

# Investor Trading and the Post-Earnings-Announcement Drift

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**ABSTRACT:** We examine whether the two distinct post-earnings-announcement drifts associated with seasonal random walk-based and analyst-based earnings surprises are attributable to the trading activities of distinct sets of investors. We predict and find that small (large) traders continue to trade in the direction of seasonal random walk-based (analyst-based) earnings surprises after earnings announcements. We also find that when small (large) traders react more thoroughly to seasonal random walk- (analyst-) based earnings surprises at the earnings announcements, the respective drift attenuates. Further evidence suggests that delayed small trades associated with random walk-based surprises are consistent with small traders' failure to understand time-series properties of earnings, whereas delayed large trades associated with analyst-based surprises are more consistent with a longer price discovery process. We also find that the analyst-based drift has declined in recent years.

**Keywords:** *post-earnings-announcement drift; earnings expectations; market efficiency; small and large traders; investor sophistication.*

**Data Availability:** *All data are publicly available.*

**JEL Classifications:** *G14; M41.*

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# Investor Trading and the Post-Earnings-Announcement Drift

## I. INTRODUCTION

More than four decades of research on post-earnings-announcement drift consistently finds that stock prices tend to move in the direction of earnings surprises following earnings announcements. While the majority of prior studies focus on the drift associated with seasonal random walk-based earnings surprises, recent studies document a drift associated with analyst-based earnings surprises that appears not only distinct from but even larger than the drift associated with seasonal random walk-based earnings surprises (Livnat and Mendenhall 2006; Doyle et al. 2006). Despite the extensive literature on post-earnings-announcement drift, there is no consensus to date regarding the source(s) of either drift.<sup>1</sup>

Our study examines whether the distinct drifts are attributable, at least in part, to different identifiable subsets of investors who underreact to different forms of earnings innovations. Evidence on this issue is important for researchers and practitioners to understand the nature and the source of distinct drifts associated with seasonal random walk-based earnings surprises and analyst-based earnings surprises. Indeed, Livnat and Mendenhall (2006, 180) argue that “[i]f researchers do not understand how the magnitude of the drift depends on the specification of earnings surprise, they stand little chance of understanding the nature of the anomaly.”

We hypothesize that the two post-earnings-announcement drifts are attributable, at least in part, to distinct sets of investors (small and large traders) who use different earnings expectations models but both fail to fully react to earnings news. Specifically, if small traders use seasonal random walk-based earnings expectations models but underreact to the seasonal random walk-based earnings surprises, we expect that post-announcement trading by small traders helps explain the drift associated with seasonal random walk-based earnings surprises (hereafter RW drift). Similarly, if large traders base their earnings expectations

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<sup>1</sup> For example, prior research conjectures that the drift associated with seasonal random walk-based earnings surprises may be attributable to investor underreaction (Bernard and Thomas 1989; 1990), a subset of naïve investors trading contrary to earnings news (Hirshleifer et al. 2008), other complex short- and long-term trading patterns by investors (Bartov et al. 2000; Ke and Ramalingegowda 2005), and mismeasurement of risk-adjusted returns (Ball 1992; Kothari 2001).

on analyst forecasts but do not fully react to the analyst-based earnings surprises, we anticipate that post-announcement trading by large traders helps explain the drift associated with analyst-based earnings surprises (hereafter AF drift).

Despite the intuitive appeal of our expectations, there is little evidence that links either drift to specific investors' trading. For example, although Battalio and Mendenhall (2005) and Bhattacharya (2001) find that small traders are more likely to trade on the RW earnings surprise around earnings announcements and large traders trade on the AF earnings surprise around earnings announcements, they do not link the RW or AF *drift* to trades by specific investor groups in the post-announcement period. Bartov et al. (2000) find that the RW drift decreases with the level of institutional ownership and conclude that institutional investors improve the efficiency with which RW earnings surprises are priced. However, they do not investigate the AF drift or link investor trades to the RW drift. More recently, Hirshleifer et al. (2008) investigate whether the RW drift is attributable to individual investors trading *contrary* to the RW earnings surprises at earnings announcements, which creates underpricing after good news and overpricing after bad news. Contrarian trading by individual investors is an alternative sufficient, but not *necessary* condition for the RW drift. Hirshleifer et al. (2008) find no evidence that individual investors trade contrary to RW earnings surprises, and offer three alternative explanations for the RW drift: the RW drift is an artifact of poor measurement of risk-adjusted returns; individual investors cause the RW drift but their proprietary sample from a single discount brokerage fails to detect this relation; or institutional investors cause the RW drift. In sum, the effect of distinct investor groups on the RW drift is far from settled and there is little explanation as to whom or what causes the AF drift.

To build on prior research, we investigate the possibility that the RW and AF drifts could be explained by distinct groups of traders that underreact to differing earnings news. Using trade and quote data for trades executed from 1993 through 2005, we classify investors as small or large traders based on trade size and use a buy-sell order imbalance metric to estimate large and small traders' net buying

activities. We then examine small and large trades around and after earnings announcements and their relation to the post-earnings-announcement drifts.<sup>2</sup>

Results are consistent with our predictions. We find that only small traders systematically trade in the direction of the RW earnings surprises after earnings announcements. Likewise, we find that only large traders trade in the direction of the AF earnings surprises after earnings announcements. This evidence is consistent with distinct sets of traders explaining, at least in part, the two post-earnings-announcement drifts. Specifically, it suggests that small traders create upward (downward) price pressure on stocks in the post-announcement period for firms with good (bad) RW news. Likewise, it suggests that large traders create upward (downward) price pressure on stocks in the post-announcement period for firms with good (bad) AF news.

If the RW and AF drifts are manifested as an underreaction to earnings news by small and large traders, respectively, the more these traders act on the earnings news during the announcement period, the lower the subsequent drift should be. Consistent with this expectation, we find that when small traders trade more intensely in the direction of the RW earnings surprises *during the announcement period*, the magnitude of the subsequent RW drift is lower. Likewise, when large traders trade more intensely in the direction of the AF earnings surprises *during the announcement period*, the magnitude of the AF drift is lower.

Because large traders are considered *relatively* more sophisticated than small traders (e.g., as evidenced by their more sophisticated earnings expectation model), the nature of the underreaction by small and large traders and the related drifts are likely qualitatively different. We conduct several analyses to further explore and contrast the RW and AF drifts. First, we expect that the timing of post-announcement trades is a function of investor *relative* sophistication. If large traders are relatively more

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<sup>2</sup> Hirshleifer et al. (2008) use a proprietary sample of individual trades from a single discount brokerage, whereas we analyze a comprehensive sample of small and large trades using the New York Stock Exchange's Trade and Quote database. While our theory is not contingent on small traders being individual investors (i.e., our theory relies on small traders underreacting to the less sophisticated, RW earnings surprises and large traders underreacting to AF earnings surprises), we are able to reconcile our results to the results in Hirshleifer et al. (2008) using our small trade data. This evidence suggests that the individual investors in Hirshleifer et al. (2008) trade similarly to the small traders in this study's setting and that the differences in this study from Hirshleifer et al. (2008) stem more from the theories tested and research designs.

sophisticated than small traders, we expect that large traders end their trading on AF earnings surprises more quickly than small traders end their trading on RW earnings surprises. Consistent with our expectation, we find that large traders trade more at the early stage of the post-announcement period whereas small traders spread their trades throughout the 60-day post-announcement period.

Second, we examine small and large trades around one- to four-quarter-ahead earnings announcements using the methodology employed by Bernard and Thomas (1990). Consistent with small traders being less sophisticated, we find that small trades around subsequent earnings announcements are predictable based on lagged one- to four-quarter RW earnings surprises. Consistent with large traders being *relatively* more sophisticated and their underreaction being short-lived, we find no evidence of large trades at earnings announcements being associated with prior AF earnings surprises. This evidence suggests that the RW drift, but not AF drift, is largely explained by small or unsophisticated traders' failure to recognize the time-series property of earnings.

Third, we investigate whether the AF drift and post-announcement trades by large traders associated with the AF earnings surprise are more pronounced when the AF earnings surprise is more difficult to interpret. Prior research finds that the AF drift is greater when analysts' forecasts are more heterogeneous (Liang 2003), suggesting that investors have difficulty interpreting AF earnings surprises when analysts' forecasts are less correlated. Consistent with large traders requiring more post-earnings-announcement information to interpret earnings surprises when analysts' forecasts are more heterogeneous, we find that the AF drift and post-announcement trades by large traders associated with the AF earnings surprise are more pronounced when there is more heterogeneity among analysts' forecasts. This finding suggests that large traders' underreaction and the related AF drift may be attributable, at least in part, to a longer price discovery process when earnings are more difficult to interpret.

Fourth, we investigate how post-earnings-announcement analyst forecast revisions affect large and small traders' post-announcement trading on earnings surprises. If large traders' underreaction is corrected in the post-announcement period through subsequent price discovery, analyst forecast revisions

may be one source of such information discovery (Gleason and Lee 2003).<sup>3</sup> We find that analyst forecast revisions are sluggish with respect to prior earnings information and that much of the post-announcement trading by large traders based on the AF earnings surprise is attributable to information in analyst forecast revisions that continue to be correlated with the AF earnings surprise well after the earnings announcement. This evidence further suggests a longer price discovery explanation for the AF drift with analyst forecast revisions serving as one source of information discovery.

Finally, we examine the magnitude of the RW and AF drifts and related post-announcement trading by small and large traders in more recent years. Results suggest that the magnitude of the AF drift decreases in more recent years (after 1999), while the RW drift does not change. This evidence is consistent with a more efficient price discovery process for information contained in the AF earnings surprise in more recent years as the AF drift may have received more attention. Given the relatively new discovery and the little attention that the AF drift received during the earlier years in our sample, sophisticated investors may have not sufficiently exploited the AF drift during this period, which may explain the larger AF drift in earlier years.

This study makes the following contributions. First, we predict and find that small traders systematically trade in the direction of the RW earnings surprise after earnings announcements, whereas large traders' trading during the post-earnings-announcement period is in the direction of the AF earnings surprise. This evidence suggests that the RW and AF drifts are attributable, at least in part, to distinct sets of investors who use different earnings expectation models. Second, to our knowledge, this is the first study to link *announcement period trading* by distinct groups of investors to the *RW* and *AF drifts*. These findings are important in understanding the respective drifts and the investors that influence the size and type of the drifts. Third, we provide evidence that the two drifts are qualitatively different. The RW drift is largely explained by small traders' failure to understand the time-series property of earnings and therefore represents investor naïveté. In contrast, the AF drift may be explained by a longer price

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<sup>3</sup> Gleason and Lee (2003) find drift associated with analyst forecast revisions, consistent with a price discovery process. Because the price discovery process is *systematically correlated* with the AF earnings surprise and the AF drift is mitigated when large trades react more strongly to the AF earnings surprise during the announcement period, we characterize large traders as underreacting to the AF earnings surprise.

discovery process by large traders that highly correlates with subsequent analyst forecast revisions and increases with analysts' forecast heterogeneity. Finally, we find that the AF drift and related large trades during the post-announcement period has decreased in more recent years as the AF drift may have received more attention. In sum, we conclude that the two drifts are quite different despite both being manifested as an investor underreaction to earnings news.

Section II develops hypotheses. Section III describes how we classify trades into buys and sells and how we partition small and large traders. Section IV presents our sample selection and descriptive statistics, and Section V presents the results of our hypotheses tests. Section VI provides evidence of additional differences between the AF and RW drifts. Section VII summarizes and concludes.

## II. HYPOTHESIS DEVELOPMENT

### **Investors' Post-Announcement Trading**

To date, there is no consensus regarding who or what causes either drift, random walk-based or analyst-based. While prior studies have not investigated the source(s) of the AF drift (given its relatively new discovery), recent studies have begun to focus on how different investor groups influence the RW drift. Bartov et al. (2000) find that the RW drift decreases with the level of institutional ownership and conclude that institutional investors improve on the earnings-processing problems that cause the RW drift. Their finding implies that higher individual ownership exacerbates the RW drift. Similarly, Ke and Ramalingegowda (2005) find that quarterly changes in *transient* institutional ownership in the direction of RW earnings surprise (e.g., an increase in ownership after good news) are associated with lower RW drift. This evidence suggests that more aggressive trading by transient institutional investors at earnings announcements negates mispricing associated with RW earnings surprises.

