

**Anomalous stock returns around internet firms' earnings announcements:
The role of disagreement, short sales constraints, and retail trading**

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Abstract

Trueman et al. (2003) show that, during the late 1990's, internet stock prices increase significantly in the few days prior to earnings announcements, and reverse in the days following the announcements. Consistent with Miller (1977), we find the magnitude of these temporary stock price run-ups is related to changes in investor disagreement on the days around the earnings announcement, and the strength of this relation depends on the severity of short sales constraints. Furthermore, we find changes in investor disagreement are positively related to net initiated order flow from retail investors and negatively related to net initiated order flow from institutional investors. This evidence is consistent with our hypothesis that Miller's theory is more applicable to retail investors than institutional investors in the short period around earnings announcements. This hypothesis is further supported by our finding that the magnitude of the temporary stock price run-ups, and the strength of the association between disagreement and stock returns, are greater when there is a greater proportion of retail trading in a stock.

JEL Classification: D82, G14, G19.

Key Words: market efficiency, short-sales restrictions, disagreement, earnings announcements, internet stocks, retail investors.

1. Introduction

Trueman et al. (2003) report a recurring temporary increase in stock prices around quarterly earnings announcements for a sample of internet firms during the period, January 1998 to August 2000. In the few days preceding the earnings announcement, an average price increase of about 5% occurs, which is followed by a similar price reversal in the few days after the announcement. This price pattern is not related to the accounting information in the earnings announcement, or to changes in risk associated with the announcement. The pattern holds in up and down markets and shows up in each quarter during the period.

Trueman et al. (2003) also document an increase in buyer-initiated trades prior to the announcement and an increase in seller-initiated trades following the announcement, but they offer no explanation for this pattern. In his discussion of Trueman et al., Berger (2003, p. 274) observes: “The paper thus presents an intriguing apparent anomaly, but is unable to make much progress in explaining it.” Berger, along with Trueman et al., conjecture the anomalous price and order flow patterns are related to trading by short-term retail investors, who were responsible for a relatively large proportion of trading volume in internet stocks during this period (see also Ofek and Richardson, 2003).

We propose an explanation for these seemingly anomalous price and order flow patterns, and we test this explanation for the sample of earnings announcements analyzed in Trueman et al. (2003). Our explanation focuses on Miller’s (1977) hypothesis concerning the role of disagreement among heterogeneous investors in a market where short sales restrictions exist. According to this hypothesis, in the presence of short sales constraints, intensified disagreement among investors results in inflated prices as optimistic investors buy the stock while pessimists are limited in their ability or willingness to short the stock.¹

¹ Several recent papers provide empirical support for the Miller hypothesis in other contexts. For example, see Chen et al. (2002), D’Avolio (2002), Diether et al. (2002), Jones and Lamont (2002), and Ofek and Richardson

We argue that an approaching quarterly earnings announcement is an information event that is likely to trigger increased uncertainty and visibility for a stock. Both phenomena should contribute to intensified disagreement among investors.² According to the Miller (1977) hypothesis the intensified disagreement before the announcement results in upward price pressure. After the announcement, when the release of new information reduces uncertainty about earnings, disagreement dissipates and the initial price increase is naturally followed by a reversal.³

This explanation for the anomalous price and order flow patterns documented in Trueman et al. (2003) suggests the following four testable propositions. First, stocks with a larger increase in the level of disagreement before the announcement should have a larger pre-announcement price increase, and stocks with a larger decline in disagreement after the announcement should have a larger post-announcement price reversal. Second, based on Miller (1977), the strength of this association between stock returns and disagreement should be greater when short sales constraints are more binding. Third, we conjecture that the Miller hypothesis is more applicable for retail investors than institutional investors in this setting. This conjecture is based on the view that retail investors are less able or willing to short sell than are institutional investors, and that information events attract the temporary attention of retail investors to a greater extent than institutional investors (Barber and Odean 2002). To shed light on this conjecture, we investigate the hypothesis that changes in disagreement are associated with divergent patterns in net initiated order flow by retail investors versus institutional investors. Our fourth hypothesis explores this conjecture further by investigating

(2003). Prior work also shows that short selling was severely constrained for our sample stocks and time period. For example, see Ofek and Richardson (2003), and Mitchell et al. (2002).

² The dispersion of reservation prices across investors can increase because of an increase in dispersion of expectations among the existing set of investors (due to increased uncertainty), or because of an expansion of the existing set to include a larger number of investors with more diverse opinions (due to increased visibility).

³ Consistent with this scenario, Patell and Wolfson (1979, 1981) find implied volatilities increase in the days before an earnings announcement and return to their normal level after the announcement. These implied volatilities reflect investors' beliefs about the range of possible stock price reactions to a forthcoming disclosure.

whether the magnitude of the price movements, and the strength of their association with disagreement, are greater for stocks with a higher proportion of retail trading volume.

We empirically investigate these propositions for the sample of earnings announcements analyzed in Trueman et al. (2003). We use Trade-and-Quote (TAQ) data to construct daily measures of stock price movements, net initiated order flow by trade size, and abnormal trading volume. We use abnormal volume as a proxy for the level of investor disagreement on the days around the announcement.⁴ We use trade size to distinguish the daily net initiated order flow of retail investors versus institutional investors.⁵ We explore the influence of short sales constraints by examining differential behavior around announcements made during the IPO lockup period, versus announcements made after lockup expiration.⁶

We begin our empirical analysis by confirming the finding in Trueman et al. (2003), that internet stock prices increased significantly over the days prior to earnings announcements and reversed in the days following announcements, during the late 1990s. We then present four tests to investigate whether Miller's (1977) hypothesis helps to explain this seemingly anomalous behavior. We first show that changes in our disagreement measure are directly related to changes in stock prices on the days before and after earnings announcements. Second, we find the association between changes in disagreement and stock returns is stronger for announcements made during the IPO lockup period, when short sales constraints are more binding. Third, we show that changes in our disagreement proxy are positively related to net initiated order flow by small investors, but negatively related to net initiated order flow by large investors. Finally, we find greater price movements and a

4 This disagreement proxy is supported by both theoretical and empirical work. For example, see Baker and Stein (2004), Bamber et al. (1997 and 1999), Cochrane (2002), Fleming and Remolona (1999), Harris and Raviv (1993), Hong and Stein (2003), Kandel and Pearson (1995), Karpoff (1986), Kim and Verrecchia (1994, 1997) and Scheinkman and Xiong (2003). We motivate this proxy further in the literature review.

5 A substantive body of prior research indicates that disaggregating volume by trade size effectively sorts investors according to investor sophistication and informedness. See, for example, Bhattacharya (2001), Easley and O'Hara (1987), Hasbrouck (1988, 1991), Lee (1992), and Lee and Radhakrishna (2000).

6 This approach follows the argument that lockup expirations represent a loosening of short sales constraints (see Field and Hanka, 2001, and Ofek and Richardson, 2003).

stronger relation between price movements and disagreement for stocks with a higher proportion of small trades relative to large trades.

Our study contributes to the literature in several ways. First, we provide evidence to support the conjecture that Miller's (1977) hypothesis helps to explain the anomalous stock price behavior around earnings announcements documented in Trueman et al. (2003). We show that the magnitude of these temporary price increases is related to changes in investor disagreement on the days around the announcement, and the strength of this relation depends on the severity of short sales constraints prevailing at the time of the announcement. Second, our evidence indicates that Miller's hypothesis is more applicable to retail investors than institutional investors in this setting. This evidence thus contributes to the growing literature that establishes the importance of retail trading in understanding price formation in stock markets.⁷ Finally, our results indicate that Miller's hypothesis operates over a much shorter time frame than previous studies.⁸

The remainder of this study is organized as follows. Section 2 reviews the literature and develops our hypotheses. Section 3 describes the data and our measures of disagreement, stock returns, and net initiated order flow by small and large investors. Section 4 examines the patterns in these measures on the days around earnings announcements. Section 5 analyzes how investor disagreement is related to stock returns and net initiated order flow by small versus large investors. The final section summarizes and concludes.

2. Literature Review and Hypotheses

This paper draws on three main research areas. We first review the literature regarding the impact of disagreement on stock prices when investors are limited in their ability to short sell. Second, we discuss prior work that supports the use of abnormal trading volume as a proxy

⁷ See, for example, Barber and Odean (2002), Battalio and Mendenhall (2003), Bhattacharya (2001), Cohen et al. (2002), Griffin et al. (2003), Lee (1992), Odean (1998), and Ofek and Richardson (2003).

⁸ For example, Chen et al. (2002) analyze quarterly returns and Diether et al. (2002) use monthly returns.

for disagreement, and relates abnormal volume to stock price changes. Third, we review studies that distinguish between the order flow of retail versus institutional investors to empirically examine issues related to investor heterogeneity.

2.1 Heterogenous beliefs and short-sales constraints

There is a substantial literature on the consequences of short sales constraints in financial markets.⁹ Miller (1977) introduced the idea that, when there are short sales constraints, a stock price will be biased upward because the most optimistic investors will buy the stock whereas pessimists are kept out of the market. According to Miller's model, a larger increase in disagreement among investors should result in a more inflated price, and should be followed by a larger price decline when the disagreement dissipates.¹⁰

Recent empirical evidence supports the basic Miller (1977) prediction, indicating that arbitrageurs do not always force prices back to equilibrium. Ofek and Richardson (2003), Jones and Lamont (2002), and Chen et al. (2002) focus on the severity of the short sales constraints, and find that more severe constraints are associated with temporarily higher prices and lower subsequent returns. Diether et al. (2002) use the dispersion across analysts' earnings forecasts to capture changes in investor disagreement, and find stocks subject to greater disagreement have lower returns over the following months.

