

Getting Out Early: An Analysis of Market Making Activity at the Recommending Analyst's Firm

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ABSTRACT

This paper examines trading volume for Nasdaq market makers around analyst recommendation changes issued by an analyst at the same firm. Using Nasdaq Post-Data, we find a disproportionate increase in market making volume associated with the firm's recommendation changes and evidence of elevated sell volume at the recommending analyst's firm in the 2 days preceding a downgrade. The implications are that the information source matters in determining the placement of trades and that the issuing analyst's firm appears to be rewarded for prereleasing information through increased volume. These findings constitute new evidence of compensation for research production through the market making channel.

IN THIS PAPER, we explore issues related to private returns from the private acquisition of information (Grossman and Stiglitz (1980)). If the acquisition or production of information is costly, excess returns are necessary for the existence of a competitive equilibrium. Research departments at large brokerage firms are a source of information production, yet these units do not generate income directly, instead relying on complementarities with other lines of business for partial compensation. Our paper offers a number of new empirical findings that have implications for the compensation of research production in brokerage firms. In particular, we examine patterns in trading volume for Nasdaq market makers surrounding analyst recommendation changes issued by an analyst at the market maker's same firm.¹ We find a dramatic disproportionate increase in trading volume at the firm associated with upgrades and downgrades. Further, we find evidence that suggests some investors have

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¹Unlike a single specialist market system, such as the NYSE, the Nasdaq market requires a minimum of two competing market makers per security. Most brokerage firms maintain both market making and research departments, and there is generally substantial overlap among the securities in which firms make markets and provide research coverage. See also Chung and Cho (2005).

access to information contained in analyst reports in the days prior to the official release.

The production of recommendations by brokerage firms is a costly activity. One way for firms to recover costs is through increased trading. While evidence indicates that investors trade in response to analyst opinions and can earn abnormal profits in the short run, an unexplored question is whether there are differential volume effects at the analyst's firm.² If an analyst recommendation is released simultaneously to all market participants, there should not necessarily be a systematic pattern to the order flow or trading at the market maker of the analyst's firm, and the potential to recover information production costs would therefore be diminished. Alternatively, different subjective assessments of analyst quality, trading in discretionary accounts, brokers "working the phones," or soft dollar agreements in exchange for research could all lead to increased trading at the analyst's firm (relative to other firms) upon the dissemination of an analyst recommendation change. In this paper, we ask if there is a differential effect on trading at the issuing analyst's firm in response to revisions in analyst opinions. By identifying any disproportionate trading response, we can further examine issues related to the direction of trade and the timing of the information dissemination.

While previous research documents a relation between a brokerage's coverage of a security and increased market share in that security (Irvine (2001)), establishing this more direct link between recommendation changes and trading volume offers a number of distinct advantages. First, the coverage decision is highly endogenous, making it difficult to determine whether coverage leads to increased market share or whether other factors simultaneously lead to both coverage and increased market share.³ Moreover, while initiation of coverage might involve substantial fixed costs, most coverage extends for a lengthy period of time, such that the bulk of a firm's research costs are likely attributed to ongoing research production. Most importantly, establishing the link between recommendation changes and trading enables us to assess both the directional effects and the timing effects of any increased trade. Examining the direction of trade allows us to test the relative agreement between the recommendation by the market maker and clients of the firm. Further, following recent regulatory events (Regulation FD and the Global Research Analyst Settlement), it is possible that analysts have heightened incentives to extract compensation from sources other than banking, increasing the incentives to provide favored access to opinions.

² See, for example, Chen and Cheng (2005), He, Mian, and Sankaraguruswamy (2005), Barber et al. (2001), Irvine (2003), Stickel (1995), and Womack (1996).

³ While revisions can also be driven by outside factors, our unit of analysis based on daily measures makes controlling for these factors more feasible, via stock returns or the existence of other analyst reports at the same time, for example. We also perform a series of robustness checks, such as excluding recommendation changes that occur on the same day as other recommendation changes or after the first in a series and, unlike previous studies, account for correlations in the error structure that arise from having multiple market maker observations for the same security and time period. Such adjustment is particularly important for measures such as market share that sum to 1. See, for example, Petersen (2007).

Using Nasdaq PostData, we link the daily trading activity of each market making firm security-by-security to analyst recommendation changes emanating from the same firm. We document that, for a broad set of Nasdaq securities, trading volume for the recommended security at the market maker of the analyst's own firm increases disproportionately around upgrades and downgrades relative to the total market volume for the security. It does not appear that better execution prices explain these differences. Further, the direction of the volume, on average, is in the same direction as the analyst revision, suggesting that either the firm itself, through building a position, or the brokerage firm's clientele believe their own analyst recommendations. The implications are that the information channel matters in determining the placement of trades, and the issuing analyst's firm seems to be rewarded with increased order flow or proprietary trading profits.

While elevated buy volume for the market maker is confined to the upgrade release date, we find evidence of elevated sell volume at the recommending analyst firm's market maker in the 2 days preceding a downgrade. This finding is robust to the potential endogeneity of the analyst recommendation, so it does not appear that the downgrade is a reaction to elevated sell volume at the firm. Bad news seems to be disseminated early either internally or to important clients of the firm.

We also observe that the disproportional increase in sell volume 2 days prior to the downgrade date is confined to firms that engage in proprietary trading, that is, trading on behalf of the brokerage firm's house account. Moreover, the disproportional increase in sell volume is positively associated with the proportion of revenue a firm derives from proprietary trading. For the day prior to the recommendation release, the disproportional sell volume extends to market makers who act strictly in an agency capacity on behalf of their clients, so that at least a portion of the trading activity is driven by clients of the firm.

The incidence of prerelease selling appears to be fairly widespread among types of analysts and firms, as measured by reputation and experience. The prerelease selling, however, is stronger for downgrades that, when released, prior literature has shown to have stronger price or volume effects. Thus, it appears that the content of the report drives the incentive to disseminate information early and/or the strength of the trading response.

Trading in anticipation of the issuance of a research report is governed by Nasdaq Rule 2110-4, which states that such activity is "inconsistent with the just and equitable principles of trade." The interpretation of this rule, however, "recommends but does not require that member firms . . . establish effective internal control systems and procedures that would isolate specific information within research and other relevant departments of the firm." Trading for the firm's own account in anticipation of a research report would be a clear violation of this rule. The interpretation, however, "does not apply to changes in an inventory position related to unsolicited order flow from a firm's retail or broker/dealer client base. . . ." Rule 2110-4, therefore, does not explicitly cover selective disclosure to clients. Such disclosures may violate internal firm policies related to the equitable treatment of clients, but only if such policies are in place.

The contributions of this study are fourfold. First, we show that upgrades and downgrades trigger disproportionate trading volume for the recommending firm. These findings add to the literature that relates analyst research to commission-generating activity. Irvine (2001), using attributed volume data from the Toronto Stock Exchange, notes that there is a positive relationship between analyst coverage of a security and volume in that security, while Agrawal and Chen (2008), Irvine (2004), and Jackson (2005) document that brokerage firms can increase the amount of trade and thus trading commissions, through more positive stock recommendations. Our paper establishes the new finding of attributed volume responses on specific analyst event days.

In addition, we are able to highlight investors' trading patterns around upgrades and downgrades following recent regulatory changes that may have altered market perceptions about analyst opinions. Several studies show that price and aggregate volume responses are generally in the direction of the recommendation (Barber et al. (2001), Chen and Cheng (2005), Womack (1996)), though evidence is mixed depending upon the identity of the investor (He et al. (2005)). More recently, studies suggested that some investors, particularly institutions, are skeptical about the relevant information in positive recommendation revisions (Iskoz (2002), Malmendier and Shanthikumar (2007)). Our paper documents relative agreement between the direction of the revision and the corresponding trading response in the postregulatory environment.

Third, our event-based approach allows us to examine the timing of volume effects from the information release; therefore, we also contribute to the literature suggesting informed trading prior to the public release of analyst recommendations. Green (2006) and Kim, Lin, and Slovin (1997) observe an increase in aggregate trading immediately prior to the public release of analyst recommendations, suggesting an informational advantage. There is also evidence in the literature that market makers may "front-run" firm clientele by adjusting their bid-ask spreads prior to the market-wide announcement of analyst recommendations (Green (2006), Heidle and Li (2004), Madureira and Underwood (2008)). From these studies, it is not clear whether market makers have advanced knowledge of their own analyst recommendations or whether they are reacting to publicly available information. Given our identification of the timing of trading activity preceding the analyst report release (in days rather than minutes), it is unlikely we are measuring reactions to publicly available information.

Last, we provide evidence that the analyst's firm appears to be compensated for prereleasing information through increased volume. Irvine, Lipson, and Puckett (2007) document institutional buying imbalances up to 5 days before the initiation of positive analyst coverage, inferring that this increased order flow is compensation for tipping to select clients. While we find no evidence of increased disproportionate buying through the market maker of the upgrading firm ahead of positive revisions, we do find evidence consistent with information prerelease for downgrades and an associated increase in sell volume at the downgrading analyst's firm. This finding represents the only evidence of which we are aware that the brokerage firm is compensated for providing favored

access to clients through increased trading. Further, our rough estimates of revenue driven by the volume effects indicate sums sufficiently large to cover a substantial portion of costs for a bulge-bracket research department.

The remainder of the paper is organized as follows. In Section I, we provide a detailed description of the data. Section II presents evidence of disproportional changes in market making volume for securities on days when a firm's analyst issues a recommendation change. In Section III, we examine trading prior to the information release date, including the relationship between predowngrade trading and possible institutional and proprietary trading. Section IV offers additional evidence on the characteristics of the issuing analyst and firm as well as the types of downgrades experiencing prerelease trading. Section V presents a number of robustness checks, and Section VI concludes.

I. Data

A. Data Sources

The source for daily attributed market making volume is Nasdaq PostData; information on analyst recommendations comes from Thomson Financial's I/B/E/S. These data are supplemented with additional information from the NASD, as well as from SEC Filings, CRSP, *Institutional Investor*, and Yahoo!Finance.

To our knowledge, this is the first study to make use of Nasdaq PostData, an online source that was available for subscription from January 2002 to March 2005. The key feature of PostData relative to other U.S. sources is that trading data are attributed to particular market makers, which allows one to link market making activity to recommending analysts.⁴ The data consist of daily total and signed volume (designated buy or sell volume) for combined agency trades and riskless principal transactions. In the case of principal transactions (market maker initiated trades or trades to be held in inventory), each side of the transaction is included. The PostData are not available historically; only 45 calendar days of data were available at any point in time. We received permission to begin collecting data in September 2004, and our sample ranges from August 23, 2004, through March 16, 2005. Daily information was the finest gradation for which Nasdaq would release the data to us.

The data contain the trade date, ticker symbol, market maker ID and type (including a code for ECNs), number of shares traded, dollar volume of trade, number of trades, and average trade size for all Nasdaq market makers. Each is divided into buy, sell, and crossed trades.⁵ In addition, for a subset of market

⁴ We note that other researchers have had access to similar information through the Order Audit Trail System (OATS) while in residence at Nasdaq (see, for instance, Easley, O'Hara, and Paperman (1998)).

