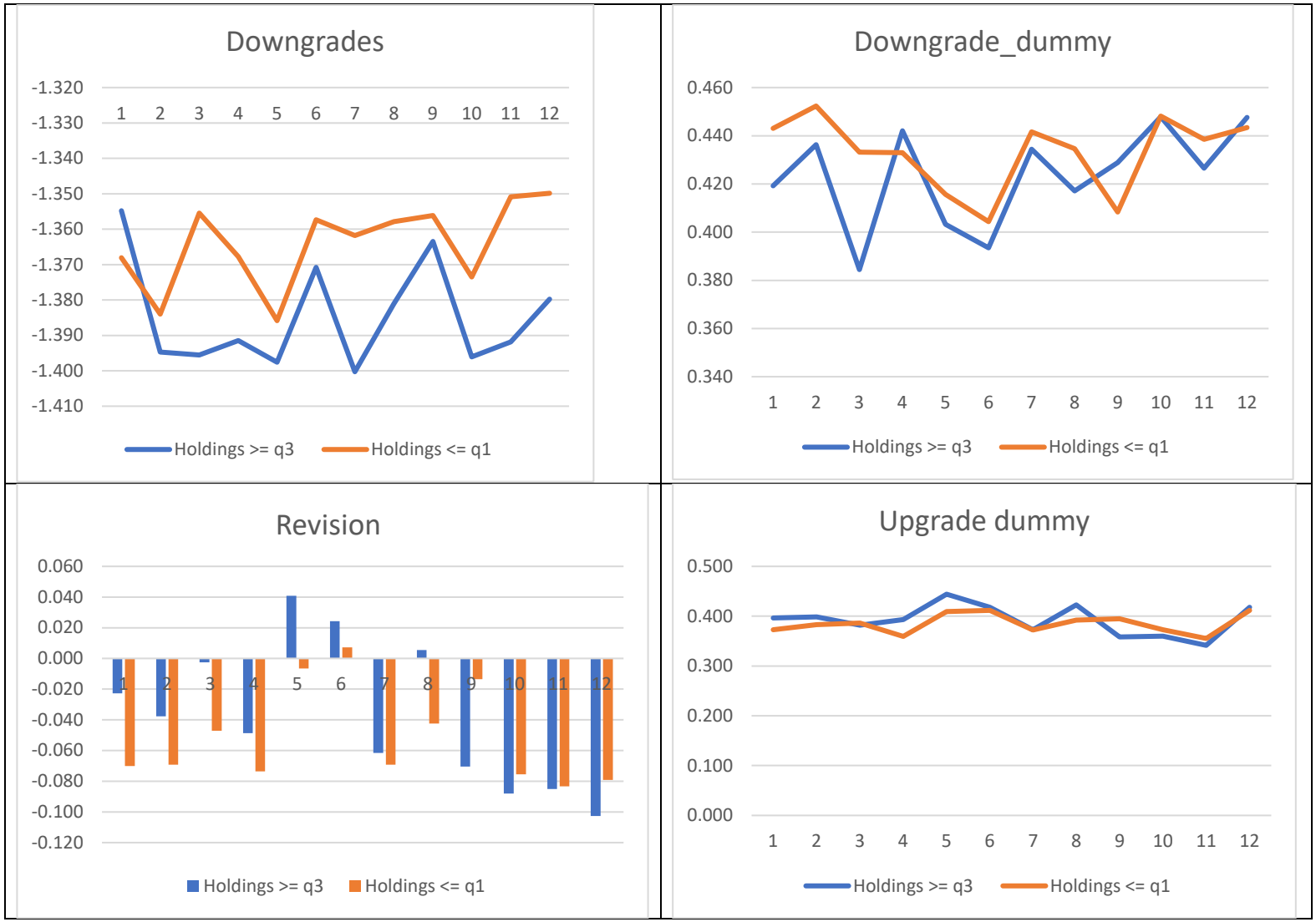

Table 1. Summary Statistics

The table reports descriptive statistics of the sample by analyst recommendations (Panel A), firm characteristics (Panel B) and brokerage house and analyst characteristics (Panel C).

Panel A. Analyst Recommendations

Variable	N	Mean	Median	Std.dev	Q1	Q3
Raw recommendation	763,146	3.647	4	0.954	3	4
Strong Buy and Buy, %	763,146	52.465%	1	0.499	0	1
Underperform and Sell, %	763,146	7.643%	0	0.266	0	0
Relative Recommendation	747,913	-0.108	-0.110	0.877	-0.690	0.500
Relative Recommendation ordinal	747,913	-0.135	-1	0.946	-1	1.000
Relative Recommendation dummy	747,913	0.389	0	0.487	0	1
Update	487,194	-0.116	0	1.287	-1	1
Upgrade	189,268	1.211	1	0.654	1	2
Downgrade	208,769	-1.368	-1	0.553	-2	-1
Upgrade dummy	487,194	38.849%	0	0.487	0	1
Upgrade to Strong Buy dummy	487,194	19.508%	0	0.396	0	0
Downgrade dummy	487,194	42.851%	0	0.495	0	1
Revision	487,194	-0.040	0	0.903	-1	1