We analyze the relation between changes in investor disagreement and stock prices on the days around earnings announcements. Earnings announcements provide a natural experiment for this analysis, since we expect a temporary increase in dispersion of beliefs around the announcement. Based on this discussion, we derive our first two hypotheses:

⁹ See, for example, D'Avolio (2002), Duffie et al. (2002), Figlewski and Webb (1993), Geczy et al. (2002), Jarrow (1980), Jones and Lamont (2002), Lintner (1969), Miller (1977), Mitchell et al. (2002), Shleifer and Vishny (1997), and Viswanathan (2000).

¹⁰ More recent theoretical models such as Chen et al. (2002), Duffie et al. (2002), and Morris (1996) arrive at similar predictions. In contrast, Diamond and Verrecchia (1987) and Hong and Stein (2003) argue that rational traders take into account short sales constraints and adjust their prices so that, on average, prices are not biased.

Hypothesis 1: The increase (decrease) in prices before (after) the earnings announcement is larger for stocks with a larger increase (decrease) in disagreement before (after) the announcement.

Hypothesis 2: The association between changes in disagreement and stock returns is stronger around announcements made during the IPO lockup period, when short sales constraints are more binding.

2.2 Abnormal trading volume, investor disagreement, and stock price changes.

A substantial body of theoretical and empirical work relates abnormal trading volume to investor disagreement.¹¹ This literature establishes how trading activity is a natural reflection of traders' dispersion of beliefs, and it attributes much of the abnormal trading volume around earnings announcements to disagreement among investors. While this research supports a theoretical and empirical linkage between investor disagreement and abnormal trading volume, this literature does not have implications for the direction of price changes.

Several recent theoretical studies introduce speculative trading into the analysis, and offer implications for the direction of price changes. In particular, they arrive at results consistent with the observed positive correlation between trading volume and stock prices during price bubbles. For example, Scheinkman and Xiong (2003) assume short sales are costly, and develop a dynamic model in which overconfidence generates disagreement among investors. In their model intensified disagreement among investors results in increased speculative trading volume and an increase in the price above its fundamental value. In a similar vein, Cochrane (2002) argues that the desire to speculate, combined with a limited supply of shares, resulted in a trading-related convenience yield on internet stocks during the late 1990s. His model is also consistent with the observation that high prices are associated with high trading volume during bubbles. Finally, Baker and Stein (2004) assume short sales constraints along with a class of overconfident investors, and they build a model that comes

¹¹ See, for example, Bamber et al. (1997, 1999), Harris and Raviv (1993), Kandel and Pearson (1995), Karpoff (1986), and Kim and Verrecchia (1994 and 1997).

to similar predictions. Their model shows how demand from overconfident optimistic investors can drive rational investors to the sidelines, increase liquidity, and lead to overvaluation. They also argue that if unsophisticated investors have a greater desire to trade than sophisticated investors, turnover and prices are positively correlated even if the unsophisticated investors do not systematically underreact.

Two recent studies appeal to these theoretical developments and empirically examine the role of trading volume as a proxy for differences of opinion, as well as its implications for price changes. First, Mei et al. (2003) use stock turnover as a proxy for speculative trading due to differences of opinion. Consistent with Scheinkman and Xiong (2003), they find that increases in turnover for Chinese A shares result in increases in the speculative component of share prices. Second, Diether (2004) shows that issuers of seasoned equity offerings with high pre-event trading volume experience low subsequent stock returns.

In our empirical tests, we use abnormal trading volume as a proxy for disagreement among investors. This choice is supported by the body of theoretical and empirical research discussed above. This choice is also dictated by our need for a timely measure that reveals changes in the degree of disagreement among investors on the few days before and after earnings announcements. Other potential proxies for investor disagreement, such as the dispersion across analyst earnings forecasts, do not vary on a daily basis.

It is important to note that, while prior work supports the view that much of the trading volume around earnings announcements is caused by investor disagreement, this literature also observes that high volume might not always reflect increased dispersion of expectations. For example, high volume after the announcement could reflect converging expectations among investors that lead to the unwinding of their speculative positions. On the other hand, abnormal volume after the announcement could also reflect “jumbling of expectations” (Bamber et al. 1997, 1999), or renewed investor disagreement resulting from

differential interpretations of the same public information (Kandel and Pearson 1995). In addition, while the earnings announcement itself resolves uncertainty about the firm's performance, it also heightens a stock's visibility and thereby may attract continued speculative activity.

We recognize there are other possible reasons for daily changes in trading volume besides variation in investor disagreement. However, we emphasize that if changes in volume around earnings announcements are not due to variation in disagreement, this would make it more difficult for our disagreement proxy to reveal the robust relations with stock prices and net initiated order flow that are documented in this study. In this sense our choice of disagreement proxy represents a conservative approach to investigate these issues.

2.3 Retail versus institutional order flow

Both Trueman et al. (2003) and Berger (2003) suggest the anomalous price pattern around earnings announcements for internet stocks during 1998-2000 might be related to the trading of unsophisticated, retail investors. This suggestion is reasonable in light of the evidence that retail traders sometimes make irrational trading decisions (Barber and Odean, 1999 and 2000) that might not always be arbitrated away (Shleifer and Vishny, 1997). Furthermore, D'Avolio (2002) shows that the probability of a stock having significant short sales constraints is greater if there is less institutional ownership. We therefore expect less arbitrage activity for stocks with a higher proportion of retail trading.

In addition to the supply-side argument in D'Avolio (2002), we conjecture that Miller's theory applies more to retail investors than to institutional investors in this setting, because the two central elements of this theory (i.e., short sales constraints and a temporary increase in disagreement) apply more to retail investors. First, several deterrents to short selling exist for retail investors, making short selling less common for retail traders than for

institutional investors.¹² Second, the temporary increase in disagreement around earnings announcements is more likely to reflect a temporary increase in disagreement among retail investors than institutional investors. Most institutional investors continuously monitor a wide and fairly stable range of stocks. On the other hand, retail investors typically monitor a limited number of stocks, and are more likely to focus on a few stocks that temporarily attract their attention (for example, due to an earnings announcement). Thus, information events are likely to result in a relatively large increase in the number of retail investors that analyze a stock (Barber and Odean, 2002).

This discussion suggests divergent patterns in the net buying behavior of retail versus institutional investors during times of intensified disagreement. According to this discussion, optimistic retail investors are likely to have a stronger tendency (than institutional investors) to exert buying pressure on stocks with a relatively high level of disagreement that is not offset by selling pressure from pessimistic retail investors. As a result, we should expect a higher correlation between disagreement and net initiated order flow by retail investors than by institutional investors. This discussion leads to our last two hypotheses:

Hypothesis 3: There is a stronger association between investor disagreement and net initiated order flow by retail investors than by institutional investors on the days around earnings announcements.

Hypothesis 4: The magnitude of the temporary price changes around earnings announcements, and the strength of the association between these price changes and changes in disagreement, are greater for stocks with a higher proportion of retail trading relative to institutional trading.

3. Data, Research Design, and Descriptive Statistics

3.1 Data

¹² For example, short selling requires a grasp of stock trading rules and procedures (e.g., related to margin calls and the risk of a recall). Furthermore, short selling is relatively expensive when applied to small amounts, and may be impossible for retail investors when stocks are on special (Geczy et al., 2002). In support of this view, Barber and Odean (2002) report that only 0.29 percent of the stock positions of households are short positions.

We analyze the sample of earnings announcements in Trueman et al. (2003). The authors provided their list of earnings announcement dates and times, acquired from *Dow Jones Interactive*. This list includes all earnings announcements made between January 1998 and August 2000, by an augmented set of 403 component firms that comprise internet.com's twelve internet indexes as of June 2000 (see Trueman et al. for details).

We are interested in the behavior of stock prices, net initiated order flow, and trading volume on the days immediately before and after each quarterly announcement. As part of our analysis we examine the close-to-open and open-to-close returns on the announcement day. Thus, following Trueman et al. (2003), we focus on earnings announcements that occur outside normal trading hours, after the market's close and before the open. Specifically, we exclude 81 announcements made during regular trading hours, and 77 announcements for which no time is given (so that we cannot identify whether the announcement was made during regular trading hours). In addition, we delete any duplicate earnings announcements (due to firms changing their ticker during the sample period). These screens leave a total of 1,871 quarterly earnings announcements by 395 firms in our final sample.

Measures of daily stock returns, trading volume, and net initiated order flow are generated from the Trade-and-Quote (TAQ) database. These data include the number of shares traded and the transaction prices for all trades. We adjust the daily stock price of each firm for stock splits during the sample period. Then, for each sample company, we compute stock returns, total volume, and net initiated order flow on the 30 days before and after each quarterly earnings announcement.

The unadjusted daily close-to-close return for stock i on day t (R_{it}) is defined as the percent change in the daily closing stock price. Our measure of daily market-adjusted abnormal stock returns (Adjusted R_{it}), is calculated as the unadjusted return minus the return

on the Nasdaq Composite Index over the same period. Daily total volume for each stock (Vol_{it}) is obtained by aggregating the dollar value of all trades during trading hours.

To generate measures of daily net initiated order flow for every stock, we first apply the ‘tick rule’ to classify trades as buyer-initiated or seller-initiated, according to whether the most recent price change was positive or negative.¹³ The dollar value of individual trades initiated by buyers and sellers, respectively, is then aggregated to obtain total buyer-initiated and seller-initiated order flow during the day ($BIOF_{it}$ and $SIOF_{it}$, respectively). Total daily net initiated order flow is then defined as the difference between buyer-initiated and seller-initiated order flow, $NIOF_{it} = BIOF_{it} - SIOF_{it}$.