⁵ PostData requires only that total volume be released by participants each day; however, 83% of market makers in our sample also report cumulative buy, sell, and crossed volume, and corresponding data on dollar volume, average trade size, and the number of trades. These market makers comprise 96% of trading volume in our sample.

makers and stocks, we have separate information for block trades, again divided into buys, sells, and crosses. In total, we have 136 days of data for 3,874 Nasdaq-traded stocks for all quoting market makers. Our sample contains 225 uniquely identified market makers, with an average (median) of 18 (12) firms making a market in each security.

We collect analyst information from I/B/E/S for the same time period. To link the databases, we hand-match I/B/E/S brokerage firm codes to Nasdaq market maker identification codes. We then match recommendations for each security to PostData based on market maker identifier and the date and time stamp of the recommendation.⁶ If the recommendation is released prior to the market open or intraday, the event date is the same trade date. If a recommendation is released after 4:00 p.m. or on nontrading days, the event date becomes the trade date after the recommendation release.⁷ There are 7,557 recommendation releases (initiations, reiterations, or changes) for 1,590 distinct firms during our sample period, of which 1,918 are upgrades and 3,963 are downgrades. We consider upgrades to be any recommendation initiated with a strong buy recommendation, or any positive change in opinion, regardless of whether the level would be considered positive or not. Downgrades are any negative revisions, as well as initiations of strong sells, sells, and holds.⁸ In our sample, approximately 10% of the recommendations are sell and strong sell (as opposed to fewer than 5% in earlier studies, including Barber et al. (2006)), and the ratio of negative to positive recommendations is roughly 2:1.

We augment these two main databases with stock price returns calculated from CRSP. Yahoo!Finance (data provided by Thomson Financial) is the source for the number of analysts covering a particular security, taken as of March 2005. In addition, we obtain from the NASD (now the Financial Industry Regulatory Authority, FINRA) information on which market making firms have proprietary trading desks as well as information on past regulatory infractions. We

⁶ Ljungqvist, Malloy, and Marston (2006) document a discrepancy between many of the recommendation dates recorded by IBES and First Call (an alternate source of analyst recommendations). We hand-check stocks with different dates in the two sources and observe that most discrepancies stem from different procedures in dealing with holiday, weekend, and after-hour recommendations. The remainder consists of 407 batch-processed recommendations and 77 observations (1.02% of our sample) with inconsistent dates. Our analysis is robust to the exclusion of the 484 observations where the timing of the release is in question. We note that the other data irregularities documented by that study do not involve the time period used in our sample.

⁷ PostData records all trades between 8 a.m. and 6:30 p.m. in total volume. Our results are robust to assigning recommendations released during extended trading hours to the same trading day, as well as assigning recommendations released late in the day (after 3:00 p.m. but before close) to the next trading day.

⁸ Numerous studies show that it is a recommendation revision rather than the level of the recommendation that has a greater impact on market variables (Agrawal and Chen (2008), Francis and Soffer (1997), Jegadeesh and Kim (2006)). Further, several studies suggest that hold recommendations are negative due to analysts' reluctance to issue extremely pessimistic opinions (see, for instance, Barber, Lehavy, and Trueman (2006), Womack (1996)). Despite efforts by the NASD and NYSE regulations of 2002 as well as the Global Settlement Agreement to bring recommendations more in line with true opinions, the recent literature also views hold recommendations as negative signals (Clarke et al. (2006), Kadan et al. (2006)).

collect information on brokerage firm revenue composition from SEC filings, analyst reputation information from *Institutional Investor*, and Carter–Manaster ranks for underwriter reputation from Jay Ritter’s website.⁹

B. Sample and Variable Construction

Our approach is to examine trading by each market maker in the days surrounding analyst upgrades and downgrades. For our analysis, we take all market maker data for security-days where any analyst issues an upgrade or a downgrade. We also examine security-days around the recommendation change, where the focus is a 3-day window before and after the release date.¹⁰ Our results are robust to alternative sample construction methods, discussed in Section V.

An observation, therefore, is a unique combination of market maker, security, and trading day in event time. Because the research question concerns the effect of analyst recommendations on market making at a particular firm, the dependent variables in the multiple regression framework are various measures of daily volume for a particular market maker in a particular security (e.g., total volume or sell volume as a proportion of total volume) on a given day.¹¹

The main independent variables of interest are indicator variables for analyst upgrades and downgrades at the market maker’s firm for a particular security and day, which we term *affiliated*. Affiliated upgrades and downgrades are indicator variables equal to 1 if the upgrade or downgrade came from an analyst at the same brokerage firm as the market maker on the event day, 0 otherwise.

To control for normal volume levels for a particular market maker in a particular security, we construct benchmark volume measures from all nonevent-window trading days, defined as the average volume from days that are not within ± 3 days of any recommendation date for a given security–market maker pair. This gives us a baseline measure for “typical” trading for each market maker and security in order to test whether trading behavior around analyst rating changes is different from patterns on nonrecommendation days.

We also include controls for aggregate trading on the event day and characteristics of the stock, including the total daily volume, the number of market makers for the security, and the security’s market capitalization. Further, we include an indicator variable to signify if the market maker is an electronic communication network (ECN), where an ECN is an electronic limit order book that allows for anonymous transactions, and also total daily ECN volume.

A concern might be analyst revisions in response to other analyst activity or external news. We include a control for the number of analysts covering the

⁹ Available at <http://bear.cba.ufl.edu/ritter/ipodata.htm>.

¹⁰ We further check up to 15 days around the recommendation release date and find no significant effects from affiliated recommendation changes beyond the 2 days before or after upgrades or downgrades.

¹¹ Note that because our data are market maker-by-market maker, the volume measures used as dependent variables do not suffer from distributional difficulties (right skewness) often associated with analyzing aggregate daily volume or imbalance measures (Cremers and Mei (2007)).

security and account for other analyst activity in the ± 3 days around an affiliated analyst's revision with indicator variables. We construct three indicator variables equal to 1 if the number of *unaffiliated* analyst upgrades (downgrades) is equal to 1, 2, or more than 2 within 3 days on either side of the event date, 0 otherwise. In unreported tests, the number of recommendations is used instead of the indicator variables, and the results are qualitatively unchanged. Because news events may trigger an analyst report, we include returns for the 3 days prior to the analyst revision (or alternate event day). We also include the price response on the revision day, though all specifications are robust to the exclusion of the returns controls. Table I provides a list of variable names and definitions.

Summary statistics for the sample of upgrade and downgrade days prior to any natural log or logit transformations can be found in Table II. We have a total of 138,419 observations for market maker activity in a given security on days where there is an upgrade or downgrade. The average market maker trades approximately 96,850 shares in a security, representing a market share of 2.5%. Approximately 20% of the reporting market maker volume is attributed to ECNs.

In Table III, Panel A reports market-adjusted stock return information separately for upgrades and downgrades on and around the event days. Both upgrades and downgrades result in significant event day returns in the direction of the revision (2.7% and -2.8% , respectively). For downgrades, we do not observe abnormal returns in the 3 days before the recommendation, though postrevision returns are statistically significant, albeit, economically small (-0.22%). Upgrades, in comparison, have significant pre- and postevent returns. In Panel B, we report a transition matrix separated into finer detail by the level of the prior and target recommendations. These returns for upgrades and downgrades are in line with prior studies (Barber et al. (2001), Boni and Womack (2006)). The possible exception is an increase in the symmetry between returns for upgrades and downgrades, likely brought about by the re-centering of the distribution of recommendations around "holds" rather than "buys" in response to regulatory action (Kadan et al. (2006)).

II. Market Making Volume on Recommendation Days

A. *Difference in Means*

To begin our analysis, we examine differences in market making activity for affiliated and unaffiliated market makers, excluding ECNs, on days with analyst recommendation changes. Table IV compares volume characteristics to their corresponding benchmarks on and before each event day, with *p*-values for differences. In addition to the volume metrics used in our multiple regression analysis, namely, total volume, signed volume, and market share, we also report average dollar volume and average trade size. There is a statistically and economically significant increase in trading activity on recommendation days (day 0) for both affiliated and unaffiliated market makers. Average

Table I
Definition of Variables

Table I lists variable definitions. In addition to those listed below, all volume measures used as dependent variables in the analysis also have an associated *Benchmark* measure. The *Benchmark* measures are averages computed for each market maker–security pair for trading days that fall outside of the analyst recommendation release event window (± 3 days).

Variable Name	Definition
Total Volume	The natural log of the number of shares traded for a given market maker and security on the trading day. It is the sum of buys, sells, and two times the number of internally matched (crossed) trades
Block Volume	The natural log of total block volume, defined as trades over 10,000 shares, for a given market maker and security on the trading day
Prop Buy (Sell)	Proportional buy (sell) volume, defined as the buy (sell) volume for stock i of market maker j on day t divided by total volume for stock i of market maker j on day t . We use the logit transformation, $\ln(x/1 - x)$, to map proportional volume, which is bounded by 0 and 1, to the real line. This measure is computed for all trades as well as for block trades only
Market Share	A market maker's volume in a given security on a given day divided by the total volume for that security and day. We take the logit transform of this ratio
Affiliated Upgrade (Downgrade)	An indicator variable set equal to 1 if market maker j issued an upgrade (downgrade) for stock i on day t , 0 otherwise
Aggregate Volume _{t}	The natural log of the number of shares traded by all market makers for stock i on day t , 0 otherwise
Market Makers	The natural log of the average number of market makers for a particular security as reported by Nasdaq as of March 2005
Market Cap	The natural log of the market capitalization of the stock taken from CRSP as of December 2004
ECN Volume (ECN Shr)	The natural log of the number of shares traded (market share) for all ECNs for stock i on day t , 0 otherwise
ECN Indicator	An indicator variable set equal to 1 if the market maker is an electronic exchange network, 0 otherwise
Analyst Coverage	The natural log of the number of analysts following the security, taken as of March 2005
Unaffiliated Up(Down)1	An indicator variable set equal to 1 if an analyst other than market maker j 's analyst issued an upgrade (downgrade) for stock i in the ± 3 day window around day t , 0 otherwise
Unaffiliated Up(Down)2	An indicator variable set equal to 1 if two analysts other than market maker j 's analyst issued an upgrade (downgrade) for stock i in the ± 3 day window around day t , 0 otherwise
Unaffiliated Up(Down)>2	An indicator variable set equal to 1 if more than two analysts other than market maker j 's analyst issued an upgrade (downgrade) for stock i in the ± 3 day window around day t , 0 otherwise
Prior 3-Day Returns	The cumulative net of market return (value-weighted CRSP universe) for stock i in the 3-day window prior to day t
Day t Return	The net-of-market (value-weighted CRSP universe) return for stock i on day t , where t is the unit of observation trading day
Event Day Return	The net-of-market (value-weighted CRSP universe) return for stock i on the recommendation day
Proprietary Desk	An indicator variable set to 1 if the market making firm is listed by Nasdaq as also engaging in trading for its own account, 0 otherwise. This variable is used as an interaction with affiliated downgrade
Fraction Proprietary Revenue	For public firms with proprietary trading, the revenue from proprietary trading activities divided by total revenue as listed in the 2004 10-K

Table II
Summary Statistics by Market Maker, Security, and Day

This table displays the number of observations, mean, median, and standard deviation for selected variables in the recommendation day sample. Data are reported prior to natural logs or logit transformations. The market capitalization of firms is reported in thousands.

