

# The Value of Client Access to Analyst Recommendations

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## Abstract

I find evidence that early access to stock recommendations provides brokerage firm clients with incremental investment value. After controlling for transaction costs, purchasing (selling short) following upgrades (downgrades) results in average two-day returns of 1.02% (1.50%). Short-term profit opportunities persist for two hours following the premarket release of recommendation changes. A calendar based strategy produces annualized returns of over 30%, and the results are robust during both bull and bear markets. Market makers within the recommending firm shift their quotes with the sentiment of the recommendation change, which provides indirect evidence that clients make use of their short-term informational advantage.

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## 1. Introduction

Each day in the United States thousands of security analysts go to work at hundreds of different brokerage firms, providing market analysis, writing research reports 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 residual 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.<sup>1</sup> Recommendations are often distributed over newswire services such as Dow Jones or Bloomberg not long after they are shared with brokerage clients. Thus, clients' informational advantage is relatively short-lived. Is it valuable? Several recent studies suggest that early access to analyst recommendations may be particularly useful. Womack (1996) finds that the price response to recommendation changes over a three-day event window is roughly equal in magnitude to the price drift over the next six months. In other work, Barber, Lehavy, McNichols, and Trueman (2001) form portfolios based on consensus recommendation levels and find that delaying portfolio adjustments after recommendation changes quickly erodes the abnormal performance between the least and most favorably recommended portfolios.<sup>2</sup> Also, Jegadeesh, Kim, Krische, and Lee (2002) show that consensus recommendation changes are much more useful than levels at predicting future stock performance. While

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<sup>1</sup>An exception is Dimson and Marsh (1984), who find evidence of abnormal performance in the analyst recommended trades put on by a U.K investment fund.

<sup>2</sup> Boni and Womack (2003) find more persistent differences in performance when constructing portfolios at the industry level.

these studies emphasize longer-term investment strategies after recommendations become widely available, their results suggest that early access to analyst reports may provide brokerage clients with incremental investment value. In this paper, I examine intraday trade and quote data to investigate the value of early access to analyst recommendations for Nasdaq listed stocks.

The structure of the Nasdaq stock market and the types of companies that list there make it a rich environment for a profitability study on analyst recommendations. Unlike the NYSE, institutional investors typically do not pay commissions for their Nasdaq trades since brokerage firms are compensated indirectly by making markets in Nasdaq listed stocks. This aspect of trading makes observed effective bid-ask spreads a more accurate measure of total transaction costs. In addition, recent research suggests that analyst recommendations may be more useful for Nasdaq listed companies. Amir, Lev, and Sougiannis (2000) find that the incremental value of analyst forecasts is greater for smaller companies, those in high-tech industries, and those with negative earnings. To the extent that young, technology oriented firms are more likely to list on Nasdaq, analyst recommendations on Nasdaq stocks will contain more investment value. Also, the multiple dealer structure of Nasdaq provides another avenue of investigation. Dealers within the recommending brokerage firm potentially hold an informational advantage over other dealers. Do their quotes reflect the sentiment of the recommendation change?

I examine over 7000 recommendation changes from 16 major brokerage firms during the period 1999 through 2002 and find evidence that recommendation changes do provide brokerage clients with a short-term trading opportunity. After controlling for transaction costs, purchasing following upgrade recommendations results in an average two-day return of 1.02%, whereas selling short following downgrades produces a return of 1.50%. Moreover, in contrast to the longer-term abnormal performance results in Barber, et al. (2001), which Barber, et al. (2003) show are completely reversed in more recent data, the short-term profitability results are robust in bull and bear markets.

Profit opportunities remain significantly positive for roughly two hours following the premarket release of analyst recommendation changes. The gradual price response is in contrast to Busse and Green (2002), who find that profit opportunities dissipate within seconds following the televised broadcast of analyst recommendations. The profits also appear to be economically meaningful. A calendar based trading strategy that purchases following upgrades and sells short following downgrades results in average annualized returns of over 30%.

Trading activity more than doubles after recommendation changes, yet there is relatively modest evidence that order imbalances shift in line with the recommendation change. Contrarian trading may arise from those unaware of the recommendation change or could also reflect profit taking. In either case, the actions of contrarian traders appear to delay the incorporation of the recommendation change into prices. 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. Overall, the findings indicate that early access is an important component of the value of analyst research. Investment strategies that rely on analyst recommendations benefit from the acting quickly, both in terms of favorable prices as well as increased liquidity.

The results also have implications for the evolving structure of sell-side analyst research following the Securities and Exchange Commissions' Global Analyst Research Settlement, which mandates the separation of research and investment banking activities.<sup>3</sup> Although the results offer convincing evidence that analyst recommendations do provide clients with investment value, the evidence also demonstrates the difficulty of

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<sup>3</sup> 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](http://www.sec.gov).

maintaining investment value while at the same time widely distributing stock recommendations. Cumulative abnormal returns during the month following upgrades and downgrades are roughly 6.5% and –8.5%, yet the majority of the price impact is complete by the time trading begins after the recommendation change (3.9% for upgrades and –6.4% for downgrades). Moreover, firm characteristics that lead to larger price impacts such as size or industry characteristics do not generally translate into larger client trading profits. These results suggest that efforts to delay the dissemination of stock recommendations to other market participants may enhance their value to brokerage firm clients.

