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Driven to Distraction: Extraneous Events and Underreaction to Earnings News

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Abstract

Psychological evidence indicates that it is hard to process multiple stimuli and perform multiple tasks at the same time. This paper tests the *investor distraction hypothesis*, which holds that the arrival of extraneous news causes trading and market prices to react sluggishly to relevant news about a firm. Our test focuses upon the competition for investor attention between a firm's earnings announcements and the earnings announcements of other firms. We find that the immediate stock price and volume reaction to a firm's earnings surprise is weaker, and post-earnings announcement drift is stronger, when a greater number of earnings announcements by other firms are made on the same day. A trading strategy that exploits post-earnings announcement drift is most profitable for earnings announcements made on days with a lot of competing news, but it is not profitable for announcements made on days with little competing news.

> [Attention] is the taking possession by the mind in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought...It implies withdrawal from some things in order to deal effectively with others.
>
> William James, *Principles of Psychology*, 1890

> Almost a quarter of British motorists admit they have been so distracted by roadside billboards of semi-naked models that they have dangerously veered out of their lanes.
>
> Reuters (London), 11/21/05

1 Introduction

Since minds are finite, attention must be allocated selectively. When individuals try to process multiple information sources or perform multiple tasks simultaneously, performance suffers.[1] Indeed, conscious thought requires a focus on particular ideas or information to the exclusion of others.

These elemental facts suggest that limited attention is likely to affect the perceptions and behavior of investors. Specifically, an investor's effort to understand the implications for a firm of a news announcement by and about one firm may interfere with the processing of information about another firm at the same time. Although there is recent empirical research on the effects of limited investor attention on securities prices, this basic prediction has not to our knowledge been tested.

A recent theoretical literature models how constraints on processing multiple information signals affects beliefs perceptions and security market prices.[2] These models imply that investor neglect of information signals can lead to serial correlation in asset return volatility (Peng and Xiong (2002)), mispricing that is related to publicly available accounting information (Hirshleifer and Teoh (2003)), excessive asset price comovement (Peng and Xiong (2006)), faster rate of incorporation of information by large than by small stocks (Peng (2005)), and neglect of long-term public information (DellaVigna and Pollet (2005b)). There has also been analysis of how firms can exploit limited investor attention by disclosing bad news at times when other firms are making salient disclosures (Hirshleifer, Lim, and Teoh (2004)).

[1] See, e.g., Kahneman (1973), Riley and Roitblat (1978), Pashler (1998); Baddeley (1990) reviews interference effects in the recall of stored information.

[2] Research that examines the effects of limited attention on individual decisions such as trading include Sims (2003), Gabaix, Laibson, Moloche, and Weinberg (2006), and Gabaix and Laibson (2004).

In the model of Hirshleifer and Teoh (2005), investors are risk averse, and a subset neglect the information contained in a firm's latest earnings realization about its future profitability. In equilibrium stock prices underreact to earnings surprises, so that prices are on average too low after favorable surprises and too high after unfavorable surprises. In consequence, positive surprises predict high subsequent returns and negative surprises predict low subsequent returns. In other words, there is post-earnings announcement drift, as documented by Bernard and Thomas (1989).[3]

A further empirical implication of the model is that when the amount of attention investors direct toward a firm decreases, there should be more severe underreaction to its earnings surprises, intensifying drift. The amount of attention toward a given firm is likely to be smaller when there are more extraneous news events distracting investors from that firm. Therefore, greater distraction implies more severe underreaction to the firm's earnings news – a weaker immediate reaction to the earnings surprise, and stronger post-earnings announcement drift. Intuitively, we also expect that the greater the distraction, the weaker the trading volume response to a news announcement.

Together, we call these predictions the *investor distraction hypothesis*. In this paper we test the investor distraction hypothesis by measuring whether the immediate stock price reaction to the firm's earnings surprise is weaker, and post-earning announcement drift stronger, when a greater number of public disclosures by other firms compete for investor attention; and whether greater distraction reduces volume of trade.

For at least two reasons, the stock market's processing of a firm's earnings announcements provides an attractive test of whether investors are able to filter away extraneous news. First, earnings surprise are frequent and directly value-relevant. Second, a recent body of evidence suggests that limited attention affects stock price reactions to a firm's earnings announcements. The post-earnings announcement drift anomaly (Bernard and Thomas (1989)) suggests that some investors at least temporarily neglect the information in earnings surprises about future profitability. Furthermore, recent research provide evidence that market reactions to earnings announcements are more prompt and complete when there is reason to think investors are paying attention to earnings: during trading hours rather than non-trading hours (Francis, Pagach, and Stephan (1992), Bagnoli, Clement, and Watts (2005)), on regular weekdays rather than on Fridays as the weekend approaches (DellaVigna and Pollet (2005a)), and during up markets rather than down markets (Hou, Peng, and Xiong (2006)).

The competing news events that we examine are also earnings surprises. Since all

[3]Since limited attention causes neglect of earnings components, the analysis further implies an even stronger underreaction to the cash flow component of earnings, but possible overreaction to the accruals component of earnings, consistent with an empirical literature on the accrual anomaly (see, e.g., Sloan (1996), Teoh, Welch, and Wong (1998), Teoh, Wong, and Rao (1998)).

publicly traded U.S. firms need to make earnings announcements, earnings surprises provide an extensive sample of distracting events. Our concept of 'extraneous' news does not require that earnings news about other firms be completely irrelevant for the valuation of a given firm. Indeed there is literature that explores whether one firm's earnings announcement conveys information relevant for other firms in the same or different industries. Even if such news is relevant for the given firm, it may be much more relevant for valuing other firms than the given firm's own earnings announcement. Thus, if attention is limited, news announcements about other firms call attention to purposes other than valuing the given firm, thereby reducing the given firm's stock price reaction to its earnings surprise.

Our study adds to a recent literature that provides evidence suggesting that limited attention may affect both market prices and the decisions of investors and financial professionals. Evidence that stock prices underreact to public news events[4], and that information seems to diffuse gradually across industries, between large and small firms, between economically linked firms, and between firms that are followed by different numbers of analysts[5] is consistent with limited attention causing investors to neglect public information (although other possible explanations have also been offered). Evidence that the stock market sometimes reacts to previously-published news[6] suggests that, possibly owing to limited attention, relevant information was previously neglected. Some studies address the effects of limited attention by examining how investors trade in response to public news arrival.[7]

The past empirical literature on investor attention discussed above has primarily focused on the neglect of public information signals, and on how greater publicity draws attention to the firm. A distinctive feature of our paper is that it focuses on the competing signals that draw investor attention *away* from a given firm. In other words, our

[4]On the new issues puzzle, see Loughran and Ritter (1995); on the repurchase anomaly, see Ikenberry, Lakonishok, and Vermaelen (1995); on other types of events, see the review of Hirshleifer (2001). Recent papers also test whether investors neglect demographic information (DellaVigna and Pollet (2005b)) and information in oil prices (Pollet (2005)). Klibanoff, Lamont, and Wizman (1998) find that in typical weeks closed-end country fund prices underreact to shifts in net asset value (NAV), but underreact much less during weeks in which news about the country appears on the front page of the *New York Times*. They argue that this news is redundant given NAV (which is publicly observable), and therefore suggest that publicity about the country causes the greater reaction in the fund price.

[5]See, e.g., Brennan, Jegadeesh, and Swaminathan (1993), Cohen and Frazzini (2006), Hong, Lim, and Stein (2000), Hong, Torous, and Valkanov (2004), Hou (2005); Hou and Moskowitz (2005) report that delay-prone firms have anomalous returns.

[6]Ho and Michaely (1988); Huberman and Regev (2001) analyze in detail a case of a particular company in which salient reporting of already-public information in the news media about a company led to extreme price reactions.

[7]See, e.g., Barber and Odean (2005), Hirshleifer, Myers, Myers, and Teoh (2003), Linnainmaa (2005), and Seasholes and Wu (2005).

aim is to test *directly* whether extraneous news distracts investors, causing market prices to underreact to relevant news.

Our measure of distraction, the number of earnings announcements by other firms occurring on the same day as a the test firm's earnings announcement, is highly seasonal, since the number of earnings announcements tends to cluster by month and day of the week. So the total number of competing announcements is likely to be correlated with other variables that exhibit seasonality, contaminating the test. To ensure that our results are not driven by seasonalities in returns, or by seasonalities or common trends in other causal variables, we therefore perform our tests using the residual number of announcements after regressing the number of announcements on day of week, month, and year dummy variables.[8]

For our initial tests of the investor distraction hypothesis, we perform quarterly two-way independent sorts of stocks based on the earnings surprise, and by the residual number of earnings announcements by other firms on the same day as the firm's earnings announcement. We call days with a large residual number of competing announcements "high-news days" and days with a small residual number of competing announcements "low-news days." We find that investors' reactions to earnings news on the day of announcement is significantly less sensitive to earnings news on high-news days compared to low-news days. The interdecile spread of announcement-period abnormal returns between firms with high and low earnings surprises is 7.33% for low-news days, 1.66% higher than the interdecile spread of high-news days of 5.67%.[9] In a regression analysis that controls for the effect of size, book-to-market, and Friday on the sensitivity of market reactions to earnings surprises (e.g., Skinner and Sloan (2002), DellaVigna and Pollet (2005a)), we find a similar result that the announcement date return response is significantly less sensitive to earnings news when there is a greater number of announcements on the same day.

If competing news is distracting, it may also weaken the trading volume response to earnings announcements. Using regression analysis, we find that the abnormal trading volume response to earnings is significantly weakened when the earnings announcement occurs on a high-news day than on a low-news day. Together, these findings are consistent with competing news events drawing investor attention away from a firm's earnings announcements, and thereby weakening the initial price and trading response to these announcements.

To further test the investor distraction hypothesis, we examine whether post-earnings

[8] Also, during seasonal time periods when foreseeably more announcements are likely, investors and analysts may be able to prepared to process more firm information by such means as shifting other administrative tasks to other time periods or arranging to work longer hours.

