Overreacting to a History of Underreaction?

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ABSTRACT

Prior research has documented a long history of positive autocorrelation in firms' earnings announcement news. This is one of the main features of the post-earnings announcement drift phenomenon and is typically attributed to investors' underreaction to earnings news. I document that this autocorrelation has become significantly negative for firms with active exchange-traded options. For these easy-to-arbitrage firms, the firms in the highest decile of prior earnings announcement abnormal return (prior earnings surprise), on average, underperform the firms in the lowest decile by 1.29% (0.73%) at their next earnings announcement. Additional analyses are consistent with investors learning about post-earnings announcement drift and overcompensating. For example, I find that, in recent years, stock returns are more extreme in response to extreme earnings surprises, and that investors are positioning themselves immediately prior to the next earnings announcement in anticipation of PEAD (i.e., buying shares or call options of past earnings announcement winners and selling-short or buying put options of past earnings announcement losers). It seems that due to their well-documented history of apparently underreacting to earnings news, investors are now overreacting to earnings announcement news. This paper shows that attempts to exploit a popular trading strategy based on relative valuation can significantly reverse the previously documented pattern.

1. INTRODUCTION

Grossman and Stiglitz (1980) note that only through costly information search and trading by arbitrageurs are security prices driven towards fundamental value, and Lee (2001) discusses market efficiency as a process and a journey, one in which financial researchers can help lead the market towards greater efficiency. While on this journey, financial researchers have documented an extensive set of cross-sectional stock return predictors or anomalies (Green et al. 2013). In his review of anomalies, Schwert (2003) argues that increased arbitrage activity should cast doubt on whether these anomalies can persist. Consistent with a market that becomes more efficient over time, recent research has found that many of the most well-known anomalies no longer present profitable trading opportunities (e.g., Chordia et al. 2013; Green et al. 2011; Richardson et al. 2010). While this recent research is consistent with the notion of an increasingly efficient market in which arbitrageurs exploit opportunities to the point that the opportunities are no longer profitable, it is not clear that attempts to profit from a well-known cross-sectional anomaly always drives prices to fundamental values.

Attempts to exploit well-known cross-sectional anomalies do not necessarily drive prices to fundamental values because these trading strategies are based on relative values rather than absolute or fundamental values. As these trading strategies are not based on estimates of fundamental value, arbitrageurs relying solely on these strategies never know the extent of the mispricing, if any. This inherent uncertainty regarding the magnitude of the mispricing requires the arbitrageurs to understand the price impact, if any, of other arbitrageurs using the same strategy. Stein (2009) and Lundholm (2008) present theoretical models where some arbitrageurs trade using relative value strategies without consideration for fundamental value. They show that when this arbitrage activity becomes too aggressive, these arbitrageurs can cause the

opposite of the expected cross-sectional return pattern instead of eliminating the pattern. Similarly, Lo (2004) argues that in an adaptive market, trading strategies will undergo cycles of profit and loss depending on the magnitude of the profit opportunities and on the amount of capital used by arbitrageurs in the trading strategies. From these theoretical models, I hypothesize that the return pattern from a well-known cross-sectional anomaly can significantly reverse over a nontrivial period of time due to an overcrowding of arbitrageurs in that trading strategy.

To test my hypothesis, I examine one of the main features of the post-earnings announcement drift (PEAD) phenomenon. Specifically, I examine the autocorrelation in earnings announcement news for firms with active exchange-traded options. I select this setting because it has several attractive features that increase the likelihood of it being an overcrowded trade. First, the PEAD effect is one of the most well-known cross-sectional anomalies due to its long and extensively documented history. Second, exploiting the effect is not viewed as particularly risky because the most popular explanation for PEAD is that investors underreact to earnings news. Third, I focus my analysis on firms with active exchange-traded options because the strategy is easier to implement in these firms relative to firms without active options. Finally, because the magnitude of the abnormal returns is large and the timing of those abnormal returns is precise, this aspect of the PEAD effect is attractive to potential arbitrageurs (especially ones using options) as they are after opportunities with the greatest amount of abnormal returns possible per unit of time.

