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The Value of Client Access to Analyst Recommendations

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Abstract

Early access to stock recommendations provides brokerage firm clients with incremental investment value. After controlling for transaction costs, purchasing (selling) quickly following upgrades (downgrades) results in average two-day returns of 1.02% (1.50%). Short-term profit opportunities persist for two hours following the pre-market release of new recommendations. The results are robust within sub-periods and a calendar-based strategy produces positive abnormal daily returns of over 10 basis points, or roughly 30% annualized. Recommending firms' market makers shift their quotes accordingly, providing indirect evidence that clients make use of the informational advantage that arises from analysts' opinion changes.

I. Introduction

Each day thousands of security analysts go to work at hundreds of different brokerage firms, providing market analysis and issuing recommendations. Their efforts enhance the informational efficiency of financial markets, which at the same time diminishes the marginal value of their work. The economic forces that drive prices to incorporate relevant information are compelling, but as Grossman and Stiglitz (1980) show in equilibrium prices cannot perfectly reflect all available information, otherwise information gatherers earn no compensation for their costly efforts. The interaction between analyst research and informational efficiency is therefore dynamic, and beginning with Cowles (1933) researchers have long sought to measure the value of investment recommendations.

This study departs from most work in the area by focusing on the value of analyst research from a client's perspective. Institutional investors pay significant amounts to obtain real-time access to brokerage firm research through providers such as First Call, yet recommendations are often reported on newswire services not long after they are shared with clients. Do clients' short-lived informational advantages provide them with investment value?

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Although Womack (1996) documents that recommendation changes lead to an average price response of 3% to 5% over a three-day event period, previous research emphasizes longer-term strategies after recommendations become publicly available. For example, Jegadeesh, Kim, Krische, and Lee (2003) form portfolios each quarter based on consensus analyst recommendation levels and find a 2.3% difference between the performance of the most and least favorably recommended portfolios over a six-month horizon. Barber, Lehavy, McNichols, and Trueman (2001) show that daily rebalancing significantly improves the performance of similar portfolios (up to 14.5% annually), but perhaps not enough to offset the high transaction costs associated with the strategy.[1]

While these studies offer insights into the level of mispricing that analysts are able to detect, their focus on publicly available information and their exclusion of the initial price response weaken the connection between their results and the implications of Grossman and Stiglitz (1980). In this paper, I investigate the value of analyst research to brokerage firm clients by studying the short-term profitability associated with early access to recommendation changes. Recommendation data with accurate time stamps allows sharper inferences than in earlier studies, and intraday quote and trade data permit a thorough analysis of transaction costs.

I focus on recommendations for Nasdaq listed stocks. Unlike the NYSE, institutional investors typically do not pay commissions for their Nasdaq trades since brokerage firms are compensated indirectly by making a market in the stock. This aspect of trading makes observed effective bid-ask spreads a relatively accurate measure of total transaction costs. Trade data also offers a straightforward method for gauging the economic value of client access to recommendations by calculating the dollar amount that transacts at favorable prices following recommendation changes. In addition, access to individual dealer quote data provides an opportunity to infer the extent to which clients trade based on recommendation changes.

An examination of 7,000 recommendation changes from 16 major brokerage firms during the period 1999 through 2002 reveals that recommendation changes do provide brokerage clients with incremental investment value. After controlling for transaction costs, purchasing quickly following upgrade recommendations results in an average two-day return of 1.02%, whereas selling short following downgrades produces a return of 1.50%. Trading profits also appear to be economically meaningful. Tens of millions of dollars trade at favorable prices following recommendation changes, and a calendar-based trading strategy that purchases following upgrades and sells short following downgrades results in daily excess returns of more than 0.1%, or roughly 30% annualized.

Short-term profit opportunities remain significantly positive for roughly two hours following the pre-market release of analyst recommendation changes. The delayed price response contrasts with previous studies that examine publicly reported recommendations. For example, Busse and Green (2002) find that profit opportunities dissipate within seconds following the televised broadcast of analyst recommendations, and Kim, Lin, and Slovin (1997) show that recommendations

[1] Although they do not explicitly examine transaction costs, Boni and Womack (2006) in this issue indicate that profits may be large enough to offset trading costs when constructing recommendation-based portfolios at the industry level.

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reported over the Dow Jones newswire have no effect on prices. The short-term drift that occurs after recommendations are released to clients, but before the news is widely and publicly broadcast, highlights the quasi-private nature of analyst research.

The value of early access to recommendations is also economically meaningful when compared to the longer-term price response. For Nasdaq listed firms, average abnormal returns measured from the closing price before upgrade recommendations to one month after the event are approximately 7%. Of this price response, roughly half takes place before trading begins and is therefore inaccessible. Approximately one quarter of the total price impact takes place over the following two trading days, with the remaining response occurring over the next month. Downgrades exhibit a similar but extended pattern. Average three-month abnormal returns following downgrade recommendations are approximately −10%, with roughly half of the total price response happening immediately, the next quarter of the total impact occurring over the following two trading days, and the remaining response taking place over the next three months.

Market conditions following recommendations provide evidence that brokerage clients act on their informational advantage. Trading activity more than doubles following recommendation changes, although the evidence that order imbalances shift in line with the recommendation change is relatively modest. Dealers' quoting behavior provides more direct support that clients trade in accordance with the recommendation change. Market makers within the recommending firm are more likely to quote at the best bid (ask) following upgrades (downgrades), which is consistent with inventory adjustment in response to sympathetic client trading.

The findings have practical implications for brokerage firm research departments in light of the Securities and Exchange Commission's Global Analyst Research Settlement, which mandates the separation of research and investment banking activities.[2] In an environment where analysts are less instrumental in attracting corporate finance business, the publicity that arises from recommendation-related price impacts is much less useful. Research departments are increasingly relying on commissions for funding and as a result are organizing themselves to better serve their most active clients (e.g., hedge funds). The evidence indicates that timeliness is an important component of the value of analyst research. An increased commitment to exclusivity and a willingness to make short-term recommendations, both positive and negative, could enhance the value of analyst research to active brokerage firm clients.

The paper proceeds as follows. Section II describes the data and methodology. Section III examines the impact of recommendation changes on prices and investigates the profitability of a short-term trading strategy. Section IV examines trading activity and dealer quoting behavior surrounding recommendation changes, and Section V concludes.

[2]Michaely and Womack (1999) and Lin and McNichols (1998) show that analysts' allegiance to investment banking clients can lead to unfounded optimism in their forecasts, which could potentially harm investors by encouraging analysts to tout inferior securities. Details of the settlement can be obtained from www.sec.gov.

II. Data

A. Analyst Recommendations

The analyst recommendation data are obtained from First Call, a subsidiary of the Thomson Corporation, which facilitates the dissemination and analysis of brokerage firm research. Most U.S. and international brokerage firms rely on First Call to distribute their research reports electronically to their institutional clients. First Call operates a recommendation newswire type service and also provides investors with real-time analysis such as consensus recommendations and earnings forecasts. Institutional investors typically use soft-dollar commissions to pay the subscription fees for the online computer service, which can cost thousands of dollars annually per user. The content is also subscriber specific. Brokerage firms enable their clients to have selective access to their analyst research, and also decide whether to allow their forecasts to be incorporated into First Call's consensus estimates.

One of the advantages of the First Call historical recommendations database is that it contains detailed information on the timing of analyst reports. Each recommendation record contains two separate time/date stamps. One stamp specifies when the analyst published the report and another stamp specifies when the report was added to the First Call system. In recent data, the first stamp corresponds to when the report came across the First Call newswire, and the latter stamp refers to when the information in the report is reflected in consensus values.[3]

Historically, the time stamps are seen as approximations. Womack (1996) and Juergens (2000) report that during the time periods of their studies, 1989 through 1991 and 1993 through 1996, research was made available to clients approximately one to two hours before it was available on the First Call system. In recent years, technological advances have improved First Call's data collection and dissemination procedures and it is now common for institutional investors to receive analyst research directly from First Call. Presently, analysts typically distribute their reports to First Call immediately after they receive approval from the brokerage firm's compliance department, before they discuss the information with the sales force. Clients first may see the research report online and if desired later contact their broker or the analyst for further elaboration or clarification.

Market participants that are not clients of the brokerage firm may learn of recommendation changes through word of mouth, or later through newswire services or other financial media such as Yahoo's financial coverage on the Web. Typically, the information becomes widely available by the opening trade on the day following the recommendation day. For example, roughly 75% of the recommendation changes in the sample are reported after the close on the recommendation day in Bloomberg's analyst recommendation summary.

The timing of recommendations is critical given the emphasis on short-term trading strategies. To ensure clients have access to the recommendation changes, I minimize reliance on the time stamp by focusing on reports that are released to clients outside of regular market hours (both First Call time stamps are after

[3]Recommendations are also designated as real-time or batch, which refers to reports generated from a weekly batch file. I eliminate the small number of batch records from the sample.