Since we are interested in the differential behavior of retail versus institutional investors, we use two partitioning schemes to classify all transactions into small versus large trades.¹⁴ First, following Lee (1992) we use a single cutoff of \$20,000 to partition all trades into small (retail) and large (institutional) trade categories. Our second procedure excludes a buffer zone of medium-sized trades, by splitting all trades into (retail) trades with value less than \$10,000 versus (institutional) trades with value larger than \$50,000. Lee and Radhakrishna (2000) show that excluding the buffer zone of medium-sized trades significantly reduces misclassifications of trades.¹⁵

These trade-classification schemes yield several measures of net initiated order flow for small and large investors, respectively, by subtracting SIOF from BIOF for all trade-size categories. This procedure yields the following measures: $NIOF_{\leq 10, it}$ for all trades of

13 Ellis et al. (2000) document that the tick rule correctly classifies 78% of the trades for Nasdaq stocks as buyer- or seller-initiated.

14 Prior work supports the use of trade size to classify investors according to investor sophistication and informedness. For example, see Bhattacharya (2001), Easley and O’Hara (1987), Hasbrouck (1988, 1991), Lee (1992), and Lee and Radhakrishna (2000).

15 Excluding medium-sized trades, Lee and Radhakrishna (2000) find the probability that an individual trade is erroneously classified as an institutional trade is 2 percent, and the probability that an institutional trade is erroneously included in small trades is 19 percent. While we emphasize that partitioning by trade size does not guarantee proper classification of trades, for ease of exposition we use the terms “small” and “retail” trades (or “large” and “institutional” trades) interchangeably.

\$10,000 or less, $NIOF \leq 20_{it}$ for all trades of \$20,000 or less, $NIOF > 20_{it}$ for all trades larger than \$20,000, and $NIOF > 50_{it}$ for all trades larger than \$50,000.

Finally, analysts' earnings forecasts and actual quarterly earnings per share are obtained from the I/B/E/S database. Following Trueman et al. (2003), we calculate the earnings surprise each quarter as the difference between the actual quarterly earnings per share announced and the average of the three most recent analyst forecasts made during the 90 days prior to the announcement. We scale this surprise measure by the closing share price prevailing at the time of the announcement.

3.2 Research Design

We focus on the behavior of stock prices, trading volume, and net initiated order flow over the 20-day period from ten days prior to ten days after each quarterly earnings announcement ($t = -10, \dots, -1, 1, \dots, 10$). We follow the convention in Trueman et al. (2003), to label the day before (after) the earnings announcement as day -1 ($+1$). There is no day 0 in this experimental design, since all announcements occur outside regular trading hours (i.e., after the close on day -1 and prior to the open on day $+1$).

We make trading volume and net initiated order flow comparable across firms, by standardizing each variable according to the normal behavior prior to every announcement. For each variable, we subtract the normal mean and divide by the normal standard deviation, where the normal mean and standard deviation are calculated over the 20-day period from day -30 through day -11 before the announcement. We hereafter interpret these standardized variables as measures of abnormal trading volume and net initiated order flow, respectively.

The names for these abnormal variables are as before, but are now preceded by “A”. For example, $AVol_{it}$ denotes abnormal trading volume for stock i on day t .¹⁶

3.3 Descriptive Statistics

Table 1 provides summary statistics for the variables used in this study. Except for the earnings surprise, all descriptive statistics in Table 1 are calculated across all 20 days in the announcement window (day -10 through day +10), and across all 1,871 quarterly earnings announcements in our sample.

The average firm value is \$3.8 billion, and ranges from \$4 million to \$500 billion (for Microsoft). Available I/B/E/S data enable calculation of the earnings surprise for 1,493 quarterly earnings announcements. The average earnings surprise is close to zero, and the surprise ranges from -28% of the stock price to 13% of the stock price.

Daily trading volume (Vol_{it}) ranges from \$2 thousand to \$8.7 billion, and averages \$81 million per day. The total daily volume of small trades $\leq \$10,000$ (or $\leq \$20,000$) averages 30% (or 47%) of total daily volume over the twenty days surrounding earnings announcements. As suggested in Berger (2003), Trueman et al. (2003), and Ofek and Richardson (2003), these figures indicate that retail investors accounted for a substantial proportion of trading activity around earnings announcements for this sample. The total daily volume of large trades $> \$50,000$ (or $> \$20,000$) averages 33% (or 53%) of total daily volume.¹⁷ The mean daily net initiated order flow for small trades using the \$10,000 cutoff ($NIOF_{\leq 10}$) is \$25 thousand, and ranges from -\$15.9 million to \$35.3 million. The mean and

16 An alternative normalization scheme would be to divide each daily value by the normal *mean* or *median* for each earnings announcement. However, the normal *mean* or *median* net initiated order flow is close to zero for many announcements, making this alternative scheme inappropriate.

17 We have also examined the relative number of trades by retail versus institutional investors (not reported in Table 1). The total number of small trades $\leq \$10,000$ (or $\leq \$20,000$) averages 63% (or 80%) of the total daily number of trades, whereas the total number of large trades $> \$50,000$ (or $> \$20,000$) averages 7% (or 20%) of the total daily number of trades. Replacing the dollar value of net initiated order flow for each trade size category with the net number of initiated trades yields similar results for all subsequent tests (see Chan and Fong 1999 and Jones et al. 1994).

range of the other daily net initiated order flow variables tend to increase as we move to higher trade size cutoffs.

After standardization, abnormal volume ($AVol_{it}$) displays a positive mean and a standard deviation greater than one. This outcome indicates that the 20-day period immediately around the announcement has a higher mean and standard deviation of volume than the 20-day period of normal behavior (over days -30 through -11 prior to the announcement). The average behavior for the abnormal net initiated order flow variables varies by trade size. Abnormal total net initiated order flow and abnormal net order flow for small trades ($\leq \$10,000$ or $\leq \$20,000$) also display positive means, indicating a tendency for small traders to exert abnormal buying pressure around the earnings announcements in our sample period. In contrast, abnormal net initiated order flow for large trades ($> \$20,000$ or $> \$50,000$) displays negative means, suggesting a tendency for large traders to exert more selling pressure around earnings announcements.

4. Stock returns, trading volume, and net initiated order flow

This section documents the patterns in average daily stock returns, abnormal trading volume, and abnormal net initiated order flow experienced over the 20 days around earnings announcements for our sample.

4.1 Stock Returns and trading volume around earnings announcements

Table 2, columns 2 to 5 provide the mean unadjusted and market-adjusted daily close-to-close returns for all days in the 20-day announcement window, along with their t-statistics. The mean return for a given day in the announcement window is obtained by averaging the returns for that day across all 1,871 quarterly announcements in the sample.

The market-adjusted abnormal returns in columns 4 and 5 are significantly positive on the four days immediately before the announcement, and then turn significantly negative on

the five days after the announcement. This pattern in abnormal returns duplicates the results in Trueman et al. (2003). The 3-day average cumulative abnormal return from the close on day -4 to day -1 is 2.55% (t-statistic is 6.6). Likewise, the 3-day average cumulative abnormal return from the close on day -1 to day +3 equals -3.98% (t-statistic is -12.1).

In Table 2 we also partition the close-to-close return from day -1 to day +1 into the close-to-open and open-to-close returns for that 24-hour period. We find a significant 1.7% abnormal price increase during the overnight period when the announcement takes place, followed by a 3.1% decline during trading hours on day +1. These results indicate that the accumulated price increases before the announcement reach their peak at the open on day +1, after which prices give up their pre-announcement gains over the following several days.

Columns 6 and 7 of Table 2 provide the analogous daily pattern in average abnormal volume for all 20 days around the earnings announcement. Abnormal volume increases as the earnings announcement approaches, peaking on the day after the announcement (recall that all announcements in our sample occur after the close on day -1 and before the open on day +1). The t-statistic provided for each daily mean in column 7 of Table 2 tests the null hypothesis that average abnormal trading volume is zero on that day. The positive means indicate that average abnormal trading volume is higher on each of the twenty days immediately surrounding the announcement, than it was during the normal period over days -30 through -11 prior to the announcement (and significantly higher on 18 days). These results contrast with Lee et al. (1993), who find no evidence of abnormal trading activity in the period before the earnings announcement. The high abnormal trading volume before the announcements for our sample of internet stocks in the late 1990s may be attributable to investors who wish to speculate on the news in the earnings announcement, consistent with the models in Baker and Stein (2004), Cochrane (2002), and Scheinkman and Xiong (2003).

Column 8 of Table 2 presents the Pearson correlation between abnormal trading volume and stock returns across the 1,871 earnings announcements, for each of the 20 days during the announcement period. Results reveal significant positive correlations between this disagreement measure and stock returns for all 20 days. These results indicate that a higher (lower) level of disagreement is systematically associated with an increase (decrease) in stock prices on the days around earnings announcements. This outcome is also consistent with Miller (1977), Scheinkman and Xiong (2003), Cochrane (2002), and Baker and Stein (2004), and it lends credence to the validity of abnormal volume as a disagreement proxy that captures speculative trading activity.

