The impact of illegal insider trading in dealer and specialist markets: Evidence from a natural experiment[☆]

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Abstract

We examine insider trading in specialist and dealer markets, using the trades of stockbrokers who had advance copies of a stock analysis column in *Business Week* magazine. We find that increases in price and volume occur after informed trades. During informed trading, market makers decrease depth. Depth falls more on the NYSE and Amex than on the Nasdaq. Bid-ask spreads show increases on the NYSE and Amex, but not on the Nasdaq. We find none of these pre-release changes in a nontraded control sample of stocks mentioned in the column. Our results show that insider trading has a negative impact on market liquidity; depth is an important tool to manage asymmetric information risk; and specialist markets are better at detecting information-based trades.

JEL-Classification: G12, G14, K22, D82

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1. Introduction

Many market participants believe that insider trading poses a threat to the operation of financial markets. However, this proposition is difficult to test because there are few studies of insider trading in which researchers can actually say they know for sure that traders used material, nonpublic information. Most studies rely on the position of a trader (e.g., company official or board member) to infer access to, and use of, such information.

In this study, we examine data from a recent court case on insider trading that involved 116 publicly traded companies. Five stockbrokers acquired information on these firms from *Business Week*'s "Inside Wall Street" (IWS) column, which they received the day before its public release. Although not based directly on company news, trades based on prior knowledge of the IWS column yielded abnormal returns. Because the brokers traded only a third of the 116 stocks, this episode offers a natural experiment on the impact of informed trading in financial markets. Also, because the stocks involved were listed on the NYSE, Amex and Nasdaq, the data yield the first comparison of the effects of illegal insider trading in dealer and specialist markets.

For all stocks traded by the stockbrokers and for most other IWS stocks, we have data on transactions and quotes for three days around the insider trading day. Court records from the civil and criminal cases identify the brokers' trades within the transaction stream. By aggregating the trade and quote data in 15-minute intervals, we obtain a detailed picture of market behavior during and immediately following periods of insider trading activity.

We find strong evidence that illegal insider trading has a negative impact on market liquidity. Our analysis shows that market makers adjust both depth and spreads to manage the risk presented by informed traders.[1] Depth falls in both specialist and dealer markets, but spreads increase only in specialist markets. All these informed trades involve purchases, and we find that only ask depth changes significantly. Relative to the average quoted depth on the previous day, ask depth is 38% lower for NYSE and Amex stocks during insider intervals. After controlling for

[1] Throughout the paper, we use the term "market makers" to refer to all liquidity providers, including specialists, dealers and limit-order traders.

lower Nasdaq depth, ask depth for Nasdaq stocks falls by only 3% during insider intervals.[2] These depth results are stronger when we exclude nine traded stocks featured in non-*Business Week* news stories before the insider trading period. The spread increases involve effective spreads more than quoted spreads, with market makers in specialist markets providing less price improvement during insider trading intervals. Overall, specialist markets reduce depth and price improvement more than dealer markets in response to insider trading.

We also examine how private information becomes impounded in stock prices. Because the IWS information was short-lived, these stockbrokers were pressed to act on Thursday afternoon. Faced with this constraint, we find that they tended to single out smaller, less liquid companies, which might have made their actions more detectable to others.

We find that Thursday trading volume is not unusual until the first insider trades. Though buying pressures do develop once insiders start trading, we see significant increases in the number of trades and volume only after the brokers finish trading. The Thursday volume increase is large (almost two-thirds of the previous day's total volume), but the brokers' trades only account for a small part of the increase. Court records show that the IWS information was shared beyond the defendants, but trades by the brokers' associates do not explain the additional volume. The trades of all the individuals identified by the Securities and Exchange Commission (SEC) with access to the IWS information make up no more than 9.2% of the volume increase for insider-traded stocks. We suggest that the increased buying reflects noise trading by either "falsely informed" or mimicking and momentum traders. As defined by Cornell and Sirri (1992), falsely informed traders are those who "fail to recognize the extent of the inside information reflected in the market price, and thus incorrectly believe that they have superior information." Such traders may greatly increase volume until the extent of their misinformation is revealed.

Overall, the buy-side activity is higher both during and after insider trading intervals, and prices rise markedly across these intervals. However, consistent with the mimicking or

[2] For Nasdaq stocks, we aggregate ask (*bid*) depth quotes across all market makers quoting the best ask (*bid*) price. By doing so, we ensure that our depth figures are comparable for Nasdaq- and exchange-listed stocks.

momentum view, prices do not increase enough that all of the information in the IWS column is reflected in the Thursday closing price, because abnormal returns are also observed on Friday.

Unlike other studies of insider trading, we have data on stocks for which nonpublic information was available to the five brokers but they took no action. These stocks form an ideal control group to determine whether the observed liquidity and price effects are really a consequence of insider trades. After removing stocks for which there are other information events, we find no effects like those observed for the traded stocks. Depth and spreads do not change; volume is normal; and there is no significant price appreciation, on Thursday afternoon. Thus, it appears as if no information has leaked to the market for these stocks.

To isolate the effects of these insiders' trades, we develop an additional control sample based on order flow imbalances. Chordia, Roll, and Subrahmanyam (2002) find that signed order imbalances affect bid-ask spreads and returns. Thus, it is possible that the responses we observe are due partly to market makers' reacting to order imbalances rather than to informed order flow. Our control sample uses the same set of *Business Week* stocks, but in the six months before these brokers began trading. We match stocks to order imbalances observed on the day of informed trading. After re-estimating the models with the control sample, we use these regression estimates to net out the effects of order imbalances from the data in the informed trading period. Regressions using these adjusted data show depth and spread adjustments during informed trading periods, though spreads increase significantly only for exchange-listed securities. In general, order imbalances are not responsible for our adverse liquidity results.

The data also allow us to examine the informed traders' exit strategies. The returns from trading on IWS information are short-lived. Therefore, stocks must be promptly resold for informed trades to yield abnormal returns. We find that these brokers were slow to adjust their exit strategies and close their positions the next day. They learned this rule eventually, as their holding period consistently decreased during the sample period.

The paper proceeds as follows. Section 2 discusses related theoretical and empirical studies. Section 3 describes the data and offers graphical evidence on the impact of insider

trading. Section 4 analyzes abnormal returns to insider trading on IWS stocks. Section 5 develops the statistical analysis of trades, spreads and depth. Section 6 concludes.

2. Related literature

Most theoretical models of market making focus on the bid-ask spread as the tool used to react to informed trading (e.g., Glosten and Milgrom, 1985; Glosten, 1989; Easley and O'Hara, 1992; Madhavan, 2000). Recent models by Kavajecz (1998) and Dupont (2000) examine how specialist market makers can optimally change both quoted depth and spreads during informed trading periods. Kavajecz forecasts that depth will fall and spreads widen when adverse selection increases. Dupont, who also considers quantities and prices, provides predictions closest to our results. He models the trade-off between unprofitable trades with informed traders and profitable trades with liquidity traders. A higher spread or lower depth reduces losses to insiders, but also reduces liquidity trading because uninformed traders are price sensitive. Informed trades are distinguished in his model when the information signal is more precise, which causes larger-size orders. Dupont demonstrates that these larger orders cause quoted depth to react proportionally more than bid-ask spreads to informed trading. Therefore, in empirical research, depth changes are more likely to be observable than spread changes during informed trading.

The ability to detect spread and depth changes depends on the nature of the information event. Empirical research establishes that expected events, such as earnings announcements, affect both spreads and depth.[3] In contrast, relatively little is known about how spreads or depth react to unexpected events, such as those created by informed traders. The sole evidence to date comes from Meulbroek's (1992) analysis of SEC files on insider trading between 1980 and 1989, and from case studies by Cornell and Sirri (1992) and Chakravarty and McConnell (1997, 1999) of two NYSE stocks targeted by corporate insiders in the 1980s.

[3] Liquidity falls just before and immediately following announcements regarding earnings (e.g., Lee, Mucklow, and Ready, 1993; Kavajecz, 1999), dividends (Koski and Michaely, 2000), and takeovers (Foster and Vishwanathan, 1994; Jennings, 1994). See Kim and Verrecchia (1994) and Krinsky and Lee (1996) for discussions of earlier empirical studies analyzing spread behavior around such expected information events.