The paper proceeds as follows. Section 2 describes the recommendation data, the price and transaction data, and the methodology. Section 3 examines the impact of recommendation changes on prices and investigates the profitability of a short-term trading strategy. Section 4 examines trading activity and dealer quoting behavior surrounding recommendation changes, and Section 5 concludes.

## **2. Data**

### *2.1. Analyst recommendations*

The analyst recommendation data are obtained from First Call, a subsidiary of the Thomson Corporation that facilitates the dissemination and analysis of brokerage firm research. Most U.S. and international brokerage firms submit their research reports electronically to First Call, which makes them available through an on-line computer system to subscribers who are also institutional clients of the brokerage firms. Professional investors typically use soft-dollar commissions to pay for subscription fees, which can cost thousands of dollars annually for each user. See Womack (1996) and Michaely and Womack (1999) for more details on First Call data and the informational role of sell-side analysts.

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. First Call disseminates recommendations through a newswire type service and also provides real-time analysis such as consensus recommendations and earnings forecasts. 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. 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.

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. For example, professional investors may see reports online and if desired later contact their broker or the analyst for further elaboration or clarification. Given the emphasis on short-term trading strategies in the current study, however, the timing of recommendations is critical. 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 market hours. Approximately 80 percent of the recommendation changes by are published outside of market hours.

In addition to the two time/date stamps, each recommendation record contains information on 1) the name, ticker symbol, and CUSIP of the relevant company, 2) the brokerage firm producing the recommendation, and 3) 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 recommendations changes made by the highest rated U.S. brokerage research departments, as designated by *Institutional Investor*. *Institutional Investor* magazine distributes surveys to professional investors asking them to rank research departments and security analysts, and publishes the results annually in its October issue. 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 sixteen brokerage firms that were consistently highly rated in the 1998 through 2001 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 1 or 2, 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 sentiment 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 2727 upgrade and 4450 downgrade recommendation changes.

Table 1 provides information on the number of recommendations per year and descriptive statistics for recommendations by broker. Although it is well documented that sell recommendations are relatively infrequent, the higher frequency of downgrades suggests that recommendation changes may provide a more accurate measure of consensus analyst sentiment.

## 2.2 Price and trade data and methodology

The quote and trade data is obtained from Nasdaq, the Nasdaq intraday dataset made available by the NASD. Nasdaq 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 midquote (average of the inside bid and ask prices) in effect at the time considered. To measure statistical significance for intraday price changes, I rely on the nonparametric bootstrap algorithm in Barclay and Litzenberger (1988). Specifically, consider  $n$  cross sectional returns  $(R_1, R_2, \dots, R_n)$  with sample mean  $\bar{R}$  drawn from an unknown distribution  $F$ . In order to estimate  $p \equiv \text{Prob}(\bar{R} > K)$  for some constant  $K$ , I use the following algorithm:

- (1) Estimate the distribution of  $F$  with the nonparametric empirical distribution  $\hat{F}$  putting probability  $1/n$  on each  $R_i$ .
- (2) Draw a bootstrap sample from  $\hat{F}(R_1^*, R_2^*, \dots, R_n^*)$  where each  $R_i^*$  is drawn randomly with replacement from the observed values  $(R_1, R_2, \dots, R_n)$ , and calculate  $\bar{R}^*$ .
- (3) Independently, repeat step (2) 10,000 times, obtaining  $\bar{R}^{*1}, \bar{R}^{*2}, \dots, \bar{R}^{*B}$ , and calculate

$$p \equiv \text{Prob}(\bar{R} > K) = \frac{\text{Number of times } \bar{R}^* > K}{10,000}. \quad (1)$$

The empirical bootstrap  $p$ -value for a one-sided hypothesis test  $H_0 : \bar{R} > K$  is computed as  $1 - p$ . I also calculate two-sided  $t$ -tests and find similar results.

When considering daily returns, 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. As in Womack (1996), 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 three-digit SIC code. The second measure of daily 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.<sup>4</sup> 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. I address this issue by also examining the performance of a calendar based trading strategy.

Trading profitability is measured using transactions data, where trades are identified as buyer- or seller-initiated by comparing the trade price to the prevailing bid and ask quotes. Using the algorithm in Ellis, Michaely, and O’Hara (2000), transactions at the current inside bid (ask) are classified as sales (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.

To measure the influence of recommendations on order flow, I follow Busse and Green (2002) and measure order imbalances as follows:

$$IMBAL_{it} = \frac{nBuys_{it} - nSells_{it}}{nBuys_{it} + nSells_{it}}, \quad (2)$$

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

One of Nasdaq’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.

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<sup>4</sup> Using five years of monthly data to estimate factor sensitivities produces very similar results.

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.

### **3. Price response to recommendation changes and trading profitability**

#### *3.1 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. 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. Other market participants may hear of the change in analyst sentiment through word of mouth, or later through newswires services or other financial media. Typically, the information becomes widely available by the opening trade on the day following the recommendation day. For example, approximately 75% of the recommendation changes in the sample are reported after the close on the recommendation day in Bloomberg's analyst summary.