Panel B. Firm Characteristics

Variable	N	Mean	Median	Std.dev	Q1	Q3
Size	548,147	14.369	14.319	2.053	12.881	15.765
Market Capitalization	559,388	14.347	14.276	1.865	13.014	15.619
Tobin's Q	533,116	2.183	1.578	1.712	1.117	2.518
Profitability	547,594	0.001	0.009	0.049	0.000	0.022
Asset Turnover	546,098	0.229	0.185	0.193	0.090	0.312
Leverage	533,504	0.719	0.339	1.314	0.025	0.793
Stock Turnover	559,440	12.689	8.449	13.187	4.438	15.790
Institutional holdings	761,122	0.567	0.629	0.318	0.318	0.835
Change in institutional holdings	761,122	0.010	0.013	0.176	0.000	0.056
# of analysts covering the stock in a year	763,146	12.509	10	10.083	5	17
Beta	536,025	1.124	1.062	0.579	0.739	1.434
Idiosyncratic Risk	536,025	0.027	0.023	0.016	0.016	0.034
Total Volatility	536,025	0.031	0.026	0.017	0.019	0.038
Excess Return	535,815	0.000	0.000	0.008	-0.003	0.003
Forecast error	690,414	-0.227	0.024	3.583	-0.080	0.169
Financial firms, %	559,904	14.61%	0.00%	35.32%	0.00%	0.00%
Utility firms, %	559,904	3.64%	0.00%	18.73%	0.00%	0.00%

Panel C. Brokerage House and Analyst Characteristics

Variable	N	Mean	Median	Std.dev	Q1	Q3
Brokerage Size	763,146	546.822	378.000	536.128	151.000	773.000
Brokerage Busyness	763,146	0.159	0.096	0.173	0.071	0.147
Analyst busyness	763,146	6.187	3.000	21.875	1.000	6.000
Analyst Concentration	763,146	5.614	2.000	18.613	1.000	5.000
Seniority	763,146	22.222	16.233	21.182	6.067	32.467

Table 2. Univariate Analysis on Institutional Holdings and Analyst Recommendations

The table reports descriptive statistics of analysts' recommendations for the whole sample and for 1993-2000, 2001-2010, and 2011-2020 subperiods. Columns (1) and (5) report statistics for subsample of firms with institutional holdings in the bottom quartile, columns (2) and (6) report statistics for subsample of firms with institutional holdings in the top quartile. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	Inst.Hold <= 0.318	Inst.Hold >= 0.835	Diff (2)-(1)	t-stat.	Inst.Hold <= 0.318	Inst.Hold >= 0.835	Diff (6)-(5)	t-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Recommendations	Full Sample: 1993 - 2020				1993 - 2000			
5: Strong Buy	23.122%	19.429%	-3.693%	-28.0360***	30.186%	34.707%	4.520%	10.0042***
4: Buy	33.035%	28.131%	-4.904%	-33.1005***	34.648%	37.774%	3.126%	6.6933***
3: Hold	36.080%	43.961%	7.881%	50.2228***	29.983%	25.806%	-4.177%	-9.3762***
2-1: Underperform and Sell	7.763%	8.479%	0.717%	8.1706***	5.182%	1.713%	-3.469%	-16.8308***
Average Raw recommendation	3.692	3.564	-0.129	-41.9785***	3.872	4.048	0.176	19.0336***
Relative Recommendation	-0.090	-0.152	-0.062	-21.7563***	-0.057	-0.085	-0.027	-3.3322***
Relative Recommendation (original)	-0.106	-0.191	-0.085	-28.0458***	-0.055	-0.069	-0.014	-1.6022
Relative Recommendation (dummy)	36.158%	38.297%	2.139%	13.5381***	0.371	0.438	6.702%	14.0209***
Update	-0.141	-0.103	0.038	7.1000***	-0.177	-0.071	0.106	6.4286***
Upgrade	1.186	1.261	0.075	17.2372***	1.134	1.019	-0.115	-8.7551***
Downgrade	-1.364	-1.385	-0.020	- 5.7733***	-1.382	-1.288	0.094	8.2666***
Upgrade dummy	38.028%	38.468%	0.441%	2.2003**	40.209%	46.252%	6.043%	9.65***
Upgrade to Strong Buy dummy	18.507%	18.078%	-0.429%	- 2.6923***	24.753%	33.210%	8.458%	15.1255***
Downgrade dummy	43.352%	42.447%	-0.905%	-4.4369***	45.817%	42.129%	-3.689%	-5.8249***
Revision	-0.053	-0.040	0.013	3.6298***	-0.056	0.041	0.097	8.2341***
# of Recommendations	205,100	182,889			70,333	12,257		
# of reports upgrading to Strong Buy	107,701	129,876			32,970	7,591		
# of Analysts	15,506	9,822			5,980	2,792		
# of Brokerage firms	1,036	737			380	217		
# of Covered firms	19,578	4,949			9,545	1,258		
Recommendations	2001-2010				2011-2020			
5: Strong Buy	21.140%	20.432%	-0.709%	-3.3616***	17.946%	16.000%	-1.945%	-10.1266***
4: Buy	28.476%	25.094%	-3.383%	-14.75***	35.442%	30.041%	-5.402%	-22.5218***
3: Hold	40.333%	44.761%	4.428%	17.2159***	38.325%	45.824%	7.499%	29.6972***
2-1: Underperform and Sell	10.050%	9.714%	-0.336%	-2.1708**	8.287%	8.135%	-0.152%	-1.0775
Average Raw recommendation	3.579	3.532	-0.047	-9.1063***	3.616	3.525	-0.091	-19.718***
Relative Recommendation	-0.096	-0.141	-0.045	-9.2354***	-0.117	-0.175	-0.058	-13.1178***
Relative Recommendation (original)	-0.114	-0.178	-0.064	-12.9061***	-0.148	-0.224	-0.077	-15.6006***
Relative Recommendation (dummy)	0.350	0.389	3.920%	15.2976***	0.362	0.368	0.529%	2.1037**
Update	-0.159	-0.101	0.058	6.6097***	-0.094	-0.109	-0.015	-1.8438*
Upgrade	1.195	1.286	0.090	12.3045***	1.223	1.271	0.048	7.4323***
Downgrade	-1.382	-1.425	-0.043	7.4037***	-1.333	-1.352	-0.020	3.7411***
Upgrade dummy	36.368%	39.155%	2.788%	8.6641***	37.684%	36.668%	-1.016%	-3.2208***
Upgrade to Strong Buy dummy	17.632%	19.524%	1.892%	7.3010***	14.081%	14.455%	0.375%	1.6384
Downgrade dummy	42.942%	42.398%	-0.545%	-1.6623*	41.661%	42.544%	0.883%	2.7376***
Revision	-0.066	-0.032	0.033	5.6042***	-0.040	-0.059	-0.019	-3.2713***
# of Recommendations	62,856	89,772			71,911	80,860		
# of reports upgrading to Strong Buy	35,152	64,742			39,579	57,543		
# of Analysts	7,743	7,597			7,043	4,950		
# of Brokerage firms	587	478			565	401		
# of Covered firms	7,597	2,805			7,759	2,871		