More recently, Hirshleifer et al. (2008) use individual trading data to investigate whether naïve individual investors trade *contrary* to the RW earnings surprises at earnings announcements, which creates underpricing after good RW news and overpricing after bad RW news. Implicit in the “contrarian trading” hypothesis is the presence of a group of informed or more sophisticated traders that attempts to

move prices based on the RW earnings surprises and a second group of naïve individual investors that trades contrary to the RW earnings surprises. Hirshleifer et al. (2008) use a proprietary sample of individual trades from a single discount brokerage firm and find no evidence that individual investors trade contrary to RW earnings surprises.<sup>4</sup>

To build on prior research, we investigate an alternative explanation for the RW drift (and AF drift). We hypothesize that the two distinct post-earnings-announcement drifts are attributable, at least in part, to distinct sets of investors (small and large traders) that use different earnings expectation models but fail to fully react to earnings news. Our expectations differ from Hirshleifer et al. (2008) in that our reasoning is based on two different investor groups (small and large traders) trading on two different earnings signals (RW and AF earnings surprises) with both investor groups underreacting to their respective earnings signals, as opposed to two different investor groups trading on one signal (RW earnings surprises) with one naïve group trading contrary to the signal.

We base our hypothesis on four streams of prior research: (1) findings that during the *earnings announcement period*, small traders react to RW earnings surprises, while large traders tend to react to more accurate AF earnings surprises,<sup>5</sup> (2) asset pricing models that suggest that equilibrium prices aggregate different information sets of all investors, (3) behavioral evidence that investors tend to underreact to news, and (4) evidence that arbitrage activities are often limited. Collectively, these factors create a sufficient condition to generate two distinct drifts.

Bhattacharya (2001) studies the trading volume of large and small traders during earnings announcement periods and finds that small traders' earnings expectation resembles a seasonal random

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<sup>4</sup> Shanthikumar (2004) examines small and large trades with the NYSE Trades and Quotations data and finds inconclusive evidence regarding the cause of the post-announcement earnings drift. Given the relatively new discovery of the AF drift, Shanthikumar (2004) does not consider the joint effect of RW and AF earnings surprises on investor trades and their relation with the AF and RW drifts.

<sup>5</sup> While prior research shows that analysts' quarterly forecasts are more accurate than earnings predicted by time-series models, Bradshaw et al. (2010) show that simple random walk forecasts are more accurate than analyst forecasts over longer forecast horizons and for firms that are smaller, younger, or have limited analyst following. Analysts' superiority is also less prevalent when analysts forecast large changes in earnings per share. These findings suggest that under certain conditions, sophisticated (large) traders should focus on random walk based earnings surprises instead of analyst based earnings surprises. If this is the case, it would bias against finding results consistent with our expectation for differential trading for large and small traders.



walk. Battalio and Mendenhall (2005) employ order imbalance measures and find that around earnings announcements, small traders respond to RW earnings surprises while large traders respond to AF earnings surprises. Mikhail et al. (2007) find that, while large traders trade in the direction of analyst stock recommendations and earnings forecast revisions, small traders do not. Collectively, these findings suggest that large traders use a more sophisticated earnings expectation, consistent with large traders likely being wealthier and more informed than small traders (Easley and O'Hara 1987; Lee 1992). The implication of these findings is that different investor groups (i.e., small and large traders) systematically form different earnings expectations and trade accordingly.<sup>6, 7</sup>

Prior equilibrium models suggest that investors with differing beliefs can impact prices (Grossman 1976; Grossman and Stiglitz; 1980; Admati 1985; Kandel and Pearson 1995; Shleifer and Vishny 1997). These models suggest that in equilibrium stock prices reflect the weighted average beliefs of different investor groups, with the risk-bearing capacity of each investor group determining its relative weight. These models also suggest that investor groups with differing earnings expectations (e.g., small traders who form their earnings expectation and trade based on RW earnings surprises and large traders who form their earnings expectation and trade based on AF earnings surprises) can impact prices. Consistent with this implication, Walther (1997) finds that stock returns reflect both RW earnings surprises and AF earnings surprises.

Prior behavioral research has suggested that market participants generally underestimate the implications of current earnings for future earnings. For example, Maines and Hand (1996) and Calegari and Fargher (1997) find that both undergraduate business and MBA students seem to underestimate the auto-regressive component of the seasonal changes in quarterly earnings in the process of forecasting earnings. Stevens and Williams (2004) find that undergraduate business students underreact to both positive and negative news. Likewise, Mendenhall (1991), Ali et al. (1992), Abarbanell and Bernard

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<sup>6</sup> Use of random walk-based expectations by small traders is likely in part attributable to their having less access to analyst forecasts. Consistent with this explanation, we find in tests described later that small traders' reliance on analyst forecasts increases in more recent sample years as analyst forecasts are more accessible (e.g., on the internet).

<sup>7</sup> None of these prior studies link small or large trades to RW or AF earnings surprises in the *post-announcement* period, leaving the questions of which investors or trading patterns cause the respective drifts open.

(1992), and Abarbanell and Bushee (1997) find that analysts underestimate the persistence of earnings surprises in revising their earnings forecasts. In addition, several studies (e.g., Bushee 2001; Ke and Petroni 2004; Bradshaw et al. 2004; Callen et al. 2005) find that institutional investors have difficulty interpreting financial information.<sup>8</sup>

Arbitrage activities can potentially reduce the magnitude of the drifts. However, prior research shows that arbitrage forces can be quite limited in financial markets (De Long et al. 1990a; 1990b; Shleifer and Vishny 1997). A maintained assumption of our analysis is that arbitrageurs do not *completely* eliminate underreaction, because if arbitrage activities quickly correct initial underreaction to earnings news, these post-announcement drifts would not occur.

Overall, the implication of these four streams of research is that the RW and AF drifts could be explained by distinct groups of investors that form their earnings expectations differently, who both impact prices and systematically underreact to earnings news. Because small traders are more likely to use RW earnings models to form their earnings expectations, we expect that trading by small traders in the post-announcement period primarily contributes to the RW drift. Likewise, because large traders are more apt to base their earnings expectations on analyst forecasts, we anticipate that their trading contributes more to the AF drift if they likewise fail to fully react to earnings surprises. We formulate the following hypotheses related to the post-earnings-announcement trading behavior of small and large traders:

**Hypothesis 1:** *Small traders are more likely to trade shares in the direction of seasonal random walk-based earnings surprises after earnings announcements.*

**Hypothesis 2:** *Large traders are more likely to trade shares in the direction of analyst-based earnings surprises after earnings announcements.*

Recent research questions whether small traders represent individuals or instead institutions that split their trades into smaller trades (Barclay and Warner 1993; Chakravarty 2001; Campbell et al. 2005),

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<sup>8</sup> Bushee (2001) provides evidence that some institutional investors over- (under-) weight short- (long-) term earnings in their valuation models. Likewise, Ke and Petroni (2004) find that even though sophisticated institutional investors anticipate the break of a string of consecutive earnings increases, their selling activities lag behind the decline of stock prices by one to two quarters. In addition, Bradshaw et al. (2004) and Callen et al. (2005) find that institutional investors suffer from biases in interpreting foreign earnings.

whereas other studies present evidence consistent with small traders representing individual investors (Easley and O'Hara 1987; Lee 1992; Franco et al. 2007; Bhattacharya et al. 2007; Ayers et al. 2008). It is important to note that this study's hypotheses are not contingent on small traders being individual investors and large traders being institutions. Instead, our expectations rely solely on small traders underreacting to the less sophisticated RW earnings surprises and large traders underreacting to AF earnings surprises. To the extent that both small traders and large traders represent the same traders (e.g., institutions that split their trades into small trades but use analyst forecasts to create their earnings expectations), this should bias against finding evidence supporting our hypotheses that predict trading differences between small and large traders.

### **Effect of Earnings Announcement Period Trading on Subsequent Drift**

If small and large traders' activities help explain the RW and AF drifts, respectively, we expect a relation between the two drifts and the respective trading intensity by small and large traders *around earnings announcements*. Specifically, if investors assimilate the earnings news more thoroughly and thus trade more intensely around earnings announcements on RW and AF earnings surprises, the magnitude of the respective RW and AF drifts should be lower. Since we hypothesize that small traders contribute to the RW drift, we expect that the more they trade at the announcement period on RW earnings surprises, the lower the RW drift. Likewise, we expect that the more large traders trade at the announcement period on AF earnings surprises, the lower the AF drift:

**Hypothesis 3:** *The more intense the earnings announcement period trading by small traders on seasonal random walk-based earnings surprises, the smaller the post-earnings-announcement drift associated with seasonal random walk-based earnings surprises.*

**Hypothesis 4:** *The more intense the earnings announcement period trading by large traders on analyst-based earnings surprises, the smaller the post-earnings-announcement drift associated with analyst-based earnings surprises.*

### **III. BUY-SELL ORDER IMBALANCE FOR SMALL AND LARGE TRADERS**

We obtain stock quotes and investor trade data from the New York Stock Exchange's Trade and Quote (TAQ) database for years 1993, the year the TAQ database begins, through 2005. Using the Lee

and Ready (1991) and Lee (1992) algorithm, we classify trades into buyer-initiated or seller-initiated trades. While the number of shares bought equals the number of shares sold in a transaction, the Lee (1992) algorithm identifies the likelihood that a transaction is buyer-initiated or seller-initiated.<sup>9</sup>

Specifically, we compare traded prices with quotes that are at least five seconds earlier. If the traded price is above the mid-point of the bid-ask spread, we define the trade as a buy (*BUY*). If the traded price is below the mid-point of the bid-ask spread, we define the trade as a sell (*SELL*). For day  $k$ , we add up all the buys  $\sum_{n=1}^M BUY_{in}$  and all the sells  $\sum_{n=1}^N SELL_{in}$ , where  $M$  is the total number of buys on Day  $k$  and  $N$  is the total number of sells on Day  $k$ . We then compute daily buy-sell order imbalance (i.e., net-buy)  $BMS_i$  ( $\sum_{m=1}^M BUY_{im} - \sum_{n=1}^N SELL_{in}$ ). A positive (negative)  $BMS_i$  indicates net-buying (net-selling) on Day  $k$ .

Because we are interested in *excess* trading activities, we subtract *normal* daily net-buy from the daily net-buy measure during the event period. We measure normal daily net-buy during the control period, a 40-day period from Day -45 to Day -6 relative to the earnings announcement Day  $i$ .<sup>10</sup> Specifically, the normal daily net-buy relative to Day  $i$  is the average daily net-buy computed as

$$NBMS_i = \sum_{k \in [-45, -6]} BMS_{i,k} / T . \quad (1)$$

where  $T$  is the total number of days with data available for  $BMS$ . Our daily excess net-buy measure is defined as  $BMS_i - NBMS_i$ .

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<sup>9</sup> Based on Lee (1992), a transaction is classified as buyer-(seller-) initiated if a buyer (seller) demands immediate execution (i.e., a market order). Generally there are three types of orders: market orders, limit orders, and standing orders. A market order demands immediate execution. A limit order is an order to be executed when a pre-specified price is attained. A standing order is an order to buy or sell shares at the best available price over a certain period of time, in which a broker has to use discretion. After the opening trade, a trade occurs only when a market order arrives. If a market order to buy is filled by a limit order to sell, the trade is classified as a buyer-initiated trade. If a market order to sell is filled by a limit order to buy, the trade is classified as a seller-initiated trade. Sometimes, the size of a market order and the size of a limit order are not equal. If one large market order to buy (sell) is filled by several small limit orders to sell (buy) (and possibly partially filled by the specialist), the trade is classified as one large buyer- (seller-) initiated trade. If several small market orders to buy (sell) are filled by one large limit order to sell (buy) (and possibly partially filled by the specialist), the trades are classified as several buyer- (seller-) initiated trades. Lee and Radhakrishna (2000), using the Trades, Orders, Reports, and Quotes database that contains information on trade directions and trader identities, find that while few (6 percent) of the total market orders are split up in execution, a much larger portion (24 percent) of the total market orders is batched in execution. However, despite the prevalence of order batching, trade size is still highly effective in separating large traders and small traders.

<sup>10</sup> Results are similar if we do not base our test on *excess* net-buys – i.e., if we do not create our measure of abnormal daily net-buys by subtracting the normal daily net-buys during the control period.