Table 2 shows that the mean price response over the two-day event horizon is 5.74% following upgrades and -8.81% following downgrades.<sup>5</sup> The magnitude of the event window price response is approximately twice as large as response found in Womack (1996). The large price response to analyst recommendation changes is

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<sup>5</sup> 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.

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 premarket distribution of recommendation changes to brokerage firm clients is sufficient for prices to reflect the majority of the information by the time trading begins. However, prices continue to drift throughout the day and it takes approximately two trading days for prices to fully incorporate the information in the recommendation change. Price changes on the third day following the recommendation change are not statistically different from zero.

The magnitude and statistical significance of the price drift is greater than that found in earlier intraday work on analyst recommendations. Kim, Lin, and Slovin (1997) study 87 initiations of coverage in 1991 and find prices incorporate the recommendations within 5 to 15 minutes. Juergens (2000) studies recommendations on computer industry firms between 1993 and 1996 and finds that prices can take more than one day to fully incorporate recommendation changes, although the post event drift is smaller, on the order of 80 basis points. The larger, longer price response documented in Table 2 may be a reflection of the sample, which consists of recommendations from top rated brokerage firms on the types of firms where analysts may have a comparative advantage at forecasting the financial prospects of the firm. The response pattern is consistent with the gradual incorporation of the 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.

### *3.2 Trading profitability*

The gradual price response in Figure 1 and Table 2 highlights the possibility that clients may be able to trade profitably based on their early access to analyst recommendation changes. Do transaction costs offset attempts to profit from the observed price drift? Figure 2 depicts the net profitability of a short-term trading strategy. The top plot shows the profits from purchasing following upgrade recommendations and the bottom plot shows the profits from selling short following downgrade recommendations. The positions are assumed to be entered into during five-minute intervals from 9:30 to 10:00 and half-hour intervals from 10:00 to 12:00, and unwound during intervals on the afternoon of the recommendation day and the following trading day. Trades are specified as buyer- or seller-initiated according to the algorithm in Ellis, Michaely, and O'Hara (2000), and returns are calculated using the volume weighted average purchase (sale) prices calculated from buyer- (seller-) initiated transactions. Short-sell transaction prices are also required to satisfy the uptick rule.

After controlling for transaction costs, market participants who purchased stocks in the morning following a premarket recommendation change were 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 subperiods. 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 positive 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.

It is worth noting that price impacts as well as profit opportunities are evident for both upgrades and downgrades in 2002, during which analysts received considerable negative publicity over conflicts of interest between brokerage research and investment banking. See, for example, “Wall Street Analysts, Vilified, To Get Stricter Regulations” Wall Street Journal, February 7, 2002. The results in Tables 2 and 3 indicate that analyst recommendation changes continue to reveal price relevant information. Moreover, the evidence also suggest that recommendations provide brokerage firm clients’ with incremental investment value.

### *3.3 Cross-sectional determinants of price impact and profitability*

The cross-sectional determinants of price response and trading profitability following recommendation changes are investigated by regressing price changes on characteristics of the analyst recommendation and the recommended firm. The choice of firm characteristics is motivated by Amir, Lev, and Sougiannis (2000), who find that the incremental value of analysts forecasts is greater for firms that report losses, for technology oriented firms, and for small firms. I create two industry related independent variables. TECHNOLOGY and INTERNET are industry variables based on North American Industry Classification System (NAICS) codes, and are 1 if the firm operates in the industry, and 0 otherwise.<sup>6</sup> NEGATIVE EPS is 1 if the firm's most recently reported earnings per share are negative, and 0 otherwise. I also create firm-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, etc.

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 is 1 if the firm made an earnings announcement during the two days preceding a recommendation change, and 0 otherwise. Ivkovic and Jegadeesh (2003) find that recommendations made during the week following earnings announcements lead to smaller price impacts. To examine whether this translates into smaller profits as well, I also include NEAR EPS RELEASE, which is 1 if the recommendation is released in the week following an earnings announcement (but not within the preceding two days). Finally, as an additional control for confounding public information events I create an independent variable that is 1 if more than one firm issued a recommendation for the stock that day.

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<sup>6</sup> 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](http://www.naics.com).

The results are reported in Table 4. 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 3 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 price during the first hour of trading after the premarket release of a recommendation change and unwound at the average price between 2:00 and 4:00 on the following day.

The independent variables are able to explain 3.1 percent of the variation in price response to upgrades, and 11.5% of the variation in the response to downgrades. The effect of firm characteristics on the price response is generally consistent with Amir, Lev, and Sougiannis (2000). Technology firms experience a 2.16% larger price increase following upgrades and 3.03% larger price decline following downgrades, and both coefficients are statistically different from zero at the one percent level using White's correction for heteroskedasticity. The results for internet firms are roughly similar, 3.45% and -1.78%, yet the coefficient is significant only for upgrades. Recommendations on firms with negative earnings do not appear to elicit significantly larger price responses.

Recommendations have a larger impact on smaller firms, and the relation is generally monotonic. Recommendations on the smallest quintile stocks rise 5.18% more following upgrades and fall 6.18% more following downgrades than recommendations on the largest quintile stocks, and both coefficients are significant at the one percent level. Downgrades on quintile 4 stocks produce marginal price responses of -2.07%, which is also significant. For upgrades, the marginal price response of recommendations on quintile 4 is positive but insignificantly different from zero.