	Number of Observations	Mean	<i>SD</i>	Median
Total Volume	138,419	96,850	476,029	9,500
Proportional Buy Volume	138,419	0.478	0.228	0.495
Proportional Sell Volume	138,419	0.513	0.228	0.500
Market Share	138,419	0.025	0.046	0.007
Affiliated Upgrade	138,419	0.005		
Affiliated Downgrade	138,419	0.011		
UnaffiliatedUp1	138,419	0.263		
UnaffiliatedUp2	138,419	0.033		
UnaffiliatedUp>2	138,419	0.015		
UnaffiliatedDown1	138,419	0.450		
UnaffiliatedDown2	138,419	0.104		
UnaffiliatedDown>2	138,419	0.067		
AggregateVolume (<i>t</i>)	138,419	7,262,554	16,694,462	1,841,927
ECN Indicator	138,419	0.084		
ECN Volume	138,419	1,454,227	4,760,106	247,579
Analyst Coverage	138,419	15	10	13
Market Makers	138,419	34	15	33
Market Capitalization	138,419	9,319,493	27,664,885	1,375,963

affiliated share volume more than doubles from the benchmark of 47,926 shares to 105,531 shares, with a corresponding increase in dollar volume. Market share increases roughly a percentage point, and average trade size increases from a benchmark of 564 shares to 657 shares. For unaffiliated market makers, the increased activity is smaller in magnitude, and measurably smaller for total volume and average trade size. Our results suggest that there is significant reaction in the market to recommendation changes on average.

The increase in volume across market makers is not surprising since many investors, not just clients of the firm, would be informed of the recommendation change after the official release (via First Call or newswire services, for example). Further, clientele of affiliated firms may direct trades to other firms where additional soft dollar agreements exist (Conrad, Johnson, and Wahal (2001), Goldstein et al. (2004), Irvine (2003)).¹² The relative sizes of the volume increases as well as the univariate comparison for market share suggest, however, that the firm issuing the analyst recommendation sees a disproportionate increase in volume. The affiliated market makers see an improvement

¹² Broker-dealers typically provide a bundle of services including research and execution of transactions. Because commission dollars pay for the entire bundle of services, the practice of allocating certain of these dollars to pay for the research component has come to be called “softing” or “soft dollars” (SEC (1998)).

Table III
Summary of Returns for Analyst Recommendation Days

Panel A presents cumulative net-of-market returns separately for upgrades and downgrades for the recommendation day (day 0), the 3-day window surrounding the recommendation (−1 to 1), and the 3 days before and after the recommendation event (−3 to −1 and 1 to 3, respectively) for all recommendation changes over the sample period. Panel B shows average event day returns based on the starting and terminal levels of the recommendation changes. Initiations are shown separately. The top number in each cell is the net-of-market recommendation day returns while the bottom number is the number of observations. Standard I/B/E/S ratings are used. Superscripts a, b, and c represent the 1%, 5%, and 10% significance levels, respectively.

Panel A: Returns for Downgrades and Upgrades								
Day	Downgrades (<i>N</i> = 3,963)				Upgrades (<i>N</i> = 1,918)			
	Mean	<i>SD</i>	<i>t</i> -stat	Median	Mean	<i>SD</i>	<i>t</i> -stat	Median
0	−2.80%	8.00%	−20.50	−0.97%	2.70%	6.31%	20.21	1.56%
−1 to 1	−3.53%	10.65%	−19.46	−1.69%	3.58%	8.73%	18.76	2.76%
−3 to −1	−0.02%	8.02%	−0.11	0.18%	0.62%	7.44%	3.86	0.50%
1 to 3	−0.22%	5.04%	−2.56	−0.10%	0.80%	4.95%	7.51	0.66%

Panel B: Transition Matrix for Recommendation Levels					
FROM	TO				
	Strong Buy	Buy	Hold	Sell	Strong Sell
Strong Buy	0.86% 73	−2.77% ^a 152	−4.23% ^a 634	0.03% 5	−5.96% ^a 23
Buy	3.65% ^a 119	0.47% ^c 184	−4.23% ^a 769	−5.19% ^a 38	−8.27% 5
Hold	3.68% ^a 452	3.35% ^a 536	−0.78% ^a 330	−5.62% ^a 202	−5.57% ^a 135
Sell	0.55% 4	2.42% 25	2.78% ^a 166	0.08% 52	−1.90% 7
Strong Sell	2.56% ^c 14	−0.42% 3	3.50% ^a 102	9.42% 6	−0.25% 10
INITIATIONS	Strong Buy	Buy	Hold	Sell	Strong Sell
	1.41% ^a 665	1.26% ^a 739	−0.58% ^a 1,211	−1.65% ^a 155	−0.45% 94

in market share of up to 28%, whereas unaffiliated market makers show a slight decrease.

When we examine univariate differences in directional volume, we observe that proportional buy volume is elevated relative to benchmark measures for affiliated firms on the recommendation day. There is a significant difference across affiliated and unaffiliated firms at 90% confidence, with affiliated market makers experiencing relatively more buying in response to upgrades. For proportional sell volume on the event day, we see no statistically significant elevation above the benchmark for affiliated firms and no statistical significance for increased selling across the two groups. Results for the days prior to the announcement of a recommendation change will be discussed in Section III.

Table IV
Differences in Volume Characteristics for Affiliated and Unaffiliated Market Makers

This table contains average volume characteristics for individual firms around analyst recommendations. The total volume, market share, average dollar volume, and average trade size are reported for affiliated and unaffiliated (non-ECN) market makers on days of a recommendation release. Benchmarks are computed as the average across nonevent days (events are -3 to $+3$ around the recommendation date) for an individual firm–security pair. p -values for difference of means tests from the benchmark values are included (Bench p -val), as are p -values for the differences from benchmarks across groups (Diff p -val).

	Affiliated	Bench p -val	Unaffiliated	Bench p -val	Diff p -val
Day -3					
Volume	73,808	0.120	62,547	<0.001	0.406
Benchmark Volume	65,918		58,905		
Market Share	3.93%	0.018	2.29%	<0.001	0.742
Benchmark Market Share	3.63%		2.04%		
Average Dollar Volume	1,794	<0.001	1,625	<0.001	0.245
Benchmark Dollar Volume	1,081		1,064		
Average Trade Size	650	0.272	495	<0.001	0.109
Benchmark Trade Size	592		523		
Proportional Buy Volume: Upgrade	0.463	0.125	0.468	<0.001	0.993
Benchmark Prop Buy Vol	0.450		0.456		
Proportional Sell Volume: Downgrade	0.530	0.065	0.525	<0.001	0.328
Benchmark Prop Sell Vol	0.517		0.518		
Day -2					
Volume	81,231	<0.001	64,879	<0.001	0.026
Benchmark Volume	65,098		58,642		
Market Share	3.91%	0.005	2.28%	<0.001	0.433
Benchmark Market Share	3.59%		2.04%		
Average Dollar Volume	1,975	<0.001	1,656	<0.001	0.030
Benchmark Dollar Volume	1,076		1,057		
Average Trade Size	556	0.676	516	0.659	0.938
Benchmark Trade Size	567		525		
Proportional Buy Volume: Upgrade	0.464	0.379	0.469	0.003	0.655
Benchmark Prop Buy Vol	0.455		0.455		
Proportional Sell Volume: Downgrade	0.535	0.007	0.523	<0.001	0.064
Benchmark Prop Sell Vol	0.517		0.518		
Day -1					
Volume	77,464	<0.001	72,699	<0.001	0.833
Benchmark Volume	60,856		56,986		
Market Share	3.76%	0.034	2.20%	<0.001	0.695
Benchmark Market Share	3.52%		2.02%		
Average Dollar Volume	1,854	<0.001	1,819	<0.001	0.569
Benchmark Dollar Volume	999		1,023		
Average Trade Size	579	0.797	518	0.461	0.953
Benchmark Trade Size	586		524		
Proportional Buy Volume: Upgrade	0.480	0.601	0.465	<0.001	0.526
Benchmark Prop Buy Vol	0.463		0.455		
Proportional Sell Volume: Downgrade	0.535	0.004	0.522	<0.001	0.025
Benchmark Prop Sell Vol	0.516		0.518		

(continued)

Table IV—Continued

	Affiliated	Bench <i>p</i> -val	Unaffiliated	Bench <i>p</i> -val	Diff <i>p</i> -val
Day 0					
Volume	105,531	<0.001	81,137	<0.001	<0.001
Benchmark Volume	47,926		54,894		
Market Share	4.27%	<0.001	1.97%	<0.001	<0.001
Benchmark Market Share	3.37%		2.03%		
Average Dollar Volume	2,243	<0.001	1,978	<0.001	<0.001
Benchmark Dollar Volume	776		985		
Average Trade Size	657	0.002	529	0.689	0.002
Benchmark Trade Size	564		532		
Proportional Buy Volume: Upgrade	0.484	0.045	0.457	0.499	0.057
Benchmark Prop Buy Vol	0.465		0.456		
Proportional Sell Volume: Downgrade	0.520	0.630	0.514	<0.001	0.290
Benchmark Prop Sell Vol	0.517		0.517		

B. Regression Analysis

In this section, we investigate in a multiple regression setting whether analyst recommendation changes generate trades for their own firm over and above the general increase in volume that may occur on any event day. We examine several measures of attributed volume as dependent variables, including *Total Volume*, *Market Share*, *Proportional Buy Volume*, and *Proportional Sell Volume*.¹³ The independent variables of interest are *affiliated* upgrades and downgrades. Control variables are as detailed in Section I.B.

Table V presents results of OLS regressions for the four measures of attributed volume. Reported standard errors are White heteroskedasticity-adjusted and are clustered for observations on the same security-day.¹⁴ Both affiliated upgrades and downgrades significantly and positively affect attributed total volume for the market maker, indicating that affiliated investors and/or market makers actively trade around recommendation releases. The coefficients on the variables suggest that total volume at the affiliated market maker increases roughly 59% on average for downgrades and 70% for upgrades. We do not find evidence that unaffiliated recommendations around the event day significantly affect attributed total volume, though signs on the coefficients are quite intuitive. If a competing analyst also issues a recommendation, the increase in affiliated volume is not as large. The higher the

¹³ In unreported regressions, we analyze additional volume metrics such as dollar volume, average trade size, market share ranking, and the natural logs of buy and sell volume. The results are economically and statistically similar.

¹⁴ The market maker data for the same security on a different event day and the market maker data for the same event day but a different security are assumed independent. The benchmark measures and the daily volume controls make this assumption reasonable. Given the structure of our data, clustered errors on any one or more of three dimensions may be more appropriate (Rogers (1993)). We rerun all reported regressions clustering on trading date, market maker, and security individually and simultaneously as in Cameron, Gelbach, and Miller (2007). Results are robust to the alternative specification of the error structures.

Table V
Volume Effects on Recommendation Days

Table V reports results from OLS regressions where the dependent variables are attributed volume measures in each security on days with recommendation changes. Total Volume is the natural log of total volume for a given market maker on a day that a recommendation is released. Market Share is the logit transformation of percentage total volume attributed to a given market maker on the recommendation day. Proportional Buy (Sell) Volume is the logit transformation of directional proportional volume. Affiliated Upgrade (Downgrade) is equal to 1 if the recommending analyst is affiliated with the market maker (in the same firm). Benchmark is the average value of the dependent variable (volume, market share, or proportional volume) of a given market maker for a given security on a nonevent day. Aggregate Volume is the total daily volume for all market makers for a given stock on the recommendation day. Unaffiliated Up1, Up2, Up>2 (Down1, Down2, Down>2) are indicators equal to 1 if 1, 2, or >2 analysts make an upgrade (downgrade) in a ± 3 day event window. Variables for the information environment and ECN volume are also included. Standard errors are White heteroskedasticity-adjusted and are clustered for the same security-day (Rogers (1993)). In parentheses, we report t -statistics. Superscripts a, b, and c represent the 1%, 5%, and 10% significance levels, respectively.