Consistent with my hypothesis, I find that instead of the expected positive autocorrelation in firms' earnings announcement news from the PEAD literature, there is a significantly negative autocorrelation in firms' earnings announcement news for firms with active options trading

during my 1996 – 2010 sample period. This significantly negative relation between firms' current earnings announcement abnormal returns and their prior earnings announcement news is of large economic significance, and is present regardless of whether the prior earnings news is measured as the prior earnings surprise or as the abnormal stock return at the prior earnings announcement. From 1996 - 2010, firms in the highest decile of prior earnings announcement abnormal returns (prior earnings surprises), on average, significantly underperform firms in the lowest decile by 1.29% (0.73%) over their next two-day earnings announcement window.

For firms with active options trading, prior earnings news remains a significantly negative predictor of future earnings announcement abnormal returns even after controlling for various variables that prior research has shown to predict future earnings announcement abnormal returns. In fact, it is the second most powerful predictor of future earnings announcement abnormal returns for firms with active options.[1] This new negative relation is a more powerful predictor than classic earnings announcement abnormal return predictors such as size (e.g., Freeman 1987; Chari et al. 1988; Ball and Kothari 1991), growth (La Porta et al. 1997), and accruals (Sloan 1996). It is also a stronger predictor of earnings announcement abnormal returns than newly discovered predictors from options data such as option spreads (Jin et al. 2012; Atilgan 2012), option skews (Jin et al. 2012; Van Buskirk 2011), and O/S - option trading volume relative to share volume (Johnson and So 2012; Roll et al. 2010).

I examine three possible explanations for the negative autocorrelation in earnings news, and find some evidence consistent with each of them. First, I find that the stock price reactions to earnings surprises are more extreme in recent years (2003Q3 – 2010). This is consistent with investors learning from their past underreaction and overcompensating. Second, I find that

[1] The most powerful predictor of the earnings announcement abnormal returns in my sample is the abnormal return in the days immediately prior to the earnings announcement (So and Wang 2011; Landsman et al. 2011; Aboody et al. 2013).

proxies of firm-specific investor sentiment are significantly higher (lower) immediately prior to the next earnings announcements for firms that did well (poorly) at their previous earnings announcement. This is consistent with investors overly positioning themselves in a manner consistent with the expectation of the PEAD effect, and this excessive sentiment being corrected when the earnings news is released, resulting in negative autocorrelation in firms' earnings news. Finally, I find that the autocorrelation in firms' earnings surprises is still significantly positive, but that after controlling for a firm's prior earnings surprise, a firm's prior earnings announcement return is negatively associated with the firm's next earnings surprise. This is consistent with analysts overreacting to the other information in firms' earnings announcements that is unrelated to the earnings surprise, when they forecast next quarter's earnings. Overall, the evidence is consistent with investors learning about PEAD and trading more aggressively at both the current earnings announcement and immediately prior to the next earnings announcement in an effort to profit from PEAD.

The results that I document are of interest to both financial researchers and practitioners alike. Consistent with the theoretical models of Stein (2009) and Lundholm (2008), I document that the return pattern from a well-known cross-sectional anomaly can significantly reverse for an extended period of time. These theoretical models and my results suggest that arbitrage activity related to cross-sectional anomalies does not always drive prices towards fundamental value. In fact, arbitrage activity can actually reverse the cross-sectional stock return pattern that it intends to eliminate. This result should caution investors not to blindly follow relative value trading strategies because the worst-case scenario is not that the strategy will not work (i.e., earn zero excess returns), the worst-case scenario is that the strategy will consistently fail (i.e., earn negative excess returns).