Table 3. Firm Characteristics and Institutional Holdings

The table reports descriptive statistics of control variables for the whole sample and for 1993-2000, 2001-2010, and 2011-2020 subperiods. Columns (1) and (5) report statistics for subsample of firms with institutional holdings in the bottom quartile, columns (2) and (6) report statistics for subsample of firms with institutional holdings in the top quartile. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	Inst.Hold <= 0.318	Inst.Hold >= 0.835	Diff (2)-(1)	t-stat.	Inst.Hold <= 0.318	Inst.Hold >= 0.835	Diff (6)-(5)	t-stat.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Characteristics			Full Sample				1993 - 2000	
Size	13.251	14.605	1.354	1.9e+02***	12.534	13.929	1.396	69.9139***
Market Cap	13.213	14.703	1.490	2.3e+02***	12.613	14.192	1.579	93.2049***
Tobin's Q	2.400	2.158	-0.242	-32.3977***	2.584	2.622	0.038	1.4867
Profitability	-0.018	0.008	0.026	1.2e+02***	-0.012	0.015	0.027	41.4323***
Asset Turnover	0.206	0.247	0.042	52.0161***	0.249	0.301	0.053	21.6771***
Leverage	0.737	0.751	0.014	2.3740**	0.612	0.589	-0.024	-1.7541*
Stock Turnover	10.597	17.012	6.415	1.2e+02***	8.703	13.035	4.332	33.2886***
Beta	0.977	1.219	0.242	1.0e+02***	0.843	1.105	0.262	34.996***
Idiosyncratic Risk	0.036	0.023	-0.013	-186.6069***	0.038	0.029	-0.008	- 40.0502***
Total Volatility	0.039	0.027	-0.012	-161.1140***	0.039	0.031	-0.008	- 34.7122***
Excess Return	0.0005	-0.0002	-0.0007	-18.5960***	0.0001	-0.0007	-0.0008	-6.9232***
Financial firms, %	18.423%	9.239%	-9.183%	-68.9407***	17.471%	12.613%	-4.859%	-11.9665***
Utility firms, %	3.825%	1.584%	-2.241%	-36.0263***	5.311%	0.727%	-4.585%	-20.4293***
Firm Characteristics			2001 - 2010				2011-2020	
Size	13.055	14.340	1.285	1.1e+02***	14.348	14.995	0.647	53.5734***
Market Cap	12.846	14.432	1.586	1.7e+02***	14.282	15.077	0.795	74.4962***
Tobin's Q	2.145	2.056	-0.090	-8.1615***	2.352	2.202	-0.150	-12.1676***
Profitability	-0.022	0.009	0.031	85.3966***	-0.023	0.006	0.029	82.8560***
Asset Turnover	0.177	0.260	0.083	58.7211***	0.173	0.226	0.053	43.5912***
Leverage	0.672	0.669	-0.003	-0.3333	0.960	0.866	-0.094	- 8.7780***
Stock Turnover	8.342	18.410	10.069	1.0e+02***	14.831	16.069	1.238	12.8446***
Beta	1.008	1.239	0.230	51.9893***	1.129	1.215	0.085	27.4991***
Idiosyncratic Risk	0.039	0.026	-0.014	-112.9474***	0.032	0.020	-0.012	-115.1473***
Total Volatility	0.042	0.030	-0.012	-87.6752	0.037	0.023	-0.014	-128.7281***
Excess Return	0.0012	-0.0002	-0.0014	-20.3138***	0.0003	-0.0002	-0.0006	-9.8516***
Financial firms, %	27.117%	8.663%	-18.455%	-78.1356***	12.788%	9.368%	-3.420%	- 16.8111***
Utility firms, %	1.882%	1.097%	-0.784%	- 9.7202***	3.429%	2.247%	-1.181%	-11.0991***