Earnings releases also have a significant influence on the price impact following recommendations. Recommendations within two days of earnings announcements

coincide with significantly larger price impacts (2.1% and -2.6%), whereas recommendations in the following week result in smaller price impacts (-1.4% and 3.49%).<sup>7</sup> The results are consistent with Ivkovic and Jegadeesh (2003), and suggest that while analysts' typically 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%), which suggests the multiple downgrades are likely responding to material negative public information releases.<sup>8</sup>

The independent variables have considerably less power at explaining cross sectional variation in trading profits following recommendation changes; the adjusted R-squared is 0.47% for upgrades and 1.20% for downgrades. The industry dummies play a smaller role, although there is evidence that technology stocks are more profitable following downgrades. Trading on downgrades is significantly more profitable for firms with negative earnings (0.99%), but trading on upgrades is hindered by negative earnings (-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 after controlling for the bid-ask spread. Downgrades on firms in quintiles 1 and 2 produce significantly larger profits than downgrades for firms in quintile 5.

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<sup>7</sup> For upgrades, the coefficient on NEAR EPS RELEASE is marginally significant with a p-value equal to 0.067.

<sup>8</sup> 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 4000 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.

### 3.4 Returns over longer horizons

Figure 2 and Table 3 indicate that clients with early access to analyst recommendation changes may be able to trade profitably on their short-term informational advantage. To help gauge the benefit of client access relative 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 a 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.<sup>9</sup>

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 returns are 1.40% and 2.59% using the Size-Industry and three-factor benchmarks, and both are statistically significant at the one percent 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

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<sup>9</sup> The factors are obtained from Ken French's website. I also estimate a four-factor model, including a daily momentum factor from Jeffrey Busse's website. The abnormal returns are very similar to the three-factor model results and are not reported for brevity.

-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 one percent level, whereas three-factor abnormal returns are insignificantly different from zero.

Although event period abnormal returns are on the order of five percent for upgrades and negative eight percent 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.

### *3.5 A calendar based strategy*

As an additional measure of the incremental value of early access to recommendation changes, I examine the performance of a calendar strategy that trades based on analyst recommendation changes and maintains the position for two days. Positions are assumed to be entered into at the volume weighted average transaction price from 9:30 to 10:30 on the day of the premarket release of the recommendation change, and unwound at the volume weighted average price from 2:00 to 4:00 on the day following the recommendation change. Purchase (sell) prices are measured using buyer-

(seller-) initiated transactions where trade direction is inferred using the algorithm in Ellis, Michaely, and O'Hara (2000). Since positions are held for two days but recommendations can take place each day, 50% of the portfolio is invested each day in equally weighted manner across the number of recommended stocks that day. If no recommendations take place on a day, that half of the portfolio is idle and earns 0%. Abnormal performance for the long only and short only strategies is measured by subtracting the daily return on the CRSP value weighted index (on idle days portfolios earn the negative return on the index). Statistical significance is measured using bootstrap p-values, although t-statistics produce similar results.

Another important consideration is the number of recommendations available to investors. Although Goldstein, Irvine, Kandell, and Weiner (2002) report that large institutions regularly trade through more than 50 different brokers, smaller investors may have access to research from a single broker. Thus, performance is examined for each individual brokerage firm as well as for the full sample of recommendation changes. Table 6 reports the performance of purchasing following upgrades, selling short following downgrades, and for a combined long and short strategy.

The table indicates that a short-term strategy of purchasing following upgrades produces positive abnormal returns for 15 of the 16 brokers, five of which are significantly different from zero at the five percent level and two others are significant at the ten percent level. The average abnormal performance across brokers is 6.9 basis points per day, which translates into an annualized return of 18.9% (assuming 252 trading days in a year). The overall market fell during the sample period; across brokers the average unadjusted performance is 5.4 basis points per day or 14.6% annualized.

Given the frequency of upgrade recommendations, the average portfolio is active only once every 7.7 trading days, which makes the daily returns considerably smaller than those implied by Table 3. Extending the strategy to include recommendations from all brokerage firms, which is more likely for large institutions, greatly increases the

activeness of the portfolio and its performance. The abnormal performance of the strategy based on all recommendations is 29.6 basis points per day on average, which is significantly different from zero at the one percent level and translates into roughly 110% annualized returns. The strategy is risky, however, with a standard deviation of daily returns equal to 2.52% compared to 1.04% for the overall market.

The abnormal returns from selling short following downgrades are positive for 15 of the 16 brokers, with six being significant at the five percent level and an additional two being significant at the ten percent level. Across brokers, the average abnormal performance is 10.5 basis points per day, or 30.4% annualized (average unadjusted returns are 25.8% annualized). Extending the strategy to include all recommendations issued by top rated brokerage firms again greatly increases the performance. The average abnormal daily return is 41.6 basis points, which translates into over 180% annualized returns.

The combined long and short strategy produces more consistently positive returns. The average daily returns for the combined long and short strategy are positive for all 16 brokers and nine are significantly different from zero at the five percent level, with two additional brokers significant at the ten percent level. The average performance across brokers is 12.9 basis points per day, or 38.3% annualized. A strategy that assumes investors have access to the recommendations from all brokerage firms again produces large returns, 41.4 basis points per day or over 180% annualized returns.