	Total Volume (1)	Market Share (2)	Proportional Buy Volume (3)	Proportional Sell Volume (4)
Affiliated Upgrade	0.704 ^a (9.49)	0.320 ^a (4.00)	0.128 ^b (2.35)	
Affiliated Downgrade	0.591 ^a (12.35)	0.367 ^a (7.91)		0.029 (0.90)
Benchmark	-0.154 ^a (-14.68)	0.368 ^a (93.72)	3.509 ^a (120.08)	3.418 ^a (111.95)
Aggregate Volume _{<i>t</i>}	0.712 ^a (54.32)		0.014 ^c (1.86)	-0.029 ^a (-3.81)
Unaffiliated Up1	-0.013 (-1.08)	-0.033 ^b (-2.30)	-0.019 ^b (-2.10)	0.027 ^a (2.97)
Unaffiliated Up2	-0.016 (-0.57)	-0.070 ^c (-1.81)	-0.005 (-0.28)	0.020 (1.03)
Unaffiliated Up>2	-0.024 (-0.60)	-0.121 ^b (-2.24)	0.021 (0.70)	-0.023 (-0.74)
Unaffiliated Down1	-0.008 (-0.67)	-0.014 (-0.97)	0.030 ^a (3.43)	-0.023 ^b (-2.55)
Unaffiliated Down2	-0.023 (-1.22)	-0.067 ^a (-3.24)	0.039 ^a (2.87)	-0.041 ^a (-2.94)
Unaffiliated Down>2	0.024 (1.15)	-0.084 ^a (-2.84)	0.033 ^b (2.15)	-0.039 ^a (-2.47)
ECNVolume/Shr _{<i>t</i>}	0.014 (1.25)	-0.000 ^a (-4.57)	-0.035 ^a (-5.13)	0.040 ^a (5.86)
ECN Indicator	1.553 ^a (108.01)	0.357 ^a (21.30)	0.164 ^a (13.11)	-0.228 ^a (-18.02)
Analyst Coverage	-0.084 ^a (-7.71)	0.065 ^a (5.39)	-0.013 ^c (-1.75)	0.005 (0.62)
Market Makers	-0.312 ^a (-11.60)	-0.537 ^a (-25.07)	0.010 (0.62)	0.016 (0.99)
Market Cap	0.074 ^a (14.13)	-0.029 ^a (-4.38)	0.017 ^a (5.15)	-0.016 ^a (-5.01)

(continued)

Table V—Continued

	Total Volume (1)	Market Share (2)	Proportional Buy Volume (3)	Proportional Sell Volume (4)
Event Day Return	0.097 (1.14)	0.324 ^a (2.74)	−1.027 ^a (−14.03)	1.002 ^a (13.65)
Prior 3-Day Returns	−0.093 (−1.29)	−0.031 (−0.36)	−0.005 (−0.11)	0.016 (0.32)
Intercept	1.001 ^a (15.10)	−3.936 ^a (−46.17)	−1.790 ^a (−40.16)	−1.563 ^a (−35.23)
Number of Observations	138,419	138,419	138,419	138,419
Adjusted R^2	0.22	0.43	0.15	0.14
F -statistics	2,587.02	3,321.09	1,229.02	1,148.58

benchmark volume, the lower the total attributed volume on recommendation days, consistent with the notion that each market maker has a limited capacity for trading.

The other control variables also have intuitive signs. As the aggregate daily volume increases for the stock on the event day, each individual market maker's total volume increases. Market maker total volume is increasing with ECN volume, and the indicator variable for whether the market maker is an ECN is also highly statistically significant and positively related to total volume. These results are consistent with investors shifting trades to ECNs when there may be an advantage to trading anonymously. As the total number of analysts and market makers increases, the total volume attributed to any given market maker declines. Stocks of bigger companies, as measured by market capitalization, are associated with larger attributed volume.

Column (2) of Table V presents the results for market share. This measure provides a more intuitive gauge for whether changes in analyst opinions have an economically meaningful impact on affiliated market makers. As in the volume specification, an affiliated analyst opinion change is associated with a substantial increase in market share, after controlling for the benchmark. The coefficients on affiliated upgrades and downgrades imply an increase in market share of 37% for upgrades and 44% for downgrades.

The volume and market share regressions indicate that there is increased trading activity at the issuing analyst's firm on recommendation change days but do not answer whether there is increased buying around affiliated upgrades and increased selling around affiliated downgrades. We therefore examine the proportion of buy and sell volume separately, using the same control variables as in the prior specifications, with the benchmark measure redefined according to the dependent variable in each specification.

Proportional buy volume (column (3)) increases if the affiliated recommendation is an upgrade, but, interestingly, there is no significant relation between downgrades and proportional sell volume (column (4)). The results suggest that, while both upgrades and downgrades generate increased trade at a given

market maker, only upgrades increase proportional buy volume for the analyst's firm on the event day. This buying could stem from investor orders or the brokerage house itself. Even after the substantial negative publicity surrounding analyst upgrades in recent years, there is significant trading activity in the direction of the recommendation.

It is notable that buy volume increases as much as sell volume on downgrade days at the affiliated market maker. One explanation of our findings may be the differences in institutional versus individual trading. Chen and Cheng (2005) and He et al. (HMS, 2005) observe that investors, particularly institutions, trade in the direction of the analyst opinion. Individual investors, on the other hand, are net buyers regardless of the direction of the recommendation (HMS).¹⁵ Another explanation is that downgrades may generate more disagreement in the market, since analysts historically have been reluctant to lower their investment opinions. Downgrades, therefore, could lead to both buying and selling activity when the recommendation is released. In the next section, we consider a third (but not mutually exclusive) possibility—that clients of the firm or the firm itself has access to the information before the official release date, such that the affiliated trading in agreement with the recommendation that we observe for upgrades occurs prior to the recommendation day in the case of downgrades.

III. Directional Volume Prior to Recommendation Days

In this section, we discuss differences in market maker trading volume in the 3 days prior to the recommendation for upgrades and downgrades.¹⁶ We investigate individual days rather than a pre-event period so that we can detect when affiliated analyst recommendations affect individual market maker volume. We also refine our analysis by considering whether the market maker's firm engages in proprietary trading.

A. Aggregate Effects for Upgrades and Downgrades

In the univariate tests of Table IV, there is evidence of increased trading activity at affiliated firms 2 days before the recommendation release in the general volume measures, though it is not enough to significantly impact market shares relative to unaffiliated market makers. For directional volume, however, proportional sell volume before downgrade days is higher than benchmark measures for the affiliated analyst's firm for the 3 days prior to the release of a recommendation, and this measure is significantly different from increases in proportional sell volume at the unaffiliated firms on days -2 and -1 .

¹⁵ Lee (1992) finds similar results around earnings announcements. In contrast, Malmendier and Shanthikumar (2007) find that small and large traders both trade in the direction of the information.

¹⁶ In the interest of brevity, we report directional volume regression results only. In all cases where we find a directional volume effect, there is also a total volume effect.

The regression analysis echoes these results. The specifications for prior trading days are the same as reported in Section II, with the controls for prior stock returns adjusted to control for the previous 3 trading days from the date examined and the inclusion of an additional return for the corresponding day. Though a forward-looking variable, we keep the return for the recommendation release day as a measure of the relative importance of the recommendation.

In Table VI, we report results for prerecommendation release trading. In columns (1) through (3), the dependent variable is proportional buy volume for the days preceding the recommendation release date and the variable of interest is affiliated upgrade. There is no evidence to suggest that there is unusual directional trade (or, in unreported results, increased volume) at the issuing analyst's firm prior to affiliated upgrades as was the case for the event day regressions. The own-firm directional trading response to the information revealed in the affiliated upgrade is confined to the recommendation event day.¹⁷

Columns (4) through (6) of Table VI report the relation between downgrades and pre-event proportional sell volume. In the pre-event period, a significant and positive coefficient is observed on affiliated downgrades beginning 2 days prior to the recommendation release. This result holds after controlling for other analyst upgrades and downgrades, which are by and large unrelated to proportional sell volume, and other news, as captured by pre-event returns. From these results, it appears that there is an increase in trading at the affiliated firm's market maker prior to the official downgrade release. We discuss a variety of robustness checks on this result in Section V.

In unreported results, we examine block trading separately. Given that investors may break up their trades in order to "stealth trade" on private information rather than risking any signaling effects from making large trades (Barclay and Warner (1993), Chakravarty (2001), Economides and Schwarz (1995)), it is important to note that the absence of block trading is not interpreted as conclusive evidence for the absence of institutional trading. For upgrades, there does not appear to be increased institutional buying, as measured by block trading, for market makers on days when affiliated analysts issue an upgrade. For downgrades, the pattern is similar to what is seen for the full sample. In the 2 days prior to the release of a downgrade, the coefficients suggest that the market maker of the downgrading firm sees a disproportionate amount of block sell volume. These results indicate elevated institutional selling, as measured

¹⁷ This result holds when we add initiations at "buy" to the definition of upgrade and breakout initiations and revisions separately. This result runs somewhat counter to Irvine et al. (ILP, 2007), who document institutional buying in the 5 days leading up to a positive initiation. It is possible that trading before positive initiations occurs, but that it is spread out over multiple market makers. We note that the ILP sample extends over a longer time period and eliminates many types of predictable initiations; it is possible that we do not have enough unpredictable initiations to detect an effect. It is also possible that because the ILP sample is predominately prior to Regulation FD, simultaneity drives their results. For example, "analyst days" at a company where both interested analysts (performing due diligence before an initiation) and institutional managers would have had access to company management were a common practice and could produce coincident positive initiations and institutional buying.

Table VI
Pre-event Directional Volume for Recommendation Releases

Table VI reports results from OLS regressions where the dependent variable is the logit transformation of Proportional Buy Volume or Proportional Sell Volume for a given market maker in the 3 days prior to a recommendation release. Affiliated Upgrade (Downgrade) is equal to 1 if the recommending analyst is in the same firm as the market maker. Benchmark Proportional Volume is the expected proportional buy (sell) volume of a given market maker on a nonevent day. Aggregate Volume is the total daily volume for all market makers for a given stock on the recommendation day. Variables for the information environment and ECN volume are also included. Controls for unaffiliated recommendation changes (Up1, Up2, Up>2, Down1, Down2, Down>2) and stock price returns (Prior 3-Day, Day t , and Day 0) are included but not reported. Standard errors are White heteroskedasticity-adjusted and are clustered for the same security-day (Rogers (1993)). In parentheses, we report t -statistics. Superscripts a, b, and c represent the 1%, 5%, and 10% significance levels, respectively.