[9] The results are generally similar using total rather than residual number of announcements.

announcement drift is stronger when earnings announcements occur on days with many competing announcements. When we sort stocks based upon the earnings surprise and by the residual number of earnings announcements on the same day, we find that the post-earnings announcement drift is significantly stronger on high news days; The inter-decile spread of post-announcement 60-day cumulative abnormal returns between firms with high and low earnings surprises is 7.14% and highly significant for high-news days announcements while the spread is only 2.30% and insignificant for low-news days. Regression analyses also confirm that post-announcement drift is significantly stronger for earnings announcements made on days with a greater number of competing announcements after controlling for other possible determinants of the drift.

Taken together, the univariate and multivariate findings that high-news days are associated with a lower (higher) sensitivity of announcement abnormal returns (post-announcement abnormal returns) to earnings news and a lower trading volume response compared to low-news days support the investor distraction hypothesis.

When we examine market reactions to positive and negative earnings news separately, we find that the distraction effect is found mainly in firms receiving positive earnings news. A possible explanation lies in the fact that attention-drawing events including extreme news are on average associated with individual investor purchases (Barber and Odean (2005)), which, after negative news, is contrarian trading. To the extent that distraction mutes this attention-driven contrarian trading, distraction could strengthen instead of weaken the market response to negative surprises.

There may be reasons other than distraction why the number of competing announcements affects the sensitivity of returns to earnings. As discussed in detail in Section 4 of the paper, it is not entirely obvious why this should be the case. One possible reason is that the number of competing announcements affects the informativeness of a given firm's earnings surprise. However, the distraction hypothesis implies that the number of competing news announcements has opposite effects on the immediate reactivity of the firm's stock to its earnings surprise, versus the post-event reactivity. To compete with the distraction hypothesis, any alternative explanation faces the hurdle of explaining these opposite effects.

Our findings also suggest that an investor who seeks to exploit the post-earnings announcement drift anomaly can gain by taking into account the amount of competing news on earnings announcement dates. To test whether the number of competing news announcements is useful information for trading strategies, we form portfolios based upon earnings surprises and upon the distracting events on the day of earnings announcement. At the beginning of each month, we perform an independent double sort of stocks into $5 \times 5 = 25$ groups based on their most recent quarterly earnings announcements within the preceding three months and the residual number of announcements on the announcement day. The portfolio that is long in good earnings news firms and short in bad earnings news firms within the lowest residual number of announcements quintile is called the "low-news portfolio," and the portfolio that is long in good earnings news firms and short in bad earnings new firms within the highest residual number of announcements quintile is called the "high-news portfolio."

We find that taking into account extraneous news is useful for portfolio trading strategies. The three- and four-factor alphas associated with these portfolios differ significantly; the 4-factor alpha is 1.34% per month and highly significant for the high-news portfolio, while it is -0.33% and insignificant for the low-news portfolio. The effects of competing announcements are particularly marked in small-cap firms, for which the abnormal return difference between high- and low-news portfolios is about 3% per month, but almost non-existent in large-cap firms.

It is possible that not all competing announcements affect attention the same way. For example, the announcement of record-high earnings by British Petroleum might make investors pay *more* attention to other oil firms' earnings announcements on the same day, either because of greater press coverage of the oil industry on that day, because the announcement inherently draws investor attention to the oil industry, or because a focus on one oil firm makes it easier for investors to process information about oil industry firms. If such attention-drawing effects occur, the news about British Petroleum should then distract investors from earnings announcements by firms in different industries. This suggests that there may be a difference between the effect of industry-related versus industry-unrelated announcements on the attention that investors devote to the earnings announcements of a given firm.

To test for such a difference, we separate competing announcements into related and unrelated announcements, using the Fama-French 10 industry classification to measure industry relatedness. We find, consistent with our findings that do not distinguish related versus unrelated announcements, that a greater number of unrelated announcements reduces the sensitivity of returns to earnings news. In contrast, the number of related announcements does not affect the sensitivity of announcement returns to earnings news when examined alone. Furthermore, the number of related announcements increases the sensitivity of announcement returns to earnings news after we control for the amount of unrelated news. For post-announcement returns, the effect of related news on the sensitivity of returns to earnings becomes insignificant after we control for the effect of unrelated news.

Overall, our evidence about announcement period returns, post-earnings announcement drift, and trading volume responses are consistent with the investor distraction hypothesis. These findings therefore suggest that limited investor attention affects investor behavior and capital market prices.

2 Motivation and Hypothesis Development

In this section we discuss psychological evidence motivating our approach (Subsection 2.1), and why we might expect limited attention to affect security prices (Subsection 2.2).

2.1 Psychology Basis for Distraction Effects

Psychologists have provided a great deal of evidence that it is hard to process multiple information sources or perform multiple tasks at the same time. The interfering effect of extraneous information is illustrated by the famous Stroop task (Stroop (1935)), in which subjects are asked to name the color in which a word is printed, when the word does not match its print color, e.g., the word "blue" printed in red ink. When the meaning of the word differs from its print color, subjects are slower to name its color, as compared, e.g., with naming the color of a geometrical figure.

Selective attention involves the focus (conscious or otherwise) on a portion of a scene or set of stimuli. In some studies of selective attention, individuals are asked to direct their attention toward a stimulus, which interferes with the processing of another. In studies of *dichotic listening* (Cherry (1953), Moray (1959), Broadbent (1958)), two messages are separately and simultaneously played into a subject's left and right ear using headphones. In some studies, subjects are asked to attend to one of two messages, and 'shadow' (repeat back) the words of this message. They are then asked questions about the message they were not attending to. Subjects absorb very little information about the unattended message—whether the voice was male or female, but not what language was spoken or any of the words that were spoken, even if the same word is spoken repeatedly

In visual studies of selective attention, participants often think that they have absorbed a scene fully when in fact they have only absorbed the subset of details upon which they have focused. Selective attention leads to 'change blindness' (wherein a large change in a visual scene is not noticed; see Simons and Levin (1997)). The phenomenon of inattentional blindness' involves the failure to perceive task-unrelated stimuli while performing a visual observation task. In such experiments, participants often fail to notice even seemingly conspicuous events in the video scene they are observing—such as a woman walking by in a gorilla suit, stopping, and beating her chest before moving on (Simons and Chabris (1999)).

Studies of *divided attention* and *dual task performance* ask participants to attend to multiple stimuli at the same time and to respond to them. For example, in the auditory domain, a subject in a dichotic listening experiment can be asked to pay attention to *both* messages, and later can be asked about the content of each. Studies of dual task performance have found that there is interference between tasks (see, e.g., Pashler and Johnston (1998)), so that performance is much worse when the two tasks are similar, as with tasks involving the same sensory modalities (McLeod (1977), Treisman and Davies (1973)).

In a financial context, the problem of reacting to multiple earnings surprises by revaluing two different stocks divides attention, and therefore may also be hard to do. Performing valuations involves using similar kinds of information and types of cognitive processing, potentially leading to interference between tasks. Regardless of whether this is the case, more generally, time and cognitive constraints compel restricting attention to a limited set of inputs and tasks.

An investor who tries to forecast firms' prospects are faced with the arrival of many information signals over time. Psychologists have studied experimentally how subjects learn over time to forecast a variable that is stochastically related to multiple cues.[10] A consistent finding in both animal and human studies is that *cue competition* occurs: the arrival of irrelevant cues causes subjects to use relevant cues less. In financial markets, investors presumably try to economize on attention by filtering away irrelevant signals. Nevertheless, psychological evidence of cue competition suggests that stock investors may be more prone to underreact to relevant information about a firm when there is greater arrival of irrelevant signals.

2.2 Why Distraction Can Affect Security Prices

A limited attention explanation for an asset pricing pattern must explain why investors who are not paying full attention would participate in markets and affect prices, and why any such effects are not eliminated by the trades of fully rational arbitrageurs. The issue of arbitrage has been addressed by many papers in behavioral finance; if the risk-bearing capacity of fully rational individuals is finite, then their beliefs do not dominate prices in the short run; instead, prices reflect a weighted average of investor beliefs, where the weights depend on the frequencies of different investor types in the population and on their risk tolerance.[11]

In the long-run, we might expect wealth on average to flow from less rational traders

[10]See, e.g., Baker, Mercier, Valleettourangeau, Frank, and Pan (1993), Busemeyer, Myung, and McDaniel (1993), and Kruschke and Johansen (1999).

[11]In the context of reactions to earnings news, see the model of Hirshleifer and Teoh (2005).

to more rational traders, which in the long run could diminish the influence of imperfectly rational traders on prices. Again, this is a standard issue in the behavioral finance literature, and there are some standard responses: that stock prices are noisy so that this wealth-transfer process can be very slow, that in the long run new generations of nave traders enter the market, and that owing either to aging or to psychological biases in learning processes some investors may learn to be less rather than more rational over time; see, e.g., the review of Hirshleifer (2001).

In the specific context of limited attention, owing to cognitive resource constraints, *all* investors have limited attention, so there is no way for a flow of wealth to fully eliminate the effects of limited attention (see, e.g., Hirshleifer and Teoh (2005)). Even if some investors allocate high resources to the study of a given stock at a given time, and therefore can be viewed as attentive with respect to that stock, this entails withdrawal of cognitive resources from other activities, so we cannot conclude that wealth will tend to flow toward such an investor.

This perspective helps address the question of why an investor who is neglecting relevant public information about a stock does not withdraw from trading in that stock. Since it is impossible to attend to all relevant information about a stock in trading decisions, all traders will neglect some information, and it is reasonable to trade even though one is neglecting some information. Of course, one can leverage attention by focusing on more important signals, but it can be hard to know how important an item is until it is carefully processed.

Furthermore, the same processing and memory constraints that cause neglect of a signal also make it hard to compensate optimally for the failure to attend to it. For example, an investor whose valuation disagrees with the market price may inattentively fail to reason through why the market price differs from his own valuation. Experimental evidence that the presentation format of decision problems affects choice (e.g.,Tversky and Kahneman (1981)) indicates that individuals do not compensate optimally for the limitations in their information processing. Empirically, there are strong indications that investors are very willing to trade even when they do not possess superior valuations (Barber and Odean (2000)).[12]

Other psychological evidence also indicates that individuals do not fully compensate for the fact that they do not possess all relevant information. For example, when presented with one-sided arguments and evidence and asked to judge a legal dispute, experimental subjects were biased in favor of the side they heard (Brenner, Koehler,

[12] An additional possible source of such neglect is overconfidence, a well-documented psychological bias. An overconfident individual who wrongly thinks that he has already incorporated the most the important signals may not perceive the urgency of adjusting for the fact that he is neglecting a relevant public signal.

and Tversky (1996)). As the authors state, "The results indicate that people do not compensate sufficiently for missing information even when it is painfully obvious that the information available to them is incomplete."