The large returns apparently available to institutions with early access to research from the top rated brokerage firms are striking but also perhaps misleading. While returns are measured using volume weighted average transaction prices that take into account the effective spread, the assumed one-hour entry window may be insufficient time for large institutions to put on a position of reasonable size without substantially moving the price. In the next section I examine trading activity and order flow in more detail, but as a first pass I limit the portfolios to stocks with large market values using NYSE size

breakpoints. Restricting the portfolios to recommended stocks in size deciles six through ten produces returns of 19.7, 14.3, and 17.0 basis points per day for the upgrade, downgrade, and combined strategies (the upgrade and the combined strategy are significant at the one percent level). Further restricting the portfolio to stocks in size deciles nine and ten produces daily returns of 14.5, 12.2 and 18.5 basis points per day, with the same levels of statistical significance.<sup>10</sup>

Another potential concern with using transaction data to measure returns is that trading could be endogenously related to transaction costs. For example, if observed trading is less likely when spreads are wide, depths are low, etc., then blindly trading on recommendation changes would result in lower returns than those reported in Table 6. Indeed, if every brokerage firm client quickly bought recommended stock after upgrades and sold short after downgrades, it is highly unlikely the available liquidity would be high enough to consistently accommodate short-term profits. Although the evidence does not imply that all clients can trade profitably following recommendation changes, it does provide convincing evidence that early access enhances the value of analyst research.

#### **4. The impact of recommendation changes on market conditions**

##### *4.1 Trading activity*

Table 7 reports data on trading intensity and volume following recommendation changes. Compared to the previous day, trading intensity doubles in the first five minutes of trading following a recommendation upgrade, from a median (mean) of 8.0 to 21.2 (44.4 to 81.7) trades per minute. The increase following downgrades is also considerable, from 7.4 to 19.4 (46.6 to 98.9) trades per minute. For both upgrades and downgrades, throughout the recommendation day trading intensity and volume remain two the three

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<sup>10</sup> I also examine the performance assuming a two-hour entry window. The combined upgrade and downgrade strategy produces average daily returns of 35.4, 14.6, and 17.7 basis points for recommendations on all stocks, stocks from size deciles six through ten, and stocks from deciles nine and ten, all of which are statistically different from zero at the five percent level.

times higher than the previous day, and the differences are statistically different using two-sample t-tests as well as nonparametric two-sample Kolmogorov-Smirnov tests.

The pattern for trading volume is similar. The median (mean) trading volume during the first five minutes of trading following an upgrade recommendation is \$1.9 (\$12.5) million, and the trading volume from 9:30 to 10:30 is \$6.0 (\$40.4) million. Focusing on stocks in the largest two size deciles as in the trading strategy in Panel B of Table 6, the median trading intensity during the first hour of trading is 32.7 trades per minute, with a median trading volume of \$59.8 million during the interval.

If the increase in trading activity is related to recommendation changes, we 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 fifteen 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 five percent level. The results for downgrades are less robust. While percentage and dollar order imbalances are generally negative for ten 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 analyst 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.

#### *4.2 Dealer quoting behavior*

Although firewalls exist between analyst research and market making activities<sup>11</sup>, 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 change, their quotes may reveal information regarding the sentiment of recommendation. 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.

One difficulty with investigating quoting behavior is that institutional arrangements weaken the link 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 adjust their inventory positions without moving their quotes. Although these arrangements diminish the power to detect inventory adjustments through quoting behavior, it increases the significance of any observed change in quoting behavior.

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

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<sup>11</sup> The Securities Act of 1934 prevents dealers from adjusting inventory in advance of analyst recommendations to prevent market manipulation.

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 one percent 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.<sup>12</sup>

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 five percent 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%).

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<sup>12</sup> 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.

Huang (2002) shows that the ECNs Instinet, which is primarily used by institutional investors, and Island, which is geared towards individual investors, play an important role in price discovery. In his sample of heavily traded Nasdaq stocks, he finds that the 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.

## **5. Conclusions**

Previous research on the value of brokerage firm stock recommendations emphasizes longer-term strategies after the recommendations become widely available. By focusing on the short-term informational advantage of brokerage firm clients and carefully controlling for trading costs using intraday transaction data, I find convincing evidence that analyst recommendations do contain investment value. During the 1999 through 2002 sample period, market participants with early access to analyst 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. A calendar strategy of short-term investments based on recommendation changes produces annualized returns of over 30%, and the results are robust during bull and bear markets. The results indicate that the performance of recommendations based investment strategies, such as those studied in Barber, Lehavy, McNichols, and Trueman (2001), Boni and Womack (2003), and Jegadeesh and Kim (2003), can be significantly enhanced by transacting quickly following recommendation changes.

Short-term profit opportunities persist for roughly two hours following the premarket release of analyst recommendation changes. Trading activity more than doubles, and the behavior of dealer quotes within the recommending firm is consistent with clients making use of their short-term informational advantage. Overall, the findings indicate that early access is an important component of the value of analyst research, and suggest that efforts to delay the dissemination of analyst recommendations to other market participants may enhance their value to brokerage firm clients.