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16:00 or before 9:30). Approximately 80% of the recommendation changes are published outside of market hours. In addition to the two time/date stamps, each recommendation record contains information on i) the name, ticker symbol, and CUSIP of the relevant company, ii) the brokerage firm producing the recommendation, and iii) a numerical rating of the sentiment of the current and previous recommendations according to a five-point scale with one being most favorable and five being least favorable (and zero being no previous recommendation).

As in Womack (1996), I focus on stock recommendation changes made by the highest rated U.S. brokerage research departments, as designated by *Institutional Investor*. Stickel (1992) documents a positive relation between *Institutional Investor* rank and forecast accuracy, which suggests recommendations from top rated brokerage firms may contain more investment value. I examine the recommendations of 16 brokerage firms that were consistently highly rated in the 1998 through 2001 annual rankings and distribute their recommendations through First Call. Brokerage firm names are not reported to maintain the confidentiality of the database.

I classify recommendation changes as upgrades, which are upgrades to 2 or 1 (buy or strong buy), and downgrades, which are any type of downgrade. Reiterations happen frequently in the data and often do not include the previous recommendation. As a result, it is difficult to distinguish between initiations of coverage and reiterations. To ensure a recommendation represents a change in opinion, I restrict the sample to those recommendations with a recorded previous recommendation, which excludes initiations of coverage. Requiring the availability of price data results in 2,727 upgrade and 4,450 downgrade recommendation changes. Table 1 provides information on the number of recommendations per year and descriptive statistics for recommendations by broker.

TABLE 1

Descriptive Statistics for Analyst Recommendation Changes

	No. of Upgrades	No. of Downgrades
By Brokerage Firm		
Least active broker	61	153
Median	171	264
Mean	170	278
Most active broker	319	458
Sub-Periods		
1999	761	667
2000	666	1,040
2001	830	1,857
2002	470	886
Total	2,727	4,450

Table 1 shows the number of stock recommendation changes by broker and calendar year. The sample period covers January 1999 through December 2002. Upgrades are stock recommendations raised to buy or strong buy. Downgrades are all downward recommendation changes.

B. Price and Trade Data and Methodology

The quote and trade data is obtained from Nastraq, the Nasdaq intraday data set made available by the NASD. Nastraq contains time-stamped trades and inside quotes for Nasdaq listed securities. The sample period covers January 1999

through December 2002. Intraday price changes are calculated using the price change from the mid-quote (average of the inside bid and ask prices) in effect at the time considered. Since intraday returns are not normally distributed, I rely on the nonparametric bootstrap algorithm in Barclay and Litzenberger (1988) to determine statistical significance. Two-sided *t*-tests produce similar results.

Daily abnormal returns are measured two ways. The first approach measures abnormal returns as the difference between the total stock return and the return on an equal-weighted portfolio of stocks with the same Standard Industrial Classification (SIC) code and from the same NYSE market capitalization decile. Stocks are matched based on four-digit SIC codes. If fewer than two stocks match the size and SIC code criteria, I match based on size and the three-digit SIC code. The second measure of abnormal performance is the residual from a Fama and French (1993) three-factor regression, where betas are estimated using daily data during the year prior to the event.[4] Standard errors for the daily abnormal performance measures are calculated using a cross-sectional approach that accommodates increased event volatility but is sensitive to overlapping event periods. Given that cross-sectional dependence issues may bias the test statistics (see, for example, Mitchell and Stafford (2000)), I also examine the performance of a calendar-based trading strategy. The calendar time portfolio approach has its own drawbacks, which motivates using both approaches. For example, Loughran and Ritter (2000) argue that calendar-based approaches have low power to detect abnormal performance when it exists primarily in periods of high event activity.

Profitability is measured using transactions data, where trades are identified as buyer- or seller-initiated by comparing the transaction price to the prevailing bid and ask quotes. Using the algorithm in Ellis, Michaely, and O'Hara (2000), transactions at prices less than or equal to the current inside bid are classified as sales, and transactions at prices greater than or equal to the current inside ask price are classified as purchases. The tick rule is used for trades that occur within the prevailing bid-ask spread. The tick rule classifies a trade as buyer-initiated if it occurs on an uptick or a zero-uptick (i.e., no price change on the current trade but the previous trade occurred on an uptick), and seller-initiated if it occurs on a downtick or a zero-downtick. Employing alternative algorithms such as Lee and Ready (1991) or excluding trades inside the posted quotes, which may be harder to sign correctly, does not appreciably change the results.[5]

To investigate the influence of recommendations on order flow, I measure order imbalances in dollars, defined as the dollar value of purchases minus the dollar value of sales, as well as percentage order flow, defined as

$$\text{IMBAL}_{it} = \frac{\text{nBuys}_{it} - \text{nSells}_{it}}{\text{nBuys}_{it} + \text{nSells}_{it}}, \tag{1}$$

where nBuys_{it} and nSells_{it} are the number of buyer- and seller-initiated trades during time interval t around recommendation i. Thus, $\text{IMBAL}_{it} = 1$ implies all trades are buyer-initiated and $\text{IMBAL}_{it} = -1$ implies all trades are seller-initiated.

[4]Using five years of monthly data to estimate factor sensitivities produces very similar results. Including an additional momentum factor also has little impact on the results.

[5]Peterson and Sirri (2003) examine order data to evaluate different trade algorithms and conclude that the EMO algorithm provides the most accurate inferences regarding execution costs.

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One of Nastraq's distinguishing features is that it also contains the time series of dealer quotes and depths by market participant (commonly referred to as Nasdaq Level II quotes). Data on individual market maker quotes permits an analysis of how analyst recommendations influence the quoting behavior of market makers within the recommending brokerage firm. One difficulty with investigating quoting behavior is that institutional arrangements reduce the correspondence between quoting and order flow. Internalization, preferencing, and payment for order flow make it common for market makers to execute orders at the national best bid or offer (NBBO) without posting quotes at the NBBO (see Smith (2000)). Thus, it is possible that dealers may adjust their inventory position in light of recommendation changes without the information being reflected in their quotes. Although the power to detect inventory adjustments is low, it increases the significance of any observed change in quoting behavior.

III. Price Response to Recommendation Changes and Trading Profitability

A. Magnitude and Speed of Price Response

Table 2 and Figure 1 document the price response to changes in analyst recommendations. Price changes are measured from the close of trading the day before the recommendation change to the close of trading the day after the recommendation (two trading days). All recommendations considered are distributed to clients outside of market hours. To clarify the language, the day before a recommendation change is the trading day before the recommendations are available to brokerage clients. On the recommendation day, clients have access to the recommendation change before the market opens.

Table 2 shows that the mean price response over the two-day event horizon is 5.74% following upgrades and −8.81% following downgrades.[6] The magnitude of the event window price response is approximately twice as large as the response found in Womack (1996). The large price response to analyst recommendation changes is consistent with the interpretation that characteristics of Nasdaq listed firms make analysts' opinions particularly useful, which is an implication of Amir, Lev, and Sougiannis (2000).

More than half of the event period price change, 3.88% for upgrades and −6.42% for downgrades, is incorporated into prices by the time trading begins after recommendation change. Although public information releases are a potential source of overnight price movement that is investigated more thoroughly in a later subsection, the results indicate that the pre-market distribution of recommendation changes to brokerage firm clients is sufficient for prices to reflect the majority of the information by the time trading begins. Prices continue to drift throughout the day, however, and it takes approximately two trading days before short horizon returns become insignificant from zero.

The magnitude and statistical significance of the observed short-term price drift contrasts with previous work that relies on public information sources. For

[6] Adjusting the intraday returns in Table 2 by subtracting the intraday price change on the Nasdaq 100 exchange traded index fund (QQQ) produces very similar results.