Table 4. The Difference-in-Difference Analysis of Analysts' Recommendations

The table reports difference-in-difference analysis of analysts' recommendations and updates by month of quarter beginning and end and by high and low institutional holdings. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	Raw Recommendation					Relative Recommendation			
	Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)		Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)
Begin_QTR	3.658	3.547	-0.111	-21.9294***	Begin_QTR	-0.099	-0.166	-0.067	-13.9048***
End_QTR	3.727	3.574	-0.153	-28.0648***	End_QTR	-0.077	-0.149	-0.072	- 14.4213***
Diff (End_QTR - Begin_QTR)	0.069	0.027	-0.042	-5.57***	Diff (End_QTR - Begin_QTR)	0.021	0.016	-0.005	-0.74
t-stat(sign)	13.2880***	5.1051***			t-stat(sign)	4.4711***	3.1845***		
	Revision					Update			
	Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)		Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)
Begin_QTR	-0.072	-0.055	0.017	2.8891***	Begin_QTR	-0.163	-0.122	0.041	4.7443***
End_QTR	-0.033	-0.038	-0.004	-0.6444	End_QTR	-0.118	-0.104	0.014	1.435
Diff (End_QTR - Begin_QTR)	0.039	0.017	-0.022	-2.39**	Diff (End_QTR - Begin_QTR)	0.045	0.018	-0.027	-2.08**
t-stat(sign)	5.7779***	2.8134***			t-stat(sign)	4.6878***	2.0196**		
	Upgrade					Downgrade			
	Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)		Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)
Begin_QTR	1.195	1.264	0.069	9.8214***	Begin_QTR	-1.368	-1.384	-0.016	-2.9142***
End_QTR	1.168	1.239	0.071	8.5885***	End_QTR	-1.355	-1.377	-0.023	-3.4690***
Diff (End_QTR - Begin_QTR)	-0.027	-0.025	0.002	0.19	Diff (End_QTR - Begin_QTR)	0.013	0.007	-0.006	-0.74
t-stat(sign)	-3.2722***	-3.5482***			t-stat(sign)	2.0241**	1.2103		

Table 5. Likelihood of analysts' recommendations around quarter end

The table reports the results of logit regression of analyst recommendation occurrence as the dependent variable on the month of a quarter being either the last month (*end_quarter*) or the first month (*begin_quarter*) and their interaction terms with institutional holdings of the stock in the prior quarter (*insthold*). All other control variables are defined in section 2. All regressions control for year fixed effects with robust standard errors. t-stats are reported below coefficients. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	Full Sample	1993 - 2000	2001 - 2010	2011 - 2020
end_quarter	-0.010	-0.009	-0.054***	0.015
	(-1.058)	(-0.599)	(-3.352)	(0.729)
begin_quarter	0.096***	-0.001	0.175***	0.190***
	(10.176)	(-0.095)	(11.085)	(9.463)
end_qtr_insthold	0.030*	0.114***	0.118***	-0.066**
	(1.861)	(3.272)	(4.485)	(-2.261)
begin_qtr_insthold	0.209***	0.188***	0.215***	0.068**
	(13.233)	(5.444)	(8.342)	(2.397)
insthold_lag	0.205***	0.100***	0.236***	0.197***
	(16.571)	(3.743)	(12.029)	(8.765)
change_lag	0.354***	1.480***	0.351***	0.135***
	(16.686)	(17.524)	(13.331)	(3.293)
marketcap_lag	0.499***	0.517***	0.510***	0.484***
	(289.765)	(159.032)	(179.594)	(160.958)
leverage_lag	0.000	0.010***	-0.008***	0.003
	(0.080)	(2.744)	(-2.627)	(1.086)
roa_lag	-0.818***	-0.118	-0.617***	-1.456***
	(-16.693)	(-1.292)	(-7.940)	(-16.179)
tobin_lag	-0.024***	-0.060***	0.019***	-0.018***
	(-14.974)	(-21.423)	(6.524)	(-6.635)
assetturn_lag	0.113***	0.296***	-0.061***	0.110***
	(9.246)	(14.775)	(-2.999)	(4.570)
turnover_lag	0.032***	0.032***	0.031***	0.032***
	(106.952)	(51.121)	(63.144)	(62.812)
mean_beta	0.251***	0.210***	0.308***	0.222***
	(54.963)	(24.484)	(43.873)	(23.766)
mean_ivol	0.811***	0.018	0.745***	2.454***
	(5.010)	(0.059)	(3.020)	(7.988)
mean_exret	2.511***	1.204**	3.063***	3.408***
	(7.139)	(2.067)	(5.519)	(4.613)
Intercept	-9.146***	-9.280***	-8.479***	-8.122***
	(-288.542)	(-185.020)	(-194.321)	(-174.323)
Observations	1218425	416842	442206	359377
Wald Chi2	189725.22	59574.25	79622.56	48446.61

Table 6. Cross-sectional analysis of analysts' recommendations and revisions by month of a quarter