Finally, to facilitate cross sectional comparison of our daily excess net-buy measure, we scale it by the normal daily trading volume (i.e., daily trading volume during the control period). Daily trading volume,  $BPS_i$ , is defined as daily  $BUY$  plus daily  $SELL$  (i.e.,  $\sum_{m=1}^M BUY_{im} + \sum_{n=1}^N SELL_{in}$ ), and the normal daily trading volume relative to Day  $i$  is the average daily buy plus sell:

$$NBPS_i = \sum_{k \in [-45, -6]} BPS_{i,k} / T, \quad (2)$$

where  $T$  is the total number of days with data available for  $BPS$ .<sup>11</sup> The excess net-buy on Day  $k$  during the event period (relative to the earnings announcement Day  $i$ ) is therefore defined as net-buy in excess of the control period net-buy, scaled by the control period volume:

$$EXBMS_{i,k} = \frac{BMS_{i,k} - NBMS_i}{NBPS_i}. \quad (3)$$

This measure captures the excess net buying activities on Day  $k$ . Once we have a measure of daily excess net-buy, we calculate the average excess net-buy during an event window  $[k_1, k_2]$  (relative to the earnings announcement Day  $i$ ) as  $\sum_{k=k_1}^{k_2} EXBMS_{i,k} / (k_2 - k_1 + 1)$ .

To analyze the trading behavior of small and large traders, we compute excess net-buy for small trades and large trades separately.<sup>12</sup> Specifically, if the dollar value of a round lot trade is below \$5,000, we classify the trade as a small trade. If the dollar value of a round lot trade is above \$30,000, we classify the trade as a large trade. Note that there are no exact cutoffs for defining small and large trades. The \$5,000 and \$30,000 cutoffs are used here to distinguish small and large traders that prior research suggests form earnings expectations based on RW and AF earnings surprises, respectively. We use a buffer of \$25,000 between the \$5,000 cutoff for small trades and the \$30,000 cutoff for large trades to reduce the ambiguity that a trade is initiated by a small or large trader (Lee and Radhakrishna 2000).<sup>13</sup>

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<sup>11</sup> We require  $T$  to be at least 20 to compute  $NBPS_i$  and  $NBMS_i$ .

<sup>12</sup> Battalio and Mendenhall (2005) classify trade size by number of shares. We classify traders based on the dollar amount involved, because this is a relatively more direct measure of investor wealth (Bhattacharya 2001; Bhattacharya et al. 2007).

<sup>13</sup> As a sensitivity analysis, we use alternative cutoffs such as \$10,000 and \$15,000 for small trades and \$20,000 and \$25,000 for large trades. Results are robust to these alternative cutoffs.

## IV. SAMPLE AND DESCRIPTIVE STATISTICS

### Sample Selection

We obtain actual quarterly earnings, analyst forecasts of quarterly earnings and earnings announcement dates from the I/B/E/S unadjusted file for the period 1993-2005.<sup>14</sup> We also require firms to have I/B/E/S earnings for the same quarter in the prior year to calculate RW earnings surprise. We define RW earnings surprise ( $RW$ ) as

$$RW = (EPS_t - EPS_{t-4}) / P_{t-1}, \quad (4)$$

where  $EPS_t$  is the I/B/E/S actual earnings per share (EPS) for quarter  $t$ ,  $EPS_{t-4}$  is the I/B/E/S actual EPS for quarter  $t-4$ , and  $P_{t-1}$  is stock price at the beginning of quarter  $t$ .<sup>15, 16</sup>

Similar to Equation (4), we define AF earnings surprise ( $AF$ ) as the I/B/E/S actual EPS for quarter  $t$  minus the analyst forecast for quarter  $t$ , deflated by beginning of quarter  $t$  stock price in Compustat. We use the single most recent forecast made by the timeliest analyst(s) prior to the earnings announcement date as our analyst forecast.<sup>17</sup> When there is more than one analyst forecast on the most recent day, we take the mean of these forecasts. Consistent with prior studies, we convert  $RW$  and  $AF$  into earnings surprise deciles based on the magnitude of earnings surprises in the population in the same quarter. Similar to Livnat and Mendenhall (2006), we focus on a 60-day post-earnings-announcement period and require firms to have stock return data from the CRSP Daily Stock file during the period  $[-1, +65]$  surrounding earnings announcement dates. We obtain 129,215 observations based on these selection

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<sup>14</sup> We use earnings announcements dates from I/B/E/S because we require analyst forecasts issued prior to I/B/E/S earnings announcement dates. The earnings announcement dates in I/B/E/S differ from Compustat by no more than one calendar day.

<sup>15</sup> While prior research uses Compustat actual earnings to calculate RW earnings surprises, we use I/B/E/S actual earnings to be consistent with the definition of AF earnings surprises. Livnat and Mendenhall (2006) demonstrate that using I/B/E/S actual earnings does not significantly alter the RW drift. Our results are similar when we use Compustat actual earnings to calculate RW earnings surprises.

<sup>16</sup> Following Livnat and Mendenhall (2006), we define RW and AF so that they only differ in expected earnings (i.e., they have the same reported actual earnings and same deflator). In sensitivity analyses, we use the standard deviation of prior RW surprises over the past eight quarters as the deflator for RW (Bernard and Thomas 1990) and obtain similar results.

<sup>17</sup> Brown and Caylor (2005) argue that the most recent forecast is a better proxy for expected earnings than the consensus forecast for two reasons. First, using the most recent forecast mitigates the effects of pre-announcements. Second, evidence suggests that the most recent forecast is more closely related to the stock price reaction to earnings announcements (Brown and Kim 1991). When we use the consensus analyst forecast as the benchmark for our analysis, we obtain qualitatively similar results.

criteria. Finally, we merge this data with excess net-buy measures and require no missing excess net-buy measures for both the [-1, +1] and [+6, +65] periods following earnings announcements.<sup>18</sup> For regression analyses, we delete observations in the top or bottom one-percentile in the distributions of excess net-buy measures. Our final sample includes 73,469 observations for 5,661 firms.<sup>19</sup>

### **Descriptive Statistics for the Earnings Announcements Period**

Table 1 displays abnormal returns and average excess net-buy for small and large traders during the three-day [-1, +1] earnings announcement period, for quintiles of RW and AF earnings surprises. Panel A reports the magnitude of the average value of three-day cumulative abnormal returns for the 25 portfolios formed by the RW and AF earnings surprises quintiles. Within each AF quintile, abnormal returns generally increase in RW quintiles, and within each RW quintile, abnormal returns generally increase in AF quintiles, consistent with Walther (1997).

[INSERT TABLE 1 ABOUT HERE]

Panel B of Table 1 shows the mean values of three-day average excess net-buy for small traders around the earnings announcement period for the 25 portfolios formed by RW and AF quintiles. Within each AF quintile, small traders' excess net-buy generally increases in RW quintiles. On the other hand, within each RW quintile, the pattern with respect to AF quintiles is less clear. Consistent with Bhattacharya (2001) and Battalio and Mendenhall (2005), our data suggest that small traders react more to RW earnings surprises during the announcement period.

Panel C of Table 1 shows the mean value of three-day average excess net-buy for large traders around the earnings announcement period. Within each RW quintile, large traders' excess net-buy generally increases in AF quintiles. However, within each AF quintile, we do not observe any systematic pattern

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<sup>18</sup> Because our focus is on trading during the *post*-earnings-announcement period, we do not analyze trading data during [+2, +5] window to avoid ambiguity as prior research (Morse 1981; Bamber 1987) finds that volume reactions extend up to day +5.

<sup>19</sup> To determine if results are robust to less stringent sample criteria, we relax the requirement that each firm-quarter has 60 days of post-announcement trading data. Specifically, we compute the daily average post-announcement buy-sell order imbalance for firm-quarters that have at least 20 days of buy-sell order imbalance data during the [+6, +65] post-announcement period. Relaxing this requirement increases the total number of observations in our main analysis to 94,917 (out of 112,876 observations after we require TAQ data for the 40-day control period and 3-day announcement period) and yields similar results.

between large traders' excess net-buy and RW quintiles. In sum, data indicate that large traders' earnings announcement period trading responds only to AF earnings surprises, consistent with Battalio and Mendenhall (2005).<sup>20</sup>

### **Descriptive Statistics for the Post-Earnings-Announcement Period**

Table 2 provides statistics on the 60-day [+6, +65] cumulative abnormal returns during the post-earnings-announcement period, and small and large trader excess net-buy for RW and AF quintiles. Panel A reports the average 60-day cumulative abnormal returns for the 25 portfolios sorted on RW and AF earnings surprises. Overall, the average abnormal returns during the post-earnings-announcement period generally increase both in AF and RW earnings surprises, although the results are not monotonic within quintiles. Regarding the magnitudes of the two drifts, we find that the spread in abnormal returns between *AF5* and *AF1* is 4.8 percent, while the spread between *RW5* and *RW1* is 4.3 percent. The spreads are not statistically different ( $p = 0.60$ ), but they are comparable to those reported by Livnat and Mendenhall (2006), who find a spread of 4.9 percent between the top and the bottom AF deciles, and 3.8 percent between the top and the bottom RW earnings surprise deciles in their sample.

[INSERT TABLE 2 ABOUT HERE]

Panel B of Table 2 presents the mean value of average excess net-buy for small trades for the 60-day post-earnings-announcement period. Results suggest that, within each AF quintile, small trader excess net-buy generally increases in RW quintiles. Thus, consistent with Hypothesis 1, small traders continue to trade on information in RW earnings surprises in the post-announcement period. We also find that small traders' excess net-buys decline in AF quintiles in the second and third RW quintiles. Therefore, it appears that, while small traders continue to trade in the direction of RW earnings surprises, they also trade in the opposite direction of AF earnings surprises.

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<sup>20</sup> We note that the contrarian trading hypothesis in Hirshleifer et al. (2008) predicts that small traders trade contrary to RW earnings surprises (not AF earnings surprise) during the announcement period. We find no evidence of contrarian trading by either small or large traders during the announcement period. Thus, like Hirshleifer et al. (2008), our evidence does not support the contrarian trading hypothesis.



Panel C of Table 2 focuses on the average excess net-buy for large traders during the 60-day post-earnings-announcement period. In the second, third, fourth and fifth quintiles of the RW earnings surprises, large traders' excess net-buys generally increase in AF quintiles. Thus, consistent with Hypothesis 2, large traders continue to trade on information in AF earnings surprises in the post-announcement period. In the first, second, third, and fourth AF quintiles, large traders' excess net-buys generally decrease in RW quintiles. Therefore, it appears that, while large traders continue to trade in the direction of AF earnings surprises, they also trade in the opposite direction of RW earnings surprises.

## V. RESULTS OF HYPOTHESES TESTS

### Trading during the Earnings Announcement Period

We first examine trading during the earnings announcement period. Specifically, to estimate Equation (5), we regress cumulative abnormal returns (*CAR*) or average excess net-buy (*EXBMS*) for small or large traders during the three-day (i.e., [-1, +1]) earnings announcement period on the decile ranks of the seasonal random walk-based earnings surprises (*RW*) and the decile ranks of the analyst-based earnings surprises (*AF*). Following Bernard and Thomas (1989), we scale *RW* and *AF* to be between zero and one in all regression analyses.

$$CAR_{it}/DRIFT_{it}/EXBMS\_Small_{it}/EXBMS\_Large_{it} = \beta_0 + \beta_1 RW_{it} + \beta_2 AF_{it} + \varepsilon_{1it}. \quad (5)$$

We report regression results estimating Equation (5) in Panel A of Table 3. All *t*-statistics in this table and subsequent tables are adjusted for clustering by firm (Rogers 1993). When the three-day *CAR* is the dependent variable, the coefficients on the seasonal random walk earnings surprise, *RW*, and the analyst-based earnings surprise, *AF*, are positive and significant ( $\beta_1 = 0.011$ ,  $t = 10.59$ ,  $p < 0.01$ ;  $\beta_2 = 0.056$ ,  $t = 46.46$ ,  $p < 0.01$ ).<sup>21</sup> An *F*-test indicates that  $\beta_2$  is significantly greater than  $\beta_1$  ( $p < 0.01$ ), suggesting that,

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<sup>21</sup> *RW* and *AF* are not highly correlated (correlation = 0.34), which suggests that 'earnings news' conveyed by the same reported number can generate significant differential implications if investors have different earnings expectation models. Similarly, regression diagnostics do not suggest that multicollinearity is an issue. The variance inflation factor (VIF) for Equation (5) is 1.13, well below the conventional value of 10 indicating a multicollinearity problem. In supplemental analysis, we analyze small and large trades for firms with no I/B/E/S analyst following (i.e., limited or no analyst following). We find that during earnings announcement period small traders react to *RW* earnings surprises while large trades are *not* associated with *RW* earnings surprises. We also find that after earnings announcements small trades are positively associated with *RW* earnings surprises, while large trades are negatively

while the market as a whole reacts to both the RW earnings surprises and the AF earnings surprises (Walther 1997), it reacts more intensely to AF earnings surprises.<sup>22</sup>

[INSERT TABLE 3 ABOUT HERE]

When the small traders' excess net-buy (*EXBMS\_Small*) is the dependent variable, the coefficients on *RW* and *AF* are positive and significant ( $\beta_1 = 0.055, t = 13.84, p < 0.01$ ;  $\beta_2 = 0.016, t = 3.81, p < 0.01$ ), but the coefficient on *AF* is much smaller ( $p < 0.01$ ) than that on *RW*. Thus, small traders react more to the *RW* earnings surprises than to the *AF* earnings surprises.