These correlations are significantly positive on the 10 days after the announcement when stock prices are falling, as well as the 10 days before the announcement when prices are rising. On the other hand, these correlations tend to decline in magnitude on the days after the announcement. We test whether this decline is statistically significant, by re-computing the correlations between abnormal volume and returns for each earnings announcement across two subsamples, over the 10 days before and the 10 days after each announcement. This exercise yields 1,871 pairs of correlations. The average of the 1,871 correlations before the announcement is 0.235 (t-statistic is 24.4), while the average correlation after the announcement is 0.150 (t-statistic is 13.6). A mean difference t-test across these groups of correlations yields a t-statistic of 5.64 (p-value < .001).

This decline in the association between abnormal volume and returns after the announcement may be due to a change in the composition of trading volume after the announcement. For example, discretionary liquidity traders could postpone their trading until after the announcement when they expect trading costs to be lower. In this case, a larger proportion of volume after the announcement would be unrelated to speculative trading.

The significant decline in the association between abnormal volume and stock returns after the announcement is also consistent with further implications of Scheinkman and Xiong (2003). Their model predicts that the sensitivity of price changes to trading volume should decline when trading costs are lower. We empirically assess this prediction by analyzing the daily closing relative bid-ask spread (actual spread divided by the midpoint) over the ten days before versus the ten days after the earnings announcement. Results (not reported here for brevity) reveal that the average relative spread after the announcement is a significant 7% lower than the average relative spread before the announcement. This decline in trading costs after the announcement may thus help to explain the decline in the correlations between abnormal volume and stock returns, consistent with Scheinkman and Xiong (2003).¹⁸

4.2 Net Initiated Order Flow around earnings announcements

Table 3 provides information on the average daily abnormal net initiated order flow (ANIOF_{it}) for all days over the 20-day announcement window. The second and third columns present the mean abnormal net initiated order flow including all trades each day, along with the corresponding t-statistics. The next ten columns provide analogous results for our measures of abnormal net initiated order flow for small and large trades, respectively.

Table 3 reveals evidence of significant buying pressure on the days leading up to the announcement, followed by significant selling pressure after the announcement. Specifically, columns 2 and 3 of Table 3 show that average abnormal net initiated order flow of all trades is positive on all ten days before the announcement, and is significantly positive (at the .05 level or better) on three of these ten days. On the five days immediately following the announcement, average abnormal net order flow of all trades is negative, and it is significantly negative on days +2 and +3. Over the remaining five days, +6 through +10, total

¹⁸ When we just compare the day before and the day after the earnings announcement (days -1 and +1), we similarly find the average relative spread on the day after the announcement is a significant 11% lower than the average relative spread on the day before the announcement..

abnormal net order flow again turns positive, and is significantly positive on day +7. This evidence is consistent with the results in Trueman et al. (2003).

Additional insight is gained by analyzing the patterns for small and large trades separately. Consider first the results based on the \$20,000 cutoff, provided in columns 4 to 8 of Table 3. These results indicate that the average net buying pressure for all trades before the announcement is largely due to significant net buying by small traders on seven of these ten days. In contrast, there is no evidence of significant net buying by large traders over the ten days leading up to the announcement. On the days immediately following the announcement, abnormal net buying by retail investors quickly levels off, while large traders are net sellers after the earnings announcement (and are significantly so on day +3). This differential behavior of small versus large traders is statistically significant. The mean difference t-tests in Column 8 show that the average abnormal net initiated order flow from small traders is significantly greater than that from large traders on six of the twenty days around the earnings announcement, based on the \$20,000 cutoff.¹⁹

Next consider the analogous results in columns 9 to 13 of Table 3, based on a \$10,000 cutoff for small trades and a \$50,000 cutoff for large trades. Once again, column 9 of Table 3 reveals significant net buying by small traders (\leq \$10,000) on seven of the ten days before the announcement. In contrast, column 11 indicates that large traders ($>$ \$50,000) are never significant net buyers around earnings announcements. Instead, large traders now become significant net sellers on day -1, *before* the earnings announcement. This outcome suggests that small traders (\leq \$10,000) and large traders ($>$ \$50,000) tend to take opposite positions on the day before the announcement. A possible explanation for this differential behavior is that earnings news might be received and processed more quickly by institutional investors, causing an earlier reduction in uncertainty and disagreement among institutional investors

¹⁹ Lee (1992) reports that small traders are significantly more active net buyers than large traders on the day before and the day after the earnings announcement.

relative to retail investors.²⁰ Column 13 shows that these differences in the net initiated buying patterns of small versus large traders are now statistically significant on seven of the twenty days around the announcement.

5. Stock returns, net initiated order flow, and disagreement

In this section we present empirical evidence on the four hypotheses derived in section 2 that address different aspects of the theory in Miller (1977).

5.1 Stock Returns and Disagreement

This section explores the first hypothesis by investigating whether changes in disagreement are associated with changes in stock prices on the days around earnings announcements.

Miller argues that, in the presence of short sales constraints, the price of a stock is positively related to the level of disagreement among investors. Assuming a linear relation between the level of investor disagreement and the natural log of prices, this implies:

$$\log(P_{i,t}) = \alpha_{i,t} + \beta DA_{i,t}; \quad (1)$$

where $P_{i,t}$ is the price of stock i at time t , $DA_{i,t}$ is the level of disagreement about the value of stock i at time t , $\alpha_{i,t}$ is the equilibrium price in the absence of disagreement, and $\beta > 0$.

We test this hypothesis by specifying an empirical model in terms of first differences:

$$\Delta \log(P_{i,t,t-k}) = a + b \Delta DA_{i,t,t-k} + e_{i,q}. \quad (2a)$$

Alternatively, we can expand the change in disagreement on the right-hand-side of (2a) to explicitly include the level of disagreement at, both, the beginning and end of the period:

$$\Delta \log(P_{i,t,t-k}) = a + b_1 DA_{i,t-k} + b_2 DA_{i,t} + e_{i,q}. \quad (2b)$$

Under the null hypothesis, $H_1: b = -b_1 = b_2$, (2a) and (2b) are equivalent.

We operationalize models (2a) and (2b) by using our proxy for disagreement, and focusing on the 3-day periods immediately before and after the announcement, when the most

²⁰ The sample period is prior to implementation of Regulation FD, so that some institutional investors may have had access to the information conveyed in the earnings announcement before retail investors.

significant abnormal returns are observed. We also repeat the analysis using 6-day windows before and after the announcement (other windows produce similar results).

Define the return for the i^{th} stock over the 3-day period before the q^{th} announcement ($\text{Retbefore}_{i,q}$) as the log of the closing price on the day before the announcement (day -1) minus the log of the closing price 3 days earlier (day -4).²¹ Similarly, the change in disagreement before the q^{th} announcement ($\Delta\text{DAbefore}_{i,q}$) is defined as abnormal volume on day -1 minus abnormal volume on day -4. According to Miller's hypothesis, we expect the magnitude of the pre-announcement return to be directly related to the magnitude of the change in disagreement from day -4 through day -1, as follows:

$$\text{Retbefore}_{i,q} = a + b \Delta\text{DAbefore}_{i,q} + e_{i,q}; \quad (3a)$$

and
$$\text{Retbefore}_{i,q} = a + b_1 \text{DA}(-4)_{i,q} + b_2 \text{DA}(-1)_{i,q} + e_{i,q}. \quad (3b)$$

In regression (3a) we expect b to be positive; in regression (3b) we expect b_1 to be negative and b_2 to be positive.

Next, we define the analogous return after the earnings announcement ($\text{Retafter}_{i,q}$) as the log of the closing price at the end of the 3-day period following the announcement (day +3) minus the log of the closing price on the day before the announcement (day -1). As before, we expect the magnitude of the stock return after the announcement to be directly related to the change in the level of disagreement during the same period:

$$\text{Retafter}_{i,q} = a + b \Delta\text{DAafter}_{i,q} + e_{i,q}; \quad (4a)$$

and
$$\text{Retafter}_{i,q} = a + b_1 \text{DA}(-1)_{i,q} + b_2 \text{DA}(+3)_{i,q} + e_{i,q}. \quad (4b)$$

Similar to (3a) and (3b) above, in (4a) we expect b to be positive, while in (4b) we expect b_1 to be negative and b_2 to be positive. We account for concurrent market movements in these

²¹ Table 2 shows that prices peak at the opening on the day after the announcement. However, part of the overnight return between the close on day -1 and the open on day +1 may be due to a tendency for traders to trade at the closing bid, and at the opening ask (see also Trueman et al. 2003). When we re-define the return measure using the opening price on day +1 rather than the closing price on day -1, similar results are obtained.

regression models by using market-adjusted abnormal returns as the dependent variables (defined as the unadjusted return minus the return on the Nasdaq Composite Index over the same window). In addition, we account for information in the earnings announcement by including the quarterly earnings surprise as an explanatory variable.

Evidence for the relation between stock returns and disagreement before (after) the earnings announcement is reported in Panel A (Panel B) of Table 4. The first model in Panel A (3a) reveals a significant positive relation between stock returns and the change in disagreement over the 3-day period before the announcement. The second model in Panel A (3b) provides more detail to show that the 3-day pre-announcement return is greater if there is a lower level of disagreement (i.e., abnormal volume) at the beginning of the period (day -4), and a higher level of disagreement at the end of the period (day -1). Analogous results are found for the 6-day window. These results are consistent with the Miller hypothesis and the implications of Baker and Stein (2004), Cochrane (2002), and Scheinkman and Xiong (2003), indicating that stocks with a larger increase in abnormal trading volume prior to the announcement have a larger stock price run-up.