The table reports the results of regression models with different measures of analyst recommendation or revisions as the dependent variable on the month of a quarter being either the last month (*end_quarter*) or the first month (*begin_quarter*) and their interaction terms with institutional holdings of the stock in the prior quarter (*insthold*). Panel A contains models with dependent variables being raw (*Raw Rec*) and relative (*Rel Rec*) recommendations. Panel B contains models with dependent variables recommendation revision indicator (Revision), revision continuous variable (*Revision cont*), and upgrade (*Upgrade*) and downgrade (*Downgrade*) of recommendations. Panels C and D contain models with the same dependent variables as Panels A and B, but with institutional holdings being proxied with indicator variables for top and bottom quartile (Panel C) and additional quadratic term for institutional holdings (Panel D). All other control variables are defined in section 2. All regressions control for year fixed effects with robust standard errors. t-stats are reported below coefficients. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A	Raw Rec OLS	Raw Rec ologit	Rel Rec OLS	Rel Rec ordinal ologit	Rel Rec logit
	(1)	(2)	(3)	(4)	(5)
end_quarter	0.003	0.004	-0.003	0.008	0.040**
	(0.313)	(0.215)	(-0.385)	(0.506)	(2.072)
begin_quarter	-0.015*	-0.034**	0.014*	0.025	0.066***
	(-1.932)	(-2.085)	(1.843)	(1.561)	(3.569)
begin_qtr_insthold	-0.013	-0.032	-0.046***	-0.090***	-0.125***
	(-1.174)	(-1.372)	(-4.264)	(-3.759)	(-4.732)
end_qtr_insthold	-0.016	-0.034	-0.016	-0.050**	-0.083***
	(-1.386)	(-1.432)	(-1.407)	(-2.028)	(-3.019)
insthold_lag	0.115***	0.237***	-0.039***	-0.072***	0.124***
	(12.613)	(12.897)	(-4.511)	(-3.780)	(5.883)
change_lag	0.205***	0.426***	0.028***	0.119***	0.130***
	(20.027)	(20.250)	(2.877)	(5.335)	(5.662)
analysts_per_stock	-0.079***	-0.156***	-0.003	-0.029***	0.114***
	(-34.198)	(-33.183)	(-1.483)	(-6.173)	(21.471)
marketcap_lag	0.010***	0.027***	0.007***	0.021***	0.037***
	(8.966)	(11.723)	(6.553)	(8.527)	(14.163)
leverage_lag	-0.001	0.000	0.001	0.003	0.005**
	(-0.944)	(0.171)	(1.041)	(1.140)	(2.294)
roa_lag	0.424***	0.778***	-0.012	0.178**	0.089
	(12.318)	(11.251)	(-0.361)	(2.472)	(1.098)
tobin_lag	0.045***	0.092***	-0.012***	-0.011***	-0.014***
	(52.611)	(53.754)	(-15.532)	(-6.076)	(-6.834)
assetturn_lag	0.015**	0.028*	-0.008	-0.019	-0.010
	(2.077)	(1.837)	(-1.172)	(-1.182)	(-0.598)
turnover_lag	-0.002***	-0.005***	-0.000	-0.000	-0.001**
	(-15.841)	(-15.515)	(-1.007)	(-1.194)	(-2.485)
mean_beta	0.023***	0.037***	0.005**	-0.003	0.046***
	(8.071)	(6.601)	(2.005)	(-0.558)	(7.133)
mean_ivol	0.695***	2.260***	-0.691***	-0.430	-2.650***
	(4.486)	(7.919)	(-4.817)	(-1.487)	(-7.497)
mean_exret	15.470***	33.939***	13.284***	29.312***	30.189***
	(55.300)	(92.638)	(55.516)	(71.834)	(69.314)
broker_size	-0.062***	-0.144***	-0.043***	-0.104***	-0.098***
	(-48.300)	(-55.386)	(-35.320)	(-39.234)	(-35.271)
std_broker_busyness	0.012***	0.030***	0.015***	0.025***	0.023***
	(6.670)	(8.538)	(9.403)	(6.706)	(5.709)
busyness	-0.019*	-0.020	-0.082***	-0.133***	-0.141***
	(-1.671)	(-0.888)	(-7.809)	(-5.531)	(-5.617)
concentration	-0.056***	-0.128***	0.029***	0.026	0.022
	(-4.881)	(-5.508)	(2.637)	(1.056)	(0.835)
senior	-0.007***	-0.013***	0.006***	0.006**	0.008***
	(-5.258)	(-4.968)	(5.067)	(2.033)	(2.689)
frcsterr_cons	0.008***	0.015***	0.003***	0.005***	0.008***
	(15.396)	(15.186)	(6.108)	(5.762)	(7.194)
Observations	499322	499322	497080	497080	497080
Adjusted R^2	0.0721		0.0255		
Wald chi2		37570.64		10948.82	10571.66