When the large traders' excess net-buy (*EXBMS\_Large*) is the dependent variable, the coefficient on *RW* is insignificant ( $\beta_1 = 0.005, t = 0.55, p = 0.58$ ) and the coefficient on *AF* is positive and significant ( $\beta_2 = 0.106, t = 11.41, p < 0.01$ ). Thus, large traders appear to respond only to analyst-based earnings surprises during the announcement period, consistent with Battalio and Mendenhall's (2005) result.

### **Testing H1 and H2: Trading during the Post-Earnings-Announcement Period**

Panel B of Table 3 provides the results of estimating Equation (5) for the 60-day (i.e., [+6, +65]) period *after* the earnings announcements. When the cumulative abnormal return, *DRIFT* (i.e., the post-earnings-announcement drift), is the dependent variable, the coefficients on *RW* and *AF* are positive and significant ( $\beta_1 = 0.040, t = 6.73, p < 0.01$ ;  $\beta_2 = 0.043, t = 7.47, p < 0.01$ ), consistent with the existence of distinct *RW* and *AF* drifts (Livnat and Mendenhall 2006). The coefficients for *RW* and *AF* are not statistically different ( $p = 0.71$ ).

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associated with *RW* earnings surprises. These results indicate that small traders react to *RW* earnings surprises at the earnings announcements and continue to trade in the direction of *RW* earnings surprises after the earnings announcements. Large traders, however, are more sophisticated, potentially understand that *RW* earnings surprises are inferior signals, and update their expectations based on other sources of information, such as market, firm, and industry news events, etc. Within the sample of firms without I/B/E/S analyst following, these results also hold for firms in the top tercile of market value and top tercile of large trader trading volume, which suggests that transaction costs do not explain large traders' lack of trading on *RW* earnings surprises.

<sup>22</sup> In sensitivity analyses, we analyze those firms with conflicting signs of *RW* and *AF* earnings surprises. We find that 18.8 percent of the time a firm meets/beats analyst forecasts but fails to beat earnings of the same quarter in the prior year, and 12.5 percent of the time a firm meets/beats prior earnings but reports earnings lower than analysts' expectations. We find that firms with conflicting signs of *RW* and *AF* earnings surprises are not significantly different in size, trading volume, expected growth, number of analyst following, or analysts' forecasts dispersion. Finally, we find that the *RW* and *AF* drifts and related trading patterns are not significantly affected by whether the sign of *RW* and *AF* earnings surprises agree or disagree.

Panel B of Table 3 also presents tests of Hypotheses 1 and 2. Consistent with Hypothesis 1, when we use the post-earnings-announcement small trader excess net-buy as the dependent variable, the coefficient on *RW* is positive and significant ( $\beta_1 = 0.030, t = 15.21, p < 0.01$ ). This evidence indicates that small traders continue to trade in the direction of *RW* earnings surprises after earnings announcements.

Consistent with Hypothesis 2, when the post-earnings-announcement large trader excess net-buy is the dependent variable, the coefficient on *AF* is positive and significant ( $\beta_2 = 0.015, t = 4.30, p < 0.01$ ). This result indicates that large traders continue to trade in the direction of analyst-based earnings surprises after earnings announcements. In combination, this evidence is consistent with distinct sets of traders explaining, at least in part, the two post-earnings-announcement drifts.

Results in Table 3, Panel B also indicate a negative and significant coefficient on *AF* ( $-0.005, t = -2.58, p = 0.01$ ) in the small trader net-buy regression, suggesting that, while small traders continue to trade in the direction of the *RW* earnings surprises, they also trade in the opposite direction of the *AF* earnings surprises. Similarly, we find a negative and significant coefficient on *RW* ( $-0.018, t = -5.77, p < 0.01$ ) in the large trader net-buy regression, suggesting that, while large traders continue to trade in the direction of the *AF* earnings surprises after the earnings announcements, they also trade in the opposite direction of the *RW* earnings surprises. These results are similar to the relations we find in univariate comparisons.

A plausible explanation for large traders trading in the opposite direction of *RW* earnings surprises during the post-announcement period is that they provide liquidity to small traders trading on *RW* earnings surprises. Specifically, because large traders have an earnings expectation model different from that of small traders and consequently a different and independent estimate of the intrinsic value of the same firm, they may sell a security when the demand by small traders for the security pushes its price above large traders' private valuation of the security.

Liquidity trading is less likely to explain the negative association between trades by less sophisticated small traders and *AF* earnings surprises, and thus, we investigate an alternative explanation: attention-based trading. Lee (1992), Battalio and Mendenhall (2005) and Hirshleifer et al. (2008) find that small

traders are net buyers irrespective of the direction of the earnings surprise. Barber and Odean (2008) argue that retail investors are heavily influenced by a “news attention” effect that prompts buying whenever a company is in the news. To test the possibility that the negative coefficient on  $AF$  may be due primarily to net-buying by small traders when  $AF$  is negative, we add to Equation (5) an indicator variable,  $NegAF$ , which equals one if the analyst-based earnings surprise is negative and zero otherwise. Consistent with individual net buys following negative AF surprises explaining the negative association between small trades and AF surprises, the coefficient on  $NegAF$  is positive and significant, while the coefficient on  $AF$  becomes insignificant.<sup>23</sup> Further, following Barber and Odean (2008), we add trading volume,  $Vol$ , to Equation (5) to proxy for news attention and interact it with  $NegAF$ . We define  $Vol$  as the average daily trading volume during the earnings announcement period [-1, +1], scaled by the average daily trading volume during the control period [-45, -6]. Consistent with attention-based trading, the coefficient on  $NegAF \times Vol$  is positive and significant while the coefficients on  $NegAF$  and  $AF$  are insignificant.<sup>24</sup>

### **Testing H3 and H4: Effects of Announcement Period Trading Intensity on the Post-Earnings-Announcement Drift**

Hypothesis 3 (4) predicts that the intensity of earnings announcement period trading by small (large) traders on RW (AF) earnings surprises reduces the magnitude of the post-earnings-announcement drift associated with RW (AF) earnings surprises. We run the following regression to test Hypotheses 3 and 4:

$$\begin{aligned}
 DRIFT_{it} = & \theta_0 + \theta_1 RW_{it} + \theta_2 AF_{it} + \theta_3 EXBMS\_Small_{it} + \theta_4 EXBMS\_Large_{it} \\
 & + \theta_5 RW_{it} \cdot EXBMS\_Small_{it} + \theta_6 AF_{it} \cdot EXBMS\_Small_{it} \\
 & + \theta_7 RW_{it} \cdot EXBMS\_Large_{it} + \theta_8 AF_{it} \cdot EXBMS\_Large_{it} \\
 & + \theta_9 RW_{it} \cdot TransCost_{it} + \theta_{10} AF_{it} \cdot TransCost_{it} + \theta_{11} TransCost_{it} + \varepsilon_{2it},
 \end{aligned} \tag{6}$$

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<sup>23</sup> To assure that attention trading does not explain the negative coefficient for  $RW$  in the large trade regression, we run a similar analysis for large trades, including an indicator variable,  $NegRW$ , which equals one if the seasonal random walk earnings surprise is negative and zero otherwise. Including  $NegRW$  does not affect the negative coefficient for  $RW$ .

<sup>24</sup> The coefficient on  $Vol$  is also positive and significant. The positive and significant coefficients on  $Vol$  and  $NegAF \times Vol$  imply an asymmetric net buying by small traders in response to the news effect, with small traders reacting more to negative AF news. This intriguing finding is consistent with negative news drawing more attention-based trading by small traders and warrants further study by future research.

where *DRIFT* is the 60-day [+6, +65] cumulative abnormal return. *EXBMS\_Small* and *EXBMS\_Large* are the three-day [-1, +1] announcement period excess net-buy for small and large traders, respectively.

*TransCost* is a measure of transaction cost that takes on values between 0 and -1 and is defined as minus one times the average of scores on the following three dimensions: (a) the decile ranking (scaled to between 0 and 1) of market value at the end of the earnings announcement quarter, (b) the decile ranking (scaled to between 0 and 1) of trading volume over the preceding fiscal year ending in the earnings announcement quarter, and (c) an indicator variable that equals 1 if price at the end of the earnings announcement quarter is greater than \$10 and 0 otherwise (Bhushan 1994; Kimbrough 2005).<sup>25</sup>

We test whether small (large) trades during the announcement period attenuate the relation between RW (AF) earnings surprises and post-announcement returns by interacting small (large) trades with RW (AF) earnings surprises in Equation (6). In this regression, the coefficient on the interaction term between small trades and RW earnings surprise (*RW·EXBMS\_Small*) captures whether earnings announcement trading by small traders attenuates the association between RW earnings surprises and post-announcement returns (i.e., the RW drift), as posited by H3. The coefficient on the main effect of announcement period small trades (*EXBMS\_Small*) captures the overall relation between small trades and post-announcement returns, unconditioned on RW earnings surprises. We expect a negative coefficient on *RW·EXBMS\_Small*.

Likewise, the coefficient on the interaction term between large trades and AF earnings surprises (*AF·EXBMS\_Large*) captures whether earnings announcement trading by large traders attenuates the association between the AF earnings surprises and post-announcement returns (i.e., the AF drift), as posited by H4. Similarly, the coefficient on the main effect of large trades (*EXBMS\_Large*) captures the overall relation between announcement period large trades and post-announcement returns, unconditioned on AF earnings surprises. We expect a negative coefficient on *AF·EXBMS\_Large*.

Transaction costs reduce the incentives for arbitrage activities and, *ceteris paribus*, should enhance the post-earnings-announcement drift. Accordingly, we expect the coefficients on *RW·TransCost* and

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<sup>25</sup> Results are similar if we use bid-ask spread as an alternative measure of transaction cost.

*AF·TransCost* to be positive to the extent that transaction costs limit arbitrage opportunities associated with the RW and AF drifts.

Table 4 presents the results from estimating Equation (6). In Column (1), we report the results from estimating Equation (6) separately for small traders (i.e., excluding the *EXBMS\_Large<sub>it</sub>* variable and related interactions). In Column (2), we report the results from estimating Equation (6) separately for large traders (i.e., excluding the *EXBMS\_Small<sub>it</sub>* variable and related interactions), and in Column (3), we report the results including both the small trade and large trade variables.

[INSERT TABLE 4 ABOUT HERE]

In Column (1), the coefficients on *RW* and *AF* are positive and significant, verifying that the drift is associated with both RW and AF earnings surprises. In addition, consistent with Hypothesis 3, the coefficient on *RW·EXBMS\_Small* is negative and significant ( $\theta_5 = -0.044$ ,  $t = -3.20$ ,  $p < 0.01$ ). As predicted, this evidence suggests that small traders' announcement period trading intensity, conditioned on RW earnings surprises, reduces the magnitude of the RW drift.<sup>26</sup> In contrast, the coefficient on *AF·EXBMS\_Small* is insignificant ( $\theta_6 = 0.009$ ,  $t = 0.47$ ,  $p = 0.64$ ), indicating that small traders' announcement period trading intensity does not reduce the AF drift.<sup>27</sup> Finally, consistent with the drifts increasing with higher transaction costs, we find positive and significant coefficient on *RW·TransCost* (0.076,  $t = 2.67$ ,  $p < 0.01$ ) and positive but insignificant coefficient on *AF·TransCost* (0.042,  $t = 1.49$ ,  $p = 0.14$ ).<sup>28</sup>

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<sup>26</sup> Hirshleifer et al. (2008) find that adding the *main* effect of individual investor trades during the announcement period to a regression of post-announcement returns on the RW earnings surprises does not decrease the power of RW to explain post-announcement returns. We are able to reconcile this result. Similar to Hirshleifer et al. (2008), we find that the *main* effect for net small trades does not decrease the power of RW to explain post-announcement returns. In contrast to Hirshleifer et al. (2008), we posit that small trades during the announcement period attenuates the RW portion of the drift (i.e., the association between the RW earnings surprise and post-announcement returns). To capture the statistical significance of this attenuation, we therefore *interact* small trades with the RW earnings surprises (and also include small trades as a main effect) in the regression of post-announcement returns on the RW earnings surprises (see Equation (6)).