Meulbroek (1992) focuses on price discovery in 183 cases of insider trading. She finds that the average cumulative abnormal return per episode is large (6.85%) and amounts to 47.6% of the abnormal return on the day the information becomes public. She also finds that the median insider's trading represents only 11.3% of the stock's trading volume. However, Meulbroek makes the case that the trades of insiders (as opposed to falsely informed or momentum traders) account for most of the extra volume on insider days. She hypothesizes that insider trade-specific characteristics and not trading volume *per se* impound the inside information into security prices.

Cornell and Sirri (1992) and Chakravarty and McConnell (1997, 1999) analyze illegal trading during two takeover attempts. Cornell and Sirri analyze trades made by a director of Anheuser-Busch and his accomplices during that company's 1982 acquisition of Campbell-Taggart. In all, 38 insiders bought 265,600 shares over 23 days, which is equivalent to 29% of the target's trading volume. Unlike Meulbroek (1992), but consistent with our evidence, Cornell and Sirri find a large increase in non-insider, falsely informed trading. Their most striking proposition is that bid-ask spreads are unchanged by insider trading. Further, they argue that liquidity improved while insiders were active, with liquidity measured as the cost of trading an additional share, which is different from the quoted depth measure analyzed in this study.

Chakravarty and McConnell (1997, 1999) analyze Ivan Boesky's purchase of 1,731,200 Carnation shares before Nestlé's 1984 acquisition. They analyze trades on 24 days for about 5% of Carnation's outstanding shares. They find that Boesky's trades made up only one-half of the incremental volume, and that price increases took place both during and following Boesky's trades. As do Cornell and Sirri (1992), they find that spreads were generally unaffected by these trades. They also report that depth was unchanged or improved when Boesky bought shares, with quoted depth changes greater on the bid side than the ask side. However, they question whether "[those] results can or should be generalized to a larger population or to a different time period."

A key contribution of our paper is to show that, although many of these results can be reproduced in a cross-section of insider trading episodes, some important extant results are not general in nature. In particular, we show that informed trading based on material, nonpublic

information leads to spread increases and reduced price improvement in specialist markets. We also show that such trading has a negative impact on depth, and that the magnitude of this impact depends on the type of financial market (specialist or dealer) where the trades are carried out.

Our paper is also related to Corwin and Lipson (2000); Christie, Corwin, and Harris (2002); Garfinkel and Nimalendran (2002); and Heidle and Huang (2002). Those papers analyze information effects on dealer and specialist markets.[4] Corwin and Lipson find that trading halts on the NYSE are sufficient to resolve price uncertainty. In contrast, Christie, Corwin, and Harris find that halts do not resolve price uncertainty for Nasdaq stocks: spreads more than double after Nasdaq halts, and only decrease 20 to 30 minutes after trading resumes. They argue that Nasdaq dealers, with a limited knowledge of the order flow, may be at a disadvantage to informed investors. This finding is consistent with both Heidle and Huang and Garfinkel and Nimalendran, who find that specialists, located on the exchange floor and managing the entire order flow, appear better at detecting informed trades. Our findings, based on actual insider trades, support these results.

Our paper is also part of the literature on the stock market impact of financial columns, which include the *Wall Street Journal*'s "Heard on the Street" (e.g., Lloyd-Davis and Canes, 1979; Liu, Smith, and Syed, 1990; Beneish, 1991) and "Dartboard" (e.g., Barber and Loeffler, 1993; Greene and Smart, 1999; Liang, 1999); *Business Week*'s IWS (e.g., Palmon, Sun, and Tang, 1994; Sant and Zaman, 1996); and CNBC's Morning and Midday Call television programs (Busse and Green, 2002). These studies all find significant, but temporary, abnormal returns when good news is reported. For the IWS column, average abnormal returns ranged from 1.2% to 1.9%, with the initial effect negated after 26 trading days. Using recent data, we find abnormal returns more than twice that size, both before and during the insider trading period.

[4] Other studies document differences in trading between dealer and specialist markets. Most examine differences in trading costs. Examples include Huang and Stoll (1996); Barclay (1997); Bessembinder (1997, 1999); Bessembinder and Kaufman (1997a,b); Clyde, Schultz and Zaman (1997); LaPlante and Muscarella (1997); Barclay et al. (1999); Stoll (2000); Weston (2000); Chung, VanNess, and VanNess (2001); and references cited in those papers.

3. Legal case and data

The events we analyze became public in January 1999, when the SEC charged five stockbrokers with insider trading. The SEC alleged that one of the brokers paid a foreman of the local *Business Week* distributor, *Hudson News Co.*, to fax advance copies of the IWS column.[5] The broker obtained this information in the early afternoon on Thursdays, before the public release of portions of the magazine over news wire (at 5:15 PM) and electronic distribution on *America Online* (at 7:00 PM). The broker forwarded it to four other brokers who were able to enter trades before the markets had closed.

The *Business Week* scheme started in June 1995 and ended with the February 5, 1996 issue.[6] The scheme apparently ended only because officials at *Business Week* noticed unusual trading in some of the recommended stocks.[7] In all, the defendants, members of their families and some of their clients bought $7.73 million worth of securities mentioned in the IWS column, accounting for about 5% of total Thursday trading in the affected stocks. Court records provide information on the trades of the five brokers and their associates, including the date, volume, and cost of each trade. The time of each trade and profits are available only for the stockbrokers.

The IWS column mentioned 116 firms during the eight-month period when brokers had access to the column. Of the 116 firms, the stockbrokers did not trade in 76, leaving 40 traded firms. We remove ten companies to form the traded sample: nine that were traded only by a broker's customer and are missing time stamps, and one that had only stock options traded. Our focus is on the remaining 30 stocks, with stocks without insider trades acting as a control sample.

On the amounts they invested in the 30 stocks, the defendants earned an average holding-period return of 3.48%. The profits vary across traders because not all the brokers bought every

[5] See, e.g., "Group of Brokers is Facing Charges of Insider Trading," *The New York Times*, January 28, 1999, p. C-21. This case is similar to an earlier, well-publicized case of insider trading involving the same IWS column. In 1988, several security breaches occurred at *Business Week*. A number of people obtained advance copies of the magazine, and information was also leaked from within the company. Eleven individuals were convicted or settled charges of insider trading, including three stockbrokers and *Business Week's* radio broadcaster, who went to prison.
[6] See United States v. Joseph Falcone, 99 Cr. 332 (TCP) and SEC v. Smath *et al*., 99 CV 523 (TCP).
[7] See "Is someone sneaking a peek at Business Week? Early trading of a few *Inside Wall Street* stocks raises a red flag," by Chris Welles, *Business Week*, February 5, 1996.

stock and because the number of shares purchased varies across both brokers and stocks. At one extreme, the initiating broker earned over $92,000 on 29 of the 30 stocks, for a holding-period return of 3.81%. At the other extreme, one broker actually lost $657 on transactions involving 13 of the 30 stocks. The mean (*median*) holding was 6,720 (*5,000*) shares for all five brokers combined. The smallest orders were for 1,000 shares and the largest purchase by a single broker was 21,000 shares in one stock. The brokers often established these positions from smaller lots. As a result, the trade size varies across stocks. The average (*median*) trade size is 1,654 (*1,000*) shares for Nasdaq stocks and 2,064 (*1,000*) shares for exchange-listed stocks.

3.1. Characteristics of the traded companies

Table 1 summarizes the characteristics of the sample firms. It compares traded firms with nontraded firms mentioned in IWS. Data on the rates of return on assets and equity; level and growth rate of sales; assets; and growth rate of net income are from the 1994, 1995, and 1996 Compustat tapes. No Compustat data were found for nine traded and 16 nontraded companies. The table also includes stock listing and the column's sentiment ("Buy", "Neutral" or "Sell"). We use the Dow Jones News Retrieval service to determine whether firms are mentioned in other news articles on the Wednesday or Thursday before the public release of the IWS column.

Table 1

Table 1 shows that the IWS column offers a favorable sentiment on almost all of these stocks. There is no other news on most of them. Thus, IWS provides unexpected positive publicity for most of these companies. In the empirical analysis, to avoid the confounding effects that other news might cause, we distinguish between companies with and without other news.

The Compustat data show that traded companies are smaller than those not traded. In addition, 45% of the traded firms are listed on the NYSE or Amex, compared to 55% on Nasdaq. We find nearly the reverse listing proportions for the control sample of nontraded firms. The traded firms are also less profitable. There is little difference in the growth rate of sales.