Furthermore, traditional models of information and securities markets such as Grossman and Stiglitz (1976) provide the insight that, owing to liquidity or noise trading, prices aggregate information imperfectly. In consequence, these models imply that even an uninformed individual who is trading against others who are better informed should trade based upon his beliefs rather than lapsing into passivity. Intuitively, such an investor benefits by supplying liquidity to the market, and taking advantage of any mispricing created by liquidity trades. Analogously, even an investor who neglects a public signal can benefit from contrarian trading (e.g., through limit orders) based upon his beliefs. Such contrarian trading could on average be profitable[13], yet could also induce price underreaction to public news events such as earnings announcements.

3 The Data

We use quarterly earnings announcement data from CRSP-Compustat merged database and IBES from 1995 to 2004. To calculate the daily number of quarterly earnings announcements, we look at quarterly earnings announcements available from CRSP-Compustat merged database. When the announcement date is also available at IBES but is different from Compustat date, we take the earlier date following DellaVigna and Pollet (2005a). While the accuracy of announcement date is likely to be higher when it is available from both IBES and Compustat,[14] we include Compustat earnings announcements without matching IBES data when we compute the number of competing announcements each day because IBES coverage is rather limited to relatively large firms.[15] Our sample firms are limited to those that have IBES coverage, therefore we expect very accurate announcement dates for our sample even though the number of competing announcements can be slightly noisy.[16]

To estimate the forecast error (FE) as a measure of the earnings surprise, we calculate the difference between announced earnings as reported by IBES (e_{iq}) and the consensus

[13] Kaniel, Saar, and Titman (2004) find that contrarian trading allows U.S. individual investors to earn positive excess returns in the month after their trades; Linnainmaa (2003) finds that individual day traders in Finland provide liquidity to the market through limit orders and on average profit during the day by doing so.

[14] DellaVigna and Pollet (2005a) report that the accuracy of announcement dates imputed from both sources are almost perfect in the post-1994 period.

[15] According to Hong, Lim, and Stein (2000), 40% of CRSP firms are not covered by IBES in 1994.

[16] The results are similar when we use the number of competing announcements in the intersection of IBES and CRSP-Compustat databases.

earning forecast (F_{iq}) defined as the median of the most recent forecasts from individual analysts. When we calculate the consensus forecast, we only include 1- or 2-quarter ahead forecasts issued or reviewed in the last 60 calendar days before the earnings announcement to exclude stale forecasts. If an analyst made multiple forecasts during that period, we take her most recent forecast. The difference between the announced earnings and the consensus forecast is normalized by the stock price at the end of the corresponding quarter (P_{iq}), where earnings, forecasts, and stock prices are all split-adjusted. To control for possible data errors, we delete observations when earnings or forecasts are greater than the stock price, or when the stock price is less than \$1 before split-adjustment.

$$FE_{iq} = \frac{e_{iq} - F_{iq}}{P_{iq}}. \tag{1}$$

The cumulative abnormal returns of the announcement window and the post-announcement window are defined as the difference between the buy-and-hold return of the announcing firm and that of a size and book-to-market (B/M) matching portfolio over the windows $[0, 1]$ and $[2, 61]$ in trading days relative to the announcement date.

$$\begin{aligned} CAR[0,1]_{iq} &= \prod_{k=t}^{t+1}(1+R_{ik}) - \prod_{k=t}^{t+1}(1+R_{pk}) \\ CAR[2,61]_{iq} &= \prod_{k=t+2}^{t+61}(1+R_{ik}) - \prod_{k=t+2}^{t+61}(1+R_{pk}). \end{aligned} \tag{2}$$

R_{ik} is the return of the firm i and R_{pk} is the return of the matching size-B/M portfolio on day k where t is the announcement date of quarter q's earnings.

We choose a 60 trading days for the post-announcement window because Bernard and Thomas (1989) report that most of the drift occurs during the first 60 trading days after the announcement (about three calendar months). Each stock is matched with one of 25 size and B/M portfolios at the end of June based on the market capitalization at the end of June and B/M, the book equity of the last fiscal year end in the prior calendar year divided by the market value of equity at the end of December of the prior year. The daily returns of size and B/M portfolios are from Kenneth French's website.[17]

[17] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

4 The Effect of Competing News on Announcement Date Returns, Volume, and Post-Earnings Announcement Drift

Based on the investor distraction hypothesis, we state following test hypotheses in alternative forms:

Hypothesis 1: The sensitivity of the announcement abnormal return to earnings news decreases with the number of competing announcements.

Hypothesis 2: The abnormal trading volume on the day of announcement decreases with the number of competing announcements.

Hypothesis 3: The sensitivity of the post-announcement abnormal return to earnings news increases with the number of competing announcements.

It is, of course, important to consider the alternative possibility that the number of distracting events affects the informativeness of the firm's earnings about fundamental value, or whether for other reasons (apart from limited attention) the number of extraneous events might affect the sensitivity of a firm's return to its earnings surprise. If, for example, a given firm's earnings were more informative at times when there are few competing announcements, we would expect the immediate and total price response to the firm's earnings announcement to be larger at such times.

We do not see any clear reason why the number of competing announcements should affect the informativeness of the given firm's earnings surprise or the sensitivity of its stock price to its own earnings surprise, or any presumption as to which way such an effect would go. Suppose the number of same-day earnings announcements by other firms provides information about the market. If there is good news about the market factor, on average the test firm will probably also experience a positive return. However, our test is not whether the firm earns positive returns, but about the relation between the firm's abnormal return after adjusting for the market factor and its own earnings surprise. It is not obvious that on good news days for other firms, the sensitivity of the firm's abnormal return to its own earnings surprise should be especially high or low.

Furthermore, even if the number of competing events affects the informativeness of the earnings surprise, this would not explain why the number of competing news announcements has opposite effects on the immediate sensitivity of the firm's stock return to its earnings surprise, versus the sensitivity of the post-event return. Any alternative to the distraction hypothesis faces the difficult hurdle of explaining these opposite effects.

4.1 Descriptive Statistics

Table 1 reports the descriptive statistics of daily number of quarterly earnings announcements. The mean number of announcements a day is 120.8 and the median number is 71. The percentiles of the number of announcements show that there is a wide variation in the number of earnings announcements a day; the 10th percentile number of announcements is 20 and 90th percentile is 290. Earnings announcements seem to cluster by day of week and show a highly seasonal pattern. As documented by other studies, the number of announcements is higher on Tuesday, Wednesday, and Thursday, and lowest on Friday (e.g., Damodaran (1989), DellaVigna and Pollet (2005a)): The average number of announcements on Friday is 68.8, which is less than a half of the average number of announcements on Thursday (152.2). When examined by month, the number of announcements show approximately a 3-month cycle, with the lowest number of announcements in March, June, September, and December. This pattern reflects the fact that about 60% of the announcements are for fiscal quarters ending in March, June, September, and December and that it takes one to two months from the end of fiscal quarter until the earnings announcement date.

Since the number of announcements shows a strong calendar effect and there is seasonality in stock returns, we use the residual number of announcements from a time-series regression of the number of announcements on day of week, month, and year dummies as our measure of the amount of competing news. "high-news days" refer to days with a large residual number announcements and "low-news days" refer to days with a small residual number of announcements.

Using the residual instead of the raw number of announcements has another advantage that the characteristics of firms announcing earnings on high-news days are fairly similar to those of firms announcing earnings on low-news days. Table 2 shows the average size and book-to-market ratios by the decile rank of the raw and residual number of announcements. The decile rank is based on quarterly sorts of earnings announcement observations by raw or residual number of announcements on the announcement day. When sorted by the raw number of announcements, firms announcing earnings on high-news days are significantly larger than those announcing earnings on low-news days ($p < 0.0001$) while there is no significant difference in book-to-market ratios between two extreme number of announcements deciles. When we use the residual number of announcements as a measure of the amount of distracting news, we do not find any significant differences in size or book-to-market ratios between low-news days and high-news days.[18] Therefore, we use the residual number of announcements as our measure of dis-

[18]However, deciles 2-5 have relatively low size and deciles 2-4 have relatively high B/M compared to

traction throughout the paper. Nevertheless, the results are similar when we use the raw number of earnings announcements instead of the residual number of announcements.

4.2 Announcement Date Returns and Post-Earnings Announcement Drift

We first perform univariate analysis to examine the effect of competing news on price reactions to earnings news. In each calendar quarter, we perform a two-way independent sort of all quarterly earnings announcements observations in that quarter into $10 \times 10 = 100$ groups based upon the residual number of earnings announcements on the day of the earnings announcement and the earnings surprise (forecast error) as defined in Equation (1). We exclude earnings announcements without size or Book-to-Market information of the announcing firm because we cannot calculate abnormal returns. For each raw/residual number of announcement decile, we calculate the mean announcement-day and post-announcement cumulative abnormal returns for the most positive (FE10) and the most negative earnings surprise deciles (FE1), and the difference of announcement and post-announcement cumulative abnormal returns between the two extreme earnings surprise deciles.

The spread of announcement-day abnormal returns between earnings surprise deciles 10 and 1 (FE10 − FE1) measures the degree of stock price responsiveness to earnings news; a larger spread indicates that investors are reacting more strongly to earnings news on the announcement date. On the other hand, the spread of post-announcement abnormal returns between earnings surprise deciles 10 and 1 measures the degree of underreaction to earnings news that shows up as subsequent drift. If the market is efficient, there will be no difference between good and bad earnings news firms in their post-announcement abnormal returns. A positive spread indicates underreaction to earnings news – positive abnormal returns following good news and negative abnormal returns following bad news.