The first model in Panel B of Table 4 (4a) reveals analogous results for the 3-day post-announcement period, indicating that the magnitude of the stock price decline after the announcement is directly related to the magnitude of the decline in abnormal trading volume. The second and third models provided in Panel B (4b) show that the magnitude of the price decline after the announcement is greater if there is a higher level of disagreement at the beginning of the period (day -1), and a lower level of disagreement at the end of the period (day +3 or day +6).²²

²² The results in Table 4 are not sensitive to outliers. We have also estimated rank regressions, where the ranked observations for each dependent variable are regressed on the ranked observations of the other variables in the model (the ranked observations for each variable range from 1 for the smallest to N for the highest). Results indicate the coefficients on abnormal trading volume have the same signs as in Table 4, and are all significant at the 1% level. When we use the change in actual trading volume, instead of abnormal trading volume, similar

The economic significance of these results is based on interpreting the magnitude of the coefficients in Table 4. For example, for the 3-day window the coefficient of DA(-1) in model (3b) is .012, while this coefficient in model (4b) is -.004. The cross-sectional standard deviation of abnormal volume on day -1 [AVol (-1)] is 7.56, indicating that abnormal volume is more than seven times as volatile on day -1 as it is over the normal period. Together, these results imply that a one standard deviation increase in abnormal trading volume on day -1 is associated with a 9.1% ($7.56 \times .012$) price increase over the 3 days before the earnings announcement, and a predicted 3.0% ($7.56 \times -.004$) price decrease over the 3 days after the announcement. Similarly, over the 6-day pre- and post-announcement periods, a one standard deviation increase in abnormal trading volume on day -1 is associated with a 12.9% ($7.56 \times .017$) price increase before the announcement, and a predicted 3.0% ($7.56 \times -.004$) price decrease after the announcement.

5.2 Stock Returns, Disagreement, and the Severity of Short Sales Constraints

In this section we test our second hypothesis, by examining whether the association between disagreement and stock prices posited by Miller (1977) is exacerbated when short sales constraints are more severe. Specifically, we test whether the relation between changes in disagreement and stock prices, documented in Table 4, is stronger for announcements made during the IPO lockup period than for announcements made after lockup expiration.

Lockup expiration is a potentially confounding event that is itself likely to influence stock prices and trading volume (Field and Hanka, 2001, Ofek and Richardson, 2003). To reduce the impact of the impending expiration of IPO lockups, we exclude earnings announcements made within the 60 days immediately before or after lockup expiration. This

results are obtained. Furthermore, inclusion in model 3a and 3b (or 4a and 4b) of the sum of the abnormal trading volume over the period before (or after) the earnings announcement does not affect our conclusions.

screen leaves 1,167 earnings announcements in our sample, comprised of 248 announcements made during the lockup period and 919 observations in the post-lockup sample.

For this sample of earnings announcements, we test whether the relation between disagreement and stock prices is stronger when there are more severe short sales constraints by extending models (3a) and (4a) as follows:

$$Ret_{before_{i,q}} = a_1 + a_2 Lockup + b_1 \Delta DA_{before_{i,q}} + b_2 Lockup * \Delta DA_{before_{i,q}} + b_3 Surprise + e_{i,q} \quad (5)$$

$$Ret_{after_{i,q}} = a_1 + a_2 Lockup + b_1 \Delta DA_{after_{i,q}} + b_2 Lockup * \Delta DA_{after_{i,q}} + b_3 Surprise + e_{i,q} \quad (6)$$

where Lockup is a dummy variable that equals one for the subsample of announcements made during the IPO lockup period, and zero otherwise.

Panels A and B of Table 5 present the results for models (5) and (6), respectively. First consider b_1 , the coefficient of the change in disagreement in each model (ΔDA_{before} or ΔDA_{after}). This coefficient reflects the relation between disagreement and stock prices for the subsample of announcements that are made following lockup expiration, when short sales constraints are less severe. This coefficient is significantly positive for all models presented in Table 5, indicating a substantive relation between the change in disagreement and stock returns around earnings announcements that occur following lockup expiration. This evidence is consistent with the observation in Ofek and Richardson (2003) that internet stocks in the late 1990s were characterized by substantially constrained short selling, even following expiration of the IPO lockup period.

Second consider b_2 , the coefficient of the interaction term between our disagreement proxy and the lockup dummy in each model. This coefficient reflects the change in the relation between disagreement and stock prices for the subsample of earnings announcements that occur during the IPO lockup period, when short sales constraints are more severe. This coefficient is significantly positive for all models presented in Table 5, indicating a stronger relation between the change in disagreement and stock returns around earnings

announcements that occur during the lockup period. Furthermore, the magnitude of this interaction term (b_2) is large, ranging from two to three times the size of b_1 . The implication is that, for a given increase in the level of disagreement prior to an earnings announcement, stock returns increase by an average of three to four times more if the announcement is made during the IPO lockup period. This outcome lends more support to the Miller (1977) hypothesis, indicating that the link between changes in disagreement and stock returns is stronger when short sales constraints are more binding.²³

5.3 Investor Disagreement and Net Initiated Order Flow by Retail vs. Institutional Traders

This section investigates our third hypothesis, by further exploring the potential sources of the anomalous stock price behavior documented above. In particular, we investigate our conjecture that changes in investor disagreement around earnings announcements (proxied by daily movements in abnormal volume) are more strongly associated with abnormal net initiated order flow from retail investors than from institutional investors.

We test this conjecture by computing the Pearson correlations between abnormal volume and net initiated order flow by retail investors and institutional investors, separately. In this analysis we consider three proxies for disagreement: the abnormal total volume measure considered to this point (AVol), abnormal volume by retail traders (AVol \leq 10), and abnormal volume by institutional traders (AVol $>$ 50). First we compute each correlation separately over the 20-day period around every earnings announcement. Then we average these correlations across all announcements. The average correlations across all 20-day periods are reported in Panel A of Table 6. We have also split each earnings announcement period into two 10-day periods, before and after the announcement, and repeated this

²³ When we do not screen out earnings announcements made near lockup expiration, but instead use all available observations, the interaction term is significant for three of the four models presented in Table 5. Similar results obtain when we exclude announcements made within 40, 30, or 20 days of lockup expiration.

analysis. Analogous results appear in Panels B and C of Table 6. Several insights are obtained from this analysis.

First, consider the average correlation between each disagreement measure and net initiated order flow by retail investors ($ANIOF \leq 10$), in column 1 of Panel A.²⁴ These mean correlations are significantly positive for all three disagreement measures, indicating that retail investors as a group have an overwhelming tendency to exert more (less) buying pressure on stocks with a relatively high (low) level of disagreement. This finding is consistent with the Miller (1977) hypothesis, suggesting that greater disagreement is associated with more buying pressure from optimistic retail investors that is not offset by selling pressure from pessimistic retail investors.

Second, consider the analogous mean correlations between each disagreement measure and net initiated order flow by institutional investors ($ANIOF > 50$), in column 2 of Panel A. These correlations diverge dramatically from those in column 1, as they are all significantly negative, indicating that institutional investors tend to exert less buying pressure (or more selling pressure) on stocks that are the subject of greater disagreement.

Third, we investigate whether the differences between columns 1 and 2 of Panel A are statistically significant. Pairwise mean difference t-tests are provided in column 3, and show that the correlation between each disagreement measure and retail net initiated order flow is significantly larger in magnitude than the analogous correlation between each disagreement measure and institutional net order flow. These divergent correlations for retail versus institutional investors are consistent with our conjecture that the description in Miller (1977) is more applicable for retail investors than for institutional investors.

Finally, it is noteworthy that the results in Panel A of Table 6 are robust with respect to the analogous results in Panels B and C, computed separately across the 10 days before

²⁴ The t-statistic associated with each mean correlation coefficient in column 1 or 2 of Table 6 is based on the standard deviation of the estimated correlations across all 1,871 earnings announcements.

and the 10 days after the earnings announcement. This robustness indicates that the divergent behavior of retail and institutional investors, characterized in Panel A, applies to both the pre-announcement period when stock prices are increasing, and the post-announcement period when prices are decreasing. This robustness lends additional credence to the conclusion that the description in Miller (1977) is more applicable for retail investors than for institutional investors in this setting.

5.4 Stock Returns, Disagreement, and Retail versus Institutional Trading

In this section we examine two additional hypotheses to further explore the view that the theory in Miller (1977) is more applicable to retail investors than institutional investors. The first hypothesis is that the temporary price run-up and reversal around earnings announcements documented in Table 2 is larger in magnitude for stocks with a higher proportion of retail trading activity. The second hypothesis is that the relation between changes in disagreement and stock prices, documented in Table 4, is stronger for stocks with a higher proportion of retail trading.

We test the first hypothesis by simulating a trading strategy that would profit from the price run-up before the earnings announcement and the reversal afterwards. We assume a long position for the 3 days (6 days) before the announcement and a short position the 3 days (6 days) after the announcement. The abnormal (market-adjusted) return on this trading strategy is simply the pre-announcement abnormal return minus the post-announcement abnormal return, and it represents the magnitude of the temporary run-up in prices experienced over the few days before and after each announcement. This difference in abnormal returns is regressed on the relative amount of retail versus institutional trading activity in a stock ($\text{PropRetail}_{i,q}$), along with the quarterly earnings surprise, as follows:

$$[\text{Retbefore}_{i,q} - \text{Retafter}_{i,q}] = a + b_1 \text{PropRetail}_{i,q} + b_2 \text{Surprise}_{i,q} + e_{i,q}. \quad (7)$$

We measure $\text{PropRetail}_{i,q}$ for a given earnings announcement in three steps. First, for each announcement we compute the ratio of retail trading volume ($\text{Vol} \leq 10$) to institutional trading volume ($\text{Vol} > 50$) for all trading days in the 20-day period around the announcement (day -10 through day +10). Second, we take the median value of this ratio over the 20-day announcement period. Table 1 reveals that this ratio demonstrates substantial volatility and skewness. Thus, to mitigate the influence of outliers, our third step is to take the natural log of this median ratio. The result is our final measure of $\text{PropRetail}_{i,q}$. We anticipate a positive coefficient, b_1 , based on the results in Table 6, which suggest that the description in Miller (1977) is more applicable for retail investors than for institutional investors.