However, the average sales of traded firms are less than one-half, and their average asset size is about one-fourth, of that observed for nontraded firms. The stockbrokers likely anticipated that mention in the IWS column would have the largest impact on smaller companies.

3.2. Transaction and quote data

For all 116 stocks, we collect transaction and quote data from the Securities Industry Automation Corporation (SIAC). These data cover three days: Wednesday (the day before the leak of IWS), Thursday (the leak day), and Friday (the first day that the general public can trade on the IWS news). The transaction and quote data include time, volume, trade price, bid and ask prices, and quoted depth. The depth data for Nasdaq stocks are for all market makers quoting the best bid or ask price, which makes them comparable to exchange-listed depth.[8] We use the Lee and Ready (1991) algorithm to determine trade direction. We summarize the data into 15-minute intervals, which smoothes the data and reduces the effect of larger trades and asynchronous trading on the results. We also exclude all 15-minute intervals containing only zero or one trade.

We manually find brokers' trades in the transactions stream. For many traded stocks, the information from court records unambiguously identifies the stockbrokers' trades. Because some of the brokers' orders are broken into smaller trades, the court records may not uniquely identify some trades. To address this problem, we examine all possible trade sequences that match the brokers' trades around the time stamp and analyze the data in 15-minute intervals. It is rare for any trade sequence to cross between two 15-minute intervals. Still, we conduct the statistical analyses across all sequences of insider trading intervals. Our conclusions are robust to these choices. Therefore, we report results only for regressions on the most likely candidate sequence.

Table 2

Table 2 presents descriptive statistics of the SIAC data. The transaction information is reported in three panels. Panel A provides information for all 30 stocks traded by stockbrokers;

[8] Tim McCormick at the Nasdaq provided the depth and quote data for all market makers.

Panel B, the information for 21 of these 30 stocks that had no other news on either Wednesday or Thursday; and Panel C, the information on 44 nontraded stocks without other, non-IWS news.

Panels A and B show similar statistics for most variables. The average traded stock price is about $18 or $20 with a quoted spread of about $0.25. Effective spreads range from $0.12 to $0.16. Across all three days, there are on average about 12 trades per 15-minute interval for traded stocks, with an average trade size of 1,550 to 1,771 shares. The average number of trades increases from Wednesday (8.3 or 6.7) to Friday (17.1 or 15.1), but the average trade size shows a downward trend. This result is consistent with a publicity effect and with the findings of Sant and Zaman (1996) on the volume impact of the IWS column. The Friday impact we find is in more, not larger, trades, which is evidence that smaller investors are reacting to the IWS news.

Panels A and B also show the changes in average depth and spreads for traded stocks. In Panel A, average ask depth is 8,600 shares on Wednesday, 8,000 shares on Thursday, and 10,000 shares on Friday. The bid depth shows a similar pattern. However, this pattern does not hold for the no-news sample in Panel B. Effective spreads tend to decrease over the three days, with no indication that they may be different on Thursday. Thus, these univariate results are ambiguous as to whether market makers are reacting to informed trading by adjusting ask depth and spreads.

Average returns for traded stocks over these 15-minute intervals vary widely across days in Panels A and B. Returns are positive on Wednesday, increase significantly on Thursday, and are nearly zero on Friday. The Friday results stand out. They can be explained by the fact that the information in the IWS column is impounded into the opening price or the first few trades on Fridays. Thus, the intraday returns show no impact of the IWS column's release.

To measure the degree of buying pressure in the market, we develop a "Buyside" index based on the Lee and Ready (1991) signed trades. Using the Lee-Ready algorithm, we give a trade the value +1 if it is buyer initiated, and –1 if it is seller initiated. To develop a Buyside index value for each 15-minute interval, we sum these values for all trades in that interval. This measure is like Chordia, Roll, and Subrahmanyam's (2002) measure of signed order imbalances, except that the absolute value function is omitted to distinguish between buy and sell imbalances.

As Table 2 shows, buying pressure increases from an average index value of 1.22 on Wednesday to 7.2 on Friday for all traded stocks in Panel A. The results in Panel B show a similar pattern.

Panel C in Table 2 shows the results for 44 nontraded stocks. Some results are similar to those for the traded stocks. Quoted spreads remain steady across all three days. The number of trades increases on Friday, with the Buyside index showing increasing buyer interest. Interval volume, trade count and Buyside interest show the biggest differences from the earlier results: on Thursday, they increase sharply for traded stocks but fall for the 44 nontraded stocks. The average trade size also decreases, from 1,998 shares on Wednesday to 1,355 shares on Friday. Compared to the trade size changes in Panels A and B, this size decrease suggests that there is more interest in these nontraded stocks than in the sample traded by the stockbrokers.

3.3. Price and volume impact

Figures 1 and 2 provide additional information on how the market reacts to stockbroker trading and to the IWS column. These figures depict the volume and stock price changes in 15-minute intervals, from the open on Wednesday to the close on Friday. For the 21 traded and 44 nontraded stocks with no non-IWS news, the figures plot the median price and volume changes relative to Wednesday median volumes (Figure 1) and opening prices (Figure 2).

Stockbroker trades lead to increases in volume and price for the affected stocks. Figure 1 shows that, in many intervals after the onset of insider trading (i.e., after 1:00 PM to 2:00 PM on Thursdays), the median trading volume for stocks is more than double the average 15-minute volume on the previous day. This is likely due to falsely informed, mimicking, or momentum, traders. In contrast, there is no discernible increase in volume for the nontraded IWS stocks.

Consistent with the volume increase, Figure 2 shows a rise in the price of traded stocks but no significant price change for nontraded stocks. Much of the price increase on Thursday occurs after the stockbrokers finish trading. Consistent with the evidence in Cornell and Sirri (1992), insiders appear to only start the price discovery process. The median increase relative to the average price on Wednesday exceeds 6%. The overnight price impact between Thursday and

Friday is stronger for traded stocks (median jump of more than 4%) than for nontraded stocks (median jump of about 2%). Figure 2 also shows that, after the open on Friday, there is little price movement for traded stocks, but there is a further 2% upward drift for nontraded stocks.

4. Abnormal returns

Figure 2 suggests that private knowledge of the IWS column may have generated sizable returns. To investigate this possibility, we obtain data from the Center for Research in Security Prices (CRSP) on the high, low and closing prices of all stocks mentioned in the IWS column. These data cover a four-month interval surrounding a stock's mention in the column.

4.1. The before and during periods

The brokers first gained access to the IWS column in June 1995. To examine abnormal returns before this period, we search IWS columns from November 1994 to May 1995. A total of 117 companies are mentioned in those issues. We exclude 26 of these companies, 11 because the data are incomplete in the CRSP data and 15 because the company is mentioned in another news story on Wednesday or Thursday. There remain 81 companies in our final "Before" sample.

We apply the same procedures to companies mentioned from June 1995 to February 5, 1996, when the brokers traded. A total of 116 companies are mentioned during this period. Of these, we eliminate 47 companies to form our final sample: news articles rule out 38 companies, and we exclude the remaining nine companies because daily CRSP data are incomplete for the estimation period. These eliminations leave a total of 69 companies in our "During" sample.

4.2. Event study with closing prices

Business Week magazine is released to newsstands early Friday morning. Some of the information is available on news wires and America Online the night before, but only after the close of trading in the U.S. Thus, if the IWS information is valuable, its impact on stock prices is

expected during trading on Friday. To measure this impact, we use the Campbell, Lo, and MacKinlay (1997) event study methodology for both the Before and During data samples.

We compute stock returns from closing prices on Thursday and Friday. We adjust these returns based on IWS sentiment, i.e., a "Sell" sentiment in the column offers positive profits if returns are negative. We also adjust returns for market effects by estimating a market model. In this model, we use 90 days of close-to-close returns, beginning ten days before the Wednesday of the announcement week. We use this ten-day gap to separate the market-model regressions and the events we are analyzing. We estimate the market model using both the equal- and value-weighted market indexes computed by the CRSP. The results change little with the index choice, so we report equal-weighted results here. We use this procedure for each stock in the sample.

We compute average abnormal returns for the Wednesday, Thursday, and Friday of the week that IWS mentions the company, and we use two tests to determine statistical significance. The J_2 test described in Campbell, Lo, and MacKinlay (1997) gives better power when the average abnormal return is constant across securities. Because the potential cause of these returns is the same source, this is a reasonable assumption. The second test evaluates the likelihood that more than 50% of the abnormal returns are positive. Table 3 presents the results of these tests.