	Proportional Buy Volume			Proportional Sell Volume		
	Day -3 (1)	Day -2 (2)	Day -1 (3)	Day -3 (4)	Day -2 (5)	Day -1 (6)
Affiliated Upgrade	0.011 (0.15)	-0.033 (-0.49)	0.048 (0.75)			
Affiliated Downgrade				0.042 (0.98)	0.076 ^c (1.89)	0.084 ^b (2.17)
Benchmark Prop Volume	3.581 ^a (116.03)	3.584 ^a (114.97)	3.507 ^a (115.16)	3.517 ^a (110.63)	3.506 ^a (110.74)	3.441 ^a (109.66)
Aggregate Volume _{t}	0.010 (1.22)	0.025 ^a (3.12)	0.009 (1.14)	-0.032 ^a (-3.98)	-0.038 ^a (-4.91)	-0.023 ^a (-2.93)
ECN Volume _{t}	-0.032 ^a (-4.36)	-0.040 ^a (-5.56)	-0.030 ^a (-4.09)	0.044 ^a (5.96)	0.043 ^a (6.15)	0.033 ^a (4.53)
ECN Indicator	0.210 ^a (15.67)	0.213 ^a (15.99)	0.195 ^a (15.00)	-0.267 ^a (-19.79)	-0.270 ^a (-20.15)	-0.258 ^a (-19.73)
Analyst Coverage	0.007 (0.83)	0.003 (0.40)	-0.001 (-0.13)	-0.016 ^b (-1.95)	-0.009 (-1.20)	-0.007 (-0.82)
Market Makers	0.025 (1.36)	0.021 (1.13)	0.011 (0.58)	0.006 (0.30)	0.002 (0.11)	0.019 (1.06)
Market Cap	0.003 (0.70)	-0.000 (-0.06)	0.007 ^c (1.76)	-0.002 (-0.57)	0.001 (0.40)	-0.006 (-1.61)
Intercept	-1.708 ^a (-37.26)	-1.754 ^a (-38.55)	-1.662 ^a (-35.26)	-1.725 ^a (-38.39)	-1.686 ^a (-37.70)	-1.707 ^a (-36.33)
Controls for Unaffiliated Recommendation Changes and Stock Returns Not Reported						
Number of Observations	123,513	124,706	130,401	123,513	124,706	130,401
Adjusted- R^2	0.15	0.15	0.14	0.14	0.14	0.14
F -statistics	1,132.51	1,135.80	1,089.17	1,087.31	1,089.17	1,049.22

by proportional block sell volume, at the downgrading analyst's firm in the 2 days before the downgrade release date. Next, we consider the possibility that information is leaked in-house or to important institutional clients of the firm.

B. Proprietary versus Agency Trading around Downgrades

Thus far, we have effectively treated all market making firms in our sample equally. Some firms, however, serve in an agency capacity, where they engage

in trades strictly on behalf of their clientele. Others also place trades for their in-house account on behalf of their own (proprietary) trading desks. Our data do not distinguish the trading activity of the firm for its own account from trading volume it processes for clients, but differences across firms may be able to isolate trading on behalf of clients, thus ruling out any explicit regulatory infractions.

We follow two approaches in identifying volume more likely to be associated with proprietary trading versus client trading. First, we identify firms with proprietary trading desks and create two separate affiliated downgrade indicator variables according to whether or not the firm has a proprietary trading desk. Second, for our sample firms with proprietary desks that are publicly traded, we collect revenue information from the 2004 10-K filings to calculate what fraction of the firm's revenue is attributed to proprietary trading.¹⁸ Of the 225 unique market makers in our sample, 42 are publicly traded (of which 37 report proprietary trading revenues). These firms account for 41% of the security-market maker pairs in our sample. For the subset of firms for which we know the fraction of proprietary revenue or know that proprietary revenue is zero, we interact the revenue fraction with the affiliated downgrade variable and add the revenue fraction as a separate control.¹⁹ Therefore, the indicator variable for affiliated downgrade becomes the fraction of proprietary trading revenue for the firms that issue downgrades.

Table VII reports the results of these two specifications for the 3 days prior to the downgrade release date. Three days before the downgrade, as in previous models, neither of the affiliated downgrade coefficients is statistically different from zero. The day -2 response is isolated to affiliated downgrades of market makers with proprietary trading desks (column (2)). If analysts from both types of firms were equally likely to prerelease information to external clients, we would expect to see a commensurate increase in sell volume at firms with nonproprietary desks. One day prior to the downgrade, reported in column (3), market makers both with and without proprietary desks experience an increase in proportional sell volume in response to their affiliated downgrades. Thus, we see some evidence of early sell volume at firms that are acting strictly on behalf of clients on the day prior to the information release date, suggesting at least some information dissemination outside of the firm.²⁰

¹⁸ Other studies such as Agrawal and Chen (2005, 2008) use the X-17a-5 filing to identify proprietary revenue for all firms, but reporting sources of revenue on this form is voluntary. Upon inspection, we determined that most of the large private firms with known proprietary trading desks choose not to disclose revenue breakdowns.

¹⁹ For robustness, we also examine interactions with the natural log of proprietary trading revenue instead of the fraction of revenue. The results are similar.

²⁰ In unreported results, we also examine block trading. Two days prior to a downgrade, all block trades occur at firms with proprietary trading desks. In the specification for 1 day before the downgrade, only the proprietary trading desk affiliated downgrade variable loads significantly. Because the firms with proprietary desks also tend to be the full-service houses with larger market makers, it is possible that market makers without proprietary desks do not process sufficient volume to trade blocks without revealing information to the market.

Table VII
Pre-event Sell Volume by Firm Type

Table VII reports results from OLS regressions where the dependent variable is the logit transformation of Proportional Sell Volume for a given market maker in the 3 days prior to a recommendation release. Affiliated Downgrade is equal to 1 if the recommending analyst is in the same firm as the market maker and is split into two interaction terms depending on whether the brokerage firm has a proprietary trading desk ((1)–(3)) or if the revenue from proprietary trading is available for publicly traded brokerage firms ((4)–(6)). Benchmark Proportional Volume is the expected proportional sell volume of a given market maker on a nonevent day. Aggregate Volume is the total daily volume for all market makers for a given stock on the recommendation day. Proprietary Revenue is the fraction of revenue generated by proprietary trading relative to total revenue. Variables for the information environment and ECN volume are also included. Controls for unaffiliated recommendation changes (Up1, Up2, Up>2, Down1, Down2, Down>2) and stock price returns (Prior 3-Day, Day t , and Day 0) are included but not reported. Standard errors are White heteroskedasticity-adjusted and are clustered for the same security-day (Rogers (1993)). In parentheses, we report t -statistics. Superscripts a, b, and c represent the 1%, 5%, and 10% significance levels, respectively.

	Proprietary Desk Indicator			Fraction Proprietary Revenue		
	Day –3 (1)	Day –2 (2)	Day –1 (3)	Day –3 (4)	Day –2 (5)	Day –1 (6)
Affiliated Downgrade	0.044	0.087 ^b	0.070 ^c	0.235	0.323 ^c	0.313 ^c
PROPRIETARY DESK/REV	(1.01)	(2.09)	(1.75)	(1.29)	(1.86)	(1.79)
Affiliated Downgrade	–0.013	–0.147	0.299 ^b	–0.009	–0.125	0.286 ^b
NO PROPRIETARY TRADING	(–0.09)	(–0.94)	(2.22)	(–0.07)	(–0.81)	(2.14)
Fraction Proprietary Revenue				0.284 ^a	0.271 ^a	0.268 ^a
				(10.38)	(10.02)	(10.29)
Benchmark Prop Sell	3.517 ^a	3.506 ^a	3.441 ^a	2.756 ^a	2.760 ^a	2.638 ^a
	(110.62)	(110.75)	(109.67)	(49.96)	(49.44)	(49.65)
Aggregate Volume _{t}	–0.032 ^a	–0.038 ^a	–0.023 ^a	–0.070 ^a	–0.075 ^a	–0.050 ^a
	(–3.98)	(–4.91)	(–2.93)	(–6.03)	(–6.86)	(–4.77)
ECN Volume _{t}	0.044 ^a	0.043 ^a	0.033 ^a	0.083 ^a	0.077 ^a	0.058 ^a
	(5.96)	(6.15)	(4.53)	(7.61)	(7.69)	(5.73)
ECN Indicator	–0.267 ^a	–0.270 ^a	–0.258 ^a	–0.348 ^a	–0.386 ^a	–0.370 ^a
	(–19.79)	(–20.15)	(–19.73)	(–12.43)	(–13.62)	(–13.10)
Analyst Coverage	–0.016 ^c	–0.009	–0.006	–0.018 ^c	–0.017	–0.002
	(–1.95)	(–1.20)	(–0.82)	(–1.67)	(–1.62)	(–0.15)
Market Makers	0.006	0.002	0.020	0.027	0.030	0.020
	(0.30)	(0.10)	(1.07)	(1.00)	(1.12)	(0.79)
Market Cap	–0.002	0.001	–0.006	–0.006	–0.003	–0.005
	(–0.57)	(0.41)	(–1.62)	(–1.29)	(–0.65)	(–0.91)
Intercept	–1.725 ^a	–1.686 ^a	–1.708 ^a	–1.291 ^a	–1.215 ^a	–1.246 ^a
	(–38.39)	(–37.70)	(–36.34)	(–19.97)	(–19.13)	(–18.81)
Controls for Unaffiliated Recommendation Changes and Stock Returns Not Reported						
Number of Observations	123,513	124,706	130,401	66,609	67,133	70,122
Adjusted- R^2	0.14	0.14	0.14	0.07	0.07	0.06
F -statistics	1,026.89	1,030.30	991.36	245.74	239.90	227.84

In our second specification that interacts affiliated downgrades with the fraction of revenue from proprietary trading, columns (4) through (6) of Table VII, the disproportional increase in sell volume from affiliated downgrades is increasing with the fraction of proprietary trading revenue that the firm reports for each of the 2 days prior to the information release. As in the prior

specification, firms without proprietary revenue see an increase in sell volume on the day prior to their analyst issuing a downgrade. From our data and specification, we cannot distinguish whether the larger firms that happen to have proprietary desks are more likely to prerelease information to institutional clients or whether they are trading for the house, but we can say that the greater the fraction of revenue the firm derives from proprietary trading activity overall, the stronger the trading response. Taken together, these results are consistent with at least some dissemination of the impending downgrade outside the firm, though they are also consistent with firms trading for their own account.

IV. Prerelease Trading and Recommendation Characteristics

If analyst recommendations are disseminated in advance internally or externally, it is natural to ask how analyst, brokerage firm, or recommendation characteristics may relate to these results. One would expect both the incentive to disseminate and the intensity of trading observed in response to be correlated with the type of information provided or its source. In this section, we explore differential effects for analysts and brokerage firms based on reputation and experience measures. We also provide evidence, based on the characteristics of the recommendation itself, that the disproportionate selling volume in the days prior to the public release of the downgrade follows patterns consistent with trading on private information that one might reliably anticipate would generate a stronger reaction.

A. Reputation and Experience

We first examine the relation of predowngrade trading with the reputation of individual research analysts, as defined by the *Institutional Investor* All-Star rankings, and brokerage firms, as defined by the Carter–Manaster (CM, 1990) ranking. We also define two measures of experience. For analysts, we take experience as the number of years in the industry, as recorded by I/B/E/S. For firms, we consider an experience measure specific to our context—a firm's experience with prior regulatory infractions, as measured by the total number of infractions recorded for the firm.