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TABLE 2

Intraday Price Changes Following Analyst Recommendation Changes

	Upgrades				Downgrades			
	Return	*p*-Value	Cumulative Return	*p*-Value	Return	*p*-Value	Cumulative Return	*p*-Value
16:00 to 9:30	3.88	0.00	3.88	0.00	−6.42	0.00	−6.42	0.00
9:31	0.13	0.00	4.01	0.00	−0.24	0.00	−6.61	0.00
9:32	0.06	0.00	4.07	0.00	−0.21	0.00	−6.83	0.00
9:33	0.06	0.00	4.14	0.00	−0.17	0.00	−6.97	0.00
9:34	0.05	0.00	4.19	0.00	−0.09	0.00	−7.05	0.00
9:35	0.03	0.01	4.23	0.00	−0.06	0.00	−7.11	0.00
9:40	0.12	0.00	4.35	0.00	−0.26	0.00	−7.34	0.00
9:45	0.04	0.09	4.39	0.00	−0.08	0.00	−7.42	0.00
10:00	0.07	0.01	4.46	0.00	−0.30	0.00	−7.69	0.00
12:00	0.33	0.00	4.82	0.00	−0.51	0.00	−8.19	0.00
4:00	0.38	0.00	5.25	0.00	−0.34	0.00	−8.47	0.00
4:00 to 9:30	0.30	0.00	5.58	0.00	0.40	0.00	−8.21	0.00
9:31	−0.01	0.14	5.57	0.00	−0.03	0.01	−8.23	0.00
9:32	−0.02	0.02	5.55	0.00	−0.05	0.00	−8.26	0.00
9:33	−0.02	0.00	5.53	0.00	−0.03	0.01	−8.29	0.00
9:34	−0.01	0.07	5.51	0.00	−0.03	0.00	−8.31	0.00
9:35	−0.02	0.03	5.50	0.00	−0.01	0.05	−8.32	0.00
9:40	−0.02	0.20	5.48	0.00	−0.06	0.00	−8.37	0.00
9:45	0.00	0.47	5.48	0.00	−0.04	0.01	−8.41	0.00
10:00	0.03	0.09	5.51	0.00	−0.13	0.00	−8.53	0.00
12:00	0.02	0.47	5.55	0.00	−0.22	0.00	−8.72	0.00
4:00	0.19	0.00	5.74	0.00	−0.12	0.04	−8.81	0.00

Table 2 reports average percentage price changes for two days following the pre-market release of analyst stock recommendation changes. Average returns and average cumulative returns are reported. Statistical significance is measured using bootstrap *p*-values. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

example, Busse and Green (2002) find that prices respond within one minute to televised reports of analyst recommendation changes. In addition, Kim, Lin, and Slovin (1997) show that recommendations reported over the Dow Jones newswire have no effect on prices. The significant short-term drift after recommendations are released to clients highlights the quasi-private nature of analyst research, and suggests that financial media often report recommendations after they have already begun to have an impact on prices. The results in Table 2 are consistent with the gradual incorporation of information into prices as the market becomes fully aware of the recommendation change.

Figure 1 plots the price response for each year in the sample. The similarity in the response pattern is striking given the difference in the overall performance of the market during the sample period. The annual performance of the Nasdaq Stock Market Index during the 1999 through 2002 sample period was 80%, −40%, −20%, and −30%. Despite the dramatic swings in the market, the average event period price response to recommendation changes is relatively stable.

B. Transaction Costs and Trading Profitability

The gradual price response in Figure 1 and Table 2 suggests that brokerage firm clients may be able to trade profitably based on their early access to analyst recommendation changes. Figure 2 depicts the net profitability of trading based on recommendation changes. The top plot shows the profits from purchasing following upgrade recommendations and the bottom plot shows the profits from selling short following downgrade recommendations. Positions are assumed to

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FIGURE 1

Price Response to Analyst Recommendation Changes

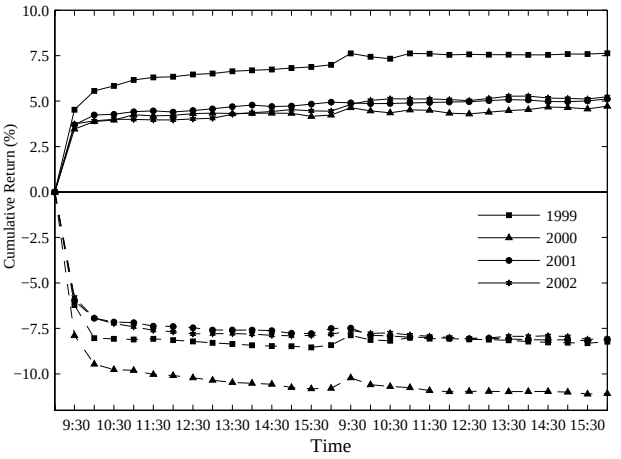


Figure 1 plots the average price response for two days following the pre-market release of analyst stock recommendations. Price changes are measured using quote midpoints. The response is shown separately for upgrade and downgrade recommendations and for each year. The data consists of 2,727 upgrade (solid line) and 4,450 downgrade recommendations (dashed line) on Nasdaq-listed stocks from January 1999 through December 2002.

be entered in the morning of the recommendation change and exited that afternoon or the next day. Purchase prices are calculated using the volume-weighted average price for buyer-initiated transactions. Similarly, sale prices are based on seller-initiated transactions, where short-sell transaction prices are also required to satisfy the bid test rule. The results are not sensitive to the choice of algorithm used to infer trade direction.

After controlling for transaction costs, market participants who purchase stocks in the morning following a pre-market recommendation change are able to obtain positive and significant two-day returns. Purchasing within the first five minutes of trading and selling the next day from 2:00 to 4:00 results in an average return of 1.02%. Profits gradually decline throughout the morning. Purchasing between 11:00 and 12:00 results in average profits of 0.32%, and profits become insignificantly different from zero after 12:00. Profit opportunities appear larger for downgrades, but dissipate more quickly. Selling short in the first five minutes of trading and purchasing the following afternoon from 2:00 to 4:00 results in an average return of 1.50%. Waiting five minutes to enter the position reduces the average return to 0.62%, but profits are still significant until noon. Selling at the average price between 11:00 and 12:00 results in average profits of 0.31%. Positions entered into after 12:00 do not provide significant short-term profits.

Table 3 focuses on a single exit period from 2:00 to 4:00 on the day following the recommendation, and reports the results for annual sub-periods. The evidence indicates the profit opportunities are relatively robust but also emphasizes the importance of acting quickly. For upgrades, significant profit opportunities appear available for at least an hour during three of the four years in the sample period. In 2000, however, profits are insignificantly different from zero and only posi-

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FIGURE 2

Intraday Trading Profits Following Analyst Recommendation Changes

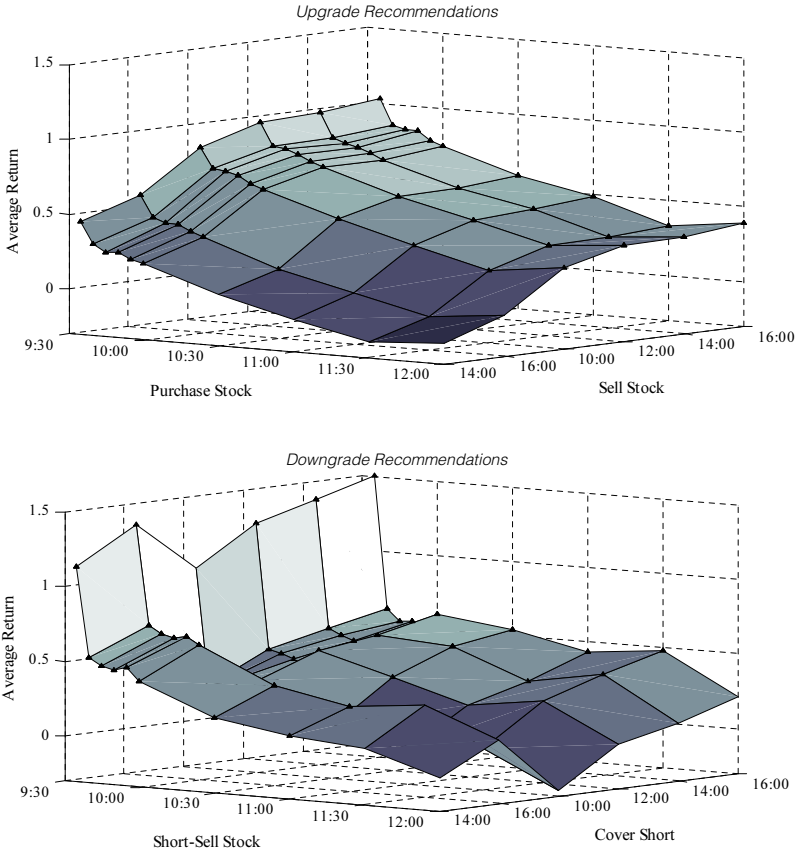


Figure 2 plots the average percentage price changes for two days following the pre-market release of analyst stock recommendation changes. The top plot shows the profits from purchasing following upgrade recommendations; the bottom plot shows the profits from short-selling following downgrade recommendations. Positions are assumed to be entered into using volume-weighted average transactions prices in five-minute intervals from 9:30–10:00 and half-hour intervals from 10:00–12:00. In a similar manner, positions are assumed to be unwound using the average transaction prices in intervals on the afternoon of the recommendation and the next trading day. Average purchase (sale) prices are calculated from buyer- (seller-) initiated transactions. Triangles represent statistically significant positive returns at the 5% level using bootstrap tests. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

tive on average when trading within the opening five minutes. The results for downgrades are similar. Profits are generally positive and significant for at least an hour in three of the four years. In 1999, however, profits were significantly positive only if the position was entered into within the first five minutes.