Table 3 shows that investors' reactions to earnings news on the announcement day is less sensitive to earnings news when earnings are announced on high-news days (NRANK=10) than low-news days (NRANK=1). For the lowest residual number of announcements decile (low-news days), the mean spread in 2-day cumulative announcement returns (CAR[0,1]) between good earnings news firms (FE10) and bad earnings news firms (FE1) is 7.33%, whereas for the highest residual number of announcements decile, the mean spread is 5.67%. This indicates that the price reactions to earnings news are stronger when earnings are announced on low-news days than on high-news

the rest.

days.

A larger amount of competing news is also associated with stronger post-earnings announcement drift. The spread in mean 60-day post announcement abnormal returns (CAR[2,61]) between good and bad earning news deciles indicates greater underreaction to earnings news on high-news days than on low-news days. The post-announcement abnormal return spread between extreme earning surprise deciles is substantial (7.14%) and highly significant ($p < 0.001$) for high-news days, whereas the spread is smaller (2.30%) and insignificant ($p = 0.12$) for low-news days. However, the spread in the post announcement abnormal returns is not monotonic across the residual number of announcements deciles (NRANK). The differences in size and B/M across the residual number of announcement deciles (see Footnote 19) may drive to the non-monotonicity in the post-announcement abnormal return spreads across NRANK. Therefore, we conduct regression analysis in Subsection 5.1 to control for the effect of size and book-to-market on the relation between announcement or post-announcement abnormal returns and earnings news.

To examine the interaction effect of earnings surprise and the amount of competing news, we use an ANOVA procedure to test if the difference in abnormal returns between high and low earnings surprise deciles is significantly different between low and high news days. This is equivalent to testing the significance of the interaction term a_3 in the following regression, using all announcements in the top and bottom of the earnings surprise deciles and top and bottom of the residual number of announcements deciles.

$$CAR = a_0 + a_1(FE10) + a_2(NRANK10) + a_3(FE10)(NRANK10), \tag{3}$$

where $FE10$ is an indicator variable that is equal to 1 for the top decile of earnings surprise, and $NRANK10$ is an indicator variable that is equal to 1 for the top decile of the residual number of announcements (high-news days). $CAR = CAR[0,1]$ for the announcement date abnormal returns, and $CAR = CAR[2,61]$ for the post-announcement cumulative abnormal return. The ANOVA procedure tests if the difference between two extreme earnings surprise groups is greater in the top residual number of announcements deciles compared to the bottom decile using all observations in four groups $((FE10 - FE1)|_{NRANK=10} > (FE10 - FE1)|_{NRANK=1})$.

The ANOVA procedure confirms that a greater number of competing announcements mutes the announcement-date stock price reaction to a firm's earnings surprise. The difference between high and low news days in interdecile spreads of $CAR[0,1]$ is -1.66%, statistically significant with a p-value of 0.01. The difference of interdecile spreads of $CAR[2,61]$ is 4.85%, also statistically significant with a p-value of 0.03 according to an ANOVA test as in Equation (3).

Figures 1 and 2 provide graphical evidence that market reactions to earnings news is weaker on the announcement day and subsequent drifts are stronger when earnings are announced on high-news days than low-news days. In Figure 1, the abnormal announcement return (CAR[0,1]) is plotted against earnings surprise deciles, separately for high-news days (Decile 10) and for low-news days (Decile 1). The market reaction is less sensitive to earnings news on high-news days as displayed by its flatter slope. It appears that the difference in the sensitivity between high and low news days is more pronounced among positive rather than negative earnings surprises. We examine the distraction effect separately for positive and negative earnings surprises later in Subsection 5.1.

Figure 2 shows the mean post-announcement abnormal returns (CAR[2,61]) as a function of earnings surprise deciles. It shows post-announcement abnormal returns are more predictable based on earnings news when earnings are announced on high-news days than low-news days, indicating stronger underreaction to earnings news announced on high-news days. Figures 1 and 2 and the univariate results in Table 3 suggest that investors react more sluggishly to earnings news when they are distracted by competing announcements.

5 Regression Analysis

To control for other possible determinants of investor responses to earnings news, we perform multivariate tests. Subsection 5.1 describes how competing news affects the return response to a firms earnings news. Subsection 5.2 describes how competing news affects the trading volume response to a firms earnings news.

5.1 Distraction and the Return Response to Earnings News

In order to control for possible sources of variation in the relation between announcement date returns and earnings news and also between post-announcement drifts and earnings news, we run regressions of two-day announcement abnormal return (CAR[0,1]) or 60-day post-announcement abnormal return (CAR[2,61]) on the earnings surprise decile rank (FE), the residual number of announcements decile rank (NRANK), their interaction term (FE×NRANK), and control variables.

$$CAR = a_0 + a_1 FE + a_2 NRANK + a_3 (FE \times NRANK) + \sum_{i=1}^{n_1} b_i (FE \times X_i) + \sum_{i=1}^{n_2} c_i X_i. \quad (4)$$

The investor distraction hypothesis posits that announcement return is less sensitive and post-announcement return is more sensitive to earnings news. Thus, we expect $a_3 < 0$

when we use CAR[0,1] as dependent variable and $a_3 > 0$ when we use CAR[2,61] as dependent variable.

Following past literature, we use the decile rank of forecast error as opposed to the forecast error itself. This has the advantage of reducing the influence of outliers, and linearizing the relation between abnormal returns and the earnings surprise (see Figure 1). For control variables, we include size and B/M deciles, day of week/month/year dummies, and the interaction terms of the earnings surprise rank with size, B/M, and Friday dummy ($FE \times X_i$). We interact Friday dummy with the earnings surprise decile based on the finding of DellaVigna and Pollet (2005a) that investor reaction to earnings news is weaker when earnings are announced on Friday. We also interact earnings surprise decile rank (FE) with size and B/M decile ranks based on previous findings that investor reactions to earnings news vary with firm size and book-to-market ratios (e.g., Bernard and Thomas (1989), Skinner and Sloan (2002)).[19] Standard errors of regression coefficient estimates are adjusted for heteroskedasticity and clustering by the day of announcement.

The regression results in Table 4 show that the sensitivity of immediate stock price reaction (CAR[0,1]) and the delayed response (CAR[2,61]) to the earnings surprise as a function of the amount of competing news. The coefficient on the interaction between earnings surprise rank and the number of competing announcements rank (FE×NRANK) measures the effect of competing announcements on market reactions to earnings news. For the announcement return (CAR[0,1]), the coefficient of the interaction term (FE×NRANK) is negative (−0.008) and significant at 5% when we do not include control variables (Regression 1), and it is −0.01 and significant at 1% after controlling for the effect other variables including that of size, book-to-market, and Friday on the sensitivity of abnormal returns to earnings news (Regression 2). Since the coefficient estimate for FE is 0.912, this implies that the market reactions are about 10% less sensitive to earnings news on high-news days (NRANK=10) compared to those on low-news days (NRANK=1).[20] We also find that the sensitivity of announcement abnormal return to earnings surprise is lower on Friday and greater for growth firms (not reported), consistent with the results of DellaVigna and Pollet (2005a) and Skinner and Sloan (2002).

We re-estimate the regression model with extreme earnings surprise deciles only

[19]The results are similar when all control variables are interacted with the forecast error decile rank.

[20]The sensitivity is $0.912 - (0.01 \times 10) = 0.812$ for NRANK=10 and $0.912 - (0.01 \times 1) = 0.902$ for NRANK=1.

(FE10 and FE1; Regression 3).

$$CAR = a_0 + a_1 FE10 + a_2 NRANK + a_3 (FE10 \times NRANK) + \sum_{i=1}^{n_1} b_i (FE10 \times X_i) + \sum_{i=1}^{n_2} c_i X_i, \tag{5}$$

where $FE10$ is an indicator variable for the most positive earnings surprise decile. We find a similar result that high-news days are associated with smaller abnormal return spreads between good earnings news and bad earnings news. The coefficient estimate for the interaction term ($FE10 \times NRANK$) is negative (-0.113) and significant at 5%.

For the post-announcement abnormal returns (CAR[2,61]), the coefficient on the interaction between earnings surprise decile rank and the residual number of announcements rank (FE×NRANK) is positive (0.047) and significant at the 1% level after controlling for the effect of size, B/M, and Friday on the sensitivity of post-announcement drifts on earnings news (Regression 5). The interaction term of firm size and earnings surprise is significantly negative (unreported), consistent with previous findings that post-earnings announcement drifts are more pronounced among small stocks (e.g, Bernard and Thomas (1989)). The results are similar when we restrict our sample to extreme earnings surprise deciles (Regression 6).

Together, our regression analyses of announcement return and post-announcement returns show that market reaction to earnings news on the day of announcement is weaker and the subsequent drift is stronger when earnings are announced on days with many competing announcements, suggesting that competing announcements distract investors from fully incorporating the implication of earnings announcements on stock prices.

Past research has shown that, stock returns are more sensitive to the size of positive earnings surprises than the size of negative ones (Hayn (1995)). Since these reactions are asymmetric, it is interesting to examine separately the effect of competing announcements for positive and negative earnings surprises.

Table 5 reports regression evidence for the positive and negative earnings surprise subsamples. FE is the quintile rank of the earnings surprise and NRANK is decile rank of the residual number of announcements based on quarterly independent double-sorts within each subsample of positive or negative earnings surprises.

The effect of competing news on market reactions to earnings News is very different in the two samples. As with the full sample, for positive earnings news, the residual number of announcements significantly reduces the sensitivity of announcement abnormal return to positive earnings news. Similarly, the residual number of announcements significantly increases the sensitivity of post-announcement abnormal return to positive earnings news. For the announcement return regression (Regression 1), the coefficient of the interaction term $FE \times NRANK$ is -0.025 and significant at the 1% level, and is 0.115 and significant at the 1% in the post-announcement return regression (Regression 2).

In sharp contrast, in the negative earnings news subsample, the effect of competing news on the market reactions to news is insignificant, both for the immediate reaction and for long-term drift (Regressions 3 and 4). Any explanation for the effect of competing news on price responses must address this asymmetry.