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**Table 1**  
**Descriptive statistics for analyst recommendation changes**

By Brokerage Firm	Number of Upgrades	Number of Downgrades
Least active broker	61	153
Median	171	264
Mean	170	278
Most active broker	319	458
Sub-periods		
1999	761	667
2000	666	1040
2001	830	1857
2002	470	886
Total	2727	4450

The table 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.

**Table 2**  
**Intraday price changes following analyst recommendation changes**

	Upgrades				Downgrades			
	Return		Cumulative		Return		Cumulative	
	Return	p-value	Return	p-value	Return	p-value	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

The table reports average percentage price changes for two days following the premarket 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 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

**Table 3**  
**Trading profits following analyst stock recommendation changes**

Panel A: Upgrade Recommendations

Enter Position	All Years		1999		2000		2001		2002	
	Return	p-value	Return	p-value	Return	p-value	Return	p-value	Return	p-value
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

Enter Position	All Years		1999		2000		2001		2002	
	Return	p-value	Return	p-value	Return	p-value	Return	p-value	Return	p-value
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

The table shows the average percentage price changes for two days following the premarket 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 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

**Table 4**  
**Characteristics of the price impact following analyst recommendation changes**

	Price response		Trading profits	
	Upgrades	Downgrades	Upgrades	Downgrades
Number of observations	2582.00	3758.00	2582.00	3758.00
Adjusted R-squared (%)	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

The table shows the results of regressions of recommendation and firm characteristics on the price response and trading profits following the premarket 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 bank recommending the stock that day. One and two stars represent statistical significance at the five and one percent levels using standard errors adjusted for heteroskedasticity. The data consists of recommendation changes on Nasdaq-listed stocks from January 1999 through December 2002.

**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	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
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

The table reports actual and adjusted returns for intervals surrounding analyst recommendation changes. Size-Industry Adjusted Returns are calculated by subtracting the return on a portfolio matched according to 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 (SDs) and t-statistics are calculated cross-sectionally from all recommendations with firm returns in each period. One and two stars denote significance at the 5% and 1% level. The data consists of 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

**Table 6****Daily calendar returns from short-term strategies based on analyst recommendation changes**

	Purchase Upgraded Stocks Minus Market			Short-Sell Downgraded Stocks Minus Market			Purchase Upgraded Stocks and Short-Sell Downgraded Stocks		
	Mean Daily Return %	Standard Deviation	Bootstrap p-value	Mean Daily Return %	Standard Deviation	Bootstrap p-value	Mean Daily Return %	Standard Deviation	Bootstrap p-value
Panel A: Recommendations by broker									
Broker 1	-0.010	1.65	0.42	0.043	2.62	0.30	0.006	2.23	0.47
Broker 2	0.064	1.90	0.15	-0.013	2.51	0.43	0.034	2.15	0.29
Broker 3	0.059	2.28	0.20	0.037	2.29	0.30	0.034	2.26	0.31
Broker 4	0.012	1.91	0.41	0.116	2.67	0.10	0.076	2.29	0.14
Broker 5	0.100	2.09	0.05	0.006	2.63	0.49	0.081	2.28	0.11
Broker 6	0.041	1.68	0.23	0.086	2.57	0.13	0.096	2.11	0.08
Broker 7	0.000	1.78	0.48	0.126	2.99	0.09	0.096	2.34	0.09
Broker 8	0.115	1.82	0.02	0.057	2.30	0.22	0.119	2.01	0.03
Broker 9	0.040	1.68	0.21	0.124	2.29	0.05	0.123	1.86	0.02
Broker 10	0.082	1.75	0.06	0.072	2.70	0.19	0.132	2.26	0.03
Broker 11	0.135	1.68	0.00	0.031	2.17	0.35	0.137	1.80	0.00
Broker 12	0.124	1.84	0.02	0.140	2.82	0.05	0.175	2.37	0.01
Broker 13	0.081	1.76	0.07	0.178	2.37	0.01	0.217	2.11	0.00
Broker 14	0.076	2.06	0.12	0.207	2.69	0.01	0.221	2.47	0.00
Broker 15	0.059	1.84	0.16	0.257	2.86	0.00	0.246	2.38	0.00
Broker 16	0.123	2.07	0.02	0.220	2.85	0.00	0.266	2.63	0.00
Panel B: All brokerage firm recommendations									
All Stocks	0.296	2.52	0.00	0.416	3.87	0.00	0.414	2.23	0.00
Size Deciles > 5	0.197	2.66	0.01	0.143	3.29	0.07	0.170	2.32	0.01
Size Deciles > 8	0.145	2.19	0.02	0.122	2.89	0.10	0.185	2.15	0.00

Positions are entered into using the volume weighted average transaction price from 9:30-10:30 following the premarket release of analyst stock recommendation changes, 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 recommendation changes occur, that half of the portfolio earns 0% before market adjustment. Upgrade only and Downgrade only strategies are adjusted by subtracting the daily return on the CRSP value weighted index. Statistical significance is measured using bootstrap p-values. Panel A reports the performance by individual broker; Panel B assumes access to all recommendation changes and reports the results for stocks with different market values using NYSE breakpoints. The data consists of 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