The profitability measures rely on effective spreads to capture the costs of trading. Comparing the profitability results in Table 3 to the price change results in Table 2 provides a point of comparison to the existing literature on institutional trading costs. The price change from the opening mid-quote following the recommendation to the closing mid-quote on the day following the recommendation is 1.86% for upgrades and −2.39% for downgrades. Thus, the profitability results

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TABLE 3

Trading Profits Following Analyst Stock Recommendation Changes

	All Years		1999		2000		2001		2002	
Enter Position	Return	*p*-Value	Return	*p*-Value	Return	*p*-Value	Return	*p*-Value	Return	*p*-Value
Panel A. Upgrade Recommendations										
9:35	1.02	0.00	2.01	0.00	0.22	0.30	0.82	0.00	0.96	0.00
9:40	0.86	0.00	1.62	0.00	−0.01	0.49	0.77	0.00	1.01	0.00
9:45	0.84	0.00	1.64	0.00	−0.02	0.48	0.79	0.01	0.91	0.00
10:00	0.72	0.00	1.54	0.00	−0.03	0.43	0.50	0.05	0.89	0.00
11:00	0.48	0.00	1.00	0.00	−0.08	0.41	0.28	0.16	0.77	0.00
12:00	0.32	0.01	0.70	0.01	−0.23	0.21	0.14	0.27	0.80	0.00
2:00	0.13	0.17	0.37	0.10	−0.28	0.16	−0.02	0.48	0.59	0.00
4:00	−0.03	0.39	0.15	0.31	−0.25	0.18	−0.22	0.13	0.34	0.04
Panel B. Downgrade Recommendations										
9:35	1.50	0.00	0.87	0.03	1.80	0.00	1.59	0.00	1.32	0.00
9:40	0.62	0.01	−0.78	0.05	0.38	0.23	0.78	0.01	1.30	0.01
9:45	0.54	0.01	−1.34	0.00	0.61	0.11	0.77	0.01	1.00	0.01
10:00	0.67	0.00	−0.98	0.05	0.54	0.12	0.92	0.00	1.28	0.00
11:00	0.47	0.00	−0.93	0.01	0.60	0.06	0.71	0.00	0.73	0.01
12:00	0.31	0.02	−0.70	0.04	0.49	0.09	0.44	0.04	0.45	0.08
2:00	0.05	0.35	−0.60	0.02	−0.22	0.24	0.29	0.08	0.24	0.22
4:00	−0.14	0.11	−0.81	0.00	−0.40	0.07	0.17	0.16	−0.06	0.39

Table 3 shows the average percentage price changes for two days following the pre-market release of analyst stock recommendation changes. Panel A shows the profits from purchasing following upgrade recommendations; Panel B shows the profits from selling short following downgrade recommendations. Positions are entered into using average transactions prices during different time intervals on the recommendation day. For example, 12:00 refers to positions entered into at the average transaction price between 11:00 and 12:00. All positions are unwound using the average transaction price between 2:00 and 4:00 on the next trading day. Average purchase (sale) prices are calculated from buyer- (seller-) initiated transactions. Statistical significance is measured using bootstrap *p*-values. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

in Table 3 imply one-way transaction costs of between 0.42% and 0.77% for upgrades and between 0.45% and 1.04% for downgrades (using entry periods from 9:30 to 12:00).[7]

Institutions generally do not pay commissions on their Nasdaq trades since brokers profit indirectly from making a market in the stock. Transaction costs therefore consist primarily of the price impact of the trade, which is measured by comparing the transaction price to a benchmark price chosen around the transaction. For example, Keim and Madhavan (1997) study a sample of institutional orders from 1991–1993 and use the closing price on the previous day as the benchmark. For order sizes in the middle quintile and for stocks with market caps in the middle two quartiles, they estimate one-way transaction costs to be between 0.51% and 0.90% for purchases and between 0.56% and 0.87% for sales. Chan and Lakonishok (1997) examine a similar sample using the opening price as the benchmark price and find one-way costs of between 0.41% and 0.95% for stocks with market caps in the middle quintile, depending on the complexity of the order.

These numbers broadly support the level of transaction costs implied by effective spreads in the current study. On the other hand, both studies find that one-way transaction costs can be over 3% for large orders in small cap stocks. Short-term profits may also be greater for small stocks (which I investigate in the next section). However, rather than focus on the costs associated with specific

[7]For example, buying following upgrades at the volume-weighted average purchase from 11:00 to 12:00 and selling the next day at the volume-weighted average sale price from 2:00 to 4:00 results in average profits of 0.32%. Comparing this to the 1.86% price change implies roundtrip transaction costs of 1.54%, or one-way costs of 0.77%.

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order submission strategies,[8] a more straightforward approach for evaluating the economic significance of the results is to measure the dollar amount that transacts at favorable prices following recommendation changes. I also provide additional evidence on the incremental value of client access to recommendations by comparing the short-term profits to the longer-term drift, as well as investigating the abnormal performance of an implementable calendar strategy based on clients' short-lived informational advantage.

C. Cross-Sectional Determinants of Price Impact and Profitability

The literature on analyst recommendations documents a number of firm characteristics that lead to greater announcement price impacts. For example, Amir, Lev, and Sougiannis (2000) find that the incremental contribution of analysts' earnings forecasts is greater for firms that report losses, for technology-oriented firms, and for small firms. In this section, I examine whether analysts' comparative advantage at forecasting earnings for these firms translates into greater investment value for their clients.

I include several variables related to the recommended firm. TECHNOLOGY and INTERNET are dummy variables based on North American Industry Classification System (NAICS) codes.[9] NEGATIVE EPS is a dummy variable based on whether the firm's most recently reported earnings per share are negative. I also create size dummy variables based on CRSP NYSE market capitalization quintiles, where QUINTILE 1 is a dummy variable for firms that fall into the smallest quintile.

I include two independent variables based on the timing of earnings releases. To help control for confounding public information releases, EPS RELEASE is a dummy variable that conditions on whether the firm made an earnings announcement during the two days preceding a recommendation change. Ivkovich and Jegadeesh (2004) find that recommendations made during the week following earnings announcements lead to smaller price impacts. To examine whether this translates into smaller short-term profits as well, I also include NEAR EPS RELEASE, which captures whether the recommendation is released in the week following an earnings announcement (but not within the two days). Finally, as an additional control for confounding public information events I create a dummy variable that controls for whether more than one analyst issues a recommendation for the stock that day.

Table 4 reports the results. The first two columns show the regression results for event period price responses, measured as the price change from the close of trading the day before the recommendation change to the close of trading the day after the recommendation change. The last two columns in Table 4 show the regression results for event period profits, measured using volume-weighted average buyer- and seller-initiated transaction prices during periods around the recommendation change. Positions are assumed to be entered into at the average

[8]For example, Conrad, Johnson, and Wahal (2003) find that institutional transaction costs are lower using alternative trading systems such as ECNs.

[9]The technology variable describes firms with NAICS codes 334, 51121, 51331, and 54152. The Internet variable describes firms with NAICS codes 514191 and 45411. Descriptions for the NAICS codes are available at www.naics.com.

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price during the first hour of trading after the pre-market release of a recommendation change and unwound at the average price between 2:00 and 4:00 on the following day. Statistical significance is calculated using standard errors adjusted for heteroskedasticity.

TABLE 4

Characteristics of the Price Impact Following Analyst Recommendation Changes

	Price Response		Trading Profits	
	Upgrades	Downgrades	Upgrades	Downgrades
No. of observations	2,582.00	3,758.00	2,582.00	3,758.00
Adjusted R^2 (%)	3.07	11.53	0.47	1.20
Coefficients				
CONSTANT	2.27**	−2.58**	0.59	−0.59
TECHNOLOGY	2.16**	−3.03**	0.50	0.75*
INTERNET	3.45*	−1.78	1.39	1.11
NEGATIVE EPS	−0.41	−0.67	−0.98**	0.99**
SIZE QUINTILE 1	5.18**	−6.18**	0.53	2.41**
SIZE QUINTILE 2	3.34**	−5.54**	0.44	1.20*
SIZE QUINTILE 3	3.45**	−3.06**	0.97	−0.03
SIZE QUINTILE 4	0.87	−2.07**	−0.57	−0.10
EPS RELEASE	2.12**	−2.61**	−0.10	0.38
NEAR EPS RELEASE	−1.40	3.49**	−0.80	−0.48
MULTIPLE RECOMMENDATIONS	2.16	−13.53**	−0.25	−0.25

Table 4 shows the results of regressions of recommendation and firm characteristics on the price response and trading profits following the pre-market release of analyst stock recommendation changes. Price responses are defined as the average price change between the closing price the day before the recommendation change and the closing price two days after the recommendation. Trading profits refer to the profits from purchasing following upgrades and short-selling following downgrades. Average purchase (sale) prices are calculated from buyer- (seller-) initiated transactions. Positions are assumed to be entered into using the volume-weighted average transaction price from 9:30–10:30, and unwound the following day at the average transaction price from 2:00–4:00. TECHNOLOGY and INTERNET are industry dummy variables classified using the North American Industry Classification System, and are 1 if the firm operates in that industry, 0 otherwise. NEGATIVE EPS is 1 if the firm has a negative quarterly EPS at the time of the recommendation, 0 otherwise. The SIZE QUINTILES are dummy variables based on NYSE market capitalizations (5 is largest). EPS RELEASE is a dummy variable designating recommendation changes within two days of an earnings announcement, whereas FOLLOWING EPS RELEASE refers to recommendation changes within a week of an earnings announcement (excluding the announcement day and the next). MULTIPLE RECOMMENDATIONS refers to more than one analyst recommending the stock that day. * and ** represent statistical significance at the 5% and 1% levels, respectively, using standard errors adjusted for heteroskedasticity. The data consists of recommendation changes on Nasdaq-listed stocks from January 1999 through December 2002.