A possible explanation lies in the fact that attention-drawing events, including extreme news, are on average associated with individual investor purchases (Barber and Odean (2005)). Barber and Odean suggest that this results from the combination of limited attention, and the asymmetry between stock buying and selling. An investor selects stocks to purchase from a potential universe of thousands of stocks, but sells are mostly limited to the few stocks in the investor's portfolio. Thus, extreme news about a stock, whether good or bad, brings investor attention to that stock, and on average leads to a greater preponderance of buying over selling.[21]

This evidence suggests that attention-driven purchases after bad news may weaken market reactions to this news. To the extent that distraction mutes attention-driven contrarian trading after negative news, distraction can strengthen instead of weaken the immediate response to the surprise. This effect can potentially offset the basic distraction effect that motivates our tests.

The reasoning is different after good news, which, as shown by Barber and Odean, is also associated with attention-driven buys. Such buying should tend to magnify the price reaction to the positive news. To the extent that distraction mutes this attention-driven buying after positive news, distraction will tend to weaken the immediate response to the surprise. Thus, this effect potentially reinforces the basic distraction effect that motivates our tests.

In summary, when we take into account that the effect of distraction is likely to be different for investor buys and sells, there are possible offsetting effects on how distraction affects price reactions to bad news; but the prediction remains unambiguous for the effect of distraction on price reactions to good news.

5.2 Distraction and the Volume Response to Earnings News

The extent to which investors react to earnings news can also be measured by trading volume in response to the earnings announcement. The investor distraction hypothesis

[21] Although their proxies for investor attention do not include distracting information, Hou, Peng, and Xiong (2006) also provide evidence suggesting that attention has a larger effect on market reactions to positive than to negative earnings news, and refer to the asymmetry between buying and selling decisions.

holds that competing announcements will mute the trading volume response to earnings news.

We define abnormal volume on day j ($j = -2, -1, 0, 1, ...5$, in trading days) relative to the announcement date t as a normalized difference between the dollar volume on day j and the average dollar volume over days $[-41, -11]$ of the announcement:

$$VOL[j] = Log\left(DollarVol_{t+j} + 1\right) - Log\left(\frac{1}{30}\sum_{k=t-41}^{t-11} DollarVol_k + 1\right). \quad (6)$$

Figure 3 shows abnormal trading volume two days before the announcement until five days after the announcement, separately for earnings announcements on high-news days and those on low-news days. We find that abnormal trading volume is higher for earnings announcements made on low-news days than high-news days, both on the announcement day and the following trading day.

We also perform regression analysis of the abnormal trading volume on the announcement day (VOL[0]) and also two days around announcement (VOL[0,1]) because Figure 3 suggests that trading volume responses to earnings news occur mainly on the announcement day and the following day. The two-day abnormal trading volume is defined in the following manner:

$$VOL[0,1] = Log\left(\frac{1}{2}\sum_{k=t}^{t+1} DollarVol_k + 1\right) - Log\left(\frac{1}{30}\sum_{k=t-41}^{t-11} DollarVol_k + 1\right). \quad (7)$$

Since both extreme positive and negative earnings surprises are likely to generate large trading volume, we regress the one- or two-day abnormal trading volume on the decile rank of *absolute* earnings surprises (AFE), the residual number of announcement decile rank (NRANK), and other control variables. In addition to the size, B/M, and year/month/day of week dummies, we include market abnormal trading volume during the same period (MKTVOL for one-day, MKTVOL2 for two-day window) so that we are not capturing the market-wide variations in trading volumes. MKTVOL is the average abnormal volume of all CRSP firms on that day where the abnormal volume of each firm is defined in a manner similar to (6).

Table 6 shows that the coefficient of NRANK is negative and significant at 1% in all regression models, indicating that both 1- and 2-day abnormal volume is lower when earnings are announced on high-news days compared to low-news days, after controlling for the effect of market trading volume, firm-characteristics, and calendar effects. We also use indicator variables for each earnings surprise deciles instead of the absolute earnings surprise decile rank to control for a possible non-linear effect of earnings surprise on trading volume (Regressions 3 and 6), and find similar results. Overall, the results show that investor reaction to earnings news as measured by abnormal trading volume is weaker when earnings are announced on high-news days.

6 Portfolio Trading Strategies

We now test whether investors can use our findings to form better portfolios that exploit post-earnings announcement drift. Based on the previous results, we expect investors to be able to achieve superior returns by combining earnings surprise information with information about distracting news, as measured by the number of competing earnings announcements.

At the end of each month from March 1995 until December 2004, we independently sort stocks into 5×5 portfolios based on their most recent earnings surprises within the last three months and the residual number earnings announcements on the day of earnings announcement. Then we calculate equally-weighted returns of the resulting 5×5 portfolios during the following month. Within each of the residual number of announcements rank (NRANK), we form a hedge portfolio that is long in good news portfolio (FE = 5) and short in bad news portfolio (FE = 1) and compute the return of the hedge portfolio.

If investors underreact to earnings news, the good news portfolio will outperform the bad news portfolio. Therefore the abnormal return of the hedge portfolio will be larger when there is stronger post-earnings announcement drift. Since quarterly earnings announcements during the preceding three months are used to form portfolios, the strategy uses most of CRSP stocks with quarterly earnings information and captures up to three months of post-announcement returns. We use alphas from a time-series regression of the portfolio excess return on Fama-French three factors or four factors (three factors plus the momentum factor) as a measure of monthly abnormal returns of the hedge portfolio.

Table 6 shows that the trading strategy that exploits post-earnings announcement drift achieves a higher abnormal return when implemented on earnings announcements on high-news days rather than those on low-news days. The abnormal return of the good minus bad earnings news hedge portfolio using 4-factor alpha is 1.34% per month and significant at 1% for the high-news portfolio (NRANK=5), but it is -0.33% and insignificant for the low-news portfolio (NRANK=1). In other words, there is no discernable post-earnings announcement drift when there is little competing news that distracts investors from the earnings news. The "fund-of-fund" portfolio which is long in the high-news hedge portfolio and short the low-news hedge portfolio has a 4-factor alpha of 1.35% which is significant at 5%, indicating that the post-announcement drift portfolio strategy using high-news day announcements earns significantly higher returns than that using low-news day announcements.[22]

We also implement the trading strategy on small and large firms separately (small firms: NYSE deciles 1-3, large firms: NYSE deciles 4-10[23]). We find that the trading strategy is not profitable among large firms; the 3- and 4-factor alphas are insiginificant among large firms across all NRANK. It is profitable for small firms, except when the announcements are made on low-news days. The competing news effect is more pronounced among small firms; the 4-factor alpha of the "fund-of-fund" portfolio long in high-news hedge portfolio and short in low-news hedge portfolio is 3.08% per month for the small firm subsample, versus 1.35% in the overall sample.

The portfolio strategy findings confirm the univariate and regression results that post earnings announcement drift is stronger for earnings announcements made on high-news days than low-news days. The portfolio findings also indicate that, in the absence of transactions costs, the amount of competing news on the day of the earnings announcement is useful information for an investor who seeks to exploit post-earnings announcement drift to achieve superior returns.

7 Related versus Unrelated Announcements

So far we have treated all announcements by other firms alike. However, it is possible that not all competing announcements are distracting. If two firms are closely related, an announcement by a one firm might *attract* attention to the other. For example, Google's announcement of its earnings may attract investors' attention to earnings announcements by other search-engine firms. But it is also likely to distract investor attention from the earnings announcements of totally unrelated firms.

To test these ideas, we identify firm relatedness by whether they are in the same industry using Fama-French 10 industry classification. The number of related announcements is the number of earnings announcements by same-industry firms and the number of unrelated announcements is the number of announcements by firms in other industries. Like the total number of announcements, we regress the related or unrelated number of announcements of each industry on month, day of week, and year dummies and use residuals to control for the calender effect. Since Industry 10 in Fama-French classification is defined as 'others' which do not belong to any of the pre-defined categories, we limit the analysis to Industries 1-9.

[22]The results are similar when we exclude earnings announcements on Friday.

[23]We use the NYSE decile 3 as a cut-off so that the small firm and large firm subsamples are about of equal size.

In the regression analyses, we interact the earnings surprise decile rank (FE) with the number of related announcements deciles (#Related) or the number of unrelated announcements deciles (#Unrelated). This allows us to compare the effect of related and unrelated announcements on investor reactions to earnings news. In addition, examining the effect of unrelated announcements rather than all announcements provides a more clean-cut test of the investor distraction hypothesis.

Table 8 shows that unrelated news distracts investors while related news does not. The number of related announcements does not affect the sensitivity of announcement returns to earnings news; the coefficient of the interaction term of earnings surprise and the number of related announcement deciles (FE×#Related) is insignificant in Regression (1). On the other hand, the number of unrelated announcements lowers the sensitivity of announcement returns to earnings news; the coefficient of the interaction term of earnings surprise and the number of unrelated announcement deciles (FE×#Unrelated) is negative and highly significant both in Regressions (2) and (3). Interestingly, the number of related announcements increases the sensitivity of announcement returns to earnings news after we control for the effect of unrelated news (Regression (3)).

Graphically, Figure 4a shows that the sensitivities of announcement abnormal returns to earnings news do not differ much between high and low *related* news days. But high and low *unrelated* news days show a clear difference in the sensitivity of abnormal returns to earnings news (Figure 4b). It appears that the effect is stronger than that of the total number of announcements as shown in Figure 1.

When we examine the effect of related and unrelated announcements on post-earnings announcement drift, both related and unrelated announcements increase the sensitivity of post-announcement returns to earnings news when examined separately. The coefficient estimate for the interaction term FE×#Related is 0.039 and in Regression (4) and the estimate for the term FE×#Unrelated is 0.046 in Regression (5). However, only the interaction term of the number of unrelated announcements (FE×#Unrelated) remains significantly positive when we include both interaction terms in Regression (6). Table 8 provides further evidence that competing announcements, especially those by unrelated firms, intensify investor underreaction to earnings news.

8 Concluding Remarks

This paper contributes to a growing literature indicating that limited investor attention has important effects. A distinctive aspect of our tests is a specific focus on the extraneous news that is the presumptive *source* of possible investor neglect of relevant news. We propose the *investor distraction hypothesis*, which holds that the arrival of extraneous earnings news causes trading volume and market prices to react sluggishly to relevant news about a firm. Specifically, we test the investor distraction hypothesis by examining how the number of earnings announcements by other firms affects the sensitivity of a firms volume, announcement-period return, and post-event return reaction to its earning surprise.