Results for model (7) appear in Table 7. For both the 3-day window and the 6-day window, the large intercept indicates a substantial temporary price run-up around earnings announcements (i.e., abnormal return from the strategy of going long the sample stocks prior to the announcement and short following the announcement). Furthermore, we find a significant positive relation between the proportion of retail trading and the size of this price run-up. These results show that the temporary price run-up is larger in magnitude for stocks with a higher proportion of retail trading. This result is consistent with the work of Ofek and Richardson (2003), who report that the first-day return for internet IPO's, and returns around the expiration of the quiet period, are significantly larger if there is a relatively high amount of retail trading.²⁵

The second hypothesis revisits the evidence in Table 4, to explore whether the relation between disagreement and stock returns around earnings announcements depends upon the relative amount of retail versus institutional trading in a stock. We hypothesize that this relation is stronger when the proportion of retail trading is higher. To test this hypothesis, we

²⁵ When we analyze the abnormal returns before and after the earnings announcement separately, we find a positive relation between the proportion of retail trading and the magnitude of the pre-announcement price run-up, and a negative relation between the relative amount of retail trading and the post-announcement price reversal. The coefficient on the proportion of retail trading is significant at the 10% level or better in all cases.

extend regression models (3a) and (4a) to include an interaction term between the change in disagreement and the proportion of retail trading, as follows:²⁶

$$\text{Retbefore}_{i,q} = a_0 + b_1 \Delta\text{DAbefore}_{i,q} + b_2 \text{PropRetail}_i * \Delta\text{DAbefore}_{i,q} + b_3 \text{Surprise} + e_{i,q}, \quad (8)$$

$$\text{Retafter}_{i,q} = a_0 + b_1 \Delta\text{DAafter}_{i,q} + b_2 \text{PropRetail}_i * \Delta\text{DAafter}_{i,q} + b_3 \text{Surprise} + e_{i,q}. \quad (9)$$

Results appear in Table 8. First, as documented previously in Table 4, the coefficient of the change in disagreement (b_1) is significantly positive for both the 3-day and the 6-day periods before and after the announcement. Second, the interaction term (b_2) is also significantly positive in all models presented in Table 8. This result indicates that the association between stock returns and the change in abnormal volume is significantly stronger for stocks with a higher proportion of retail trading.

5.5 Robustness tests

We have conducted several robustness tests to consider whether the results in tables 4-8 are related to firm characteristics. In each robustness test, we stratify the sample of earnings announcements into three groups based on a specific firm characteristic, such as firm size (market capitalization), average daily trading volume, or the average daily relative bid-ask spread. Then we re-estimate models (3)-(9) for each subsample. In addition, we partition the sample of announcements into two subsamples based on whether the firm's earnings were positive or negative, or whether the earnings surprise was positive or negative.

The results of these analyses are robust across subsamples with respect to all partitioning schemes applied (results available upon request). We conclude that the behavior of stock returns and net initiated order flow by retail and institutional investors documented in this study is not attributable to the firm characteristics discussed above. This outcome

²⁶ Note that the coefficient of the interaction term in (8) or (9) measures the influence of $\text{PropRetail}_{i,q}$ on the association between disagreement and stock returns. To see this, consider the following regression model: $Y = a + bX + \varepsilon$, where $b = c+dZ$. Thus, $Y = a + cX + dZ*X + \varepsilon$. In this last model, the coefficient of the interaction term, d , measures the influence of Z on b (where b represents the association between X and Y).

lends further credence to our proposition that the anomaly documented in Trueman et al. (2003) is due to changes in disagreement around earnings announcements, combined with a sample and time period characterized by severe short sales constraints and a high proportion of retail trading.

6. Summary and conclusions

We propose an explanation for the anomalous price and order flow patterns around the earnings announcements of internet stocks during the late 1990's, documented in Trueman et al. (2003). Our explanation focuses on Miller's (1977) hypothesis, and the role of changes in disagreement among investors before and after the announcement. Following Miller, we argue that the anomalous behavior should be more dramatic in the presence of more severe short sales constraints. We further conjecture that changes in disagreement are likely to affect the buying pressure of retail investors more than the buying pressure of institutional investors in this setting, so that these anomalous patterns should be more pronounced for stocks with a relatively high proportion of retail trading activity. These latter conjectures are based on the view that: (i) earnings announcements temporarily attract the attention of retail investors to a greater extent than institutional investors, and (ii) retail investors are less able or willing to short sell than are institutional investors.

For the sample of earnings announcements analyzed in Trueman et al. (2003), we use daily abnormal trading volume to proxy for investor disagreement. We use trade size to distinguish between the net initiated order flow of retail and institutional investors. And we examine the differential behavior across subsamples of earnings announcements made during the IPO lockup period versus announcements made after lockup expiration, to analyze the influence of short sales constraints. We conduct four cross-sectional tests to investigate our conjecture that the anomalous stock price behavior around earnings announcements is related

to variation in disagreement, the severity of short sales constraints, and the proportion of retail trading relative to institutional trading.

First, we find stocks with a larger increase in the level of disagreement before the earnings announcement have a larger pre-announcement price increase, and stocks with a larger decline in disagreement after the announcement have a larger post-announcement price reversal. Second, our results show the relation between disagreement and stock returns is stronger around announcements made during the IPO lockup period, when short sales are more constrained. Third, we find that investor disagreement (proxied by abnormal trading volume) is positively related to net initiated order flow by retail investors, but is negatively related to net initiated order flow by institutional investors. Finally, we show the magnitude of the temporary price run-up around earnings announcements is positively associated with the relative amount of retail versus institutional trading volume in a firm's stock, and the relation between abnormal stock returns and the change in disagreement is stronger for stocks with a higher proportion of retail trading volume.

This battery of tests provides consistent and corroborating evidence to support the view that the Miller (1977) hypothesis helps to explain the anomalous stock returns around internet firms' earnings announcements documented in Trueman et al. (2003), and that this explanation applies to the activity of retail investors to a greater extent than institutional investors. In particular, our evidence suggests that these stock price patterns are due to changes in disagreement around the announcement, combined with a sample and time period characterized by severe short sales constraints and a high proportion of retail trading activity.

This paper thus helps to explain a recently documented stock price anomaly. In so doing, we provide support for the Miller (1977) hypothesis operating over a much shorter time interval than previous studies. More in general, our results suggest that changes in

investor disagreement can have a substantial short term impact on price levels, especially for stocks with a high proportion of retail trading.

This work suggests several avenues for future research. First, since our sample is comprised of internet firms during the technology boom of the late 1990's and the subsequent crash, there is a need for similar research using a broader sample of companies over a longer time period. It may also be fruitful to study the impact of investor disagreement on the price formation process around other information events, and on an intra-day basis. Finally, this study has implications for related research that focuses on the potential impact of trading by individual investors with respect to other short-run stock price anomalies.

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Table 1
Descriptive statistics

The sample is based on the quarterly earnings announcements analyzed in Trueman et al. (2003). It consists of 20-day announcement periods centered around 1,871 quarterly earnings announcements by 395 publicly traded firms that are components of internet.com's Internet Stock Indexes. The sample period is January 1998 to August 2000. The daily market value of common shareholders' equity is obtained from CRSP. The earnings surprise is the difference between actual quarterly earnings and the average of the three most recent analyst forecasts, scaled by the stock price. The earnings surprise variable is available only quarterly from I/B/E/S, while the stock return and trade flow variables are measured over daily intervals from TAQ data. The daily return for our sample stocks is based on the percent change in daily closing prices, as is the daily Nasdaq return. For ease of exposition, both return measures are multiplied by 100, market value is divided by 1,000,000 and the net initiated order flow and volume measures are divided by 1000. All variables are defined in the text.

	N	Mean	Median	Std Dev	Min	Max
Market Value ^a	37,109	3,766	499	22,200	4	500,134
Nasdaq Return (%)	37,332	.043	.282	2.559	-9.66	7.97
Stock Return (%)	36,735	-.089	-.752	8.246	-60.22	164.58
Earnings surprise	1,493	.001	.001	.017	-0.28	.13
Vol ^b	36,761	80,827	6,349	328,467	2	8,666,723
Vol \leq 10 / Vol	36,761	.300	.213	.262	0	1.00
Vol \leq 20 / Vol	36,761	.468	.422	.288	.01	1.00
Vol $>$ 20 / Vol	36,761	.532	.578	.288	0	1.00
Vol $>$ 50 / Vol	36,761	.332	.311	.259	0	.99
Vol \leq 10 / Vol $>$ 50	30,105	1.595	.441	3.694	0	76.84
NIOF ^b	36,761	431	-31	24,945	-1,507,955	1,090,421
NIOF \leq 10 ^b	36,761	25	-11	927	-15,895	35,286
NIOF \leq 20 ^b	36,761	138	-23	2,120	-43,229	74,451
NIOF $>$ 20 ^b	36,761	293	0	24,348	-1,464,726	1,069,742
NIOF $>$ 50 ^b	36,761	61	0	23,664	-1,414,634	1,036,556
AVol	36,332	.517	-.375	6.657	-3.46	604.90
ANIOF	36,332	.038	.003	2.348	-73.71	179.78
ANIOF \leq 10	34,992	.066	-.072	4.525	-717.06	150.04
ANIOF \leq 20	36,192	.093	-.076	2.480	-62.39	220.56
ANIOF $>$ 20	36,101	-.026	.039	2.561	-145.44	225.90
ANIOF $>$ 50	35,243	-.035	.040	2.554	-116.16	231.92

^a Millions of dollars

^b 1,000's of dollars.