The independent variables are able to explain 3.1% of the variation in price response to upgrades and 11.5% of the variation in the response to downgrades. Price impacts are higher for technology firms (2.16% and −3.03%) and Internet firms (3.45% and −1.78%), with three of the four coefficients statistically significant from zero at the 5% level. Recommendations also have a larger impact on smaller firms, and the relation is generally monotonic.

The variation in recommendation price impact around earnings announcements is consistent with Ivkovich and Jegadeesh (2004), and suggests that while analysts' often change their recommendations to reflect earnings surprises, their views are generally less influential in the week following an earnings announcement. Multiple recommendations do not significantly influence the price impact following upgrade recommendations but lead to substantially larger price declines following downgrades (−13.5%). This suggests that analysts contemporaneously downgrade following negative public information releases, which is consistent

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with the findings of Conrad, Cornell, Landsman, and Rountree (2006) in this issue.[10]

The independent variables have considerably less power at explaining cross-sectional variation in trading profits; the adjusted R^2 is 0.47% for upgrades and 1.20% for downgrades. The industry dummies play a smaller role, although there is evidence that trading on downgrades is more profitable for technology stocks. Trading on downgrades is also more profitable for firms with negative earnings (0.99%), whereas the opposite is true for upgrades (−0.98%).

Smaller stocks have larger price responses, but they also typically have higher transactions costs that hinder attempts to profit from recommendation changes. The net effect of firm size on profits is mixed, although there is some evidence that shorting small stocks following downgrades is more profitable even after controlling for the larger effective bid-ask spread. Downgrades on firms in quintiles 1 and 2 produce significantly larger profits than downgrades for firms in quintile 5.

Taken together, the results in Table 4 suggest that firm characteristics that lead to larger announcement price impacts do not generally translate into larger short-term profits for their clients. This is partially explained by the higher transaction costs for these firms. However, the overnight price response is also larger (before trading begins), which may reflect differences in the firms' information environments. Although liquidity differences tend to make small firms respond more slowly to public information releases, the increased relevance of analyst opinions for these firms may accelerate the transmission of quasi-private information to the market.

D. Returns over Longer Horizons

To help gauge the incremental benefit of client access relative to the value of recommendations over longer horizons, Table 5 shows abnormal returns for different holding periods around the recommendation change, where benchmark returns are calculated using a size and industry matching portfolio as well the residuals from the Fama and French (1993) three-factor model. The event-day results confirm the price change findings in Table 2. Abnormal returns are significantly different from zero in each subsample regardless of whether the return benchmark is based on firm size and industry classification or the Fama and French (1993) three-factor model.[11]

Examining data from 1989 through 1991, Womack (1996) finds that recommendation changes continue to impact prices for one month following upgrades and for six months following downgrades. The evidence from a decade later generally supports these impact horizons. In the month following upgrades, abnormal

[10] As an additional control for confounding public information events, I also search for other types of information releases using Bloomberg Public Relations Newswire for a subset of the recommendations (roughly 4,000 recommendations during 1999 through 2001). Examples of information deemed material are financial releases, new product developments, and announcements of influential contracts. Including a news-related dummy variable in a cross-sectional regression for this subset of recommendations results in insignificant coefficients for both upgrades and downgrades.

[11] The factors are obtained from Ken French's Website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/. I also estimate a four-factor model, including a daily momentum factor from Jeffrey Busse's Website at http://www.bus.emory.edu/jbusse/. The abnormal returns are very similar to the three-factor model results and are not reported for brevity.

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TABLE 5

Cumulative Abnormal Returns Following Analyst Recommendation Changes

	Upgrade Recommendations						Downgrade Recommendations					
	Actual Returns		Size-Industry Adjusted Returns		Fama-French Excess Returns		Actual Returns		Size-Industry Adjusted Returns		Fama-French Excess Returns	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1-Month period before event												
1999	8.48**	25.6	2.33*	24.2	4.38**	22.3	−0.31	29.2	−7.37**	30.2	−4.25**	26.2
2000	2.03	30.2	1.03	26.6	4.36**	23.1	−10.78**	28.4	−9.20**	26.8	−7.40**	26.2
2001	2.66*	30.0	0.38	25.2	2.52**	23.5	−6.48**	34.2	−6.92**	28.3	−4.81**	26.1
2002	−5.33**	17.4	−1.50	16.0	−1.27	16.7	−12.07**	23.1	−7.09**	20.3	−7.17**	21.1
All years	2.74**	27.4	0.80	24.1	2.76**	22.1	−7.68**	30.4	−7.55**	26.9	−5.81**	25.2
Recommendation day												
1999	6.97**	10.4	6.67**	10.4	6.09**	8.9	−8.45**	14.0	−8.76**	13.9	−8.24**	13.1
2000	4.32**	11.3	3.96**	10.6	3.82**	10.1	−10.89**	16.2	−10.84**	16.7	−9.98**	15.5
2001	4.88**	9.7	4.64**	9.6	4.43**	8.6	−7.50**	13.6	−7.16**	13.3	−6.91**	12.6
2002	4.46**	9.4	4.72**	9.0	4.47**	8.6	−7.86**	14.3	−7.50**	14.0	−7.36**	13.9
All years	5.26**	10.3	5.06**	10.1	4.78**	9.1	−8.51**	14.5	−8.32**	14.4	−7.92**	13.7
1st Month after event												
1999	7.59**	22.1	1.29	20.5	3.58**	18.5	3.86**	23.6	−0.79	24.4	1.19	23.1
2000	0.93	28.1	0.91	24.8	1.96*	22.2	−2.36**	28.4	−0.41	25.8	0.05	25.8
2001	0.60	22.3	1.21	19.1	2.20**	17.8	−1.47	32.2	−1.00	25.3	−0.78	23.1
2002	−2.12**	14.9	2.86**	13.9	2.48**	14.7	−9.79**	22.0	−1.92*	21.6	−2.97**	24.3
All years	2.22**	23.1	1.40**	20.5	2.59**	18.6	−2.41**	28.7	−0.99*	24.6	−0.70	24.0
3-Month period after event												
1999	27.31**	47.0	4.85**	44.5	7.87**	33.3	16.95**	46.0	−2.87	51.0	4.83**	41.2
2000	−5.09**	39.9	1.75	35.8	5.28**	34.7	−11.06**	36.9	−0.64	35.6	3.58**	41.5
2001	−3.80**	34.2	−1.67	29.5	2.43*	30.3	−7.63**	45.1	−6.41**	36.7	−3.59**	38.5
2002	−16.76**	26.6	−0.23	24.5	−0.53	28.9	−26.71**	25.8	−4.21**	27.2	−9.49**	31.8
All years	3.04**	42.0	1.36	35.8	4.27**	32.2	−7.32**	42.8	−4.10**	38.1	−1.26*	39.1
6-Month period after event												
1999	46.11**	74.7	7.67*	74.1	18.55**	57.3	33.43**	84.6	−2.80	79.5	9.88**	55.2
2000	−10.21**	50.7	1.87	47.8	8.12**	54.2	−13.23**	50.5	2.52	48.6	10.84**	71.1
2001	−10.66**	39.9	−4.30**	38.3	1.02	42.1	−17.31**	45.7	−10.27**	40.9	−5.33**	46.8
2002	−39.76**	25.2	−1.46	22.9	−5.35*	32.7	−46.35**	30.1	−8.21**	32.0	−16.83**	44.8
All years	4.07**	61.8	1.43	53.8	7.67**	50.4	−9.36**	58.7	−5.36**	51.6	1.04	56.5

Table 5 reports actual and adjusted returns (before transaction costs) for intervals surrounding analyst recommendation changes. Size-Industry Adjusted Returns are calculated by subtracting the return on a portfolio matched according to the NYSE market capitalization decile and four-digit SIC code. Fama-French Excess Returns are calculated using the Fama and French (1993) three-factor model. Standard deviations (Std. Dev.) and *t*-statistics are calculated cross-sectionally from all recommendations with firm returns in each period. * and ** denote significance at the 5% and 1% levels, respectively. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

returns are 1.40% and 2.59% using the size-industry and three-factor benchmarks, and both are statistically significant at the 1% level. At the three- and six-month horizons, the upgrade results are more mixed. Neither benchmark indicates consistently positive abnormal performance, although three-factor abnormal returns are significantly positive in the full sample at both the three- and six-month horizons.