Table 3

Panel A in Table 3 shows the results for the Before sample. There is no evidence of statistically significant abnormal returns for Wednesday or Thursday. However for Friday the average abnormal return is 4.75%, which is different from zero at the 99% level of confidence. Also, 70.3% of the abnormal Friday returns are positive, which is statistically different from 50% (the expected level if the IWS column has no effect). The raw Friday returns are also positive for 75% of the companies mentioned in the column. In other words, in the six months preceding the brokers' *Business Week* scheme, the IWS column had an impact on the prices of featured stocks.

In Panel B, which shows the During sample results, there is a statistically significant abnormal return of 3.87% for Friday. In contrast with the Before sample, there is also a

significant average abnormal return for Thursday of 1.51%, less than one-half the Friday abnormal return. This result could be due to the *Business Week* information's leaking into the market. In the During sample, 78.3% of the abnormal returns on Friday are positive, which is also statistically significant, and 78% of the raw returns on Friday are positive. Overall, these results show that the stockbrokers could have a reasonable expectation of profiting from advance access to the IWS column, particularly if their holding period was a single day.

4.3. Holding period

As Sant and Zaman (1996) show, the returns from trading on the IWS column are short-lived, so we expect the stockbrokers to have closed their positions quickly rather than risk losing their gains. Offsetting this incentive is that rapid turnover can arouse suspicion from exchange authorities or the SEC.

Figure 3 shows that these stockbrokers slowly reduced their trading horizon over the eight months that they traded. In the first two months, the insiders held their stocks for about a week. This period drops by two days in the next two months, and by the end of the eight months to only one and one-half days. Figure 3 suggests that, by then, insiders may have become less concerned with detection and so sought greater profits by shortening their holding period.

5. Analysis of stockbroker trades

In this section, we analyze the impact of the five stockbrokers' trades and focus on how financial markets and market makers react to insider trades. We ask if such trading is detected and if market liquidity is improved or harmed in the process.

5.1. Buying interest and interval returns

We first examine how order flow and returns are affected during and following periods of insider trading. Table 4 provides a regression analysis for all 30 companies traded by the

stockbrokers (Panel A) and the 21-company subset that did not have other news announcements on Wednesday or Thursday (Panel B).

Table 4

Table 4 uses two regression models to explain the Buyside index and interval returns. We correct all regressions for heteroskedasticity using White's (1980) method. Dummy variables capture Thursday and Friday effects relative to Wednesday, and Wednesday effects are captured by the constant. Two companies are listed on the Amex. We combine them with the NYSE companies to form the set of exchange-listed stocks. The "Nasdaq" dummy captures the effect of Nasdaq- versus exchange-listed stocks.

The first specification (Models 1 and 3 in Panel A; Models 5 and 7 in Panel B) includes an "Insider Trading Period" dummy variable to measure the effects when the brokers are trading. Typically, their trades are completed within two 15-minute intervals. We also include an interaction term to capture the differential effects of insider trading on Nasdaq companies.

The second specification (Models 2 and 4 in Panel A; Models 6 and 8 in Panel B) omits the "Insider Trading Period" dummy, but adds a dummy variable covering this period plus the remaining periods in the day. This "Insider Period and Remaining Day" variable captures the effects of other market participants who are learning of, or reacting to, the informed trading. These participants may be relatives or customers of the stockbrokers, or mimicking or momentum traders who notice the presence of informed traders. Because the "Insider Trading Period" and "Insider Period and Remaining Day" variables are highly correlated, we do not include them in the same regressions. Lastly, an interaction term is included to capture the effects of the Nasdaq dealer market on the "Insider Period and Remaining Day" variable.

Do stock orders respond to the IWS column? Table 4 shows that there is significant buy-side interest on both Thursday and Friday relative to Wednesday. Model 1 suggests that buying interest on Friday is more than three times the interest on Thursday (6.4 compared to 1.8). Model

5 shows a somewhat smaller Thursday-to-Friday increase for the 21 traded stocks without other news (5.4 compared to 2.7). Overall, the IWS column stimulates significant trading activity.

Are the trades of the stockbrokers detected? The "Insider Trading Period" dummy is not significant in Models 1 and 5. That is, the brokers' trading volume itself is not causing order imbalances, which is consistent with the fact that informed trading only makes up about 5% of Thursday volume. However, the "Insider Period and Remaining Day" variable in Models 2 and 6 shows that the Buyside index increases after informed trades, i.e., the market has by then become aware of higher buying interest. The earlier part of Thursday shows no significant change. Thus, the market does appear to detect unusual buying activity, at least after the informed trading.

Table 4 also shows that Nasdaq stocks exhibit significantly higher buying interest than do exchange-listed securities. Although the effect during insider trading is not significant, trading volume increases for Nasdaq stocks after informed trades. The reason for this finding may be that the IWS column has a greater effect on Nasdaq stocks, which are often smaller companies.

Do interval returns react to the stockbrokers' trades, the follow-up trades, or the release of the IWS information? Figure 2 shows that the price of the 21 traded stocks with no news starts to increase after 1 PM on Thursday (the earliest time for insider trades). Models 3, 4, 7, and 8 in Table 4 confirm that, although the Thursday dummy variable is not significant, both the "Insider Trading Period" and "Insider Period and Remaining Day" dummies are significant. That is, the regressions confirm that interval returns are positive on Thursday once the brokers start trading. However, the "Insider Trading Period" dummy is statistically significant only at the 10% level (Model 3) or at the 5% level (Model 7). This weak significance suggests that, perhaps more than the insiders, it may be mimicking traders not privy to the IWS information who cause the market price impacts. This observation refines Meulbroek (1992) and Cornell and Sirri (1992), who find that abnormal returns are confined to the day or the period in which insiders illegally trade.

Figure 2 also shows that the prices of the traded stocks take a discrete jump between the Thursday close and the Friday open. Thereafter, we see that Friday interval returns are volatile and that some are even negative. The Friday dummy is negative in all of the return regressions,

which verifies that the entire gain from the IWS information is impounded at the open on Friday and also implies that the overall price trend after the Friday open is downward.

Finally, the Nasdaq dummy shows that the Nasdaq stocks offer higher returns than do the exchange-listed stocks. However, the interaction terms between the Nasdaq dummies and the time-period dummies are not significant. Thus, the regressions tell us that there is nothing unique about the returns to Nasdaq- compared to exchange-listed stocks in the afternoon on Thursday.

5.2. Volume effects

To explore further how the five stockbrokers' trades affect the price process, we examine the number of trades and trade size. If these brokers' trades are unusual, then market makers and other investors may detect their trading more easily. To ensure that our results are comparable across stocks, we standardize the dependent variables relative to their averages across 15-minute intervals on Wednesday, and then omit Wednesday from the analysis. That is, we subtract Wednesday's average and then divide by the same average to standardize these data. The daily dummies are now different from Wednesday if they are significantly different from zero. Table 5 presents these regressions using the set of explanatory variables examined in Table 4.

Table 5

In Table 5, Models 1, 2, 5, and 6 explain the relative number of trades. These results show significant increases in trading on Friday, with the number of trades on Friday significantly greater than Wednesday's trading. Trading also increases sharply on Thursday during the "Insider Trading Period" or the "Insider Period and Remaining Day" intervals. This pattern is notable because these stockbrokers do not trade a large fraction of the volume on Thursday. In contrast to Meulbroek's (1992) findings on trading effects, we find that even a relatively low volume of trading can initiate large price effects, such as those in Figure 2. The number of trades is also higher for Nasdaq- compared to exchange-listed stocks.

In Table 5, Models 3, 4, 7, and 8 explain the results for relative trade size across traded stocks. These models show a negative, but generally insignificant, coefficient on Thursday and Friday. The relative trade size increases significantly only for Nasdaq stocks in these regressions.

Overall, our results indicate that the five brokers and their followers trade more frequently on Thursday and that public investors follow the same pattern after the news becomes known on Friday. The more frequent trading by stockbrokers in short time intervals may have helped market makers identify these informed trades.