Our evidence indicates that the presence of a large number of competing earnings announcements by other firms is associated with a weaker announcement-date price reaction to a firm's own earnings surprise, a lower volume reaction, and stronger subsequent post-earnings announcement drift. The distraction effect is more pronounced in market reactions to positive news than negative news, consistent with distraction weakening the 'buy on news' attention effect of Barber and Odean (2005). A portfolio trading strategy that exploits post-earnings announcement drift achieves superior performance when implemented on earnings announcements on days with a large number of competing announcements than those on days with little competing news. Competing announcements made by firms in other industries have a stronger distraction effect, whereas those by same-industry firms do not have a significant effect. Our findings generally support the investor distraction hypothesis, and suggest that investors' limited attention may drive market underreaction to public news such as post-earnings announcement drift.

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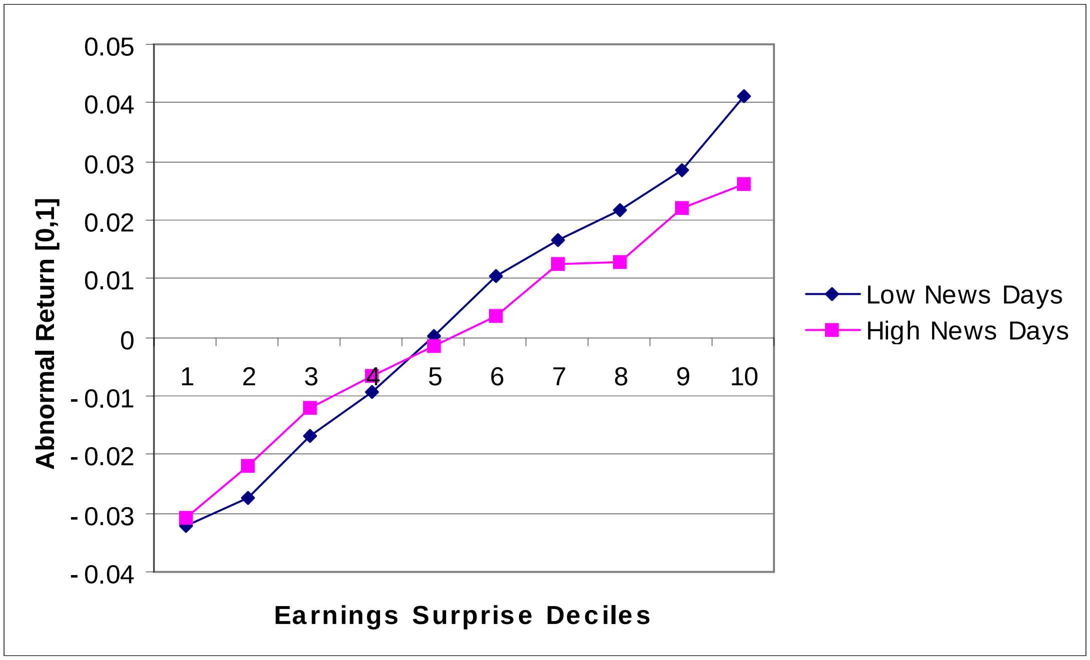

Figure 1. Market Reactions to Earnings News: CAR[0,1]

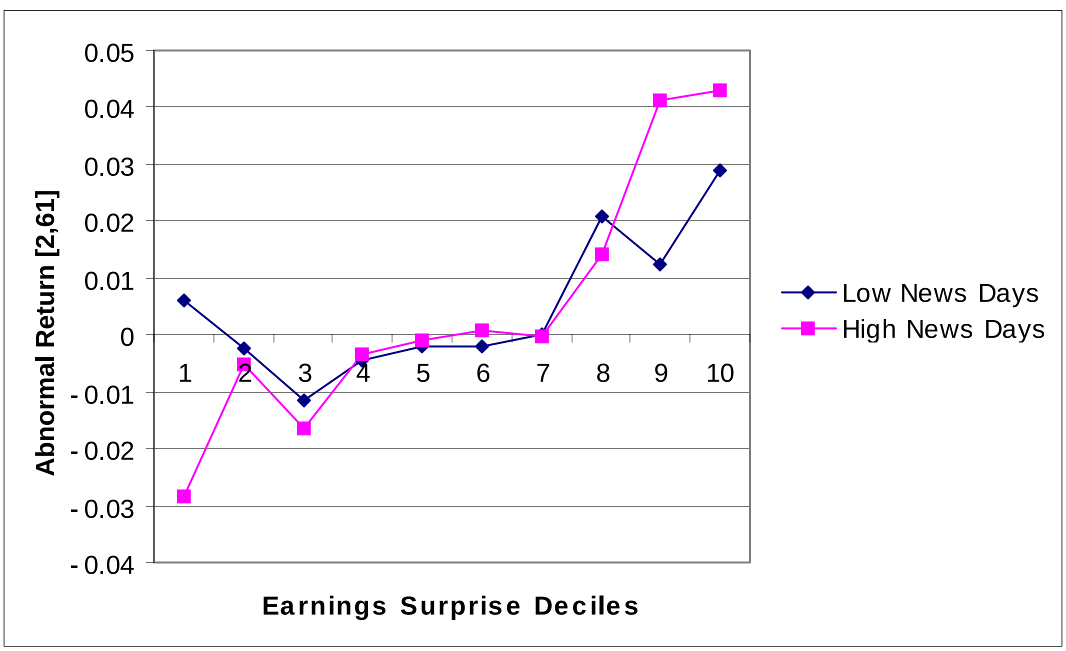

Figure 2. Post-Earnings Announcement Drift: CAR[2,61]