Abnormal returns in the month following downgrades are negative when using both the size-industry adjustment and the three-factor model (−0.99% and −0.70%), but only significant for size-industry adjusted returns. At the three-month horizon, average size-industry adjusted returns are −4.10% while three-factor abnormal returns are −1.26%, both of which are significantly different from zero. At the six-month horizon, the results are sensitive to the benchmark. Average size-industry adjusted returns are −5.37%, which is significant at the 1% level, whereas three-factor abnormal returns are insignificantly different from zero.

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Although event period abnormal returns are on the order of 5% for upgrades and −8% for downgrades, most of the price response takes place by the time trading begins after the recommendation change. Assuming recommendations become more widely available after the close of trading on the recommendation day, the price response exclusively available to clients is better measured from the opening price after the recommendation change until the opening price on the following day. According to Table 2, the price response after clients have access to the recommendation change but before the recommendations are more widely distributed is 1.7% for upgrades and −1.9% for downgrades. These numbers compare favorably to the abnormal returns over one month following upgrades and three months following downgrades, roughly 2% and −2.5% depending on the benchmark. Taken together, Tables 2 and 5 suggest that the incremental investment value of client access to analyst recommendations is economically meaningful relative to the value over longer horizons.

E. A Calendar-Based Strategy

As an additional measure of the economic significance of clients' short-lived informational advantage, I examine the performance of a calendar strategy that trades based on analyst recommendation changes and holds the position for two days. The calendar time approach facilitates risk adjustment and helps control for overlapping event periods that may overstate the significance levels reported in Table 3. Value weighting the portfolios diminishes the role of smaller stocks, and volume weighting, while not implementable ex ante, provides an additional check for ensuring the observed transaction prices reflect meaningful market conditions.

The portfolios are rebalanced daily. Since the positions are held for two trading days, half the portfolio is invested each day. If no recommendation changes take place on a given day, that half of the portfolio remains idle and earns 0% (or zero excess return for the measures of abnormal performance). Positions are assumed to be entered into at the volume-weighted average transaction price during the first 15 minutes, half-hour, and hour following the pre-market release of recommendation changes. Positions are unwound at the average price from 2:00 to 4:00 on the day following the recommendation change. Abnormal performance (alpha) is measured using the Fama and French (1993) three-factor model. Including an additional momentum factor does not appreciably alter the results. Standard errors are calculated using the Newey-West adjustment for autocorrelation with two lags; the results are similar using White's correction for heteroskedasticity.

Table 6 reports the performance of purchasing following upgrades, selling short following downgrades, and a combined long and short strategy. Daily rebalancing an equal-weighted portfolio of upgraded stocks, where positions are assumed to be entered at the volume-weighted purchase price during the first hour of trading, results in a mean daily return of 0.281% and an excess return of 0.274%. The annualized returns associated with these returns are roughly 100%. Value weighting the portfolios reduces the abnormal performance to 0.228% per day, which is still economically large and statistically significant from zero at the 1% level. The performance of the short and long/short strategies are similar. The ex-

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cess returns for each portfolio strategy are economically large and statistically different from zero at the 1% level. The portfolios are risky, however, with standard deviations of 2%–3%, compared to roughly 1.5% for the CRSP value-weighted index.

TABLE 6

Daily Calendar Returns from Short-Term Strategies Based on Analyst Recommendation Changes

	Purchase Upgraded Stocks			Short-Sell Downgraded Stocks			Purchase Upgraded Stocks and Short-Sell Downgraded Stocks		
Position Entry Period	Mean Daily Return %	Std. Dev.	Fama-French Excess Return %	Mean Daily Return %	Std. Dev.	Fama-French Excess Return %	Mean Daily Return %	Std. Dev.	Fama-French Excess Return %
Panel A. Equal-Weighted Portfolios									
9:30–9:45	0.366**	2.75	0.360**	0.611**	3.55	0.591**	0.570**	2.35	0.548**
9:30–10:00	0.336**	2.69	0.331**	0.481**	3.43	0.452**	0.495**	2.27	0.470**
9:30–10:30	0.281**	2.59	0.274**	0.398**	3.25	0.371**	0.412**	2.23	0.387**
Panel B. Equal-Weighted Portfolios, Two Cent Commission									
9:30–9:45	0.278**	2.74	0.272**	0.434**	3.59	0.413**	0.411**	2.36	0.389**
9:30–10:00	0.247**	2.68	0.242**	0.291**	3.47	0.262*	0.327**	2.31	0.302**
9:30–10:30	0.192*	2.58	0.186*	0.199	3.31	0.171	0.238**	2.27	0.214**
Panel C. Value-Weighted Portfolios									
9:30–9:45	0.274**	2.95	0.273**	0.472**	3.55	0.448**	0.390**	2.63	0.363**
9:30–10:00	0.259**	2.89	0.258**	0.350**	3.43	0.317**	0.328**	2.58	0.300**
9:30–10:30	0.229**	2.79	0.228**	0.278**	3.29	0.245*	0.268**	2.55	0.239**
Panel D. Value-Weighted Portfolios, Two Cent Commission									
9:30–9:45	0.206*	2.94	0.204*	0.352**	3.57	0.328**	0.297**	2.62	0.271**
9:30–10:00	0.190*	2.89	0.189*	0.223*	3.47	0.190	0.230**	2.60	0.202*
9:30–10:30	0.161	2.79	0.160	0.149	3.34	0.115	0.170*	2.58	0.141
Panel E. Volume-Weighted Portfolios									
9:30–9:45	0.334**	3.15	0.333**	0.548**	3.75	0.523**	0.467**	2.93	0.438**
9:30–10:00	0.310**	3.06	0.309**	0.462**	3.71	0.429**	0.384**	2.85	0.354**
9:30–10:30	0.267**	2.92	0.265**	0.368**	3.57	0.334**	0.303**	2.80	0.273**
Panel F. Volume-Weighted Portfolios, Two Cent Commission									
9:30–9:45	0.266**	3.14	0.265**	0.431**	3.76	0.404**	0.375**	2.93	0.346**
9:30–10:00	0.243*	3.05	0.242**	0.338**	3.74	0.304**	0.287**	2.87	0.257**
9:30–10:30	0.200*	2.92	0.198*	0.241*	3.61	0.206	0.206*	2.83	0.175

Positions are entered into using volume-weighted average transaction prices during different periods following the premarket release of analyst stock recommendations, and unwound at the average price from 2:00 and 4:00 on the next trading day. Average purchase (sale) prices are calculated from buyer- (seller-) initiated transactions. Half the portfolio is invested each trading day. If no recommendations, that half of the portfolio earns 0%. The Fama-French three-factor model is used to measure excess returns. * and ** represent statistical significance at the 5% and 1% levels, respectively, using standard errors adjusted for heteroskedasticity. Panels A, C, and E show the average daily performance for equal-weighted, market value-weighted, and volume-weighted (during the interval) portfolios. In Panels B, D, and F, transaction prices are adjusted assuming brokerage commission costs of two cents per share. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

Thus far, the calculations have assumed no commission costs. While this may be reasonable for brokered institutional trades in Nasdaq stocks, it will generally not be the case for other traders, or when institutional investors trade using alternative systems venues such as electronic communication networks (ECNs). Schwartz and Steil (2002) report that commissions for non-intermediated electronic trading range between 0.25 to two cents per share for institutions. Brokers catering to active retail investors charge 0.5 to one cent per share commissions.

As a conservative benchmark, Table 6 also reports the performance results after incorporating commission costs of two cents per share (i.e., purchase prices

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are increased by two cents and sale prices are reduced by two cents). Assuming positions are entered into during the first half-hour of trading, daily abnormal performance of the value-weighted portfolios are 0.189%, 0.190%, and 0.202% for the upgrade, downgrade, and long/short portfolios, two of which are significant at the 5% level and the other at the 10% level. Extending the trading window to one hour results in performance of 0.16%, 0.115%, and 0.141% accordingly, and two of the three remain significantly different from zero at the 10% level.