5.3. Insider trades and market making

A key question in this analysis is how market makers respond to insiders; that is, to what extent do bid-ask spreads and depth adjust to informed trading? In two case studies, Cornell and Sirri (1992) and Chakravarty and McConnell (1997) find no significant effect on spreads. By using a cross-section of companies, we can investigate whether their findings generalize beyond two NYSE-listed stocks. Table 6 shows the results for quoted and effective spreads; quoted minus effective spreads; and ask and bid depths, using 15-minute interval data.

Table 6

As in Table 5, we standardize the dependent variables in Table 6 relative to their average values on Wednesday. Also, we add the relative volume of trading (versus Wednesday) to control for volume effects on spreads and depth. Panel A shows the results for all 30 traded stocks, and Panel B shows the results for the subsample of 21 companies without other news.

Models 1 through 4 (Panel A) and 10 through 13 (Panel B) in Table 6 show the spread results. The coefficients on the Thursday and Friday dummy variables show that quoted spreads are generally lower on both days, but effective spreads are 8% to 12% higher on Friday. These results depend on whether the company is Nasdaq- or exchange-listed. Nasdaq companies have higher quoted spreads, except during insider periods when the net effect is a 3% to 7% decrease. Effective spreads generally show no difference for Nasdaq stocks except in Model 3 where they

decrease during insider trading. Although consistent with Cornell & Sirri (1992), unchanged or reduced spreads are not what we anticipate of market makers who detect informed traders, so we examine spreads more carefully below.

Table 6 also shows how insider trading affects market depth. Models 6 and 7 (Panel A) and 15 and 16 (Panel B) show that insider trades significantly lower ask depth. Because insiders are buying shares, ask depth is the side affected. The 30-stock results in Model 7 show that exchange-listed depth rebounds late on Thursday, but this effect is less significant in the 21-stock results of Model 16. Models 8, 9, 17, and 18 confirm that their purchases do not affect bid depth.

The strength of the depth results on the ask side depends on the market structure. For Nasdaq-listed companies, the 30-stock estimates show a much smaller depth decrease during insider intervals (-1.4% compared to –35.7% for exchange-listed) and the 21-stock estimates show a reduced effect (-24% compared to –75.3%). This result is understandable in the context of a dealer versus specialist market, because the diffuse nature of a dealer market makes it more difficult for a given dealer to determine the information content of the order flow.

Overall, market makers reduce risk by offering a smaller quantity of shares at the posted price. This finding extends the depth results of Lee, Mucklow, and Ready (1993); Kavajecz (1999); and Koski and Michaely (2000), to cases in which informed trading is not expected, with the added distinction that Nasdaq stocks respond less than do exchange-listed stocks.

5.4. Effects of order imbalances on market making

Chordia, Roll, and Subrahmanyam (2002) find that signed order imbalances affect bid-ask spreads. They report that order imbalances cause spreads to change, which might confound our results. For example, the increase in order imbalances indicated by the Buyside index might have caused quoted depth to decrease. Thus, market makers could be reacting to order imbalances, not to informed order flow.

To control for this effect, we collect a sample of order imbalances matched to the actual daily average imbalance on Thursday for the 30 traded stocks. This matched sample comprises

the same stocks traded by these brokers, but before they gained access to *Business Week*. Using the SIAC data, we compute daily order imbalances from December 1994 to May 1995. For each stock, we select the matching day to minimize the difference between the percentage order imbalances on the actual and matched days. The resulting average absolute percentage difference is 6.8% (the median is 3.4%).[9] To complete the control sample, we add one trading day on each side of the matched day, which provides a 3-day sequence for each stock.

We then re-estimate the regression models for depth and spreads with the matching sample. We include insider period variables just as if there is insider trading, even though there should be none in this sample (consistent with this intuition, insider variables are statistically insignificant). We use parameter estimates from the order-imbalance sample, and data from the actual insider trading sample, to predict the dependent variable in each model in Table 6. By subtracting these predictions from the actual values in each 15-minute interval, we net out the effect of order imbalances on these variables. We then re-estimate the regressions for each model, using these *adjusted* dependent variables. If order imbalances are causing the observed effects, we do not expect to find significant insider-period variables in the adjusted regressions.

Table 6 shows the adjusted regression results for spreads and depth, and also for the difference between quoted and effective spreads, which tests for changes in price improvement. We report these results for the first specification, which includes the "Insider Trading Period" variable alone. Estimates for the second specification ("Insider Trading and Remaining Day") show similar results. Adjusted Models 6 and 15 confirm our previous results on depth. After we remove the order imbalance effect, we continue to find a statistically significant decrease in ask depth during periods of insider trading, although its magnitude is now markedly reduced.

The important difference in these adjusted results is for the spread effects. In Adjusted Models 1, 3, 10, and 12, we find that both quoted and effective spreads increase during insider trading periods. This new result is confined to exchange-listed stocks, because the Nasdaq

[9] Two stocks did not have close matches, which caused some skewness. Excluding these two stocks did little to change the analysis, so they remain in the control sample for completeness.

interaction term more than offsets the effect in each regression. This finding is consistent with informed traders being more easily recognized by NYSE specialists than by Nasdaq dealers.

The adjusted effective spreads react more than adjusted quoted spreads, and the increase is also more significant. These observations suggest that market makers are less willing to provide price improvement. Indeed, adjusted Models 5 and 14 show that price improvement decreases during insider trading. This last result is largely confined to exchange-listed stocks. Overall, the adjusted spread results indicate that the findings of Cornell and Sirri (1992) and Chakravarty and McConnell (1997) on spreads may only generalize to Nasdaq stocks.

5.5. A comparison with nontraded stocks

The nontraded-stock sample provides a robustness check of our results. In that sample, we do not expect to observe any changes in market making when these brokers have access to the IWS column. To test for any effects, we estimate regressions for the 44 nontraded companies that had no other news announcement on Wednesday or Thursday. We also construct two hypothetical dummy variables to capture the time that the insiders were likely to have traded.

The results of estimating regressions on the nontraded sample confirm that there were no market-making effects on these stocks. In each case, whether it be spreads or depth, the hypothetical insider trading period dummies are not significant. Thus, there is nothing unusual about these nontraded stocks during the time that the stockbrokers are in the market.

5.6. Unbundling Liquidity Providers

The data available for this study do not show who is trading with whom. Therefore, we cannot separate liquidity providers into market makers and limit-order traders to determine which group is adjusting to informed trades. It is possible that the informed trades exhaust the inside limit orders and that market makers are left quoting their own commitment, which may be unchanged. In this event, spreads may change by only a small amount if market makers have not

detected informed trading, but depth will certainly decrease. Although we cannot completely rule out this possibility, a comparison of dealer and specialist markets makes it less likely.

Together, the five stockbrokers' average trade size is 1,654 shares in Nasdaq stocks and 2,064 shares in exchange-listed stocks. The average ask depth is 2,809 shares on Nasdaq and 16,395 shares on the exchanges. With depth for exchange-listed stocks about 5.8 times the depth for Nasdaq stocks and generally similar trade sizes, we would expect a greater reaction in depth on Nasdaq if the stockbrokers' trades are only exhausting inside limit orders. However, Models 6 and 15 in Table 6 show that depth on the exchanges reacts more than does depth on Nasdaq. The median results provide the same conclusions. The median trade size by stockbrokers is 1,000 shares for both Nasdaq- and exchange-listed stocks. The median depth is 2,732 shares on Nasdaq and 10,915 shares on the exchanges. Thus, it appears that specialists on the exchanges are playing an active role in managing quoted depth during these insider periods.

6. Conclusion

Using a unique episode of repeated insider trading across a group of Nasdaq- and exchange-listed stocks, we show that the reaction to informed trading depends on market structure. For specialist markets, market makers reduce quoted depth and increase spreads during periods of informed trading. For dealer markets, quoted depth also decreases but less than in specialist markets, and there is no observable increase in spreads. Our findings indicate that specialist markets are better able to detect informed trading, and that quoted depth is an important tool used by liquidity providers to adjust to informed traders.

We also show that, during and immediately following periods when insiders are buying shares, trades are much more numerous than at other times. These results show that trades during those periods are overwhelmingly buyer-initiated. In contrast to earlier studies, we find that insiders' trades do not account for the major fraction of the trading volume increase. Our evidence suggests that the volume increase likely reflects an increase in noise trading by falsely informed or mimicking and momentum traders.