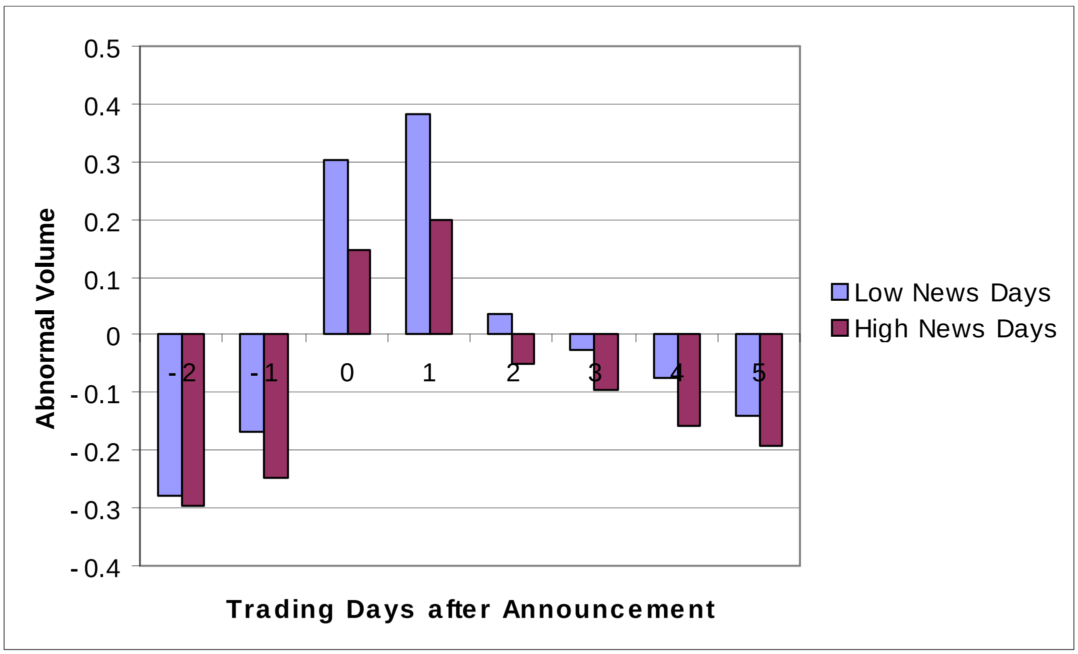

Figure 3: Abnormal Trading Volume around Earnings Announcement Date

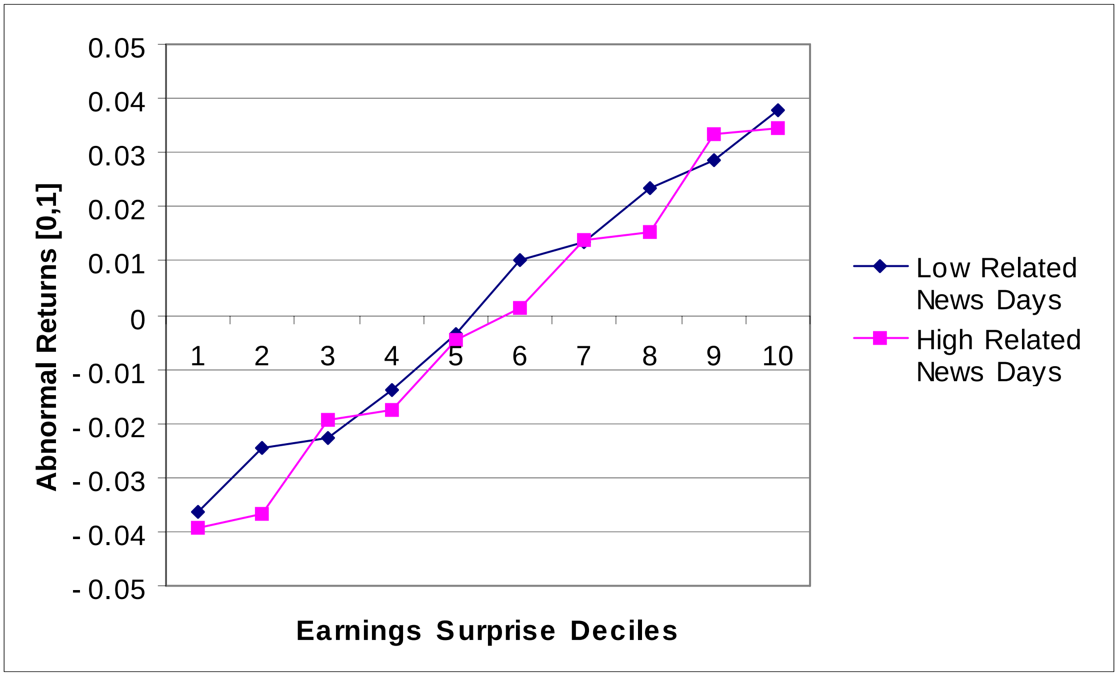

Figure 4a. Market Reactions to Earnings News: High vs. Low Related News Days

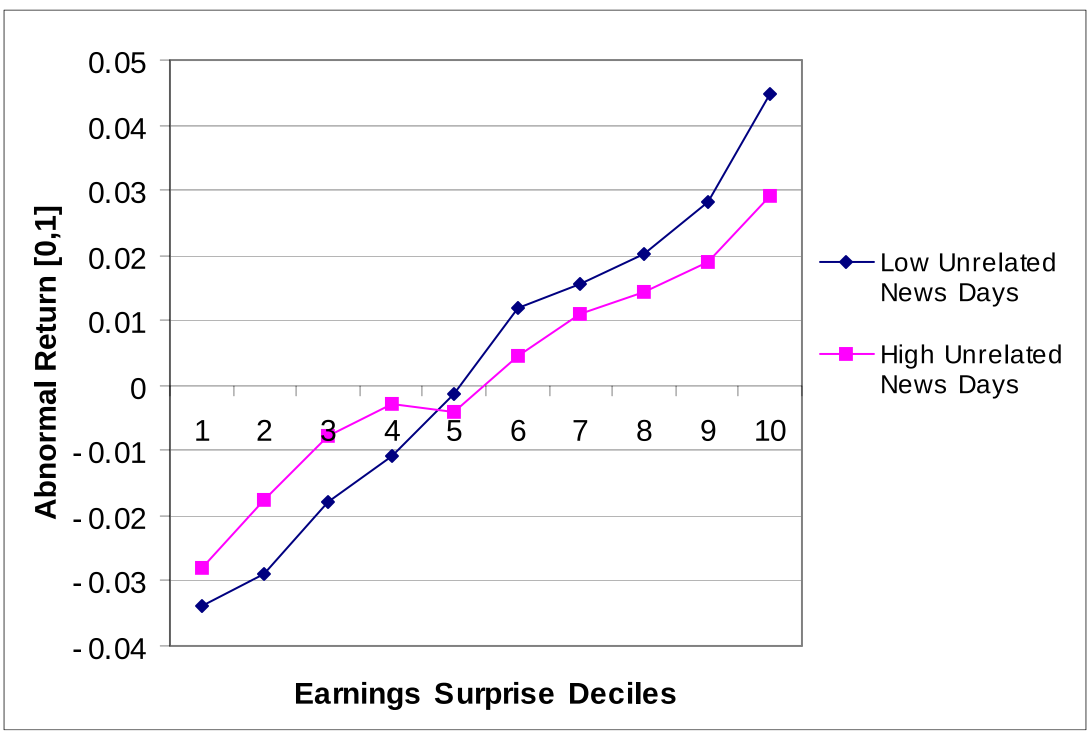

Figure 4b. Market Reactions to Earnings News: High vs. Low Unrelated News Days

Table 1. Descriptive Statistics of Daily Number of Earnings Announcements

Quarterly earnings announcement dates are from CRSP-Compustat merged database and IBES for the period from January 1995 to December 2004. We use the earnings announcement date from Compustat when the firm is not covered by IBES or when Compustat and IBES dates agree, and use the earlier date when Compustat and IBES announcement dates differ. Weekend earnings announcements are excluded from the sample. The daily number of announcements is the total number of quarterly earnings announcements on each day.

Panel A. Distribution of Daily Number of Announcements

		Percentiles				
Mean	Std. Dev	P10	P25	Median	P75	P90
120.8	129.7	20	33	71	175	290

Panel B. Mean and Median Number of Announcements a Day, by Day of Week/Month/Year

	Monday	Tuesday	Wednesday	Thursday	Friday
Mean	103.7	140.2	138.9	152.2	68.8
Median	62	78	77	90	53

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	116.8	145.4	78.5	195	155.2	32.7	176.5	148.7	34	174.1	154.3	32.4
Median	86	147	68.5	142	123	30	122.5	107	32	128	118.5	31

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Mean	100.4	107	112.4	117	121.3	145.5	138.1	130.9	120.4	114.5
Median	62	72	76	66	70	86.5	78	72	66	66

Table 2. Firm Characteristics by the Number of Announcements Deciles

In each calendar quarter, we sort quarterly earnings announcements during that quarter with earnings surprise (forecast error), size, and book-to-market (B/M) information into deciles by the raw or residual number of announcements on the day of the announcement. The raw number of announcements is the total number of quarterly earnings announcements by all firms covered by CRSP-Compustat, and the residual number of announcements is the residual from the regression of the raw number of earnings announcements on year, month, and day of week dummies. Table 2 reports the average size and B/M by the number of announcements deciles and the difference of size and B/M between deciles 10 and 1 with p-values. The size and B/M values are calculated at the end of June of each year based on the market value of equity at the end of June and the book value of equity for the last fiscal year end in the previous calendar year divided by the market value of equity for December of the previous calendar year.

	By Raw Number of Announcements		By Residual Number of Announcements	
	Size	B/M	Size	B/M
Decile1 (low-news days)	2347.1	0.662	3266.6	0.684
2	2916.5	0.799	2361.5	0.868
3	2347.8	0.946	2086.0	0.829
4	2216.8	0.831	2091.3	0.925
5	2718.9	0.756	2575.3	0.745
6	3347.3	0.742	3282.2	0.704
7	3076.7	0.714	3298.5	0.679
8	3284.2	0.664	3140.5	0.669
9	3434.4	0.679	3581.1	0.678
Decile10 (high-news days)	3228.8	0.789	3185.1	0.802
Difference (10-1)	881.7	0.127	–81.4	0.118
p-value	<0.0001	0.128	0.40	0.161

Table 3. Cumulative Abnormal Returns of Extreme Earnings Surprise Deciles By Number of Announcements Deciles

Average 2-day announcement cumulative abnormal returns (CAR[0,1]) and 60-day post-announcement cumulative abnormal returns (CAR[2,61]) for extreme earnings surprise deciles (FE10: good news, FE1: bad news) are calculated for each residual number of announcements deciles (NRANK). The residual number of announcements is the residual from the regression of the number of earnings announcements on year, month, and day of week dummies. Earnings surprise and number of announcement deciles are formed based on quarterly independent double sorts of quarterly earnings announcements by the corresponding forecast error and the residual number of quarterly earnings announcements on the day of announcements. The significance of the return spreads between good and bad earnings news firms (FE10–FE1) is marked by * (significant at 5%) and ** (significant at 1%).

NRANK	Average CAR[0,1] for Earnings surprise deciles 10 and 1			Average CAR[2,61] for Earnings surprise deciles 10 and 1		
	FE10	FE1	FE10 –FE1	FE10	FE1	FE10–FE1
1 (low-news days)	4.13%	–3.20%	7.33%**	2.89%	0.60%	2.30%
2	3.26%	–2.89%	6.14%**	1.18%	–2.50%	3.68%*
3	3.13%	–4.07%	7.20%**	4.67%	–2.33%	7.00%**
4	2.86%	–3.40%	6.26%**	1.64%	–4.33%	5.96%*
5	2.27%	–3.14%	5.40%**	2.33%	–1.16%	3.49%
6	3.56%	–2.97%	6.53%**	3.46%	0.63%	2.83%**
7	2.59%	–3.21%	5.80%**	3.76%	–4.27%	8.03%**
8	2.23%	–3.96%	6.19%**	4.02%	–2.97%	7.00%**
9	3.04%	–3.77%	6.80%**	5.52%	–1.92%	7.44%**
10 (high-news days)	2.61%	–3.07%	5.67%**	4.30%	–2.84%	7.14%**
Difference (10–1)	–1.52%	0.14%	–1.66%	1.41%	–3.44%	4.85%
p-value	(0.00)	(0.77)	(0.01)	(0.35)	(0.03)	(0.03)

Table 4. Market Reactions to Earnings News: Regression Analysis

Table 4 reports the results of the regression analysis of the 2-day announcement cumulative abnormal returns (CAR[0,1]) and the 60-day post-announcement cumulative abnormal returns (CAR[2,61]). FE is the earnings surprise deciles (FE=1: lowest, 10: highest) and NRANK is the residual number of announcement deciles based on quarterly independent sorts by forecast errors and the residual number of announcements on the day of announcement. Regressions (3) and (6) include extreme earnings surprise deciles only (FE=10 and FE=1) and the indicator variable FE10 is equal to one for the top earnings surprise decile (FE=10) and zero for the bottom earnings surprise decile. Control variables include size deciles and book-to-market (B/M) deciles based on the most recent June size and book-to-market ratio of the firm using NYSE breakpoints, year, month, and day of week dummies, and interaction terms of earnings surprise variable (FE or FE10) with size deciles, B/M deciles, and Friday dummy. Standard errors adjusted for heteroskedasticity and clustering by the day of announcement are in parentheses
(* significant at 10%; ** significant at 5%; *** significant at 1%).