Table 2

Average daily stock returns, abnormal trading volume, and their correlation

For each day over the 20-day announcement period, this table presents the mean unadjusted stock return, the market-adjusted abnormal return, abnormal trading volume, and the Pearson correlation between abnormal volume and the abnormal return. For each day, the mean or correlation is computed across all 1,871 announcements in the sample. The daily market-adjusted abnormal return is the unadjusted close-to-close return minus the close-to-close return on the Nasdaq Composite index. All earnings announcements in the sample occur outside normal trading hours. Trading day -1 (+1) is the trading day just before (after) the announcement. We also partition the close-to-close return from day -1 to day +1 into the close-to-open return and the open-to-close return for that 24-hour period. The t-statistic associated with each daily statistic is based on the cross-sectional standard error, and tests the null hypothesis that the statistic in question equals zero.

(1) Day	(2) Unadjusted Return	(3) t-statistic	(4) Adjusted Return	(5) t-statistic	(6) Mean AVol	(7) t-statistic	(8) Correlation (Adj Return, AVol)
-10	0.0004	0.19	0.0007	0.36	.222	3.25 **	.305**
-9	0.0017	0.87	0.0026	1.44	.294	2.73 **	.294**
-8	-0.0031	-1.58	-0.0028	-1.56	.232	3.41 **	.295**
-7	-0.0008	-0.37	0.0005	0.28	.355	3.33 **	.268**
-6	-0.0044	-2.08 *	-0.0034	-1.81	.285	3.87 **	.199**
-5	0.0036	1.77	0.0019	0.98	.261	3.08 **	.187**
-4	0.0055	2.69 **	0.0061	3.25 **	.325	3.21 **	.307**
-3	0.0027	1.26	0.0042	2.19 *	.664	3.15 **	.182**
-2	0.0071	3.56 **	0.0075	4.03 **	.474	4.47 **	.110**
-1	0.0163	7.65 **	0.0138	6.99 **	.913	5.15 **	.191**
1 (close-to-open)	0.0197	11.21 **	0.0167	9.88 **			
1 (open-to-close)	-0.0325	-16.16 **	-0.0306	-15.77 **			
1	-0.0139	-5.40 **	-0.0149	-6.03 **	2.229	12.42 **	.122**
2	-0.0126	-7.15 **	-0.0122	-7.24 **	.599	8.90 **	.227**
3	-0.0114	-6.86 **	-0.0127	-8.15 **	.493	6.10 **	.145**
4	-0.0027	-1.71	-0.0037	-2.45 *	.585	1.73	.236**
5	-0.0043	-2.67 **	-0.0059	-3.93 **	.483	2.13 *	.105**
6	0.0006	0.35	-0.0011	-0.68	.312	3.28 **	.196**
7	0.0004	0.28	-0.0026	-1.72	.310	2.47 *	.220**
8	-0.0017	-1.02	-0.0033	-2.15 *	.457	1.67	.120**
9	-0.0011	-0.63	-0.0010	-0.62	.365	3.11 **	.244**
10	-0.0002	-0.09	-0.0003	-0.20	.487	3.31 **	.302**

* indicates significance at the .05 level; ** at the .01 level.

Table 3

Average daily abnormal net initiated order flow

This table presents the mean daily abnormal net initiated order flow across all 1,871 quarterly earnings announcements in the sample, for each day over the 20-day announcement period. Day -1 (+1) is the trading day immediately before (after) the announcement. The mean daily abnormal net initiated order flow is provided for all trades during the day, for all small trades (less than or equal to \$10,000 or \$20,000), and for all large trades (greater than \$20,000 or \$50,000). All net order flow variables and the standardization scheme used to construct the abnormal measures are described in the text. The t-statistic associated with each day's mean is based on the cross-sectional standard deviation, and tests the null hypothesis that mean abnormal net initiated order flow on that day is zero (i.e., mean net initiated order flow on that day is no different than that during the 'normal' period, covering days -30 through -11 before the announcement period for that firm). The mean difference t-tests in columns 8 and 13 test the null hypothesis that abnormal net initiated order flow is identical for small and large trades.

(1) Day	(2) all trades ANIOF	(3) t-stat	(4) small trades ANIOF≤20	(5) t-stat	(6) large trades ANIOF>20	(7) t-stat	(8) Difference Small-Large	(9) small trades ANIOF≤10	(10) t-stat	(11) large trades ANIOF>50	(12) t-stat	(13) Difference Small-Large
-10	.038	1.22	.062	1.76	-.005	-.12	1.31	.078	1.72	.009	.19	1.03
-9	.059	1.84	.133	3.23 **	.005	.14	2.33 *	.119	3.21 **	-.034	-.86	2.83 **
-8	.033	.99	.033	.81	-.001	-.01	.59	.036	.91	-.047	-1.13	1.45
-7	.104	1.00	.088	2.23 *	.066	.50	.16	.105	2.62 *	.066	.45	.25
-6	.014	.34	.047	1.03	-.041	-.89	1.36	.013	.30	-.045	-.81	.83
-5	.101	2.89 **	.109	2.76 **	.046	1.20	1.13	.114	2.79 **	.041	.92	1.23
-4	.145	2.80 **	.209	3.71 **	.028	.75	2.68 **	.157	2.57 *	-.021	-.50	2.39 *
-3	.098	1.49	.136	2.26 *	.006	.10	1.60	.128	2.16 *	.005	.09	1.48
-2	.055	1.28	.138	3.31 **	.024	.52	1.81	.111	2.29 *	-.046	-.85	2.16 *
-1	.274	2.58 *	.403	4.38 **	.030	.74	3.71 **	.337	4.95 **	-.114	-2.24 *	5.31 **
1	-.065	-1.27	.066	1.29	-.057	-.96	1.57	.023	.36	-.060	-.93	.92
2	-.089	-2.08 *	-.079	-1.91	-.124	-1.38	.46	-.132	-3.21 **	-.029	-.72	-1.76
3	-.123	-2.71 **	-.026	-.69	-.131	-2.60 *	1.68	-.018	-.45	-.094	-1.57	1.05
4	-.005	-.09	.142	1.55	-.059	-1.48	2.01 *	.098	1.35	-.054	-1.14	1.76
5	-.075	-1.37	.151	1.19	-.124	-1.71	1.88	.081	1.18	-.153	-1.87	2.19 *
6	.084	1.87	.116	2.38 *	-.019	-.29	1.66	.127	2.18 *	-.026	-.53	2.01 *
7	.069	1.99 *	-.018	-.36	.033	.71	-.75	.051	.86	.067	1.52	-.21
8	.028	.53	.039	.96	-.039	-.47	.85	.137	1.45	-.004	-.08	1.29
9	.009	.15	.064	1.30	-.086	-1.57	2.03 *	.111	1.80	-.067	-1.48	2.33 *
10	.004	.09	.053	1.12	-.077	-1.69	1.98 *	-.363	-.87	-.090	-1.65	-.65

* indicates significance at the .05 level; ** at the .01 level.

Table 4
Abnormal stock returns and changes in disagreement

This table presents results of OLS regressions of abnormal, market-adjusted stock returns on the change in abnormal trading volume before (after) the earnings announcement, in panel A (panel B). The 3-day (6-day) pre-announcement return in panel A is the percent change from the closing price on day -4 (or day -7) to the close on day -1. This stock return is adjusted for market movements by subtracting the return on the Nasdaq Composite Index over the same period. Similarly, the 3-day (6-day) post-announcement return in Panel B is the percent change from the closing price on day -1 to the close on day +3 (or day +6), and is also adjusted for concurrent market movements. The change in abnormal trading volume before and after the announcement is measured over the same 3-day (6-day) periods. DA(i), is abnormal volume on day i before or after the earnings announcement. The earnings surprise is the difference between actual quarterly earnings and the average of the three most recent analyst forecasts, scaled by the stock price. T-ratios appear in parentheses.

Panel A. Relation between Market-Adjusted Return and Disagreement Before the Earnings Announcement

Model	Period (sample size)	Intercept	$\Delta DA_{\text{before}}$	DA(-4 or -7)	DA(-1)	Surprise	Adj R ²	Overall F
(3a)	3-days (N = 1,452) ^a	.018 (5.49) **	.012 (13.09) **			.011 (.06)	.105	85.84 **
(3b)	3-days (N = 1,452) ^a	.017 (5.12) **		-.009 (-6.34) **	.012 (13.29) **	-.0003 (-.00)	.107	59.26 **
(3b)	6-days (N = 1,452) ^a	.015 (3.47) **		-.002 (-2.39) *	.017 (15.11) **	-.029 (-.11)	.135	76.27 **

Panel B. Relation between Market-Adjusted Return and Disagreement After the Earnings Announcement

Model	Period (sample size)	Intercept	ΔDA_{after}	DA(-1)	DA(+3 or +6)	Surprise	Adj R ²	Overall F
(4a)	3-days (N = 1,448) ^a	-.036 (-9.58) **	.007 (7.27) **			.518 (2.35) *	.037	28.48 **
(4b)	3-days (N = 1,448) ^a	-.040 (-10.52) **		-.004 (-3.91) **	.011 (8.90) **	.484 (2.21) *	.053	28.23 **
(4b)	6-days (N = 1,448) ^a	-.047 (-10.32) **		-.004 (-3.56) **	.011 (8.87) **	.344 (1.32)	.050	26.59 **

* indicates significance at the .05 level; ** at the .01 level.