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Table 1
Characteristics of traded and nontraded companies mentioned by *Business Week*

The table presents summary data for 30 companies traded by insiders and 76 nontraded companies mentioned in *Business Week's* "Inside Wall Street" column. We searched the Dow Jones News Retrieval Service for mention of these stocks in another news source on the insider trading day or the day before. We obtained financial data from Compustat, which provided data on 20 traded and 60 nontraded companies. The two-day return data are for Thursday and Friday combined.

	Traded		**Nontraded**	
Business Week Sentiment	*Buy*	*Sell*	*Buy*	*Sell*
Count	30	0	72	4
Percent	100.0%	0.0%	94.7%	5.3%
Mentioned in Another News Source?	*Yes*	*No*	*Yes*	*No*
Count	9	21	22	54
Percent	30.0%	70.0%	28.9%	71.1%
Exchange Listed	*NYSE / AMEX*	*Nasdaq*	*NYSE / AMEX*	*Nasdaq*
Count	12 / 2	16	38 / 6	32
Percent	45.2%	54.8%	57.9%	42.1%
Rate of Return on Assets	***1994***	***1995***	***1994***	***1995***
Average (Median)	-3.5% (1.6%)	-0.8% (1.8%)	3.1% (3.6%)	-1.2% (3.8%)
Standard Deviation	18.4%	10.1%	12.5%	44.0%
Rate of Return on Equity				
Average (Median)	-1.1% (4.7%)	4.6% (3.6%)	13.8% (11.2%)	-22.4% (11.5%)
Standard Deviation	24.8%	17.6%	55.2%	221.2%
Sales *(millions of dollars)*				
Average (Median)	1529.9 (218.3)	1713.4 (364.3)	3022.2 (261)	3383.2 (297.3)
Standard Deviation	3604.1	4066.6	8925.1	10184.0
Total Assets *(millions of dollars)*				
Average (Median)	2294.6 (374.2)	2401.8 (357.7)	8825.8 (413.9)	8978.4 (406.5)
Standard Deviation	6055.6	6220.0	29279.4	32960.4
Growth Rate of Sales (1994-1995)				
Average (Median)	33.2% (17.5%)		32.7% (21.3%)	
Standard Deviation	58.9%		49.1%	
Two-Day Return (Thursday & Friday)				
Average (Median)	8.17% (7.82%)		3.66% (3.08%)	
Standard Deviation	17.9%		12.1%	

Table 2
Descriptive statistics of the transaction data

This table presents the average and median values for variables and samples in this study. We compute these data for all trading days and separately for Wednesday, Thursday, and Friday. The transaction data are summarized into 15-minute intervals with the average shown computed across these intervals. Panel A summarizes information for all 30 stocks traded by the five brokers with access to advance copies of *Business Week* magazine. Panel B is for a subset of 21 traded stocks that had no other news announced on Wednesday or Thursday. Panel C shows information for 44 nontraded companies mentioned in *Business Week* that did not have any other news on Wednesday or Thursday. Missing transaction data for an additional four nontraded, no-news companies ruled out their inclusion in Panel C.

	All Days		**Wednesday**		**Thursday**		**Friday**	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median
	Panel A: 30 Stocks traded by insiders							
Stock Price	19.75	14.50	19.26	13.42	19.55	14.00	20.62	15.22
Quoted Spread	0.25	0.20	0.25	0.19	0.25	0.19	0.26	0.21
Effective Spread	0.13	0.10	0.15	0.11	0.13	0.10	0.12	0.09
Bid Depth (100s)	65	35	66	34	63	40	66	34
Ask Depth (100s)	89	38	86	41	80	35	100	39
Trade Count	12.6	7.0	8.3	5.0	10.5	7.0	17.1	9.0
Trade Size	1664	1589	1735	1591	1704	1679	1550	1519
Interval Volume	20147	9500	14153	7200	18345	9000	25616	11854
Interval Returns (%)	0.1021	0.0233	0.0831	0.0000	0.2139	0.0998	0.0063	-0.0312
Buyside Index	3.80	2.25	1.22	1.11	3.09	2.54	7.20	4.15
	Panel B: 21 Traded stocks without any other news							
Stock Price	17.93	13.13	17.39	12.62	17.83	13.13	18.57	13.35
Quoted Spread	0.28	0.22	0.28	0.23	0.27	0.21	0.28	0.23
Effective Spread	0.15	0.11	0.16	0.13	0.15	0.11	0.13	0.10
Bid Depth (100s)	46	27	42	27	40	26	54	29
Ask Depth (100s)	60	32	51	31	54	28	76	36
Trade Count	11.6	6.0	6.7	4.0	10.8	6.0	15.1	8.0
Trade Size	1712	1618	1751	1393	1771	1728	1615	1577
Interval Volume	19979	9696	11005	6000	19445	9900	25610	11904
Interval Returns (%)	0.1469	0.0496	0.1044	0.0000	0.3494	0.2598	-0.0132	-0.0377
Buyside Index	3.90	2.75	1.45	1.13	3.74	3.33	6.50	4.61
	Panel C: 44 Nontraded stocks without any other news							
Stock Price	22.63	16.93	22.36	16.65	22.45	16.71	23.08	17.28
Quoted Spread	0.26	0.20	0.26	0.19	0.25	0.20	0.27	0.21
Effective Spread	0.14	0.09	0.14	0.10	0.15	0.10	0.13	0.09
Bid Depth (100s)	68	10	60	11	71	10	71	10
Ask Depth (100s)	73	14	74	15	64	13	81	15
Trade Count	17.1	8.0	13.2	7.0	12.9	7.0	23.2	11.0
Trade Size	1584	1305	1998	1437	1399	1165	1355	1364
Interval Volume	29150	9605	27529	8602	22126	8498	35490	12200
Interval Returns (%)	0.0576	0.0020	0.0328	0.0000	0.0673	-0.0043	0.0727	0.0676
Buyside Index	4.14	1.60	2.30	1.15	2.06	1.15	8.07	3.10

Table 3
Average abnormal returns on Wednesday, Thursday, and Friday for companies mentioned in *Business Week's* "Inside Wall Street" column

We compute average abnormal returns using a market model for stocks mentioned in *Business Week*. *Our first period is* between November 7, 1994 to May 29, 1995, which is before the "Inside Wall Street" column became available ahead of publication. Our second period is June 5, 1995 to January 29, 1996, which is during the period of insider trading. The column is publicly released after the close on Thursday. We exclude stocks with other news announcements on Wednesday or Thursday from these samples. Our results use the equal-weighted CRSP index to measure overall market returns. Results that are statistically significant at the 99% level of confidence are shown with an "**".

	Wednesday	Thursday	Friday
	Panel A: "Before" period sample of 81 companies		
Average Abnormal Return	0.64%	0.27%	4.75%
Asymptotic Normal J2 Test	1.62	0.68	12.05**
Percent Positive Abnormal Returns	53.09%	56.79%	70.31%
Asymptotic Normal Z-test	0.56	1.22	3.67**
	Panel B: "During" period sample of 69 companies		
Average Abnormal Return	0.77%	1.51%	3.87%
Asymptotic Normal J2 Test	1.99	3.90**	10.01**
Percent Positive Abnormal Returns	46.38%	47.83%	78.26%
Asymptotic Normal Z-test	-0.61	-0.36	4.69**

Table 4
Buying sentiment and interval returns on Wednesday, Thursday, and Friday

In Panel A, we compute regressions for IWS stocks traded by brokers for all companies combined. In Panel B, we exclude nine companies that had other news announcements on Wednesday or Thursday. We analyze transactions data in 15-minute intervals on Wednesday, Thursday, and Friday. Trades are signed with the Lee-Ready algorithm (+1 for buyer initiated and -1 for seller initiated). The "Buyside *I*ndex" measures buying sentiment as the sum of the signed trades in the interval, which is also a measure of order imbalances. We compute "Interval Returns" from the last trade in the previous interval to the last trade in the present interval. The independent variables are: "Thursday" and "Friday" are dummy variables for these days; "Insider Trading Period" is a dummy variable for intervals of insider trading; "Insider Period and Remaining Day" equals one on Thursday for all intervals after the first insider trade; and "Nasdaq" is a dummy variable for Nasdaq stocks, which is zero for exchange-listed stocks. The two interaction terms measure the effect of insider trading on Nasdaq stocks. Regressions are corrected for heteroskedasticity using White's (1980) method. The p-values are shown in parentheses below the coefficients.