<sup>27</sup> If small traders were to arbitrage the AF drift, we would expect their trading intensity at the earnings announcements should be positively associated with their expected profits of this strategy (i.e., the magnitude of the AF drift), which would result in a positive relation between AF drift and the interaction term of *AF* and *EXBMS\_Small*. The insignificant coefficient on the interaction term *AF* and *EXBMS\_Small* in Table 4 is inconsistent with arbitrage by small traders.

<sup>28</sup> Evidence that the RW drift increases with transaction cost is consistent with transaction costs providing one explanation for why large traders do not completely eliminate the RW drift.

Consistent with Hypothesis 4, Column (2) reports a negative and significant coefficient on  $AF \cdot EXBMS\_Large$  ( $\theta_8 = -0.017$ ,  $t = -2.07$ ,  $p = 0.04$ ). Thus, as predicted, large traders' announcement period trading intensity in the direction of AF earnings surprises reduces the AF drift. Interestingly, the coefficient on  $RW \cdot EXBMS\_Large$  is positive and marginally significant ( $\theta_7 = 0.015$ ,  $t = 1.72$ ,  $p = 0.09$ ), suggesting that when large traders trade more intensely during the earnings announcement period in the direction of RW earnings surprises, the RW drift is enhanced.<sup>29</sup> As in Column (1), Column (2) also reports positive coefficients on  $RW \cdot TransCost$  ( $0.077$ ,  $t = 2.71$ ,  $p < 0.01$ ) and  $AF \cdot TransCost$  ( $0.044$ ,  $t = 1.54$ ,  $p = 0.12$ ).

When we run regression Equation (6) with small and large traders together, we obtain similar results. Specifically, in Column (3) the coefficients on  $RW \cdot EXBMS\_Small$  and  $AF \cdot EXBMS\_Large$  are negative and significant ( $\theta_5 = -0.046$ ,  $t = -3.29$ ,  $p < 0.01$ ;  $\theta_8 = -0.018$ ,  $t = -2.16$ ,  $p = 0.03$ ). In sum, this analysis suggests that the RW and AF drifts, at least in part, are attributable to the underreaction (i.e., incomplete trading) by different groups of investors with alternative earnings expectations models.

## VI. EVIDENCE OF ADDITIONAL DIFFERENCES BETWEEN THE RW AND AF DRIFTS

We conduct several analyses to further explore and contrast the RW and AF drifts. While our evidence suggests that the RW and AF drifts are attributable to distinct investor groups that underreact to RW and AF earnings surprises, we expect the nature of these two drifts to be qualitatively different because large traders are considered relatively more sophisticated than small traders (e.g., as evidenced by their more sophisticated earnings expectation model). In this section we provide additional analyses that investigate the persistence of trading associated with each drift, the predictability of post-announcement

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<sup>29</sup> Ke and Ramalingegowda (2005) and Ali et al. (2007) find evidence consistent with certain institutional investors exploiting the RW drift. A significant positive coefficient on  $RW \cdot EXBMS\_Large$  is consistent with large traders initiating trades around earnings announcements to profit from the RW drift. Specifically, in anticipation of the RW drifts, some sophisticated large traders may trade at the earnings announcements based on the RW surprises. Subsequently, they can trade against the orders of small traders for a profit during the post-earnings-announcement period. The trading intensity of large traders at the earnings announcements should be positively associated with their expected profits of this strategy (i.e., the magnitude of the RW drift), which would result in a positive relation between RW drift and the interaction term of  $RW$  and  $EXBMS\_Large$ . We note, however, that based on the results in Panel A, Table 3, during the announcement period large traders *on average* do not trade on the RW earnings surprises (the coefficient on  $RW$  is insignificant). Therefore, as one might expect, arbitrage trading on the RW signal does not seem to be a significant motive for the *average* large trader at earnings announcements.

trades based on prior earnings surprises, the roles of analyst forecast heterogeneity and analyst forecast revisions after earnings announcements in explaining the drifts, and how the RW and AF drifts have changed in recent years.

### **Persistence of Trading after the Earnings Announcements**

While we find that small and large investors underreact to distinct forms of earnings surprises, we further investigate whether the persistence of investors' post-announcement trading varies predictably with investor sophistication. To the extent that small traders are relatively less sophisticated than large traders as prior studies argue (Bhattacharya 2001; Bhattacharya et al. 2007; Malmendier and Shanthikumar 2007), we expect small traders' trading on information in RW earnings surprises to continue longer during the post-earnings-announcement period and large traders' trading on information in AF earnings surprises to concentrate at the early stage of the post-announcement period.

To test our expectation, we divide the 60-day post-earnings-announcement period into three 20-day periods. We run the same regression Equation (5) for small and large traders during these three 20-day sub-periods. We expect that large traders' activities are more concentrated in the first 20-day sub-period, while small traders' activities are more evenly distributed among these three sub-periods.

Consistent with expectations, results in Panel A of Table 5 show that small traders' activities do not mainly concentrate in the early sub-period. In particular, the coefficient on *RW* is positive and significant in all three 20-day periods ( $\beta_1 = 0.023$ ,  $t = 9.59$ ,  $p < 0.01$  for the first 20-day period,  $\beta_1 = 0.033$ ,  $t = 12.80$ ,  $p < 0.01$  for the second 20-day period, and  $\beta_1 = 0.034$ ,  $t = 11.70$ ,  $p < 0.01$  for the third 20-day period). In fact, it appears that small traders' trading activities are persistent and even become more intensified over time. Indeed, using a stacked regression including each 20-day period, we find that the coefficients for the second and third 20-day periods are significantly larger than the coefficient for the first 20-day period ( $t = 4.36$ ,  $p < 0.01$  and  $t = 3.78$ ,  $p < 0.01$ , respectively).<sup>30</sup> Panel B reports results for large traders. The

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<sup>30</sup> We conjecture that feedback loop trading (De Long et al. 1990a; 1990b) and/or increased attention (Barber and Odean 2008) cause small traders' trading intensity to increase in subperiods after the earnings announcements. Feedback loop trading suggests that a subset of small traders trade in an early subperiod and the price changes due to their trading cause another subset of small traders to trade in a later subperiod. Increased attention suggests that a



coefficients on  $AF$  are positive and decline in magnitude ( $\beta_2 = 0.018$ ,  $t = 3.27$ ,  $p < 0.01$  for the first 20-day period,  $\beta_2 = 0.014$ ,  $t = 2.46$ ,  $p = 0.01$  for the second 20-day period, and  $\beta_2 = 0.010$ ,  $t = 2.05$ ,  $p = 0.04$  for the third 20-day period). Using a stacked regression including each 20-day period, we find that the coefficients for the second and third 20-day periods are significantly smaller than the coefficient for the first 20-day period ( $t = -1.67$ ,  $p = 0.09$  and  $t = -1.83$ ,  $p = 0.07$ , respectively). Thus, consistent with our expectation, large traders' trades are more concentrated during the early stage of the post-announcement period.<sup>31</sup>

[INSERT TABLE 5 ABOUT HERE]

### Trading around Earnings Announcements and Prior Earnings Surprises

If small traders fixate on RW earnings surprises and are unaware of the serial correlations of RW earnings surprises, we expect that small trades around earnings announcements are associated with lagged RW earnings surprises (Bernard and Thomas 1990). In contrast, if large traders are more sophisticated and their underreaction is relatively short-lived, their trades around earnings announcements are less likely to be associated with lagged AF earnings surprises. To examine the associations of trades at earnings announcements and lagged earnings surprises, we run the following regression:

$$EXBMS\_Small_{it}/EXBMS\_Large_{it} = \delta_0 + \delta_1 RW_{it-q} + \delta_2 AF_{it-q} + \varepsilon_{4it}, \quad q = 1, 2, 3, \text{ or } 4, \quad (7)$$

where  $q$  represents lagged one to four quarters.<sup>32</sup>

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subset of small traders trade more when the stock catches more of their attention as other investors trade more. To determine which conjecture more likely explains the increased small traders' trading intensity after earnings announcements, we regress small traders' trading during the third subperiod [+46, +65] on the two forms of earnings surprises,  $RW$  and  $AF$ , the cumulative abnormal return during [+6, +45]  $CAR_{+6, +45}$  (or trading volume during [+6, +45]  $Vol_{+6, +45}$ ) and its interaction with the random walk based earnings surprise  $RW \times CAR_{+6, +45}$  (or  $RW \times Vol_{+6, +45}$ ). The coefficients on  $RW \times CAR_{+6, +45}$  and  $RW \times Vol_{+6, +45}$  are positive and significant, supporting both the feedback loop trading conjecture and the increased attention conjecture. However, when  $RW \times CAR_{+6, +45}$  and  $RW \times Vol_{+6, +45}$  are included simultaneously in the model, the effect of  $RW \times CAR_{+6, +45}$  become insignificant while the effect of  $RW \times Vol_{+6, +45}$  remains positive and significant, suggesting that the attention-based trading effect is likely more dominant.

<sup>31</sup> We find that the association between large trades and AF surprises are no longer significant ( $p = .18$ ) in the [+46, +65] period when we use a stronger cut on outliers (top and bottom 2 percent). Hence, it appears that the significant association between large trades and AF surprises over the [+46, +65] period is driven by a small number of outliers.

<sup>32</sup> We start with a replication of the serial correlations of RW and AF earnings surprises (Bernard and Thomas 1990; Abarbanell and Bernard 1992) for our sample. Consistent with Bernard and Thomas (1990), we find a “+, +, +, -” pattern for first- to fourth-order serial correlations among RW earnings surprises with declining magnitudes (replication results not tabulated). Consistent with Abarbanell and Bernard (1992), we find positive serial

Table 6 reports the results from estimating Equation (7). We find that average excess net-buy for small traders around earnings announcements are positively associated with  $RW_{t-1}$  (0.043,  $t = 9.33$ ,  $p < 0.01$ ),  $RW_{t-2}$  (0.027,  $t = 5.84$ ,  $p < 0.01$ ),  $RW_{t-3}$  (0.024,  $t = 5.21$ ,  $p < 0.01$ ), and  $RW_{t-4}$  (0.017,  $t = 3.78$ ,  $p < 0.01$ ). These results suggest that small trades around one- to four-quarter ahead earnings announcements are predictable based on prior RW earnings surprises. On the other hand, we find that excess net-buys for large traders are not associated with prior AF earnings surprises, indicating that large trades around future earnings announcements cannot be predicted based on prior AF earnings surprises. This evidence suggests that the RW drift (but not AF drift) is largely explained by small or unsophisticated traders' failure to recognize the time-series properties of earnings, consistent with investor naiveté.

[INSERT TABLE 6 ABOUT HERE]

### Heterogeneous Forecasts and Post-Announcement Trading

To further differentiate the RW and AF drifts, we investigate whether the AF drift and post-announcement trades by large traders associated with the AF earnings surprise are more pronounced when the AF earnings surprise is more difficult to interpret (i.e., a longer price discovery process when earnings surprises are more difficult to interpret). Prior research finds that the AF drift is greater when analysts' forecasts are more heterogeneous (Liang 2003), suggesting that investors have difficulty interpreting AF earnings surprises when analysts' forecasts are less correlated. Based on Liang (2003), we estimate the following regression model to test the effects of forecast heterogeneity on drift and post-announcement trading:

$$CAR_{it}/EXBMS\_Large_{it}/EXBMS\_Small_{it} = \gamma_0 + \gamma_1 RW_{it} + \gamma_2 AF_{it} + \gamma_3 AF_{it} \cdot Hetero_{it} + \gamma_4 Hetero_{it} + \varepsilon_{6it}. \quad (8)$$

where *Hetero* equals one minus the BKLS analyst' consensus (i.e., Barron et al. 1998). Specifically, we compute *Hetero* as:

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correlations among AF earnings surprises for first- to fourth-order serial correlations with declining magnitudes (replication results not tabulated). We also replicate prior results that future returns around earnings announcements are predictable by regressing 3-day *CAR* regressions on lagged RW earnings surprises. We find that 3-day *CAR* is positively associated with lagged one and two quarters' RW earnings surprises and lagged one to three AF earnings surprises. Further, the coefficients on RW and AF earnings surprises decline in magnitude from lagged one to lagged four quarters (replication results not tabulated).

$$1 - \frac{SE - D/N}{(SE - D/N) + D}, \quad (9)$$

where  $D$  is the forecast dispersion, the sample variance of one-year-ahead annual earnings forecasts reported within 30 days following earnings announcement;  $N$  is the number of those forecasts;  $SE$  is the squared difference between the actual annual EPS and the mean of those forecasts. If there is only one forecast available, we set *Hetero* to zero (i.e., no heterogeneous information contained in analysts' forecasts). Consistent with Liang (2003), we transform *Hetero* into deciles scaled between [0, 1]. We predict that the coefficient for  $AF \cdot Hetero$  should be positive in both the *CAR* and *EXBMS\_Large* regressions if the AF drift and post-announcement trading on AF earnings surprises by large traders is more pronounced when analysts forecasts are more heterogeneous.