^a All regressions are applied to the subsample of the original sample of N = 1,871 earnings announcements for which complete data are available.

Table 5

Abnormal stock returns and changes in disagreement for earnings announcements made during the IPO lockup period

This table presents results of OLS regressions of abnormal stock returns on the change in abnormal trading volume before (after) the earnings announcement, in panel A (panel B). We account for differential behavior around earnings announcements made during the IPO lockup period with intercept dummies and slope interaction terms. We exclude earnings announcements made within 60 days of IPO lockup expiration. The analysis is thus conducted on a subsample of 1,167 earnings announcements, comprised of 248 announcements made during the lockup period (at least 60 days prior to lockup expiration) and 919 announcements made at least 60 days after lockup expiration. The dummy variable, Lockup, takes a value of 1 for announcements made during the lockup period, and 0 for announcements made after lockup expiration. All other variables are defined in table 4. T-ratios appear in parentheses.

Panel A. Relation between Abnormal Return and Change in Disagreement Before the Earnings Announcement

Model	Period (sample size)	Intercept	Lockup	$\Delta DA_{\text{before}}$	$\Delta DA_{\text{before}} * \text{Lockup}$	Surprise	Adj R ²	Overall F
(5)	3-days (N = 1,130) ^a	.012 (2.91) **	.006 (.64)	.011 (9.66) **	.031 (6.50) **	.006 (.03)	0.14	45.20 **
(5)	6-days (N = 1,130) ^a	.019 (3.46) **	-.009 (-.72)	.015 (11.11) **	.029 (5.12) **	.010 (0.04)	0.14	47.11 **

Panel B. Relation between Abnormal Return and Change in Disagreement After the Earnings Announcement

Model	Period (sample size)	Intercept	Lockup	ΔDA_{after}	$\Delta DA_{\text{after}} * \text{Lockup}$	Surprise	Adj R ²	Overall F
(6)	3-days (N = 1,128) ^a	-.032 (-6.70) **	.011 (1.06)	.008 (6.95) **	.020 (3.92) **	.611 (2.55) *	0.07	21.06 **
(6)	6-days (N = 1,128) ^a	-.035 (-6.03) **	.003 (.27)	.007 (5.97) **	.019 (4.61) **	.410 (1.45)	0.06	20.17 **

* indicates significance at the .05 level; ** at the .01 level.

^a All regressions are estimated over the subsample of N = 1,167 earnings announcements for which complete data on all regression variables are available.

Table 6.

Correlations between disagreement and net initiated order flow by small versus large investors

This table presents the average Pearson correlations of three different proxies for disagreement (AVol, AVol \leq 10, and AVol $>$ 50) with abnormal net initiated order flow by small versus large traders (ANIOF \leq 10 versus ANIOF $>$ 50). First, we estimate each correlation across the days around every earnings announcement. Then we average these correlations across all announcements. The volume and net order flow variables and the standardization scheme used to construct abnormal measures are described in the text. The t-statistic for the null hypothesis that each average correlation is zero appears in parentheses beneath the average correlation. This statistic is based on the standard deviation of the correlation coefficients across the 1,871 earnings announcements in our sample. Column 3 provides the pairwise mean difference t-tests to formally address whether each mean correlation in column 1 is identical to the analogous mean correlation in column 2, as follows:

$$H1: \rho(\text{AVol}, \text{ANIOF} \leq 10) = \rho(\text{AVol}, \text{ANIOF} > 50)$$

$$H2: \rho(\text{AVol} \leq 10, \text{ANIOF} \leq 10) = \rho(\text{AVol} \leq 10, \text{ANIOF} > 50)$$

$$H3: \rho(\text{AVol} > 50, \text{ANIOF} \leq 10) = \rho(\text{AVol} > 50, \text{ANIOF} > 50)$$

Panel A. Mean Correlations across all 20 days around Earnings Announcements (-10, ..., +10)

Disagreement Proxy	(1)	(2)	(3)	(4)	(5)
	ANIOF \leq 10	ANIOF $>$ 50	Pairwise Test col (1) - (2)	AVol	AVol \leq 10
(1) AVol	.225 (26.62) **	-.061 (-5.78) **	H1: .293 (21.30) **	1	
(2) AVol \leq 10	.220 (23.47) **	-.077 (-8.45) **	H2: .301 (22.96) **	.793 (133.27) **	1
(3) AVol $>$ 50	0.184 (23.08) **	-.055 (-4.67) **	H3: .241 (16.38) **	.869 (206.21) **	.523 (67.14) **

Panel B. Mean Correlations across the 10 days before Earnings Announcements (-10, ..., -1)

Disagreement Proxy	(1)	(2)	(3)	(4)	(5)
	ANIOF \leq 10	ANIOF $>$ 50	Pairwise Test col (1) - (2)	AVol	AVol \leq 10
(1) AVol	.237 (23.14) **	-.041 (-3.46) **	H1: .294 (18.40) **	1	
(2) AVol \leq 10	.230 (21.07) **	-.076 (-7.04) **	H2: .316 (20.95) **	.768 (114.41) **	1
(3) AVol $>$ 50	0.188 (18.92) **	-.029 (-2.16) *	H3: .222 (12.94) **	.860 (179.32) **	.485 (52.39) **

Panel C. Mean Correlations across the 10 days after Earnings Announcements (+1, ..., +10)

Disagreement Proxy	(1)	(2)	(3)	(4)	(5)
	ANIOF \leq 10	ANIOF $>$ 50	Pairwise Test col (1) - (2)	AVol	AVol \leq 10
(1) AVol	.154 (14.02) **	-.044 (-3.48) **	H1: .213 (12.18) **	1	
(2) AVol \leq 10	.128 (10.84) **	-.061 (-5.33) **	H2: .202 (11.79) **	.807 (136.75) **	1
(3) AVol $>$ 50	0.151 (14.45) **	-.034 (-2.42) *	H3: .186 (10.23) **	.872 (188.11) **	.542 (62.94) **

* indicates significance at the .05 level; ** at the .01 level.

Table 7

Pre-announcement abnormal return minus post-announcement abnormal return
and the proportion of retail versus institutional trading volume

The dependent variable is the difference between the pre-announcement abnormal return and the post-announcement abnormal return for the i^{th} stock and the q^{th} earnings announcement. The 3-day (6-day) pre- and post announcement abnormal returns are defined in the text. We measure the proportion of retail versus institutional trading volume for each announcement (PropRetail), by first taking the ratio of daily volume of all trades less than or equal to \$10,000 to daily volume of all trades larger than \$50,000. Next we take the median value of this ratio across all 20 days in the earnings announcement period (days -10 through +10). Finally, our measure of the proportion of retail trading relative to institutional trading is the natural log of this median ratio. The earnings surprise is defined in table 4. T-ratios appear in parentheses beneath the parameter estimates.

Dependent Variable: $[\text{Retbefore}_{i,q} - \text{Retafter}_{i,q}]$

Model	Period (sample size)	Intercept	PropRetail	Surprise	Adj R ²	Overall F
(7)	3-day (N = 1,311) ^a	.068 (10.86) **	.011 (2.62) **	-.428 (-1.23)	.005	4.27 *
(7)	6-day (N = 1,311) ^a	.079 (10.18) **	.013 (2.40) *	-.201 (-.47)	.003	3.01 *

* indicates significance at the .05 level; ** at the .01 level.

^a All regressions are estimated over the subsample of the original sample of N = 1,871 earnings announcements for which complete data on all regression variables are available.

Table 8

The proportion of retail versus institutional trading volume
and the association between stock returns and changes in disagreement

In Panel A (Panel B), the abnormal market-adjusted stock return over the 3-day or 6-day window before (after) the earnings announcement is regressed on the change in abnormal trading volume during the same period, along with an interaction term between the change in abnormal volume and the proportion of retail versus institutional trading. This interaction term measures the influence of retail versus institutional trading on the association between stock returns and changes in disagreement. The proportion of retail versus institutional trading volume for a given announcement (PropRetail) is defined in table 7. T-ratios appear in parentheses beneath the parameter estimates.

Panel A. Return, Disagreement, and Proportion of Retail Trading Before Earnings Announcements

Model	Period (sample size)	Intercept	$\Delta DA_{\text{before}}$	$\Delta DA_{\text{before}}$ *PropRetail	Surprise	Adj R ²	Overall F
(8)	3-day (N = 1,307) ^a	.020 (5.62) **	.011 (10.60) **	.003 (3.52) **	-.028 (-.14)	.082	39.80 **
(8)	6-day (N = 1,308) ^a	.023 (4.80) **	.008 (7.33) **	.002 (2.85) **	.024 (.09)	.041	19.46 **

Panel B. Return, Disagreement, and Proportion of Retail Trading After Earnings Announcements

Model	Period (sample size)	Intercept	ΔDA_{after}	ΔDA_{after} *PropRetail	Surprise	Adj R ²	Overall F
(9)	3-day N = 1,307 ^a	-.037 (-9.34) **	.009 (8.30) **	.002 (3.01) **	.620 (2.64) **	.051	24.55 **
(9)	6-day N = 1,308 ^a	-.046 (-9.61) **	.009 (8.12) **	.003 (4.00) **	.513 (1.83)	.052	24.92 **

* indicates significance at the .05 level; ** at the .01 level.

^a All regressions are estimated over the subsample of the original sample of 1,871 earnings announcements for which complete data are available.