Table 6 cont'd

Panel B	Revision OLS	Revision ologit	Revision cont OLS	Revision cont ologit	Upgrade OLS	Upgrade ologit	Downgrade OLS	Downgrade ologit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
end_quarter	0.003	0.002	.0004386	-.001	-0.002	-0.026	-0.016	-0.060
	(0.249)	(0.102)	(0.03)	(-0.06)	(-0.207)	(-0.672)	(-1.625)	(-1.537)
begin_quarter	-0.014	-0.038*	-.0181492	-.031	0.024**	0.083**	-0.013	-0.070*
	(-1.367)	(-1.736)	(-1.30)	(-1.60)	(2.136)	(2.274)	(-1.430)	(-1.904)
begin_qtr_insthold	-0.016	-0.023	-.0232935	-.030	0.005	0.017	0.007	0.040
	(-1.166)	(-0.762)	(-1.19)	(-1.08)	(0.311)	(0.333)	(0.571)	(0.798)
end_qtr_insthold	-0.032**	-0.062*	-.0438618**	-.060**	-0.009	-0.026	0.015	0.072
	(-2.169)	(-1.946)	(-2.10)	(-2.06)	(-0.565)	(-0.478)	(1.129)	(1.313)
insthold_lag	0.038***	0.082***	.0341884**	.051**	0.003	0.024	-0.027***	-0.122***
	(3.395)	(3.417)	(2.16)	(2.32)	(0.230)	(0.615)	(-2.693)	(-3.025)
change_lag	0.116***	0.239***	.1234793***	.177***	-0.040***	-0.122***	-0.004	-0.030
	(9.903)	(9.616)	(7.10)	(7.03)	(-3.122)	(-2.937)	(-0.380)	(-0.724)
analysts_per_stock	-0.009***	-0.023***	.0004449	-.005522	0.054***	0.165***	-0.013***	-0.046***
	(-3.303)	(-3.865)	(0.11)	(-0.96)	(16.888)	(15.535)	(-5.149)	(-4.462)
marketcap_lag	0.020***	0.045***	.0253563***	.039***	-0.009***	-0.031***	0.005***	0.021***
	(13.882)	(15.226)	(12.47)	(14.19)	(-5.870)	(-6.155)	(3.840)	(4.132)
leverage_lag	0.005***	0.011***	.0063374***	.009***	-0.001	-0.004	0.002	0.008
	(4.097)	(4.176)	(3.67)	(3.54)	(-0.637)	(-0.928)	(1.373)	(1.636)
roa_lag	0.214***	0.487***	.3153269***	.353***	0.157***	0.480***	0.059	0.130
	(5.134)	(5.190)	(5.40)	(4.37)	(3.025)	(2.783)	(1.490)	(0.841)
tobin_lag	0.009***	0.018***	.0039351***	.005**	-0.016***	-0.052***	0.004***	0.017***
	(7.916)	(7.508)	(2.65)	(2.55)	(-13.870)	(-13.377)	(4.344)	(4.308)
assetturn_lag	0.025***	0.052***	.0331028***	.043**	0.099***	0.347***	-0.095***	-0.393***
	(2.897)	(2.746)	(2.64)	(2.39)	(10.225)	(11.004)	(-11.793)	(-12.497)
turnover_lag	-0.001***	-0.002***	-.0012461 ***	-.002***	-0.001***	-0.003***	0.000***	0.002***
	(-5.161)	(-5.487)	(-4.81)	(-5.60)	(-3.107)	(-4.446)	(2.825)	(3.176)
mean_beta	0.015***	0.031***	.0325887***	.044***	0.017***	0.061***	0.008**	0.019
	(4.325)	(4.211)	(6.66)	(6.52)	(4.495)	(4.855)	(2.449)	(1.519)
mean_ivol	-0.700***	-1.173***	-1.445555***	-1.340***	-1.540***	-5.441***	-0.403**	-0.604
	(-3.213)	(-2.939)	(-4.80)	(-3.82)	(-7.732)	(-8.197)	(-2.298)	(-0.867)
mean_exret	20.630***	51.353***	28.15358***	42.621***	2.531***	8.108***	1.817***	7.404***
	(52.131)	(93.087)	(50.79)	(96.50)	(10.905)	(10.653)	(9.876)	(10.228)
broker_size	-0.004***	-0.006**	.00536**	.0126***	-0.056***	-0.196***	0.056***	0.231***
	(-2.687)	(-2.015)	(2.54)	(4.22)	(-32.630)	(-34.619)	(39.443)	(41.680)
std_broker_busyness	0.008***	0.022***	-.0022926	.008**	-0.181***	-0.655***	0.077***	0.366***
	(4.798)	(6.789)	(-0.93)	(2.44)	(-53.639)	(-57.798)	(31.668)	(30.487)
busyness	-0.048***	-0.095***	-.0659403***	-.092***	-0.022	-0.083*	0.008	0.061
	(-3.676)	(-3.412)	(-3.61)	(-3.64)	(-1.441)	(-1.672)	(0.714)	(1.280)
concentration	0.031**	0.065**	.0408591**	.063**	0.020	0.083	-0.032***	-0.146***
	(2.341)	(2.279)	(2.17)	(2.43)	(1.269)	(1.615)	(-2.655)	(-2.955)
senior	-0.007***	-0.014***	-.013502***	-.019***	-0.004*	-0.012	-0.011***	-0.048***
	(-3.192)	(-3.015)	(-4.56)	(-4.53)	(-1.655)	(-1.622)	(-5.853)	(-6.314)
frcsterr_cons	0.005***	0.012***	.0069901***	.010***	-0.002***	-0.007***	0.001**	0.004**
	(9.938)	(9.683)	(8.81)	(9.18)	(-3.010)	(-3.228)	(2.193)	(2.268)
Observations	334583	334583	334583	334583	131248	131248	142566	142566
Adjusted R^2	0.0438		0.0412		0.0838		0.0362	
Wald chi2		11694.89		13012.49		10765.06		5428.7