Results in Table 7 are consistent with our expectation. Specifically, we find that the coefficient on  $AF \cdot Hetero$  is positive and significant in the large traders' trading regression ( $\gamma_3 = 0.009$ ,  $t = 2.67$ ,  $p = 0.01$ ), indicating that large traders' post-earnings-announcement period trading associated with AF earnings surprises is more pronounced when analysts' forecasts are more heterogeneous. Similar to Liang (2003), we also find a positive coefficient on  $AF \cdot Hetero$  in the *CAR* regression ( $\gamma_3 = 0.056$ ,  $t = 5.83$ ,  $p < 0.01$ ). This evidence is consistent with investors and analysts requiring more post-announcement information or price discovery to interpret earnings surprises when analyst forecasts are more heterogeneous. Finally, consistent with the pattern in our previous analyses, the results for small traders are opposite to the results for large traders. Specifically, we find a negative and significant coefficient for  $AF \cdot Hetero$  in the small trader regression ( $\gamma_3 = -0.030$ ,  $t = -8.02$ ,  $p < 0.01$ ).

[INSERT TABLE 7 ABOUT HERE]

### **Effect of Analyst Forecast Revisions during the Post-Announcement Period**

We next investigate how analyst forecast revisions in the post-earnings-announcement period affect large and small traders' post-announcement trading on earnings surprises. We propose that large traders' underreaction is corrected in the post-announcement period through a price discovery process and offer analyst forecast revisions as one source of information discovery (Gleason and Lee 2003). Specifically,

we conjecture that post-announcement trades on AF earnings surprises may be at least partially explained by analyst forecast revisions in the post-announcement period that are correlated with AF earnings surprises. Because our previous results suggest that small traders are less likely to trade on AF earnings surprises, we expect that analyst forecast revisions are less likely to explain small traders' post-announcement trades. We estimate the following regression to determine whether large and small trades on RW and AF earnings surprises in the post-announcement period are partially explained by post-announcement analyst forecast revisions:

$$DRIFT_{it}/EXBMS\_Small_{it}/EXBMS\_Large_{it} = \lambda_0 + \lambda_1 RW_{it} + \lambda_2 AF_{it} + \lambda_3 Rev_{it} + \varepsilon_{5it}, \quad (10)$$

where *Rev* is the decile rank of analyst forecast revisions during the post-earnings-announcement period. We compute an analyst's forecast revision as an analyst's most recent forecast issued during [+46, +65] window minus the *same* analyst's earliest forecast issued during the [+6, +25] window, scaled by lag stock price (Gleason and Lee 2003). To aggregate analyst-level revisions to firm-level, we average individual analysts' revisions for each announcement event. We code forecast revisions as zero if the I/B/E/S Detail file reports no associated forecasts.

We report regression results for Equation (10) in Panel A of Table 8.<sup>33</sup> In the regression with post-announcement stock returns as the dependent variable, the coefficient on *Rev*, is positive, 0.273, and significant ( $t = 51.57, p < 0.01$ ). As expected, this evidence suggests that market returns incorporate information contained in analyst forecast revisions. Controlling for post-announcement revisions causes the coefficient on *RW* to drop from 0.040 ( $t = 6.73, p < 0.01$ ) to 0.011 ( $t = 1.91, p = 0.06$ ; the coefficient decrease is significant at  $p < 0.01$ ) and the coefficient on *AF* to drop from 0.043 ( $t = 7.47, p < 0.01$ ) to 0.020 ( $t = 3.51, p < 0.01$ ; the coefficient decrease is significant at  $p < 0.01$ ). This evidence suggests that the information captured by analyst forecast revisions explains substantial portions of the RW and AF drifts.

[INSERT TABLE 8 ABOUT HERE]

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<sup>33</sup> The Pearson correlation between *RW* and *Rev* is 0.1234 and between *AF* and *Rev* is 0.1147, consistent with prior research showing an association between post-earnings-announcement analyst forecast revisions in the post-announcement period and both random walk earnings changes and analyst-based earnings surprises (Abarbanell and Bernard 1992).

When we use excess buy-sell order imbalance of large traders as the dependent variable, the coefficient on *Rev* is positive, 0.027, and significant ( $t = 12.93$ ,  $p < 0.01$ ), consistent with large traders incorporating the information contained in analyst forecast revisions in their trades. With the inclusion of revisions, the coefficient on *AF* declines from 0.015 ( $t = 4.30$ ,  $p < 0.01$ ) to 0.008 ( $t = 3.37$ ,  $p < 0.01$ ), a 46.67 percent decrease (significant at  $p < 0.01$ ), whereas the coefficient on *RW* remains largely unchanged. This evidence suggests that much of the post-announcement trading by large traders based on *AF* earnings surprises is attributable to information contained in analyst forecast revisions that continue to be correlated with *AF* earnings surprises well after the earnings announcements. This evidence is also consistent with the *AF* drift being largely attributable to a longer price discovery process by large traders, with analyst forecast revisions serving as one source of information discovery. In the small-trade regression, the coefficients on *RW* and *AF* are unchanged, while the coefficient on *Rev* is negative and significant. This evidence suggests that post-announcement small trades associated with *RW* earnings surprises are not explained by information contained in analyst forecasts.<sup>34</sup>

Panel B of Table 8 presents results of large trades in the three 20-day subperiods. In this analysis, we compute an analyst's forecast revision as an analyst's most recent forecast issued during the respective 20-day subperiod minus the same analyst's previous most recent forecast, scaled by lag stock price. We then aggregate analyst-level revisions to firm-level by averaging individual analyst forecast revisions and calculate *Rev* as the decile rank of the firm-level amounts. We find that the association between large trades and *AF* surprises becomes less significant during the [+26, +45] period and completely disappears during the [+46, +65] period after we control for *Rev*, whereas the association between large trades and *Rev* remains significant across each subperiod. This evidence is consistent with price discovery through

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<sup>34</sup> We obtain similar results in tests in which we include three separate analyst forecast revision variables defined as the difference between the mean value of all annual forecasts issued during the second half of the trading month (e.g., the 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> month following the earnings announcement) and the mean value of annual forecasts issued during the first half of the respective month.

analyst forecast revisions explaining the association between AF surprises and large trades well after earnings announcements.<sup>35</sup>

### Market and Trading Reactions to Earnings Surprises Over Time

In recent years, analyst forecasts have become more readily available to all investors, which may result in small traders shifting away from RW earnings expectations (Brown and Caylor 2005). Likewise, in recent years, the analyst forecast drift appears to have received more attention, which could result in decreased AF drift as investors either arbitrage the drift or simply react more thoroughly to AF earnings surprises at earnings announcements. We explore these possibilities by introducing a time trend indicator into the following regression model:

$$DRIFT_{it}CAR_{it}/EXBMS\_Small_{it}/EXBMS\_Large_{it} = \varphi_0 + \varphi_1RW_{it} + \varphi_2AF_{it} + \varphi_3RW_{it} \cdot Recent_{it} + \varphi_4AF_{it} \cdot Recent_{it} + \varphi_5Recent_{it} + \varepsilon_{7it}, \quad (11)$$

where *Recent* is an indicator variable that equals one if an earnings announcement occurs after 1999 and zero otherwise.<sup>36</sup>

Table 9 reports the results from this analysis. During the 3-day earnings announcement period, when we use abnormal return as the dependent variable, the coefficient on *RW·Recent* is insignificant, while the coefficient on *AF·Recent* is positive and significant (0.009,  $t = 4.36$ ,  $p < 0.01$ ), suggesting the market reacts more to AF earnings surprises in more recent years, consistent with Brown and Caylor (2005). When we use excess net-buy of small traders as the dependent variable, the coefficient on *RW·Recent* is negative and significant (-0.066,  $t = -8.01$ ,  $p < 0.01$ ) while the coefficient on *AF·Recent* is positive and significant (0.027,  $t = 3.06$ ,  $p < 0.01$ ), suggesting that small traders decrease their reliance on RW earnings expectations and increase their use of analyst forecasts in more recent years (e.g., as analyst forecasts are more accessible). In comparing the sum of the coefficients for *RW* and *RW·Recent* (.090 + -

<sup>35</sup> To provide further evidence that the AF drift may reflect a price discovery process through analyst forecast revisions after earnings announcements, we sort sample firms into quintile portfolios based on forecast revision frequency and examine how the AF drift varies across these portfolios in the post-announcement period. Consistent with a price discovery story, we find that when analysts' forecast revision frequency increases across Quintiles 2 through 5, the AF drift becomes more pronounced.

<sup>36</sup> We use the year 1999 to split the sample for two reasons. First, this split roughly divides our sample in half. Second, cusum statistics (Han and Park 1989) based on recursive least squares regressions of the drift indicate a structural shift in 1999.

.066 = .024) to the sum of the coefficients for *AF* and *AF·Recent* ( $-.000 + .027 = .027$ ), evidence suggest that in the later part of our sample period small traders trade approximately equally on RW and AF earnings surprises ( $F = 0.09, p = 0.763$ ). In contrast, large traders continue to trade only on AF earnings surprises, although the association between large trades and the AF earning surprise declines in the later part of the sample period (i.e., the coefficient for *AF·Recent* is negative and significant ( $-0.067, t = -3.63, p < 0.01$ )).

[INSERT TABLE 9 ABOUT HERE]

During the post-earnings-announcement period, the magnitude of the AF drift decreases in more recent years (i.e., the coefficient for *AF·Recent* is negative and significant ( $-0.073, t = -6.11, p < 0.01$ ) while the RW drift does not change (i.e., the coefficient for *RW·Recent* is insignificant). This evidence is consistent with a more efficient processing of information contained in the AF earnings surprises in more recent years as the AF drift has received more attention.<sup>37</sup> Given the relatively new discovery and the little attention that the AF drift had received during the earlier years in our sample, we speculate that sophisticated investors may have not been exploiting the AF drift during this time period, which could explain the larger AF drift in earlier years.

When we use excess net-buy of small traders as the dependent variable, we find that small traders' post-announcement trading intensity related to RW decreases in more recent years (the coefficient for *RW·Recent* is  $-0.053, t = -12.85, p < 0.01$ ), while that related to AF increases in more recent years (coefficient for *AF·Recent* is  $0.020, t = 4.33, p < 0.01$ ). These results are consistent with the trading results around earnings announcements (i.e., decreased trading by small traders on RW earnings surprises).<sup>38</sup> However, we continue to find a significant association between small trades and RW earnings surprises in

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<sup>37</sup> The sum of *AF* and *AF·Recent* is 0.010 ( $F = 3.82, p = 0.08$ ), suggesting a marginally significant AF drift in more recent years (2000 – 2005). Though we lack TAQ data for 2006 and 2007, we examined the AF drift for these years and find no evidence of an AF drift, consistent with a declining AF drift in recent years.

<sup>38</sup> To determine if the small trade results are robust to a period when sophisticated traders less frequently split their trades into smaller trades, we re-estimated Equation (11) focusing on the pre-1999 subsample period and re-defining *Recent* equal to one if the sample year is between 1996 and 1998 and zero if the sample year is between 1993 and 1995. Results are similar – e.g., we find positive coefficients for *AF·Recent* in the small trade regressions during the earnings announcement and the post-earnings-announcement periods.

the post-announcement period in the more recent time period (i.e., the sum of  $RW$  and  $RW \cdot Recent$  is .006,  $F = 11.66, p < 0.01$ ).

When we use excess net-buy of large traders as the dependent variable, we find a decrease in trading on AF earnings surprises in the post-earnings-announcement period (i.e.,  $AF \cdot Recent$  is -0.011,  $t = -1.67, p = 0.09$ ). Nonetheless, we continue to find a significant association between large trades and AF earnings surprises in the post-announcement period in the more recent time period (i.e., the sum of  $AF$  and  $AF \cdot Recent$  is .008,  $F = 2.98, p = 0.09$ ).