	(1) CAR[0,1]	(2) CAR[0,1]	(3) CAR[0,1]	(4) CAR[2,61]	(5) CAR[2,61]	(6) CAR[2,61]
NRANK	0.024	0.011	–0.036	–0.181**	–0.283***	–0.396***
	(0.022)	(0.024)	(0.042)	(0.076)	(0.079)	(0.146)
FE	0.716***	0.912***		0.344***	0.472***	
	(0.022)	(0.032)		(0.075)	(0.113)	
FE×NRANK	–0.008**	–0.010***		0.039***	0.047***	
	(0.004)	(0.004)		(0.013)	(0.013)	
FE10			7.487***			3.059**
			(0.442)			(1.543)
FE10×NRANK			–0.113**			0.480***
			(0.052)			(0.173)
Controls	No	Yes	Yes	No	Yes	Yes
Constant	–3.794***	–5.823***	–3.828***	–1.980***	–3.076***	–0.151
	(0.134)	(0.297)	(0.754)	(0.479)	(1.089)	(2.757)
# Observations	117,642	117,642	23,500	113,290	113,290	22,483
R-squared	4.9%	5.2%	8.4%	0.3%	0.8%	2.6%

Controls: Size and B/M deciles, year, month, and day of week dummies, and interaction terms of the earnings surprise variable (FE for Regressions (1),(2),(4),(5); FE10 for Regressions (3) and (6)) with size & B/M deciles and Friday dummy

Table 5. Positive versus Negative Earnings Surprises

We report multivariate tests of the effects of distraction as proxied by NRANK on the relation between returns and earnings surprises. We test positive and negative earnings surprises separately. The dependent variable is either the 2-day announcement cumulative abnormal returns (CAR[0,1]) or the 60-day post-announcement cumulative abnormal return (CAR[2,61]). FE is the earnings surprise quintile (FE = 1: lowest, 5: highest), and NRANK is the residual number of announcement deciles based on quarterly independent sorts of each subsample of earnings surprises (positive subsample, or negative subsample) by forecast errors and by the residual number of announcements on the day of announcement. Controls include size and book-to-market (B/M) deciles based on the most recent June size and book-to-market ratio of the firm using NYSE breakpoints; year, month, and day of week dummies; and interaction terms of FE with size, B/M, and Friday dummy. Standard errors adjusted for heteroskedasticity and clustering by the day of announcement are in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%).

	Positive Surprises Only		Negative Surprises Only	
	(1)	(2)	(3)	(4)
	CAR[0,1]	CAR[2,61]	CAR[0,1]	CAR[2,61]
NRANK	–0.009	-0.307***	0.027	–0.291
	(0.028)	(0.111)	(0.048)	(0.181)
FE	0.911***	0.348	0.465***	–0.377
	(0.084)	(0.301)	(0.111)	(0.407)
FE×NRANK	–0.025***	0.115***	–0.003	0.050
	(0.009)	(0.039)	(0.013)	(0.048)
Controls	Yes	Yes	Yes	Yes
Constant	–0.898**	–2.309	–6.450***	2.520
	(0.392)	(1.412)	(0.571)	(2.184)
# Observations	64,232	61,933	36,585	35,073
R-squared	1.5%	0.7%	1.7%	0.9%

Controls: Size and B/M deciles; year, month, and day of week dummies; and interaction terms of FE with size & B/M deciles and Friday dummy

Table 6: Trading Volume Response to Earnings News

We calculate the abnormal trading volume of the firm on day *t* as the dollar trading volume on day *t* normalized by the average dollar trading volume over days [*t-41*,*t-11*]. VOL[0] is the abnormal trading volume on the day of earnings announcement and VOL[0,1] is the abnormal trading volume using the average dollar trading volume over days [0,1] of the announcement. AFE is the absolute earnings surprise deciles and NRANK is the residual number of announcements deciles based on quarterly independent sorts by absolute forecast errors and the residual number of announcements on the day of announcement. Regressions (3) and (6) use indicator variables for each earnings surprise deciles (FE2-FE10) instead of the absolute earnings surprise deciles. MKTVOL is the market abnormal trading volume defined as the average abnormal trading volume of all CRSP firms on that day and MKTVOL2 is the 2-day market abnormal trading volume defined in a similar way. Other control variables include size and book-to-market (B/M) deciles based on the most recent June size and book-to-market ratio of the firm using NYSE breakpoints, year, month, and day of week dummies. Standard errors adjusted for heteroskedasticity and clustering by the day of announcement are in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%).

	(1)	(2)	(3)	(4)	(5)	(6)
	VOL[0]	VOL[0]	VOL[0]	VOL[0,1]	VOL[0,1]	VOL[0,1]
AFE	–0.012***	0.011***		–0.001	0.013***	
	(0.001)	(0.002)		(0.001)	(0.001)	
NRANK	–0.010***	–0.023***	–0.022***	–0.014***	–0.024***	–0.024***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
MKTVOL		1.000***	0.999***			
		(0.029)	(0.028)			
MKTVOL2					0.952***	0.950***
					(0.026)	(0.026)
FE2			0.064***			0.036***
			(0.016)			(0.012)
FE3			0.036**			0.009
			(0.015)			(0.011)
FE4			0.080***			0.046***
			(0.016)			(0.012)
FE5			0.119***			0.087***
			(0.014)			(0.011)
FE6			0.153***			0.117***
			(0.015)			(0.011)
FE7			0.199***			0.145***
			(0.015)			(0.011)
FE8			0.271***			0.227***
			(0.017)			(0.012)
FE9			0.320***			0.278***
			(0.018)			(0.013)
FE10			0.000			0.000
			(0.000)			(0.000)
Controls	No	Yes	Yes	No	Yes	Yes
Constant	0.225***	0.569***	0.516***	0.401***	0.905***	0.892***
	(0.016)	(0.035)	(0.036)	(0.014)	(0.029)	(0.029)
Observations	117,642	117,642	117,642	117,642	117,642	117,642
R-squared	0.1%	4.5%	5.1%	0.2%	5.5%	6.3%

Controls: Size and book-to-market (B/M) deciles, year, month, and day of week dummies

Table 7: Fama-French 3- and 4-factor Alphas of Post-Earnings Announcement Drift Portfolios

At the end of each month from March 1995 until December 2004, we independently sort stocks into 5x5 groups based on their most recent quarterly earnings surprises within the last three months (FE=1~5) and the residual number earnings announcements on the day of earnings announcement (NRANK=1~5). We calculate equally-weighted returns of the resulting 5x5 portfolios during the following month. Within each of residual number of announcements rank (NRANK), we form a hedge portfolio that is long in good news portfolio (FE=5) and short in bad news portfolio (FE=1) to exploit post-earnings announcement drifts. Alphas from time-series regressions of portfolio excess returns on Fama-French three (four) factors are reported with Newey-West standard errors with 12 lags are in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%), which indicate the average monthly abnormal returns of the portfolio strategy. The last row reports the abnormal return the fund-of-fund portfolio which is long in the top quintile (NRANK=5) hedge portfolio and short in the bottom quintile (NRANK=1) hedge portfolio. We divide the sample into two similar-sized subsamples of small and large firms using NYSE breakpoints and implement the portfolio strategy separately within each subsample.

	3-Factor Alpha			4-Factor Alpha		
NRANK	All	Size Deciles 1-3	Size Deciles 4-10	All	Size Deciles 1-3	Size Deciles 4-10
1	0.16%	-0.03%	0.14%	-0.33%	-1.03%	0.08%
	(0.53)	(0.806)	(0.23)	(0.54)	(0.96)	(0.25)
2	1.35***	2.01***	0.11	1.23***	1.80***	-0.00
	(0.16)	(0.30)	(0.29)	(0.18)	(0.34)	(0.25)
3	1.03**	1.41***	0.04	0.72	1.21***	-0.29
	(0.42)	(0.38)	(0.49)	(0.45)	(0.34)	(0.62)
4	0.79**	1.86***	0.15	0.57	1.68***	-0.06
	(0.31)	(0.44)	(0.34)	(0.38)	(0.51)	(0.33)
5	1.43***	2.53***	0.26	1.34***	2.37***	0.19
	(0.28)	(0.42)	(0.24)	(0.30)	(0.42)	(0.24)
5–1	0.95*	2.24**	-0.20	1.35**	3.08***	-0.21
	(0.56)	(0.89)	(0.37)	(0.63)	(1.09)	(0.36)

Table 8: The Effect of Related vs. Unrelated Announcements

We examine the effect of the number of related and unrelated announcements on the 2-day announcement cumulative abnormal returns (CAR[0,1]) and the 60-day post-announcement cumulative abnormal returns (CAR[2,61]). We calculate daily number of quarterly earnings announcements for each industry using Fama-French 10 industry classification, where we exclude firms in Industry 10 ('Others'). The number of related announcements is the number of quarterly earnings announcements by the same industry firms, and the number of unrelated announcements is the number of quarterly earnings announcements by firms in other industries. We regress the related and unrelated number of announcements on month, day of week, and year dummies and use the residual number of related and unrelated announcements to control for calendar effects. #Related is the related number of announcement decile (10: highest, 1: lowest) and #Unrelated is the unrelated number of announcement deciles. Control variables include size and book-to-market (B/M) deciles based on the most recent June size and book-to-market ratio of the firm using NYSE breakpoints, year, month, and day of week dummies, and interaction terms of the size, B/M, and Friday dummy with the earnings surprise deciles. Standard errors adjusted for heteroskedasticity and clustering by the day of announcement are in parentheses (* significant at 10%; ** significant at 5%; *** significant at 1%).

	(1) CAR[0,1]	(2) CAR[0,1]	(3) CAR[0,1]	(4) CAR[2,61]	(5) CAR[2,61]	(6) CAR[2,61]
#Related	–0.058**		–0.175***	–0.211**		–0.019
	(0.029)		(0.036)	(0.094)		(0.129)
FE	0.798***	0.899***	0.835***	0.446***	0.437***	0.405***
	(0.038)	(0.036)	(0.039)	(0.134)	(0.127)	(0.137)
FE×#Related	0.005		0.028***	0.039**		0.013
	(0.005)		(0.006)	(0.016)		(0.019)
#Unrelated		0.043	0.164***		–0.306***	–0.290**
		(0.028)	(0.035)		(0.091)	(0.126)
FE×#Unrelated		–0.014***	–0.033***		0.046***	0.037**
		(0.004)	(0.005)		(0.014)	(0.018)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	–5.375***	–5.971***	–5.581***	–3.635***	–3.464***	–3.395***
	(0.351)	(0.346)	(0.354)	(1.229)	(1.207)	(1.239)
# Observations	92,686	92,686	92,686	89,369	89,369	89,369
R-squared	5.3%	5.3%	5.4%	1.0%	1.0%	1.0%

Controls: Size and B/M deciles, year, month, and day of week dummies, and interaction terms of the forecast error deciles (FE) with size and B/M deciles and Friday dummy