Table 6 cont'd

Panel C	Raw Rec OLS	Raw Rec ologit	Rel Rec OLS	Rel Rec ordinal ologit	Rel Rec logit	Revision OLS	Revision ologit	Revision cont OLS	Revision cont ologit	Upgrade OLS	Upgrade ologit	Downgrade OLS	Downgrade ologit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
end_quarter	-0.016***	-0.035***	-0.020***	-0.037***	-0.028***	-0.026***	-0.054***	-0.038***	-0.055***	-0.007	-0.039**	-0.010**	-0.034*
	(-3.606)	(-3.927)	(-4.720)	(-3.866)	(-2.868)	(-4.902)	(-4.845)	(-5.152)	(-5.304)	(-1.141)	(-2.006)	(-2.031)	(-1.750)
begin_quarter	-0.022***	-0.052***	-0.014***	-0.026***	-0.015	-0.019***	-0.041***	-0.029***	-0.044***	0.023***	0.083***	-0.010**	-0.054***
	(-5.336)	(-6.051)	(-3.493)	(-2.875)	(-1.538)	(-3.825)	(-3.845)	(-4.168)	(-4.432)	(4.333)	(4.655)	(-2.288)	(-2.970)
end_qtr25	0.034***	0.068***	0.028***	0.056***	0.087***	0.042***	0.088***	0.060***	0.084***	0.005	0.020	0.002	0.020
	(3.577)	(3.634)	(3.230)	(2.981)	(3.924)	(3.495)	(3.336)	(3.537)	(3.561)	(0.351)	(0.437)	(0.170)	(0.435)
begin_qtr25	0.002	0.011	0.018**	0.026	0.061***	-0.005	-0.019	0.002	-0.002	0.008	0.028	-0.002	-0.012
	(0.233)	(0.609)	(2.086)	(1.445)	(2.805)	(-0.423)	(-0.744)	(0.131)	(-0.096)	(0.601)	(0.658)	(-0.165)	(-0.287)
end_qtr75	0.010	0.022	0.008	0.016	0.008	0.006	0.016	0.007	0.011	-0.009	-0.023	0.013	0.060*
	(1.359)	(1.439)	(1.144)	(0.946)	(0.462)	(0.680)	(0.849)	(0.546)	(0.645)	(-0.878)	(-0.731)	(1.581)	(1.859)
begin_qtr75	-0.007	-0.014	-0.016**	-0.035**	-0.030*	-0.016*	-0.030*	-0.015	-0.024	0.008	0.024	0.008	0.039
	(-0.976)	(-0.969)	(-2.353)	(-2.182)	(-1.855)	(-1.897)	(-1.733)	(-1.306)	(-1.393)	(0.894)	(0.852)	(1.026)	(1.314)
insthold_25	-0.053***	-0.108***	-0.016**	-0.025*	-0.158***	-0.034***	-0.072***	-0.041***	-0.057***	-0.019*	-0.080**	0.020**	0.085***
	(-7.702)	(-7.784)	(-2.535)	(-1.822)	(-9.632)	(-3.832)	(-3.715)	(-3.280)	(-3.306)	(-1.932)	(-2.440)	(2.486)	(2.593)
insthold_75	0.026***	0.057***	-0.032***	-0.064***	-0.033***	0.003	0.008	-0.002	-0.001	-0.004	-0.013	-0.008	-0.036
	(4.814)	(5.104)	(-6.122)	(-5.285)	(-2.653)	(0.457)	(0.573)	(-0.218)	(-0.088)	(-0.598)	(-0.599)	(-1.361)	(-1.566)
Controls	X	X	X	X	X	X	X	X	X	X	X	X	X
Observations	499322	499322	497080	497080	497080	334583	334583	334583	334583	131248	131248	142566	142566
Adjusted R^2	0.0719		0.0256			0.0438		0.0412		0.0838		0.0362	
Wald chi2		37515.75		10942.41	10699.06		11724.05		13038.91		10807.96		5450.26