## VII. SUMMARY AND CONCLUSION

Recent research finds two distinct post-earnings-announcement drifts associated with RW and AF earnings surprises. We hypothesize that these two drifts are attributable to the trading activities of small and large traders who underreact to different forms of earnings innovations. Consistent with our hypothesis, we find that small (large) traders continue to trade in the direction of RW (AF) earnings surprises after earnings announcements. We corroborate these findings with evidence that when small (large) traders react more thoroughly to RW (AF) based earnings surprises during the announcement period, the respective drift attenuates.

In additional tests, we predict and find that the timing of post-announcement trading varies with trade size – i.e., large (and *relatively* more sophisticated) traders end their post-announcement trading more quickly than small (and *relatively* less sophisticated) traders, and that small trades (but not large trades) at earnings announcements are predictable based on prior earnings surprises. Further, we find that large traders' post-announcement trading is more pronounced when AF earnings surprises are more difficult to interpret (i.e., when analysts' forecasts are more heterogeneous) and that large traders' post-announcement trades based on AF earnings surprises are largely explained by the information contained in post-announcement analyst forecast revisions that are generally in the same directions of the earnings surprises. Finally, we find that the AF drift and related large trades during the post-announcement period have decreased in more recent years as the AF drift may have received more attention.



This study makes the following contributions. First, we predict and find that small traders systematically trade in the direction of RW earnings surprises after earnings announcements, whereas large traders' trading during post-earnings-announcement period is in the direction of AF earnings surprises. This evidence suggests that the RW and AF drifts are attributable, at least in part, to distinct sets of investors who use different earnings expectation models. Second, we provide evidence that trading activities during the earnings announcement period affect the post-earnings-announcement drift. To our knowledge, this is the first study to link either *announcement period trading* or *post-announcement period trading* by distinct groups of investors to the RW and AF *drift*. Third, we find that the two drifts are qualitatively different – delayed small trades associated with random walk-based surprises are consistent with small traders' failure to understand time-series properties of earnings, whereas delayed large trades associated with analyst-based surprises are more consistent with a longer price discovery process. Finally, we find that the AF drift and related large trades during the post-announcement period has decreased in more recent years as the AF drift appears to have received more attention.

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**TABLE 1**  
**Abnormal Returns and Excess Net-Buy for Small and Large Traders**  
**During [-1, +1] Earnings Announcement Period**

**Panel A: Cumulative abnormal returns during [-1, +1]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	-0.030	-0.027	-0.023	-0.017	-0.017	-0.026
<i>AF2</i>	-0.006	-0.011	-0.009	-0.010	-0.003	-0.009
<i>AF3</i>	-0.002	0.005	0.008	0.008	0.001	0.006
<i>AF4</i>	0.006	0.013	0.020	0.022	0.015	0.017
<i>AF5</i>	0.017	0.020	0.021	0.030	0.032	0.027
Average	-0.010	-0.004	0.003	0.011	0.015	

**Panel B: Average excess net-buy for small trades during [-1, +1]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	0.008	0.033	0.044	0.027	0.062	0.026
<i>AF2</i>	0.017	0.034	0.049	0.049	0.052	0.040
<i>AF3</i>	0.038	0.033	0.057	0.075	0.061	0.055
<i>AF4</i>	0.021	0.034	0.045	0.053	0.082	0.050
<i>AF5</i>	0.031	0.058	0.043	0.050	0.082	0.059
Average	0.018	0.034	0.050	0.056	0.074	

**Panel C: Average excess net-buy for large trades during [-1, +1]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	-0.012	-0.029	-0.012	0.001	-0.031	-0.018
<i>AF2</i>	-0.005	0.006	0.000	-0.001	0.051	0.005
<i>AF3</i>	0.041	0.024	0.041	0.034	0.029	0.034
<i>AF4</i>	0.050	0.044	0.078	0.039	0.037	0.049
<i>AF5</i>	0.069	0.061	0.057	0.098	0.081	0.078
Average	0.017	0.015	0.032	0.037	0.050	

**Panel A** shows cumulative abnormal return during [-1, +1] window around earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). **Abnormal return** during the earnings announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. **Seasonal random walk earnings surprise** is defined as I/B/E/S actual EPS for quarter *t* minus I/B/E/S actual EPS for quarter *t*-4, deflated by price per share at the beginning of quarter *t*. **Analyst-based earnings surprise** is defined as I/B/E/S actual EPS for quarter *t* minus most recent forecast for quarter *t*, deflated by price per share at the beginning of quarter *t*. **Panel B** shows average excess net-buy for small trades during [-1, +1] window around earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). Small trade is defined as a trade at maximum \$5,000. **Panel C** shows average excess net-buy for large trades during [-1, +1] window around earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). Large trade is defined as a trade at minimum \$30,000.

**TABLE 2**  
**Abnormal Returns and Excess Net-Buy for Small and Large Trades**  
**During [+6, +65] Post-Earnings-Announcement period**

**Panel A: Cumulative abnormal returns during [+6, +65]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	-0.030	-0.017	-0.005	-0.001	-0.015	-0.023
<i>AF2</i>	-0.030	-0.033	-0.026	-0.010	-0.020	-0.025
<i>AF3</i>	-0.022	-0.019	-0.004	-0.008	0.011	-0.008
<i>AF4</i>	-0.009	-0.023	0.004	0.024	0.012	0.005
<i>AF5</i>	0.004	-0.020	0.013	0.012	0.053	0.025
Average	-0.021	-0.024	-0.008	0.005	0.022	

**Panel B: Average excess net-buy for small trades during [+6, +65]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	0.006	0.013	0.020	0.021	0.025	0.012
<i>AF2</i>	0.010	0.012	0.023	0.024	0.018	0.017
<i>AF3</i>	-0.008	0.004	0.020	0.028	0.035	0.018
<i>AF4</i>	-0.002	0.005	0.011	0.023	0.030	0.016
<i>AF5</i>	0.007	0.011	0.008	0.016	0.029	0.019
Average	0.005	0.009	0.018	0.023	0.028	

**Panel C: Average excess net-buy for large trades during [+6, +65]**

	<i>RW1</i>	<i>RW2</i>	<i>RW3</i>	<i>RW4</i>	<i>RW5</i>	Average
<i>AF1</i>	0.025	0.002	-0.009	0.001	-0.002	0.011
<i>AF2</i>	0.020	0.005	0.004	-0.005	-0.003	0.004
<i>AF3</i>	0.022	0.013	0.007	0.007	-0.006	0.008
<i>AF4</i>	0.025	0.014	0.018	0.012	0.004	0.013
<i>AF5</i>	0.013	0.016	0.025	0.019	0.014	0.015
Average	0.022	0.008	0.008	0.007	0.006	

**Panel A** shows cumulative abnormal return during [+6, +65] window following earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). **Abnormal return** during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. **Seasonal random walk earnings surprise** is defined as I/B/E/S actual EPS for quarter *t* minus I/B/E/S actual EPS for quarter *t*-4, deflated by price per share at the beginning of quarter *t*. **Analyst-based earnings surprise** is defined as I/B/E/S actual EPS for quarter *t* minus most recent forecast for quarter *t*, deflated by price per share at the beginning of quarter *t*. **Panel B** shows average excess net-buy for small trades during [+6, +65] window following earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). Small trade is defined as a trade at maximum \$5,000. **Panel C** shows average excess net-buy for large trades during [+6, +65] window following earnings announcements for seasonal random-walk earnings surprise quintiles (*RW* 1 ~ 5) and for analyst-based earnings surprise quintiles (*AF* 1 ~ 5). Large trade is defined as a trade at minimum \$30,000.

**TABLE 3**  
**Regressions of Abnormal Returns and Excess Net-Buy for Small and Large Trades**

	Panel A 3-Day Announcement Period			Panel B 60-Day Post-Announcement Period		
	<i>CAR</i>	Small Trades	Large Trades	<i>DRIFT</i>	Small Trades	Large Trades
Intercept	-0.031 (-43.31) <sup>***</sup>	0.011 (4.08) <sup>***</sup>	-0.026 (-4.38) <sup>***</sup>	-0.047 (-13.29) <sup>***</sup>	0.004 (3.46) <sup>***</sup>	0.012 (5.84) <sup>***</sup>
<i>RW</i>	0.011 (10.59) <sup>***</sup>	0.055 (13.84) <sup>***</sup>	0.005 (0.55)	0.040 (6.73) <sup>***</sup>	0.030 (15.21) <sup>***</sup>	-0.018 (-5.77) <sup>***</sup>
<i>AF</i>	0.056 (46.46) <sup>***</sup>	0.016 (3.81) <sup>***</sup>	0.106 (11.41) <sup>***</sup>	0.043 (7.47) <sup>***</sup>	-0.005 (-2.58) <sup>***</sup>	0.015 (4.30) <sup>***</sup>
R-square (%)	5.78	0.38	0.26	0.26	0.28	0.16
n	73,469	73,469	73,468	73,469	73,469	73,469

Table 3 shows regression of cumulative abnormal return, average excess net-buy of small trades, and average excess net-buy of large trades during [-1, +1] earnings announcement window and during [+6, +65] window following earnings announcements. **Abnormal return** during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993). <sup>\*\*\*</sup>, <sup>\*\*</sup> and <sup>\*</sup> represent significance levels at two-tailed 1%, 5% and 10%, respectively.



**TABLE 4**  
**Effects of Excess Net-Buy during Earnings Announcements Period on Post-Earnings-Announcement Drift**

	(1)	(2)	(3)
Intercept	-0.066 (-4.08) <sup>***</sup>	-0.067 (-4.14) <sup>***</sup>	-0.066 (-4.07) <sup>***</sup>
<i>RW</i>	0.097 (4.07) <sup>***</sup>	0.097 (4.06) <sup>***</sup>	0.097 (4.07) <sup>***</sup>
<i>AF</i>	0.075 (3.13) <sup>***</sup>	0.077 (3.23) <sup>***</sup>	0.075 (3.13) <sup>***</sup>
<i>RW·EXBMS_Small</i>	-0.044 (-3.20) <sup>***</sup>	-	-0.046 (-3.29) <sup>***</sup>
<i>AF·EXBMS_Small</i>	0.009 (0.47)	-	0.011 (0.56)
<i>RW·EXBMS_Large</i>	-	0.015 (1.72) <sup>*</sup>	0.016 (1.82) <sup>*</sup>
<i>AF·EXBMS_Large</i>	-	-0.017 (-2.07) <sup>**</sup>	-0.018 (-2.16) <sup>**</sup>
<i>RW·TransCost</i>	0.076 (2.67) <sup>***</sup>	0.077 (2.71) <sup>***</sup>	0.076 (2.68) <sup>***</sup>
<i>AF·TransCost</i>	0.042 (1.49)	0.044 (1.54)	0.042 (1.47)
<i>EXBMS_Small</i>	0.042 (3.60) <sup>***</sup>	-	0.042 (3.61) <sup>***</sup>
<i>EXBMS_Large</i>	-	0.001 (0.24)	0.001 (0.10)
<i>TransCost</i>	-0.027 (-1.42)	-0.029 (-1.54)	-0.027 (-1.41)
R-square (%)	0.36	0.33	0.37
Obs.	73,469	73,469	73,469

Table 4 shows regression of cumulative abnormal return during [+6, +65] window following earnings announcements. **Abnormal return** during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. **EXBMS\_Small** is the average excess net-buy for small trades during [-1, +1] window around earnings announcements. Small trade is defined as a trade at maximum \$5,000. **EXBMS\_Large** is the average excess net-buy for large trades during [-1, +1] window around earnings announcements. Large trade is defined as a trade at minimum \$30,000. **TransCost** is transaction cost taking on values between 0 and -1, and defined as minus one times the average of score on the following three dimensions: (1) the decile ranking of market value at the end of earnings announcement quarter, (2) the decile ranking of trading volume over preceding fiscal year ending in earnings announcement quarter, and (3) an indicator variable = 1 if price at the end of earnings announcement quarter is greater than \$10 and 0 otherwise. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.