	Panel A: 30 Stocks traded by insiders				*Panel B: 21 Traded stocks without any other news*			
	Buyside Index		Interval Returns		Buyside Index		Interval Returns	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Constant	-0.077	0.005	0.001	0.001	0.695	0.985	0.000	0.001
	(0.846)	(0.989)	(0.312)	(0.160)	(0.118)	(0.036)	(0.544)	(0.341)
Thursday	1.845	0.061	0.000	-0.001	2.657	0.371	0.001	-0.001
	(0.000)	(0.893)	(0.749)	(0.144)	(0.000)	(0.493)	(0.276)	(0.676)
Friday	6.425	6.441	-0.001	-0.001	5.372	5.383	-0.002	-0.002
	(0.000)	(0.000)	(0.088)	(0.095)	(0.000)	(0.000)	(0.086)	(0.088)
Insider Trading Period	2.832		0.007		4.647		0.017	
	(0.256)		(0.071)		(0.386)		(0.040)	
Insider Period and Remaining Day		3.489		0.003		2.362		0.003
		(0.000)		(0.003)		(0.014)		(0.063)
Nasdaq Dummy	4.435	4.256	0.000	0.001	2.506	2.057	0.002	0.002
	(0.000)	(0.000)	(0.014)	(0.050)	(0.000)	(0.001)	(0.026)	(0.085)
Nasdaq*Insider Period	-0.564		-0.002		-1.639		-0.012	
	(0.852)		(0.736)		(0.772)		(0.213)	
Nasdaq*Insider & Remaining Day		1.887		0.003		4.416		0.003
		(0.197)		(0.225)		(0.006)		(0.287)
Adjusted R-Squared	0.083	0.093	0.008	0.014	0.056	0.076	0.014	0.016
F-test of Regression (p-value)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Observations	1572	1572	1572	1572	1036	1036	1036	1036

Table 5
Effects of insider trades on number of trades and trade size

We compute regressions for IWS stocks traded by insiders using transactions data analyzed in 15-minute intervals on Wednesday, Thursday (the insider trading day), and Friday. Panel A shows the results with all 30 stocks. Panel B shows results excluding nine stocks that had other news announcements on either Wednesday or Thursday. All dependent variables are standardized relative to the average over 15-minute intervals on Wednesday, the day before any inside information was obtained. The "Number of Trades" is the total number of transactions during the interval and "Trade Size" is the average volume of shares traded during the interval. The independent variables are: "Thursday" and "Friday" are dummy variables for these days, "Insider Trading Period" is a dummy variable for intervals of insider trading; "Insider Period and Remaining Day" equals one on Thursday for all intervals after the first insider trade; and "Nasdaq" is a dummy variable for Nasdaq stocks, which is zero for exchange-listed stocks. All regressions are corrected for heteroskedasticity using White's (1980) correction method. The p-values are shown in parentheses below each estimated coefficient.

	Panel A: 30 Stocks traded by insiders				*Panel B: 21 Traded stocks without any other news*			
	Number of Trades		Trade Size		Number of Trades		Trade Size	
Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Thursday	0.172	-0.329	0.029	-0.038	0.842	0.265	-0.030	-0.109
	(0.234)	(0.059)	(0.589)	(0.601)	(0.000)	(0.272)	(0.631)	(0.280)
Friday	2.138	2.134	-0.008	0.037	2.136	2.236	-0.103	-0.049
	(0.000)	(0.000)	(0.878)	(0.516)	(0.000)	(0.000)	(0.079)	(0.411)
Insider Trading Period	2.206		0.513		4.681		0.144	
	(0.051)		(0.055)		(0.034)		(0.595)	
Insider Period and Remaining Day		1.308		0.099		1.021		0.027
		(0.000)		(0.322)		(0.008)		(0.817)
Nasdaq Dummy	1.631	1.637	0.170	0.088	0.624	0.475	0.355	0.274
	(0.000)	(0.000)	(0.010)	(0.212)	(0.008)	(0.091)	(0.000)	(0.001)
Nasdaq*Insider Period	-1.691		-0.303		-3.865		-0.049	
	(0.176)		(0.359)		(0.089)		(0.886)	
Nasdaq*Insider & Remaining Day		-0.037		0.417		0.907		0.432
		(0.943)		(0.014)		(0.126)		(0.017)
Adjusted R-Squared	0.079	0.086	0.006	0.002	0.042	0.051	0.020	0.034
F-test of Regression (p-value)	(0.000)	(0.000)	(0.029)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Observations	1134	1134	1134	1134	762	762	762	762

Table 6
Effects of insider trades on market makers, spreads, and depth

We compute regressions for IWS stocks traded by insiders using transactions data analyzed in 15 minute intervals. Panel A shows results for all 30 stocks (1,134 observations) while Panel B shows results excluding 9 stocks (762 observations) with other news on either Wednesday or Thursday. "Quoted Spread" is the average bid-ask spread during the interval. "Effective Spread" equals two times the absolute value of the difference between price and the midpoint of the bid-ask spread, averaged over the interval. "Depth" is reported at the best bid and offer averaged over the interval. For Nasdaq stocks, depth is aggregated across all market makers quoting at the best bid or ask. All dependent variables are standardized relative to the average over 15-minute intervals on Wednesday. "Relative Volume" equals the volume in the trading interval relative to the average volume across all 15-minute intervals on Wednesday. Adjusted models correct for order imbalances by netting predicted effects from each dependent variable. White's (1980) method is used to correct for heteroskedasticity. p-values are shown in parentheses below each estimated coefficient.

Panel A: 30 stocks traded by insiders

	Quoted Spread			Effective Spread			Quoted - Effective	Ask Depth			Bid Depth		
Variables	Model 1	Model 2	Adjusted Model 1	Model 3	Model 4	Adjusted Model 3	Adjusted Model 5	Model 6	Model 7	Adjusted Model 6	Model 8	Model 9	Adjusted Model 8
Thursday	-0.062	-0.058	-0.109	0.001	0.003	0.052	-0.161	0.135	-0.074	-0.453	0.303	0.195	-0.026
	(0.000)	(0.009)	(0.000)	(0.943)	(0.921)	(0.009)	(0.000)	(0.019)	(0.119)	(0.000)	(0.000)	(0.002)	(0.691)
Friday	-0.033	-0.025	-0.045	0.084	0.086	0.128	-0.173	0.407	0.378	-0.469	0.285	0.285	-0.074
	(0.013)	(0.058)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.104)
Insider Trading Period	0.025		0.092	0.091		0.216	-0.124	-0.357		-0.191	0.061		-0.787
	(0.592)		(0.050)	(0.179)		(0.002)	(0.074)	(0.017)		(0.000)	(0.759)		(0.110)
Insider Period and Remaining Day		-0.024			0.003				0.456			0.230	
		(0.429)			(0.931)				(0.001)			(0.124)	
Nasdaq Dummy	0.095	0.018	0.129	-0.008	-0.012	-0.070	0.199	-0.116	-0.063	0.572	-0.221	-0.221	0.168
	(0.000)	(0.001)	(0.000)	(0.746)	(0.655)	(0.005)	(0.000)	(0.037)	(0.027)	(0.000)	(0.000)	(0.000)	(0.002)
Nasdaq*Insider Period	-0.167		-0.179	-0.253		-0.327	0.148	0.459		0.035	-0.016		0.812
	(0.046)		(0.033)	(0.018)		(0.002)	(0.143)	(0.017)		(0.674)	(0.949)		(0.001)
Nasdaq*Insider & Remaining Day		0.049			-0.017				-0.135			0.046	
		(0.307)			(0.775)				(0.373)			(0.774)	
Relative Volume	0.008	0.007	0.012	-0.003	-0.003	-0.006	0.017	0.007	-0.003	-0.089	0.064	0.057	0.064
	(0.286)	(0.350)	(0.134)	(0.810)	(0.839)	(0.686)	(0.167)	(0.766)	(0.896)	(0.000)	(0.004)	(0.009)	(0.004)
Adjusted R-Squared	0.018	0.017	0.041	0.008	0.006	0.016	0.072	0.022	0.041	0.419	0.016	0.026	0.023
F-test of Regression (p-value)	(0.000)	(0.000)	(0.000)	(0.009)	(0.033)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