**Table 7**  
**Trading activity following analyst recommendation changes**

	Upgrades			Downgrades		
	Previous Day	Event Day	Following Day	Previous Day	Event Day	Following Day
<b>Panel A: Mean number of trades per minute</b>						
9:35	44.4	81.7**	49.6	46.6	98.9**	56.5**
9:40	30.5	54.7**	31.8	32.3	64.8**	34.5
9:45	28.9	48.2**	30.5	30.7	59.2**	31.9
9:50	27.4	44.6**	29.3	29.6	53.2**	29.4
9:55	26.7	40.6**	27.6	28.1	49.4**	27.9
10:00	24.9	37.6**	26.1	26.4	45.0**	26.6
12:00	16.0	21.9**	16.5	16.7	26.9**	16.7
14:00	9.5	11.4**	9.2	10.3	14.5**	9.3*
16:00	15.7	17.9*	15.0	16.9	20.6**	14.6**
<b>Panel B: Mean dollar volume (in \$thousands per minute)</b>						
9:35	1312.7	2,500.9**	1426.4	1129.2	2,358.1**	1263.6
9:40	1140.8	2,120.7**	1164.8	986.9	2,182.5**	1005.7
9:45	1064.2	1,919.1**	1122.7	916.6	1,976.9**	947.4
9:50	1046.8	1,713.7**	1096.3	893.2	1,744.3**	876.9
9:55	978.1	1,569.6**	1013.5	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*

The table reports measures of trading activity during a three-day window around the premarket release of analyst stock recommendation changes. Panel A reports the average number of trades per minute. Panel B reports the average dollar amount of trading per minute. In the Event Day and Following Day columns, one and two stars denote significantly different means at the five and one percent level. The data consists of 2732 upgrade and 4457 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

**Table 8**  
**Order imbalance following analyst recommendations**

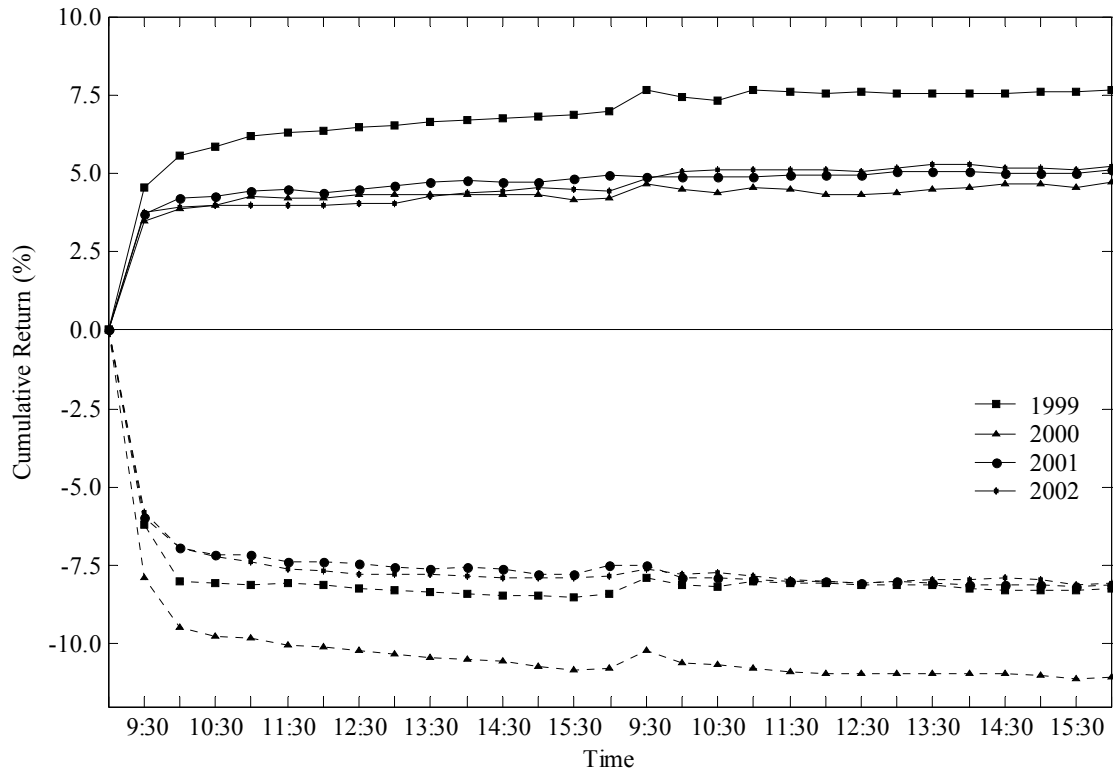
	Upgrades			Downgrades		
	Previous Day	Event Day	Following Day	Previous Day	Event Day	Following Day
<b>Panel A: Mean percentage order imbalance</b>						
9:35	1.70	7.88**	2.75	0.18	-1.75*	0.51**
9:40	1.61	4.19*	1.59	-0.31	-0.31	-0.31
9:45	-0.25	2.70*	-0.21	0.49	2.59*	0.65
9:50	1.75	2.79	1.59	0.03	0.36	-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
<b>Panel B: Mean dollar order imbalance (in \$thousands per minute)</b>						
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

The table reports measures of trading activity during a three-day window around the premarket 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, one and two stars denote significantly different means at the five and one percent level. The data consists of 2732 upgrade and 4457 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.