In Table VIII, we report the coefficients of interest from a series of regressions where the dependent variable is proportional sell volume and the independent variables are affiliated downgrade variables segmented (at the mean) by the characteristic in question. Control variables are as in prior reported regressions. In all instances, the proportional sell volume response is contained on days -2 and -1 , consistent with the results presented in Sections II and III. For upgrades (unreported results), proportional buy volume effects are concentrated on day 0, again as in our previous results.²¹

²¹ We observe a positive and significant coefficient in the proportional buy volume specifications for lower Carter–Manaster ranked firms 3 days before and 1 day before the upgrade; however, we do not observe an associated increase in volume, nor are the loadings robust to checks such as median benchmarks or the exclusion of subsequent recommendations.

Table VIII
Proportional Sell Volume by Downgrade Characteristics

Table VIII reports the coefficients of interest from a series of OLS regressions where the dependent variable is the logit transformation of Proportional Sell Volume for a given market maker in the 3 days prior to and day of a recommendation release. Affiliated Downgrade is equal to 1 if the recommending analyst is in the same firm as the market maker and is split into two variables segmented by the characteristic in question (for continuous measures, we segmented above or below the mean). In Panel A, we examine analyst and brokerage reputation (All-Star and Carter–Manaster rankings). Panel B examines two experience measures: number of years in the industry for analysts and a brokerage’s experience with regulatory violations. The three recommendation characteristics reported in Panel C are the dispersion (standard deviation) of outstanding recommendations, deviations above or below the consensus recommendation, and realized profitability. Control variables are the same as in previous tables but are not reported. Standard errors are White heteroskedasticity-adjusted and are clustered for the same security-day (Rogers (1993)). In parentheses, we report *t*-statistics. Superscripts a, b, and c represent the 1%, 5%, and 10% significance levels, respectively.

Row	Variable	Day −3 (1)	Day −2 (2)	Day −1 (3)	Day 0 (4)
Panel A: Reputation Characteristics					
(1)	Affiliated Downgrade	0.084	0.086	0.231 ^b	−0.008
	ALL-STAR ANALYST	(0.82)	(0.88)	(2.49)	(−0.09)
	Affiliated Downgrade	0.032	0.074 ^c	0.055	0.036
	UNRANKED ANALYST	(0.69)	(1.69)	(1.31)	(1.02)
(2)	Affiliated Downgrade	0.032	0.079 ^c	0.072 ^c	0.020
	HIGH CARTER–MANASTER RANK	(0.75)	(1.92)	(1.84)	(0.59)
	Affiliated Downgrade	0.320	0.007	0.311 ^c	0.166
	LOW CARTER–MANASTER RANK	(1.41)	(0.03)	(1.66)	(1.36)
Panel B: Experience Characteristics					
(1)	Affiliated Downgrade	0.065	0.164 ^b	0.092	−0.004
	HIGH TENURE	(0.98)	(2.53)	(1.38)	(−0.08)
	Affiliated Downgrade	0.026	0.019	0.079 ^c	0.051
	LOW TENURE	(0.48)	(0.37)	(1.69)	(1.19)
(2)	Affiliated Downgrade	0.057	0.113 ^b	0.064	0.040
	HIGH REGULATORY INFRACTIONS	(1.15)	(2.06)	(1.44)	(1.04)
	Affiliated Downgrade	−0.008	−0.041	0.137 ^c	0.006
	LOW REGULATORY INFRACTIONS	(−0.10)	(−0.52)	(1.83)	(0.09)
Panel C: Recommendation Characteristics					
(1)	Affiliated Downgrade	0.042	0.117 ^b	0.099 ^b	0.035
	HIGH DISPERSION	(0.86)	(2.45)	(2.17)	(0.93)
	Affiliated Downgrade	0.040	−0.010	0.051	0.018
	LOW DISPERSION	(0.49)	(−0.13)	(0.71)	(0.28)
(2)	Affiliated Downgrade	0.041	0.080 ^c	0.078 ^b	0.037
	BELOW CONSENSUS	(0.96)	(1.93)	(1.98)	(1.10)
	Affiliated Downgrade	0.042	−0.001	0.214	−0.132
	ABOVE CONSENSUS	(0.20)	(−0.01)	(1.20)	(−0.92)
(3)	Affiliated Downgrade	−0.003	0.134 ^b	0.110 ^c	−0.017
	LARGE ABSOLUTE −2 TO 0 RETURNS	(−0.04)	(2.07)	(1.73)	(−0.34)
	Affiliated Downgrade	0.066	0.043	0.067	0.059
	SMALL ABSOLUTE −2 TO 0 RETURNS	(1.30)	(0.84)	(1.40)	(1.36)

Reputation may act as a governance mechanism to stem early disclosure, but strengthen the trading response if information is disseminated early either internally or externally (see, for example, Yasuda and Fang (2008)). More reputable analysts may have a weaker incentive to give advanced notice of pending recommendation changes since their reports generate greater attention, as measured by price and trading volume responses, when released through official channels. On the other hand, analyst rankings may depend in part on the favorable treatment of institutional clients who are polled by *Institutional Investor*. We therefore investigate the extent to which reputation, for the analyst or firm, may act to limit early dissemination. Row (1) of Panel A presents results for analysts by their All-Star status as reported by the October 2004 issue of *Institutional Investor*. On the day prior to the release date, there is a positive and significant effect for ranked analysts' downgrades on disproportional selling at the analyst's market maker. For unranked analysts, the coefficient estimate is positive on day -1, but not statistically significant. We observe a weakly significant increase in sell volume for unranked analysts on day -2. If we instead consider the reputation of the brokerage firm (row (2) of Panel A), we observe an increase in proportional sell volume 1 day before the release date for above-average CM-ranked firms, similar to the result for analysts, and also a positive relation for lower ranked firms at the 90% confidence level. We observe an increase in sell volume for higher ranked firms on day -2, also at 90% confidence.²²

These findings suggest that highly reputable analysts and firms are associated with a predowngrade volume increase, though lower ranked analysts and firms may also experience increased sell volume. It does not appear that reputation limits prerelease or is damaged by it. Elevated selling on the day before the downgrade is associated with better reputation. Our results in Section III indicate that there is at least some dissemination outside the firm on day -1. The All-Star analyst result, therefore, is consistent with favorable client treatment, and the magnitude of the coefficient is consistent with a strong trading response. Insofar as day -2 effects are associated with proprietary trading, more reputable analysts do not appear to generate revenue in this way, though unranked analysts at reputable firms may.

We next ask whether experience measures are associated with disproportional predowngrade selling. Analysts with more industry experience may be more aggressive with early dissemination, perhaps being less likely to adapt to the increased scrutiny of new regulations or having better assessed what behavior is sanctioned. Firms that are past violators of regulations may also be more likely to violate Rule 2110-4, either because of corporate culture or a lack

²² In unreported results, we find evidence that elevated selling at the issuing analyst's firm reemerges in the 2 days following a downgrade. The effect is concentrated for All-Star analysts and above-average CM-ranked firms, consistent with slow traders reacting to delayed information when coverage is likely to be rebroadcast through other channels (see, for example, Stickel (1995)), as well as brokers "working the phones." Further, there is no delayed selling for highly liquid stocks, suggesting that liquidity may also play a role. There is no postannouncement response for upgrades.

of procedural controls.²³ From row (1) of Panel B, we observe that downgrades from analysts with longer employment histories are related to disproportional selling at the analyst firm's market maker 2 days prior to a downgrade. There is no statistical effect for newer analysts. On the day prior to the downgrade, we observe an increase in selling at the firms of newer analysts, though results are smaller in magnitude and significant at the 90% confidence level. The result is similar if we examine the firm's history of regulatory infractions. Two days prior to downgrades, we observe an increase in proportional sell volume at firms with an above-average number of regulatory infractions (row (2) of Panel B). On day -1 , we find an increase in proportional selling before downgrades for low regulatory event firms at the 90% confidence level.²⁴

These results show that more experienced analysts and more frequently cited firms are associated with a sell volume effect 2 days prior to a downgrade. The timing corresponds to the proprietary trading desk results of Section III. One cannot rule out less experienced analysts or firms with a lower number of infractions having an effect on day -1 , however. In summary, while the reputation and experience measures produce intuitive results, early dissemination appears to be widespread. At the 90% confidence level, ranked and unranked analysts, high and low reputation brokerage firms, experienced and inexperienced analysts, and firms with greater and fewer regulatory infractions are associated with a predowngrade trading response.

B. Types of Recommendations

In this section, we examine characteristics of the recommendation itself since both the likelihood and strength of predowngrade trading may be related to the type of information provided. We consider three measures from prior literature associated with larger price or volume responses: the relative level of recommendation dispersion, more extreme deviations from consensus recommendation levels, and realized profitability.²⁵

²³ We count all regulatory violations since 1985, as reported by FINRA. On average, there are 20 violations per investment bank, with a maximum of 349 events. Large banks (both in terms of size and lines of business) are more likely to have more regulatory violations; however, the severity of violations varies greatly from late trade reporting to violations of Global Research Analyst Settlement terms. We consider a more focused measure, but in an examination of all 225 brokerage firms in our sample, we find only one citation in violation of Rule 2110-4, which prohibits trading in advance of material information generated from analyst reports. The lack of citations may suggest difficulty in detecting violations. We are unaware of any other study that has utilized the FINRA regulatory violations data.

²⁴ In unreported results, we also specify the number of regulatory infractions as a continuous variable (raw and logged) interacted with affiliated downgrade in a regression where it was added as a control. The disproportional sell volume effect is increasing in the number of regulatory infractions on both day -2 and day -1 . Further, we find that though the number of regulatory infractions is significantly positively correlated with the existence of proprietary desks, only firms with both proprietary desks and a large number of regulatory events experience abnormal day -2 sell volume.

²⁵ We also examine revisions versus initiations since initiations have been associated with a larger effect on prices (Irvine (2003)) and trading volume (Irvine (2004)). None of the affiliated downgrade coefficients loaded significantly with this split, indicating that both types of recommendations are needed for sufficient power to detect an effect. For upgrades, we find a positive and

Our methodology proceeds as in Section IV.A, where we interact the various characteristic indicators with affiliated downgrade. The coefficients on the interaction terms from a series of regressions based on recommendation characteristics are presented in Panel C of Table VIII. The results in Panel C show that on average, disproportional selling volume is observed for recommendations where the price and volume responses are predicted to be largest. Again, the volume response is contained on days -2 and -1 , consistent with the results presented in Sections II and III. In unreported results, we find disproportional buy volume for upgrades continues to be confined to the release date, even with these finer measures.

We first analyze analyst recommendations by the level of dispersion, since measures of general disagreement have been associated with higher volume (Saffi (2006), Chan, Hwang, and Mian (2005)). We would expect reactions to be larger in high dispersion environments, where dispersion is the standard deviation of all outstanding recommendations for the firm immediately prior to the downgrade. From row (1) of Panel C, we observe disproportional sell volume in high dispersion stocks at the downgrading firm on days -2 and -1 , but no significant volume effect for low dispersion stocks. This result suggests larger pre-event volume for stocks where more trading volume might be expected upon the official release of the information.

Prior research has shown that more extreme changes in recommendations away from consensus have a larger price impact than do recommendations close to consensus, and therefore might also be associated with higher volume (see Irvine (2004), Womack (1996), Ljungqvist et al. (2006)). As in Ljungqvist et al. (2006), extreme downgrades above or below consensus are defined as those that are at least one recommendation level away from the consensus level in each direction. We observe an increase in proportional sell volume for below consensus downgrades on day -1 (row (2) of Panel C), though the positive relation weakens to the 90% confidence level on day -2 . There is no measurable effect for downgrades above consensus, suggesting that only increasingly pessimistic recommendations are more likely to be disseminated early or generate trade.