Although not implementable ex ante, volume weighting across stocks within portfolios provides an additional check for ensuring that the prices used to measure performance are economically meaningful. Assuming positions are entered into during the first hour and adjusting prices with a two cent commission results in daily abnormal performance of 0.198%, 0.206%, and 0.175% for the upgrade, downgrade, and long/short portfolios, two of which are significant at the 10% level and the other one at the 5% level.[12] Overall, the evidence of abnormal performance in Table 6 indicates that the incremental value of clients' early access to recommendations is economically meaningful. The smallest daily abnormal performance reported in the table (0.115%) translates into roughly 30% annualized.

IV. Market Conditions Following Recommendation Changes

A. Trading Activity

Table 7 reports data on trading volume following recommendation changes. The average dollar trading volume during the first five minutes of trading following recommendation changes is $2.5 million per minute for upgrades and $2.35 per minute for downgrades. Throughout the recommendation day, trading intensity and volume remain roughly twice as large as on the previous day, and the differences are statistically different using two-sample *t*-tests as well as nonparametric two-sample Kolmogorov-Smirnov tests. The results for trading intensity are similar. In untabulated results, trading intensity doubles from a median (mean) of 8.0 to 21.2 (44.4 to 81.7) trades per minute during the first five minutes of trading following upgrades. The increase following downgrades is also considerable, from 7.4 to 19.4 (46.6 to 98.9) trades per minute.

Panel B of Table 7 reports information on the trading volume associated with the portfolio strategies in Table 6. To get a sense of the trading volume corresponding to the equal-weighted strategy, the left-hand side of Panel B reports the median across days of the median across recommended stocks of dollar trading volume. The median trading volume during the first hour of trading is $11.2 million for upgrades and $6.7 for downgrades. The median (mean) across days of the value-weighted dollar volume during the first hour of trading is $34.3 ($139.2) million for upgrades and $33.3 ($162.4) million for downgrades. The results provide additional evidence that the transaction prices used to measure profitability

[12]To get a sense of performance within sub-periods, consider volume-weighted portfolios with a two cent commission. Assuming a 15-minute entry period, the upgrade, downgrade, and long/short portfolios produce positive market-adjusted returns in 66%, 66%, and 72% of the months during the sample period, respectively. Assuming a half-hour entry period results in positive excess returns in 66%, 60%, and 66% of the months during the sample period, and a one-hour entry period results in positive excess returns during 62%, 62%, and 57% of the months during the sample period.

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TABLE 7

Trading Activity Following Analyst Recommendation Changes

Panel A. Mean Dollar Volume (in $thousands per minute)

	Upgrades			Downgrades		
	Previous Day	Event Day	Following Day	Previous Day	Event Day	Following Day
9:35	1,312.7	2,500.9**	1,426.4	1,129.2	2,358.1**	1,263.6
9:40	1,140.8	2,120.7**	1,164.8	986.9	2,182.5**	1,005.7
9:45	1,064.2	1,919.1**	1,122.7	916.6	1,976.9**	947.4
9:50	1,046.8	1,713.7**	1,096.3	893.2	1,744.3**	876.9
9:55	978.1	1,569.6**	1,013.5	859.0	1,665.4**	831.8
10:00	939.2	1,510.2**	984.6	814.4	1,526.9**	770.5
12:00	494.2	714.2**	513.9	413.4	725.2**	402.3
14:00	297.9	382.5**	301.9	263.9	399.3**	234.7
16:00	488.8	565.1*	470.3	421.9	546.7**	365.9*

Panel B. Dollar Volume Associated with Trading Strategies (in $thousands)

Entry Period	Equal-Weighted (median)			Value-Weighted		
	Upgrades	Downgrades	Long-Short	Upgrades	Downgrades	Long-Short
9:30–9:45	3,758	2,306	2,716	12,503	11,075	23,531
9:30–10:00	6,661	3,877	4,732	22,061	20,289	40,741
9:30–10:30	11,200	6,715	7,832	34,311	33,297	68,920

Table 7 reports measures of trading activity following the pre-market release of analyst stock recommendation changes. Panel A reports the average dollar amount of trading on days surrounding the event. In the Event Day and Following Day columns, * and ** denote significantly different means at the 5% and 1% levels, respectively. Panel B reports levels of trading volume corresponding to the trading strategies in Table 6. The equal-weighted columns show the median across days of the median dollar trading volume across recommended stocks. The value-weighted columns show the median across days of the value-weighted average of dollar trading volume across recommended stocks. The data consists of 2,732 upgrade and 4,457 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

reflect economically meaningful market conditions. Tens of millions of dollars trade at favorable prices following recommendation changes.

If the increased trading activity is motivated by recommendation changes, I would expect to see more buyer-initiated trades following upgrades and the opposite for downgrades. Table 8 reports percentage and dollar order imbalances on the days surrounding recommendation changes. Percentage order imbalances show a significant increase in buyer-initiated trading for the first 15 minutes following upgrades, but the magnitude of the increase is relatively small. During the 9:30 to 9:35 interval, on average buyer-initiated trades account for 50.85% of trading on the day before the recommendation change and rise to 53.94% on the morning after an upgrade. The total dollar order imbalance over the 9:30 to 10:30 interval is $0.79 million the day before the recommendation change and $1.60 million on the morning of the recommendation, and the means are significantly different at the 5% level. The results for downgrades are less robust. While percentage and dollar order imbalances are generally negative for 10 to 30 minutes following a downgrade, the pattern and levels of significance are less pronounced than for upgrades.

The dramatic rise in trading activity coupled with a more modest shift in order imbalances suggests that the market interprets recommendation changes broadly as a liquidity event. Although not all market participants may be aware of the recommendation change, they may still perceive the relatively large overnight price change and increased trading as an opportunity to enter or unwind a position. Some investors may have previously arrived at the same conclusion as the ana-

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TABLE 8

Order Imbalance Following Analyst Recommendations

	Upgrades			Downgrades		
	Previous Day	Event Day	Following Day	Previous Day	Event Day	Following Day
Panel A. Mean Percentage Order Imbalance						
9:35	1.70	7.88**	2.75	0.18	−1.75*	0.51**
9:40	1.61	4.19*	1.59	−0.31	−0.31	−0.31
9:45	−0.25	2.70*	−0.21	0.49	2.59*	0.65
9:50	1.75	2.79	1.59	0.03	0.36	−0.70
9:55	2.29	2.40	2.19	0.94	1.89	1.68
10:00	3.87	2.82	0.25**	3.63	1.81	2.34**
12:00	0.63	3.53**	1.55	0.13	−0.46	0.25*
14:00	2.10	4.07**	1.05	−0.09	0.76	1.60
16:00	1.95	2.12	1.09	0.84	2.08*	1.59
Panel B. Mean Dollar Order Imbalance (in $thousands per minute)						
9:35	12.82	22.75	13.48	47.58	−10.01	36.72
9:40	23.89	74.81*	28.05	21.85	−1.29	2.10
9:45	−0.19	60.83*	12.73	19.87	−25.63*	−1.52
9:50	9.98	37.45	13.29	37.04	75.90*	4.33
9:55	35.66	13.20	2.43*	13.93	−10.90	23.53
10:00	24.25	44.38	11.46	7.88	0.85	1.63
12:00	4.86	15.78**	9.08	7.63	7.63	4.54
14:00	10.29	15.38*	9.35	8.00	6.57	10.18
16:00	6.70	17.15**	11.79	7.35	3.67	0.61

Table 8 reports measures of trading activity during a three-day window around the pre-market release of analyst stock recommendation changes. Panel A reports the average percentage order imbalance defined as (number of buys − number of sells)/(number of buys + number of sells). Panel B reports the average dollar order imbalance defined as (dollar value of purchases − dollar value of sales). In the Event Day and Following Day columns, * and ** denote significantly different means at the 5% and 1% levels, respectively. The data consists of 2,732 upgrade and 4,457 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

lyst and perceive the recommendation change as an opportunity for profit taking with relatively little price impact. Others may actively take contrarian positions, with or without knowledge of the recommendation change. Regardless of their motivation, the actions of contrarian traders appear to delay the incorporation of the recommendation change into prices, and contribute to clients' information advantage.

B. Dealer Quoting Behavior

Although firewalls exist between analyst research and market making activities,[13] dealers within the recommending firm typically become informed of recommendation changes at the same time as brokerage clients. As dealers optimally adjust their inventories in light of the recommendation, their quotes may reveal the direction of the analyst's opinion change. Specifically, a market maker that wants to acquire stock will be more likely to offer a competitive bid price and less likely to offer a competitive ask price. The opposite is true for a market maker wishing to unload inventory.[14]

[13]The Securities Act of 1934 prevents dealers from adjusting inventory in advance of analyst recommendations to prevent market manipulation.