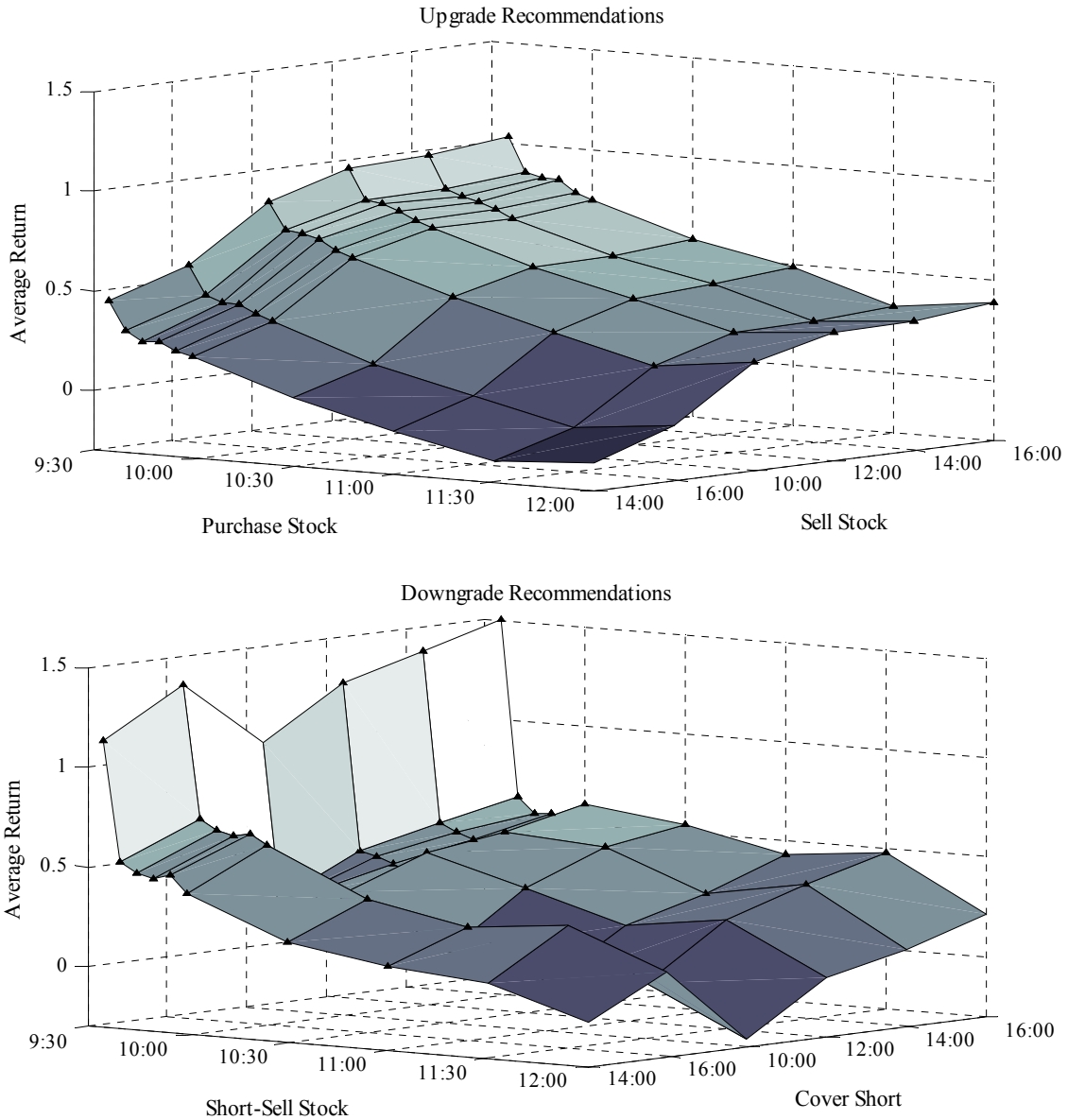
**Table 9**  
**Percentage of time at inside quotes following analyst recommendation changes**

		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													
Percent 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
Percent 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													
Percent 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
Percent 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

The table reports the average percentage of time Nasdaq market makers quote at the inside prices during a three-day window around the premarket release of analyst stock recommendation changes. In the Event Day and Next Day columns, one and two stars denote that the means are statistically different from the Previous Day average at the five and one percent level. The data consists of 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.



**Figure 1. Price response to analyst recommendation changes.** The figure shows the average price response for two days following the premarket release of analyst stock recommendations. The response is shown separately for upgrade and downgrade recommendations and for each year. The data consists of 2727 upgrade (solid line) and 4450 downgrade recommendations (dashed line) on Nasdaq-listed stocks from January 1999 through December 2002.



**Figure 2. Intraday trading profits following analyst recommendation changes.** The plots show the average percentage price changes for two days following the premarket 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 five percent level using bootstrap tests. The data consists of 2727 upgrade and 4450 downgrade recommendations on Nasdaq-listed stocks from January 1999 through December 2002.