Panel D	Raw Rec OLS	Raw Rec ologit	Rel Rec OLS	Rel Rec ordinal ologit	Rel Rec logit	Revision OLS	Revision ologit	Revision cont OLS	Revision cont ologit	Upgrade OLS	Upgrade ologit	Downgrade OLS	Downgrade ologit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
end_quarter	0.051***	0.100***	0.035***	0.090***	0.123***	0.061***	0.126***	0.077***	0.108***	-0.011	-0.042	0.001	0.019
	(4.233)	(4.158)	(3.135)	(3.707)	(4.239)	(3.824)	(3.662)	(3.477)	(3.508)	(-0.646)	(-0.735)	(0.045)	(0.316)
begin_quarter	-0.008	-0.017	0.009	0.024	0.085***	-0.020	-0.056*	-0.015	-0.032	0.036**	0.123**	-0.004	-0.029
	(-0.720)	(-0.711)	(0.847)	(0.998)	(3.038)	(-1.330)	(-1.758)	(-0.720)	(-1.127)	(2.206)	(2.319)	(-0.299)	(-0.530)
Beginqtr insthold	-0.048	-0.113	-0.028	-0.091	-0.226**	0.010	0.064	-0.043	-0.029	-0.054	-0.182	-0.035	-0.150
	(-1.070)	(-1.260)	(-0.667)	(-0.964)	(-2.159)	(0.191)	(0.542)	(-0.563)	(-0.265)	(-0.918)	(-0.940)	(-0.706)	(-0.741)
endqtr_insthold	-0.257***	-0.520***	-0.206***	-0.468***	-0.495***	-0.311***	-0.655***	-0.411***	-0.588***	0.033	0.049	-0.062	-0.300
	(-5.563)	(-5.573)	(-4.731)	(-4.809)	(-4.525)	(-5.298)	(-5.163)	(-4.991)	(-5.086)	(0.515)	(0.237)	(-1.158)	(-1.364)
beginqtr_insthold^2	0.031	0.073	-0.015	0.004	0.094	-0.023	-0.077	0.019	-0.001	0.053	0.178	0.037	0.167
	(0.777)	(0.917)	(-0.396)	(0.046)	(1.033)	(-0.495)	(-0.757)	(0.278)	(-0.006)	(1.041)	(1.070)	(0.868)	(0.965)
Endqtr_insthold^2	0.218***	0.442***	0.173***	0.383***	0.372***	0.249***	0.528***	0.328***	0.473***	-0.038	-0.070	0.069	0.328*
	(5.344)	(5.344)	(4.465)	(4.376)	(3.903)	(4.919)	(4.847)	(4.583)	(4.686)	(-0.696)	(-0.387)	(1.483)	(1.746)
insthold2	-0.022	-0.018	-0.228***	-0.461***	-0.661***	-0.113***	-0.219***	-0.187***	-0.256***	-0.121***	-0.422***	0.016	0.043
	(-0.737)	(-0.292)	(-8.014)	(-7.187)	(-9.376)	(-3.087)	(-2.763)	(-3.607)	(-3.464)	(-3.059)	(-3.267)	(0.478)	(0.319)
insthold_lag	0.139***	0.256***	0.214***	0.433***	0.857***	0.164***	0.327***	0.244***	0.337***	0.139***	0.502***	-0.045	-0.171
	(4.069)	(3.699)	(6.659)	(6.045)	(10.559)	(3.878)	(3.560)	(4.079)	(3.987)	(3.018)	(3.323)	(-1.177)	(-1.101)
Controls	X	X	X	X	X	X	X	X	X	X	X	X	X
Observations	499322	499322	497080	497080	497080	334583	334583	334583	334583	131248	131248	142566	142566
Adjusted R^2	0.0722		0.0258			0.0439		0.0412		0.0839		0.0362	
Wald chi2		37613.56		11026.55	10728.84		11738.16		13056.48		10817.6		5446.32

Table 7. The Difference-in-Difference Analysis of Three-Day Cumulative Abnormal Returns around Upgrades and Downgrades

The table reports difference-in-difference analysis of CAR (-1, +1) around the analysts' upgrades and downgrades by month of quarter beginning and end and by high and low institutional holdings. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

	CAR (-1, +1) around Upgrades					CAR (-1, +1) around Downgrades			
	Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)		Inst.Holdings <= 0.318	Inst.Holdings >= 0.835	Diff.	t-stat (sign)
Begin_QTR	2.877%	2.459%	-0.418%	-3.9548***	Begin_QTR	-3.585%	-3.924%	-0.339%	-2.4787**
End_QTR	2.151%	2.290%	0.139%	1.2505	End_QTR	-3.572%	-2.894%	0.678%	3.8121***
Diff (End_QTR - Begin_QTR)	-0.726%	-0.169%	0.557%	3.6***	Diff (End_QTR - Begin_QTR)	0.013%	1.030%	1.017%	4.61***
t-stat(sign)	-5.3582***	- 1.9269*			t-stat(sign)	0.0704	7.8045***		

Table 8

The table reports the results of regression models with cumulative abnormal returns (-1, +1) around the upgrades and downgrades as the dependent variable on the month of a quarter being either the last month (*end_quarter*) or the first month (*begin_quarter*) and their interaction terms with institutional holdings of the stock in the prior quarter (*insthold*). Panel A contains models with dependent variables being raw (*Raw Rec*) and relative (*Rel Rec*) recommendations. Panel B contains models with dependent variables recommendation revision indicator (Revision), revision continuous variable (*Revision cont*), and upgrade (*Upgrade*) and downgrade (*Downgrade*) of recommendations. Panels C and D contain models with the same dependent variables as Panels A and B, but with institutional holdings being proxied with indicator variables for top and bottom quartile (Panel C) and additional quadratic term for institutional holdings (Panel D). All other control variables are defined in section 2. All regressions control for year fixed effects with robust standard errors. t-stats are reported below coefficients. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Panel A	CAR (-1, +1)	
	Upgrades	Downgrades
end_quarter	-0.007***	-0.004*
	(-3.909)	(-1.805)
begin_quarter	0.000	-0.011***
	(0.108)	(-6.030)
begin_qtr_insthold	0.001	0.011***
	(0.323)	(4.447)
end_qtr_insthold	0.007***	0.011***
	(3.053)	(4.086)
insthold_lag	0.005***	-0.014***
	(2.596)	(-6.425)
Controls	X	X
Observations	131248	142563
Adjusted R^2	0.3420	0.4509

Panel B	CAR (-1, +1)	
	Upgrades	Downgrades
end_quarter	-0.001**	0.002*
	(-2.297)	(1.944)
begin_quarter	0.001*	-0.005***
	(1.867)	(-6.120)
end_qtr25	-0.006***	-0.001
	(-2.826)	(-0.589)
begin_qtr25	-0.002	-0.004*
	(-0.963)	(-1.870)
end_qtr75	-0.000	0.007***
	(-0.046)	(5.403)
begin_qtr75	-0.001	0.004***
	(-0.819)	(3.528)
insthold_25	-0.005***	0.008***
	(-3.143)	(4.759)
insthold_75	0.000	-0.003**
	(0.190)	(-2.527)
Controls	X	X
Observations	131248	142563
Adjusted R^2	0.3422	0.4510