[14]Accurate time stamps are important when interpreting dealer behavior around recommendations. Heidle and Li (2003) examine dealer quotes prior to the report of analyst recommendations on the Dow Jones Newswire. Their findings regarding quote behavior *before* the newswire release are consistent with the current results *after* recommendations are released to clients.

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Table 9 reports the percentage of time the recommending dealer, the other top rated brokers, and two ECNs quote at the inside bid and ask prices surrounding recommendation changes. During the first five minutes of trading, the recommending dealer quotes at the inside bid 6.2% of the time on average the day before the recommendation change and 9.1% the day of the recommendation, and the means are statistically different at the 1% level. The recommending dealer continues to be significantly more likely to quote at the inside bid throughout the recommendation day. There is no corresponding increase in the likelihood of quoting at the inside ask, which suggests the recommending dealer is acquiring stock following the upgrade, either to accommodate customer order flow or as part of their proprietary trading.[15]

TABLE 9

Percentage of Time at Inside Quotes Following Analyst Recommendation Changes

	Analyst Firm			Other Brokerage Firms			Instinet ECN			Island ECN		
	Prev. Day	Event Day	Next Day	Prev. Day	Event Day	Next Day	Prev. Day	Event Day	Next Day	Prev. Day	Event Day	Next Day
Panel A. Upgrade Recommendations												
% at inside bid												
9:35	6.2	9.1**	6.3	5.3	4.7*	4.8*	24.9	27.8*	24.9	20.2	25.0*	21.9*
9:40	5.8	8.5**	6.0	5.2	4.7*	4.5*	28.2	29.9*	29.4	23.9	27.0*	25.1
9:45	5.7	8.6**	5.8	5.1	4.5*	4.3*	28.7	29.3	30.4	25.9	28.9*	26.7
10:00	5.7	8.4**	6.3	5.0	4.8	4.5*	29.8	30.1	30.4	26.3	29.0*	27.5
12:00	6.7	8.2**	7.2	5.3	5.0	4.7*	30.3	30.7	30.9	26.5	29.2*	27.6
16:00	6.4	8.5**	7.6**	5.4	5.1	4.9*	30.2	31.1	30.6	26.0	28.1*	26.3
% at inside ask												
9:35	6.1	5.3	5.1	4.8	4.8	4.6	28.0	27.7	29.2	21.8	26.1*	25.1*
9:40	5.5	5.2	5.0	4.3	4.3	4.1	31.2	32.2	32.3	24.8	30.4*	28.7*
9:45	5.0	5.3	4.9	4.1	4.2	4.0	32.8	33.8	33.2	27.3	31.7*	30.5*
10:00	5.0	5.1	5.2	4.3	4.4	3.9	33.6	35.5*	34.2	28.2	31.8*	30.7*
12:00	5.5	6.1	5.6	4.5	4.7	4.2	32.5	33.2	33.0	27.6	30.8*	29.6*
16:00	5.5	6.2*	5.7	4.5	4.8	4.3	32.7	32.9	33.0	26.4	28.9*	27.7
Panel B. Downgrade Recommendations												
% at inside bid												
9:35	6.0	5.3	5.9	5.2	5.1	5.3	24.0	24.9	25.6*	21.2	23.7*	21.5
9:40	5.6	5.4	5.9	4.6	5.0*	4.9	29.4	30.0	29.8	25.7	27.9*	26.5
9:45	5.2	5.7	5.7	4.6	5.0*	4.7	29.8	31.2*	31.2	27.6	30.1*	28.9
10:00	5.7	5.9	6.0	4.8	5.0	4.8	30.3	32.7*	33.1*	28.9	30.2*	29.3
12:00	6.3	6.9	6.4	5.0	5.6*	5.2	30.8	32.2*	32.5*	28.6	30.5*	29.8*
16:00	6.4	7.1*	6.5	5.2	5.7*	5.4	30.5	31.6*	32.3*	27.9	29.7*	28.8
% at inside ask												
9:35	5.5	7.2*	6.0	4.8	5.1	4.6	30.7	32.6*	28.8	23.5	26.0**	25.4**
9:40	5.0	6.8*	5.3	4.4	4.8*	4.4	34.0	35.1	33.0	26.1	27.8**	27.8**
9:45	5.1	6.6*	5.3	4.2	4.7**	4.4	36.3	36.6	34.1**	27.9	29.6**	30.0**
10:00	4.7	6.7*	5.5*	4.3	4.9**	4.5	36.5	36.9	34.5**	28.7	30.6**	30.3**
12:00	5.3	6.8*	5.9*	4.7	5.0*	4.8	34.7	36.7**	34.1	28.9	30.5**	29.6
16:00	5.6	6.8*	6.0	4.7	5.0*	5.0	34.4	35.4	33.9	27.8	29.1*	28.2

Table 9 reports the average percentage of time Nasdaq market makers quote at the inside prices during a three-day window around the pre-market release of analyst stock recommendation changes. In the Event Day and Next Day columns, * and ** denote that the means are statistically different from the Previous Day average at the 5% and 1% levels, respectively. The data consists of 2,727 upgrade and 4,450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

[15]The identities of the transaction counterparties are not reported in the data, which prevents measuring the direct effect of recommendations on dealer trading. Irvine (2003) studies identified trading data from the Toronto Stock Exchange and finds that buy recommendations generate increased trading volume for the brokerage firm during the two weeks following the recommendation.

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As a benchmark, I also examine the quoting behavior of the other top brokers who make a market in the recommended stock. The results indicate that the other dealers are significantly less likely to quote at the inside bid, from 5.3% to 4.7%, with no change in the quoting behavior for the inside ask. Thus, dealers within the recommending firm are roughly twice as likely to quote at the inside bid following upgrades than dealers at other brokerage firms.

The results for downgrades are similar. During the first five minutes of trading, the recommending dealer quotes at the inside ask 5.5% of the time on average the day before the recommendation change and 7.2% the day of the recommendation, and the means are statistically different at the 5% level. The recommending dealer continues to be significantly more likely to quote at the inside ask throughout the recommendation day. There is no corresponding increase in the likelihood of quoting at the inside bid, which suggests recommending dealers reduce their inventory positions following downgrades. There is evidence that dealers at other brokerage firms are more active following downgrades, being more likely to quote at the inside at both bid and ask prices, although their propensity to quote at the inside ask is still lower than the recommending dealer (5.1%).

Huang (2002) shows that Instinet, the ECN primarily used by institutional investors, and Island, which is geared toward individual investors, play important roles in price discovery. In his sample of heavily traded Nasdaq stocks, he finds that the two ECNs match the inside quote more than 50% of the time although their share of trading volume is considerably less. Table 9 documents a smaller role for the ECNs but confirms their role in price discovery. On average, Instinet and Island quote at the inside prices roughly 30% of the time.

The behavior of quotes on Instinet provides evidence that institutions are quick to respond to the sentiment of the recommendation change. In the first five minutes following an upgrade (downgrade), Instinet is significantly more likely to post a quote at the inside bid (ask), with no corresponding change on the other side of the market. The change in quoting behavior is not as persistent as for the recommending dealer, but is consistent with institutions quickly adjusting their positions in line with the recommendation change. In contrast, the behavior of quotes on Island appears unrelated to the sentiment of the recommendation change. Island quotes are significantly more likely to appear at the inside bid and ask for both upgrades and downgrades, which suggests the ECN quoting behavior is influenced more by the increased trading activity than by the content of the recommendation change. Taken together, the pattern of quote behavior across market makers and ECNs is consistent with brokerage firm clients acting on their short-lived information advantage.

V. Conclusions

This paper studies the value of analyst research to brokerage firm clients by examining the short-term profitability associated with early access to recommendation changes. During the 1999 through 2002 sample period, market participants with early access to recommendation changes were able to capture average two-day returns of 1.02% by purchasing following upgrades and returns of 1.50% by selling short following downgrades. The trading profits also appear to be econom-

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ically meaningful. Tens of millions of dollars trade at favorable prices following recommendation changes, and a calendar-based trading strategy that purchases following upgrades and sells short following downgrades results in average annualized excess returns of over 30%. The results indicate that the performance of recommendations-based investment strategies, such as those studied in Barber, Lehavy, McNichols, and Trueman (2001), (2004), Boni and Womack (2006) in this issue, and Jegadeesh and Kim (2004), can be significantly enhanced by transacting quickly following recommendation changes.

Short-term profit opportunities persist for roughly two hours following the pre-market release of analyst recommendation changes to clients, which contrasts with Busse and Green's (2002) evidence of a near instantaneous response when recommendations are publicly broadcast on television. Trading activity more than doubles, and the behavior of dealer quotes within the recommending firm is consistent with their clients making use of the informational advantage that arises from analysts' opinion changes.

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