	Panel B: 21 Traded stocks without any other news												
	Quoted Spread			Effective Spread			Quoted - Effective	Ask Depth			Bid Depth		
	Model 10	Model 11	Adjusted Model 10	Model 12	Model 13	Adjusted Model 12	Adjusted Model 14	Model 15	Model 16	Adjusted Model 15	Model 17	Model 18	Adjusted Model 17
Thursday	-0.128	-0.175	-0.227	-0.009	-0.028	-0.034	-0.194	0.414	0.168	-0.793	0.395	0.170	-0.159
	(0.000)	(0.000)	(0.000)	(0.758)	(0.491)	(0.237)	(0.000)	(0.000)	(0.048)	(0.000)	(0.000)	(0.026)	(0.120)
Friday	-0.035	-0.035	-0.055	0.124	0.121	0.116	-0.171	0.510	0.451	-0.763	0.348	0.313	-0.228
	(0.072)	(0.074)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Insider Trading Period	0.073		0.140	0.069		0.376	-0.236	-0.753		-0.076	-0.179		-1.180
	(0.285)		(0.039)	(0.537)		(0.001)	(0.046)	(0.000)		(0.026)	(0.534)		(0.195)
Insider Period and Remaining Day		0.075			0.038				-0.267			0.377	
		(0.092)			(0.501)				(0.088)			(0.083)	
Nasdaq Dummy	0.163	0.164	0.221	0.017	0.021	-0.002	0.221	-0.358	-0.268	0.889	-0.299	-0.245	0.310
	(0.000)	(0.000)	(0.000)	(0.598)	(0.561)	(0.995)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Nasdaq*Insider Period	-0.196		-0.256	-0.208		-0.471	0.216	0.871		-0.006	0.266		1.261
	(0.050)		(0.011)	(0.147)		(0.001)	(0.084)	(0.000)		(0.949)	(0.415)		(0.000)
Nasdaq*Insider & Remaining Day		0.012			-0.031				-0.121			-0.024	
		(0.840)			(0.676)				(0.564)			(0.917)	
Relative Volume	-0.012	-0.015	-0.011	-0.015	-0.015	-0.008	-0.003	0.042	0.035	-0.038	0.061	0.051	0.064
	(0.252)	(0.180)	(0.306)	(0.460)	(0.464)	(0.712)	(0.834)	(0.161)	(0.245)	(0.000)	(0.021)	(0.045)	(0.015)
Adjusted R-Squared	0.047	0.050	0.107	0.018	0.017	0.024	0.071	0.032	0.041	0.543	0.019	0.035	0.046
F-test of Regression	(0.000)	(0.000)	(0.000)	(0.002)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)

Figure 1

Three-day median volume changes

This figure shows the median percentage trading volume from the open on the Wednesday preceding the release of the relevant IWS column until the close on the Friday when the magazine is publicly released. We measure these data in 15-minute intervals relative to the average volume on Wednesday. This plot shows the 21 stocks that at least one of the brokers traded (traded), and the 44 that no insider traded according to the SEC complaint (non-traded). We include only stocks not mentioned in another news source on the insider trading day (Th) or the day before (W). The two vertical lines represent the end of the first (W) and second (Th) trading days. The arrow indicates the 15-minute interval ending at 1:00 PM on Thursday, the earliest starting time for insider trades in the sample.

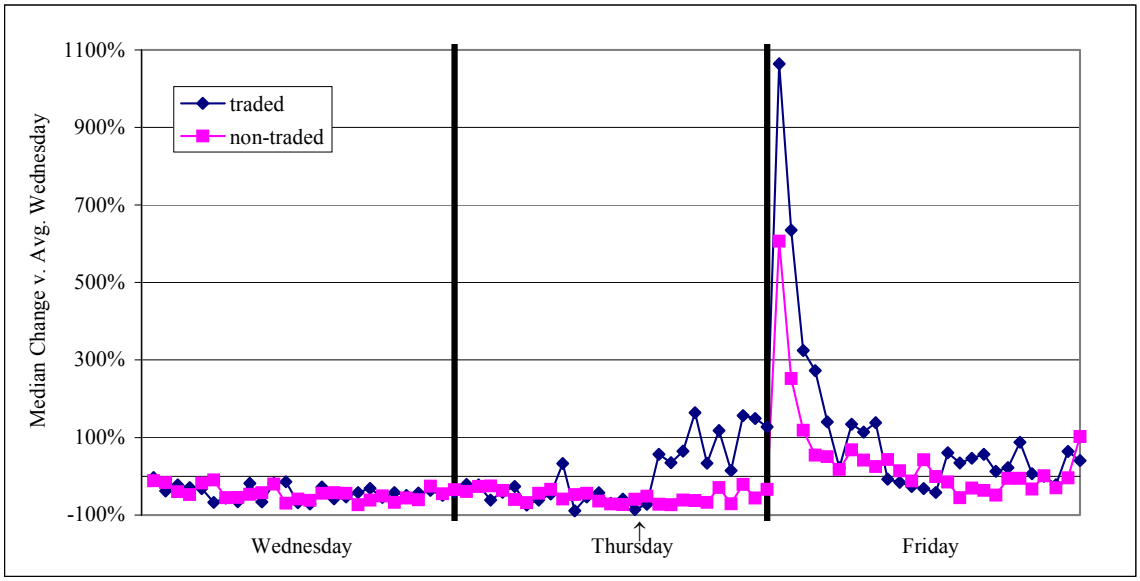

Figure 2

Three-day median price changes

This figure shows the median percentage price change from the open on the Wednesday preceding the release of the relevant IWS column until the close on the Friday when the magazine is publicly released. We measure these data in 15-minute intervals relative to the average price on Wednesday. This plot shows the 21 stocks that at least one of the brokers traded (traded), and the 44 that no insider traded according to the SEC complaint (non-traded). We include only stocks not mentioned in another news source on the insider trading day (Th) or the day before (W). The two vertical lines represent the end of the first (W) and second (Th) trading days. The arrow indicates the 15-minute interval ending at 1:00 PM on Thursday, the earliest starting time for insider trades in the sample.

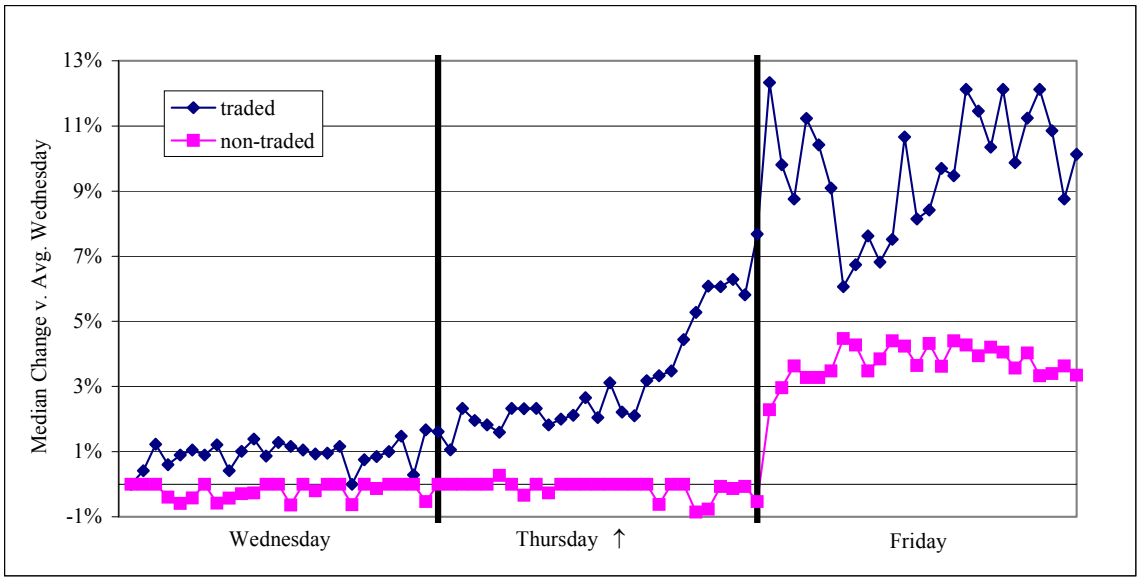

Figure 3
Average holding period for "Inside Wall Street" stocks traded by brokers

We compute the average holding period for stocks traded by stockbrokers who had advance copies of the "Inside Wall Street" column in *Business Week* magazine. The holding period decreases significantly over the period of trading, reflecting learning on the part of the brokers about the temporary nature of the *Business Week* "bounce."