**TABLE 5**  
**Sub-Period Regressions of Excess Net-Buy for Small and Large Trades**

**Panel A: Small Trades**

	[+6, +25]	[+26, +45]	[+46, +65]
Intercept	0.011 (7.05) <sup>***</sup>	-0.003 (-1.74) <sup>**</sup>	0.004 (2.44) <sup>***</sup>
<i>RW</i>	0.023 (9.59) <sup>***</sup>	0.033 (12.80) <sup>***</sup>	0.034 (11.70) <sup>***</sup>
<i>AF</i>	-0.010 (-3.91) <sup>***</sup>	-0.007 (-2.37) <sup>**</sup>	-0.000 (-0.11)
R-square (%)	0.11	0.20	0.20
Obs.	73,469	73,469	73,469

**Panel B: Large Trades**

	[+6, +25]	[+26, +45]	[+46, +65]
Intercept	0.005 (1.39)	0.013 (4.13) <sup>***</sup>	0.018 (5.09) <sup>***</sup>
<i>RW</i>	-0.013 (-2.47) <sup>**</sup>	-0.020 (-4.17) <sup>***</sup>	-0.022 (-3.98) <sup>***</sup>
<i>AF</i>	0.018 (3.27) <sup>***</sup>	0.014 (2.46) <sup>**</sup>	0.010 (2.05) <sup>**</sup>
R-square (%)	0.02	0.03	0.03
Obs.	73,469	73,469	73,469

**Panel A** and **Panel B** of Table 5 shows regression of average excess net-buy of small trades and average net-buy of large trades during three sub-periods following earnings announcements, [+6, +25], [+26, +45], and [+46, +65]. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.

**TABLE 6**  
**Excess Net-Buy for Small and Large Trades and Lagged Earnings Surprises**

	Small Trades				Large Trades			
Intercept	0.023 (8.27)***	0.029 (10.60)***	0.032 (10.96)***	0.037 (12.83)***	0.032 (5.23)	0.037 (5.92)	0.035 (5.37)	0.036 (5.85)
$RW_{t-1}$	0.043 (9.33)***	-	-	-	-0.018 (-1.84)*	-	-	-
$RW_{t-2}$	-	0.027 (5.84)***	-	-	-	-0.016 (-1.63)	-	-
$RW_{t-3}$	-	-	0.024 (5.21)***	-	-	-	-0.014 (-1.44)	-
$RW_{t-4}$	-	-	-	0.017 (3.78)***	-	-	-	-0.010 (-1.01)
$AF_{t-1}$	0.004 (1.05)	-	-	-	0.016 (1.61)	-	-	-
$AF_{t-2}$	-	0.008 (1.28)	-	-	-	0.002 (0.16)	-	-
$AF_{t-3}$	-	-	0.005 (1.07)	-	-	-	0.007 (0.73)	-
$AF_{t-4}$	-	-	-	0.001 (0.34)	-	-	-	-0.001 (-0.15)
R-square (%)	0.18	0.08	0.06	0.03	0.01	0.00	0.00	0.00
n	63,223	62,526	61,896	61,665	63,223	62,526	61,896	61,665

**Table 6** shows regressions of average excess net-buy of small and large trades during [-1, +1] earnings announcement window on lag earnings surprises.  $RW_{t-q}$  ( $q = 1, 2, 3$  or  $4$ ) is the decile rank of seasonal random-walk earnings surprise for quarter  $t-q$  converted to [0, 1].  $AF_{t-q}$  ( $q = 1, 2, 3$  or  $4$ ) is the decile rank of analyst-based earnings surprise for quarter  $t-q$  converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter  $t$  minus I/B/E/S actual EPS for quarter  $t-4$ , deflated by price per share at the beginning of quarter  $t$ . Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter  $t$  minus most recent forecast for quarter  $t$ , deflated by price per share at the beginning of quarter  $t$ . Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. All  $t$ -statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.

**TABLE 7**  
**Relation between Heterogeneity of Analysts' Forecasts and Returns and Excess Net-Buy during the Post-Earnings-Announcement Period**

	60-Day Post-Announcement Period		
	<i>DRIFT</i>	<i>Small Trades</i>	<i>Large Trades</i>
Intercept	-0.047 (-12.68)***	0.005 (3.67)***	0.005 (3.67)***
<i>RW</i>	0.041 (6.62)***	0.030 (14.26)***	-0.025 (-6.96)***
<i>AF</i>	0.012 (1.51)	-0.011 (-3.41)***	0.006 (1.90)*
<i>AF·Hetero</i>	0.056 (5.83)***	-0.030 (-8.02)***	0.009 (2.67)***
<i>Hetero</i>	0.016 (14.94)***	-0.002 (-4.18)***	0.001 (2.02)**
R-square (%)	0.32	0.39	0.37
Obs.	66,726	66,729	66,726

Table 7 shows regressions of cumulative abnormal return, average excess net-buy of small trades, and excess average net-buy of large trades during [+5, +65] window following earnings announcements. **Abnormal return** during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. Following Liang (2003), **Hetero** equals one minus the BKLS analyst' consensus (i.e., Barron et al. 1998). Specifically, we compute *Hetero* as:

$$1 - \frac{SE - D/N}{(SE - D/N) + D},$$

where *D* is the forecast dispersion, the sample variance of one-year-ahead annual earnings forecasts reported within 30 days following earnings announcement; *N* is the number of those forecasts; *SE* is the squared difference between the actual annual EPS and the mean of those forecasts. If there is only one forecast available, *Hetero* is defined as zero (i.e., no heterogeneous information contained in analysts' forecasts). Consistent with Liang (2003), *Hetero* is transformed into deciles and converted to [0, 1]. Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.

**TABLE 8**  
**Effects of Analyst Forecast Revisions Following Earnings Announcements on Drifts and Trades**

**Panel A: 60-Day Post-Announcement Period**

	<i>DRIFT</i>		<i>Small Trade</i>		<i>Large Trade</i>	
Intercept	-0.047 (-13.29) <sup>***</sup>	-0.113 (-30.33) <sup>***</sup>	0.004 (3.46) <sup>***</sup>	0.006 (4.68) <sup>***</sup>	0.012 (5.84) <sup>***</sup>	0.009 (5.71) <sup>***</sup>
<i>RW</i>	0.040 (6.73) <sup>***</sup>	0.013 (2.30) <sup>**</sup>	0.030 (15.21) <sup>***</sup>	0.031 (15.43) <sup>***</sup>	-0.018 (-5.77) <sup>***</sup>	-0.020 (-8.58) <sup>***</sup>
<i>AF</i>	0.043 (7.47) <sup>***</sup>	0.020 (3.51) <sup>***</sup>	-0.005 (-2.58) <sup>***</sup>	-0.005 (-2.26) <sup>**</sup>	0.015 (4.30) <sup>***</sup>	0.008 (3.37) <sup>***</sup>
<i>Rev</i>		0.273 (51.57) <sup>***</sup>		-0.008 (-4.02) <sup>***</sup>		0.027 (12.93) <sup>***</sup>
R-square (%)	0.26	4.66	0.28	0.30	0.16	0.29
Obs.	73,469	73,469	73,469	73,469	73,469	73,469

**Panel B: Large Trades in Three 20-Day Sub Post-Announcement Periods**

	[+6, +25]		[+26, 45]		[+46, +65]	
Intercept	0.005 (1.39)	0.002 (0.60)	0.013 (4.13) <sup>***</sup>	0.006 (1.96) <sup>***</sup>	0.018 (5.09) <sup>***</sup>	0.005 (1.40)
<i>RW</i>	-0.013 (-2.47) <sup>**</sup>	-0.014 (-2.63) <sup>***</sup>	-0.020 (-4.17) <sup>***</sup>	-0.025 (-4.96) <sup>***</sup>	-0.022 (-3.98) <sup>***</sup>	-0.026 (-4.90) <sup>***</sup>
<i>AF</i>	0.018 (3.27) <sup>***</sup>	0.017 (3.14) <sup>***</sup>	0.014 (2.46) <sup>**</sup>	0.009 (1.72) <sup>*</sup>	0.010 (2.05) <sup>**</sup>	0.005 (1.46)
<i>Rev</i>		0.018 (4.44) <sup>***</sup>		0.032 (7.50) <sup>***</sup>		0.043 (8.99) <sup>***</sup>
R-square (%)	0.02	0.04	0.03	0.10	0.03	0.14
Obs.	73,469	73,469	73,469	73,469	73,469	73,469

**Panel A** of Table 8 shows regression of cumulative abnormal return, average excess net-buy of small trades, and average excess net-buy of large trades during [+6, +65] window following earnings announcements. **Abnormal return** during the post-earnings-announcement period is defined as the firm return in excess of the corresponding Fama-French size and book-to-market six-portfolio benchmark return. Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. We compute an analyst's forecast revision as an analyst's most recent forecast issued during [+46, +60] window minus the same analyst's earliest forecast issued during the [+6, +25] window, scaled by lag stock price. To aggregate analyst-level revisions to firm-level, we average individual analysts' revisions for each announcement event. **Rev** is the decile rank (converted to [0, 1]) of this variable. Forecast revisions are coded as zero if no associated forecasts are reported in the I/B/E/S Detail file. **Panel B** of Table 8 shows regression of excess net-buy of large trades during [+6, +25], [+26, +45] and [+46, +65] subperiods. In Panel B, we compute an analyst's forecast revision as an analyst's most recent forecast issued during the respective 20-day subperiod minus the same analyst's previous most recent forecast, scaled by lag stock price. We then aggregate analyst-level revisions to firm-level by averaging individual analyst forecast revisions. **Rev** is the decile rank (converted to [0, 1]) of this variable. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.

**TABLE 9**  
**Changes in the Market and Trade Reactions to Earnings Surprises Over Time**

	3-Day Announcement Period			60-Day Post-Announcement Period		
	<i>CAR</i>	Small Trades	Large Trades	<i>DRIFT</i>	Small Trades	Large Trades
Intercept	-0.028 (-27.92) <sup>***</sup>	0.025 (5.07) <sup>***</sup>	-0.061 (-7.08) <sup>***</sup>	-0.056 (-10.35) <sup>***</sup>	0.001 (0.36)	0.024 (8.38) <sup>***</sup>
<i>RW</i>	0.011 (6.85) <sup>***</sup>	0.090 (12.42) <sup>***</sup>	0.007 (0.54)	0.029 (3.27) <sup>***</sup>	0.059 (15.63) <sup>***</sup>	-0.036 (-7.80) <sup>**</sup>
<i>AF</i>	0.051 (31.08) <sup>***</sup>	-0.000 (-0.05)	0.144 (10.64) <sup>**</sup>	0.083 (9.15) <sup>***</sup>	-0.017 (-4.14) <sup>***</sup>	0.019 (1.78) <sup>*</sup>
<i>RW*Recent</i>	0.002 (0.89)	-0.066 (-8.01) <sup>***</sup>	-0.005 (-0.28)	0.018 (1.30)	-0.053 (-12.85) <sup>***</sup>	0.033 (5.28) <sup>***</sup>
<i>AF* Recent</i>	0.009 (4.36) <sup>***</sup>	0.027 (3.06) <sup>***</sup>	-0.067 (-3.63) <sup>***</sup>	-0.073 (-6.11) <sup>***</sup>	0.020 (4.33) <sup>***</sup>	-0.011 (-1.67) <sup>*</sup>
<i>Recent</i>	-0.006 (-4.35) <sup>***</sup>	-0.025 (-4.49) <sup>***</sup>	0.064 (5.57) <sup>***</sup>	0.016 (2.32) <sup>**</sup>	0.007 (2.61) <sup>***</sup>	-0.003 (-5.22) <sup>***</sup>
R-square (%)	5.82	0.98	0.34	0.35	0.58	0.12
n	73,469	73,469	73,469	73,469	73,469	73,469

Table 9 shows regression of cumulative abnormal return, average excess net-buy of small trades, and average excess net-buy of large trades during [-1, +1] earnings announcement window and during [+6, +65] window following earnings announcements. **Abnormal return** during post-earnings-announcement period is defined as firm return in excess of corresponding Fama-French size and book-to-market six-portfolio benchmark return. **RW** is the decile rank of seasonal random-walk earnings surprise converted to [0, 1], and **AF** is the decile rank of analyst-based earnings surprise converted to [0, 1]. Seasonal random walk-earnings surprise is defined as I/B/E/S actual EPS for quarter t minus I/B/E/S actual EPS for quarter t-4, deflated by price per share at the beginning of quarter t. Analyst-based earnings surprise is defined as I/B/E/S actual EPS for quarter t minus most recent forecast for quarter t, deflated by price per share at the beginning of quarter t. **Recent** is an indicator variable that equals 1 if an earnings announcement occurs after 1999 and 0 otherwise. Small trade is defined as a trade at maximum \$5,000. Large trade is defined as a trade at minimum \$30,000. All *t*-statistics in parenthesis are adjusted for clustering by firm (Rogers 1993).

\*\*\*, \*\* and \* represent significance levels at two-tailed 1%, 5% and 10%, respectively.