Last, we measure profitability. As a measure of anticipated profitability or importance of the information contained in the report, we calculate the cumulative absolute abnormal return from 2 days before the recommendation day through the official release date, inclusive. Recommendations with price responses above the mean are coded as highly profitable (losses avoided for selling around downgrades), while revisions with below mean price responses generate smaller profits. Row (3) of Panel C presents the results for short-term profitability. Highly profitable downgrades are correlated with disproportional selling volume ahead of the release date for both days -2 and -1 , with no significant effect for those that are less profitable.²⁶

significant effect only for affiliated revisions on the event day, but this measure is not statistically different from the estimated coefficient for initiations.

²⁶ We also examine recommendations accompanied by “innovative” earnings forecast revisions, defined as those that move away from consensus, which have been shown to have larger price responses in the weeks following an analyst recommendation change (Michael and Womack (2006)).

Together, these results support our interpretation. The disproportional trading effect that we measure for downgrades mimics patterns shown in prior literature to generate more trading or larger price movements overall. Moreover, early dissemination seems to be confined to downgrades, even with more refined separations of recommendation characteristics.

V. Alternative Explanations and Robustness

We perform a variety of additional tests to further understand and ensure the validity of our empirical findings. First, we test whether the timing of trades and the price adjustment process may explain the volume shifts to the issuing analyst's firm. Second, we check that confounding news events or other types of endogeneity are not driving our prerelease trading results. Last, we discuss robustness checks on the methodology.

To check whether volume response is driven by improvements to the execution price for the affiliated market maker, we construct a daily average execution price for each market maker from daily dollar volume and daily share volume. In regressions similar to those reported throughout the paper, we examine the difference from average execution price for each market maker as a dependent variable for total, buy, and sell prices. We do not observe any significant price differences on or before the recommendation day at the market maker of the recommending firm.

We further rule out the possibility that our results are driven by clustered analyst recommendation changes or trading around earnings release dates. It is possible that analysts exhibit herd behavior (Welch (2000)), and our findings in earlier sections are a manifestation of clustering by analysts, though we control for other analyst activity in the regression framework. We repeat the analyses in the reported tables using only recommendations that occur alone or as the first in a series in a ± 3 day event window (74% of the sample). Our results are qualitatively similar when we eliminate clustered or subsequent recommendation revisions.²⁷ Since it is also common for analysts to comment on earnings reports, we identify all earnings announcements within 10 days around an analyst opinion to determine if this predictable form of public news drives our results. In total, we find 353 earnings announcements around the 5,881 upgrades and downgrades (6.0% of the prematched sample), of which 57 occur *after* the analyst opinion. In analyses similar to those performed in Sections II

In that sample, much of the overperformance documented occurs well after the initial announcement, suggesting that market participants do not immediately anticipate the value of the earnings revision. Nevertheless, we divide the affiliated downgrade variable according to whether it was "innovative" and in the same direction as the recommendation or had no accompanying earnings estimate revision. Both groups are associated with the disproportionate sell volume effect in the 2 days prior to the official downgrade date.

²⁷ The coefficient estimate on the affiliated downgrade variable is approximately the same magnitude in this smaller sample, but statistical significance drops from 0.10 to 0.15 on day -2 . The results for day -1 and for proprietary desk firms on day -2 are economically similar and remain statistically significant.

and III, we eliminate those opinions that occur within 5 trading days on either side of an earnings announcement. Our results are qualitatively unchanged when those recommendations are excluded, indicating that the findings presented in prior sections are not driven by recommendations around earnings announcements.

One might also be concerned that some other news is driving both the analyst downgrade and the disproportional sell volume at the downgrading firm. If a stock has negative news, however, there is no reason to think that selling would take place disproportionately at the market making division of a firm whose analyst is also about to issue a downgrade in response. Though we proxy for news via controls for unaffiliated analyst opinions and event returns, it is possible that increased trade at the market maker in the prerelease period is a manifestation of the lag in the analyst report following some other event, and that some unobservable factor leads a particular type of firm to experience more trading and be more likely to issue an analyst report. To test for this possibility, we construct a false experiment, where we re-assign the affiliated downgrade to a different analyst of a firm closely matched on the market making volume benchmarks of the true firm issuing the report. For these regressions, the artificially constructed indicator for a downgrade does not load as significantly greater than zero in any of the daily specifications.

In addition, we re-estimate the equations for proportional sell volume for the 2 days prior to the downgrade using an instrumental variables approach. For instruments, we identify variables that are correlated with an analyst's downgrade for a particular security but uncorrelated with the proportional sell volume in that security at the affiliated market maker. It has been shown that analyst coverage is increasing in stock volatility (Bhushan, 1989); we posit that volatility may also be related to the likelihood of a new analyst opinion and calculate the prior 1-month stock price volatility for use as an instrument. As a second instrument, we use the prior 6-month cumulative upgrades for a given brokerage firm. The idea is that analysts may shift opinions to generate trade, and the brokerage-specific variable, together with the stock-specific variable of volatility, can aid in predicting an analyst's downgrade of a given security at a particular firm. Results from the instrumental variables estimation (unreported) echo the results from Table VI, suggesting that analysts are not simply responding to increasing sell volume in the days prior to a downgrade.²⁸

Last, we run a number of robustness checks on our data construction and methodology. Many finance studies eliminate stocks with prices below five dollars. Since our regressions control for many individual stock characteristics and price changes are not our main focus, we see no reason to exclude them, though results are robust to their exclusion. Results are similar when medians are used instead of means to control for benchmark market making activity across firms.

²⁸ Joint tests of significance for the instruments exceed threshold levels for identifying weak instruments described by Staiger and Stock (1997). From the Hansen-*J* statistic, we fail to reject the joint null that the instruments are uncorrelated with the error term and correctly excluded from the "second-stage" equation.

In addition, we construct “abnormal” volume measures as dependent variables by subtracting the benchmark value from each measure rather than including it as a control, which essentially constrains the benchmark coefficient equal to 1. The use of abnormal volume measures does not change the qualitative results. We also re-estimate our primary tests using the entire sample of trading days (over 3 million observations) rather than the event day with benchmarks approach. Results are qualitatively similar using this alternative methodology. As mentioned earlier, we also cluster errors in three dimensions simultaneously (by security, trading day, and market maker) and statistical significance of our coefficients of interest remains above conventionally reported confidence levels across specifications.

VI. Discussion and Conclusion

In this paper, we examine affiliated market making activity around analyst recommendation changes. We find an increase in attributed volume around both upgrades and downgrades, after controlling for daily volume, benchmark volume, and other information. We find directionally consistent volume for upgrades and find that the effect is limited to the official recommendation release date. The relationship does not extend to block trading, so it is unclear whether institutions are trading in the direction of the upgrade through the issuing analyst's firm or whether the effect results from smaller investors at the firm.

We do not find corresponding increases in affiliated sell volume on the downgrade days themselves, though sell volume is significantly and positively related to affiliated downgrades before the actual revision date. We find evidence that a portion of the disproportionate sell volume prior to the downgrade date is institutional volume, and at least some of the volume comes from clients of the firm. A provocative finding is the relation between the presence of proprietary trading and associated revenue measures with predowngrade sell volume, which is suggestive of Rule 2110-4 violations.

An implication of our findings is the revenue generated from research production through the market making channel, specifically as it relates to upgrade and downgrade events. At minimum, the increase in volume is associated with an increase in trading commissions. The firm may also generate trading profits. In dollar terms, the effects are nonnegligible. For example, if we assume trading commissions of \$0.05 per share (Stoll (2003)) up to \$0.91 per share (obtained from conversations with full-service brokerage firms) and multiply by a rough estimate of abnormal shares traded on the release day (106,115),²⁹ the average abnormal commission revenue for a typical bulge-bracket investment bank ranges from \$5,305 to \$96,565 for each recommendation change. Multiplying by 1,741 revisions, the average among the 12 largest firms over the year of our sample, yields abnormal commissions feasibly ranging from \$9.2 million to \$168.1 million per firm-year from the event day alone.

²⁹ Abnormal shares are calculated as the average total volume of an affiliated market maker on day 0 for upgrades and downgrades less the benchmark total volume.

In addition, there are commissions or trading profits from abnormal sell volume on days -2 and -1 . If we first assume that all abnormal sell volume is proprietary, we can estimate an upper range for trading profits by computing the dollar abnormal return through day 0 multiplied by average abnormal sell volume (9,731 for day -2 and 77,029 for day -1) for the affiliated market maker. Potential trading profits (losses avoided) for abnormal trades initiated on day -2 or day -1 are \$20,400 and \$102,681, respectively. If the average large firm issues 1,016 downgrades per year, potential abnormal profits are \$20.7 million and \$104.5 million. For the 12 largest firms, the total figure for both days could approach \$1.5 billion. For commissions, calculations at the nondiscounted rate for days -2 and -1 would yield abnormal commissions of \$8,855 for day -2 and \$70,096 for day -1 . Combining these amounts and multiplying by the number of downgrades over the year for bulge-bracket firms, commissions could reach \$80.2 million per firm, or \$962.4 million for the 12 largest firms. Thus, if beneficiaries of early information pay full commissions, revenues generated from commissions approach the magnitude of those generated from trading. More importantly, these figures suggest that magnitudes are sufficiently large to cover a substantial fraction of research costs.³⁰

While an intended consequence of the regulations from 2002 to 2003 was the shift in the distribution of recommendations to more accurately reflect analysts' opinions and to reduce conflicts faced by analysts from advisory activities, an unintended consequence of the regulations may be that analysts face strengthened conflicts driven by brokerage and trading. Given the focus by both academics and the popular press on the conflicts of interest driven by investment banking relationships, we checked whether prerelease volume prior to downgrades might be driven by banking conflicts or GRAS status (the 12 bulge-bracket multifunction brokerage firms fined by the Global Research Analyst Settlement).³¹ In a series of tests controlling for these characteristics, we find evidence that both firms with and without banking relationships and both GRAS and non-GRAS firms contribute to our findings. While new regulations may have served to alleviate banking conflicts of interest, our results suggest that these regulations did not curb analyst conflicts of interest arising from brokerage and trading, as measured by attributed volume responses to recommendation revisions.

We believe that this is the first paper to identify informed trading prior to downgrades. The results suggest that some investors are aware of analyst downgrades prior to the public release and trade accordingly. The asymmetry in our findings between upgrades and downgrades warrants additional comment.

³⁰ Estimates of annual research costs at large brokerage firms are approximately \$200 million (Nocera (2004)). If we instead compute averages for the full sample (225 firms), total abnormal commissions per firm are of similar magnitude: \$1.9 billion for day 0 and \$1 billion for days -2 and -1 . Average abnormal trading profits are lower, at approximately \$500 million.

³¹ See Dugar and Nathan (1995), Iskoz (2002), Lin and McNichols (1998), Lin, McNichols, and O'Brien (2005), Ljungqvist, Marston, and Wilhelm (2006), and Michaely and Womack (1999). Ellis, Michaely, and O'Hara (2000) document that banking relationships affect market making in the case of an IPO, where the lead underwriter becomes the dominant market maker.

Since there are price responses to upgrades, it is somewhat puzzling that we do not observe similar patterns in trading at affiliated market makers before upgrades, even when more extreme upgrades are examined separately.

While returns for upgrades and downgrades in our sample are approximately equal in absolute value, it is unclear whether market participants would have anticipated such a response since their expectations would have likely been formed by observing past histories of returns. Previous studies show trading responses to downgrades to be stronger than responses to upgrades (Green (2006), Jegadeesh et al. (2004), Kadan et al. (2006), Womack (1996)). Moreover, the transition matrix of Table III shows that some asymmetry persists. The return from Hold to Buy is 3.35%, whereas the return from Hold to Sell is -5.62%. One explanation for trading on knowledge of a downgrade versus an upgrade could therefore be the difference in perceptions for upgrade and downgrade returns.

A second rationale could stem from the idea of loss aversion, where avoidance of negative outcomes relative to a reference point (say, the prevailing stock price) is weighted more highly than the experience of positive ones (Kahneman and Tversky (1979)). This idea has a quite intuitive interpretation in the context of external dissemination: If a brokerage has a large institutional client with an existing holding and does not alert them to an impending downgrade, that omission could cause more friction (and loss of future business) than merely not informing a client of a potential upgrade in a stock they may not hold.³² Further, the increase in the prevalence of hedge fund activity in the markets and their relationships with nonindependent research houses may also contribute to our findings.

Though prior research finds that analyst activity garners attention for the issuing firms more broadly, we document a dramatic effect on trading activity for the issuing brokerage firms around both upgrades and downgrades. Our paper is the first to document increased trading at the recommending firm prior to the release of an analyst report, strongly suggesting that one of the ways brokerage firms recover costs is through enabling advanced trading, and that the advanced trading comes to the market maker of the recommending firm. This effect has real and significant monetary implications for these firms, as both trading commissions and execution fees from spreads are generated from increased trading volume. While market making volume is not a measure directly applicable to securities exchanges with other structures, it is likely that proprietary trading, relationships with institutional clients, and client reaction to analyst information releases would be similar across exchanges. Our results are consistent with analyst recommendations still having value to investors in a postregulatory environment, though some investors appear to receive more valuable information than others.

³² This asymmetry between pleasure and pain could also lead to an asymmetry in internal trading. One would underweight the potential profits from upgrades relative to the potential costs of taking action.

REFERENCES

- Agrawal, Anup, and Mark Chen, 2005, Analyst conflicts and research quality, Working paper, University of Maryland.
- Agrawal, Anup, and Mark Chen, 2008, Do analyst conflicts matter? Evidence from stock recommendations, *Journal of Law and Economics* 51, 503–538.
- Barber, Brad, Reuven Lehavy, Maureen McNichols, and Brett Trueman, 2001, Can investors profit from the prophets? Consensus analyst recommendations and stock returns, *Journal of Finance* 56, 531–564.
- Barber, Brad, Reuven Lehavy, and Brett Trueman, 2006, Comparing the stock recommendation performance of investment banks and independent research firms, *Journal of Financial Economics* 85, 490–517.
- Barclay, Michael, and Jerold Warner, 1993, Stealth trading and volatility, *Journal of Financial Economics* 34, 281–305.
- Bhushan, Ravi, 1989, Firm characteristics and analyst following, *Journal of Accounting and Economics* 11, 255–274.
- Boni, Leslie, and Kent Womack, 2006, Analysts, industries, and price momentum, *Journal of Financial and Quantitative Analysis* 41, 85–109.
- Cameron, A. Colin, Jonah Gelbach, and Douglas Miller, 2007, Robust inference with multi-way clustering, Working paper, University of California at Davis.
- Carter, Richard, and Steven Manaster, 1990, Initial public offerings and underwriter reputation, *Journal of Finance* 45, 1045–1067.
- Chakravarty, Sugato, 2001, Stealth-trading: Which traders' trades move stock prices? *Journal of Financial Economics* 61, 289–307.
- Chan, Kalok, Chuan-yang Hwang, and Mujtaba Mian, 2005, Mutual fund herding and dispersion of analysts' earnings forecasts, Working paper, HSUST.
- Chen, Xia, and Qiang Cheng, 2005, Institutional holdings and analysts' stock recommendations, Working paper, University of Chicago.
- Chung, Kee H., and Seong Yeon Cho, 2005, Security analysis and market making, *Journal of Financial Intermediation* 14, 114–141.
- Clarke, Jonathan, Ajay Khorana, Ajay Patel, and Raghavendra Rau, 2006, Independents' day? Analyst behavior surrounding the Global Settlement, Working paper, Purdue University.
- Conrad, Jennifer, Kevin Johnson, and Sunil Wahal, 2001, Institutional trading and soft dollars, *Journal of Finance* 56, 397–416.
- Cremers, Martijn, and Jianping Mei, 2007, Turning over turnover, *Review of Financial Studies* 20, 1749–1782.
- Dugar, Amitabh, and Siva Nathan, 1995, The effect of investment banking relationships on financial analysts' earnings forecasts and investment recommendations, *Contemporary Accounting Research* 12, 131–160.
- Easley, David, Maureen O'Hara, and Joseph Paperman, 1998, Financial analysts and information-based trade, *Journal of Financial Markets* 1, 175–202.
- Economides, Nicholas, and Robert Schwartz, 1995, Equity trading practices and market structure: Assessing asset managers' demand for immediacy, *Financial Markets, Institutions, and Instruments* 4, 1–46.
- Ellis, Katrina, Roni Michaely, and Maureen O'Hara, 2000, When the underwriter is the market maker: An examination of trading in the IPO aftermarket, *Journal of Finance* 55, 1039–1074.
- Francis, Jennifer, and Leonard Soffer, 1997, The relative informativeness of analysts' stock recommendations and earnings forecast revisions, *Journal of Accounting Research* 35, 193–211.
- Goldstein, Michael, Paul Irvine, Eugene Kandel, and Zvi Wiener, 2004, Brokerage commissions and institutional trading patterns, Working paper, Babson College.
- Green, T. Clifton, 2006, The value of client access to analyst recommendations, *Journal of Financial and Quantitative Analysis* 41, 1–24.
- Grossman, Sanford, and Joseph Stiglitz, 1980, On the impossibility of informationally efficient markets, *American Economic Review* 70, 393–408.
- He, Wen, Mujtaba Mian, and Srinivasan Sankaraguruswamy, 2005, Differential responses of large

- and small traders to analysts' stock recommendations, Working paper, National University of Singapore.
- Heidle, Hans, and Xi Li, 2004, Is there evidence of front-running before analyst recommendations? An analysis of the quoting behavior of Nasdaq market makers, Working paper, University of Notre Dame.
- Institutional Investor*, 2004, The best analysts of the year, 38:10, 66–95.
- Irvine, Paul, 2001, Do analysts generate trade for their firms? Evidence from the Toronto Stock Exchange, *Journal of Accounting and Economics* 30, 209–226.
- Irvine, Paul, 2003, The incremental impact of analyst initiation of coverage, *Journal of Corporate Finance* 9, 431–451.
- Irvine, Paul, 2004, Analysts' forecasts and brokerage-firm trading, *The Accounting Review* 79, 125–149.
- Irvine, Paul, Marc Lipson, and Andrew Puckett, 2007, Tipping, *Review of Financial Studies* 20, 741–768.
- Iskoz, Sergey, 2002, Relative performance and institutional reaction to underwriter analyst recommendations, Working paper, Massachusetts Institution of Technology.
- Jackson, Andrew, 2005, Trade generation, reputation, and sell-side analysts, *Journal of Finance* 60, 673–717.
- Jegadeesh, Narasimhan, and Joonghyuk Kim, 2006, Value of analyst recommendations: International evidence, *Journal of Financial Markets* 9, 274–309.
- Jegadeesh, Narasimhan, Joonghyuk Kim, Susan Krische, and Charles Lee, 2004, Analyzing the analysts: When do recommendations add value? *Journal of Finance* 59, 1083–1124.
- Kadan, Ohad, Leonardo Madureira, Rong Wang, and Tzachi Zach, 2006, Conflicts of interest and stock recommendations—The effects of the Global Settlement and related regulations, Working paper, Washington University in St. Louis.
- Kahneman, Daniel, and Amos Tversky, 1979, Prospect theory: An analysis of decision under risk, *Econometrica* 47, 263–292.
- Kim, Sok Tae, Ji-Chai Lin, and Myron Slovin, 1997, Market structure, informed trading, and analysts' recommendations, *Journal of Financial and Quantitative Analysis* 32, 507–524.
- Lee, Charles, 1992, Earnings news and small traders: An intraday analysis, *Journal of Accounting and Economics* 15, 265–302.
- Lin, Hsiou-wei, and Maureen McNichols, 1998, Underwriter relationships, analysts' earnings forecasts and investment recommendations, *Journal of Accounting and Economics* 25, 101–127.
- Lin, Hsiou-wei, Maureen McNichols, and Patricia O'Brien, 2005, Analyst impartiality and investment banking relationships, *Journal of Accounting Research* 43, 623–650.
- Ljungqvist, Alexander, Christopher Malloy, and Felicia Marston, 2006, Rewriting history, Working paper, New York University.
- Ljungqvist, Alexander, Felicia Marston, and Willaim Wilhelm, 2006, Competing for securities underwriting mandates: Banking relationships and analyst recommendations, *Journal of Finance* 61, 301–340.
- Madureira, Leonardo, and Shane Underwood, 2008, Information, sell-side research, and market making, *Journal of Financial Economics* 90, 105–126.
- Malmendier, Ulrike, and Devin Shanthikumar, 2007, Do security analysts speak in two tongues? Working paper, University of California at Berkeley.
- Michaeli, Roni, and Kent Womack, 1999, Conflicts of interest and the credibility of underwriter analyst recommendations, *Review of Finance Studies* 12, 653–686.
- Michaeli, Roni, and Kent Womack, 2006, What are analysts really good at? Working paper, Cornell University.
- Nocera, Joseph, 2004, Wall Street on the run, *Fortune*, June 16.
- Petersen, Mitchell, 2009, Estimating standard errors in finance panel data sets: Comparing approaches, *Review of Financial Studies* 22, 435–480.
- Rogers, William H., 1993, Regression standard errors in clustered samples, *Stata Technical Bulletin* 13, 19–23.
- Saffi, Pedro, 2006, Differences of opinion, information and the timing of trades, Working paper, London Business School.

- Securities and Exchange Commission, 1998. *Inspection Report on the Soft Dollar Practices of Broker-Dealers, Investment Advisers and Mutual Funds*. Available at www.sec.gov/news/studies/softdolr.h
- Staiger, Douglas, and James H. Stock, 1997, Instrumental variables regression with weak instruments, *Econometrica* 65, 557–586.
- Stickel, Scott, 1995, The anatomy of the performance of buy and sell recommendations, *Financial Analyst Journal* 51, 25–39.
- Stoll, Hans, 2003, Market microstructure, in Constantinides, George, Milton Harris, and Rene Stulz, eds. *Handbook of Economics and Finance. Volume 1A: Corporate Finance* (North-Holland, Elsevier, Amsterdam, The Netherlands).
- Welch, Ivo, 2000, Herding among security analysts, *Journal of Financial Economics* 53, 369–396.
- Womack, Kent, 1996, Do brokerage analyst recommendations have investment value? *Journal of Finance* 51, 137–167.
- Yasuda, Ayako, and Lily Fang, 2009, The effectiveness of reputation as a disciplinary mechanism in sell-side research, *Review of Financial Studies*, DOI: 10.1093/RFS/hhn116.