The rest of the paper is organized as follows. Section 2 discusses prior literature and motivates the paper. Section 3 describes the data. Section 4 reports the main result. Section 5 examines potential explanations for the main result. Section 6 concludes.

2. LITERATURE REVIEW AND MOTIVATION

2.1 Elimination of Cross-sectional Anomalies

Over the past several decades, a large literature has developed documenting the ability of various cross-sectional variables to predict future stock returns (Green et al. 2013). Explanations for these phenomena generally relate to risk (e.g., Fama and French 1993), behavioral biases (e.g., Lakonishok et al. 1994), transaction costs (e.g., Amihud and Mendelson 1986), or arbitrage costs (e.g., Shleifer and Vishny 1997). To the extent that some of these cross-sectional variables are unrelated to risk, reductions in transaction costs and increases in arbitrage activity should call into question how long a variable's predictive ability can persist (e.g., Schwert 2003).

Consistent with this argument, a new literature is developing that documents a reduction in (or the elimination of) the stock return predictability due to some of these well-established variables. For example, Chordia et al. (2013) find that the predictive ability of seven of the most well-known cross-sectional predictors (i.e., firm size, book-to-market ratio, past twelve month return, accruals, change in shares outstanding, idiosyncratic volatility, and standardized unexpected earnings) are significantly weaker in recent years for liquid firms. They attribute this decline in predictive ability to increased arbitrage activity (e.g., increases in hedge funds' assets under management and increases in short interest) and reduced transaction costs (e.g., decreases in tick size and increases in trading volume).

Several other papers also use arguments involving investor learning, increased arbitrage activity, and decreases in transaction costs to explain the reduction in (or the elimination of) excess returns to various cross-sectional trading strategies. McLean and Pontiff (2012) examine 82 different anomalies and find that on average the post-publication abnormal returns decrease by about 35%. Research specifically examining the two most popular accounting-based trading strategies, PEAD and the accrual anomaly, suggest decreases much larger than 35%. Green et al. (2011) find that abnormal returns to the accrual anomaly strategy have not been reliably positive since 2001. Johnson and Schwartz (2000) find that abnormal returns to the PEAD strategy were substantially eliminated during the 1991 – 1997 period for large firms, and Chordia et al. (2013) find no evidence of PEAD in liquid stocks during the 1994 – 2011 period. Richardson et al. (2010) find that, after transaction costs, returns to both the accrual anomaly and PEAD strategies have attenuated in recent years. These papers are consistent with a market that becomes more efficient over time, as it learns about and then reduces or eliminates profitable trading opportunities.

However, it is not clear that attempting to eliminate these cross-sectional patterns in stock returns is an attractive opportunity to an arbitrageur because a significant issue arises when implementing a trading strategy to exploit one of these documented cross-sectional patterns. The problem is that the trading strategies used to exploit these patterns involve buying and selling stocks of firms in the extremes of a given variable's distribution, meaning that the strategies are relying on stocks' relative values rather than absolute or fundamental values. Without an estimate of a firm's fundamental value, the arbitrageur has no idea as to the extent of the mispricing, if any. Given that an arbitrageur solely using a cross-sectional trading strategy does

not consider the magnitude of the mispricing, they must also concern themselves with the price impact that other arbitrageurs using the same strategy may have on stock prices.

Both Stein (2009) and Lundholm (2008) model a setting in which some arbitrageurs trade using these relative value strategies without consideration for fundamental value. They show that when arbitrage activity is too high, the arbitrageurs can push prices beyond the efficient level, thereby causing the opposite of the expected return pattern rather than eliminating the pattern. In other words, if arbitrage activity using a trading strategy is too high, it becomes profitable to take the opposite positions. Lo (2004) also emphasizes that the number and size of arbitrageurs can cause a previously profitable trading strategy to become unprofitable.

Two case studies in which arbitrage attempts (based on a cross-sectional pattern) went awry are found in Stein (2009) and Khandani and Lo (2007). In both cases, it appears that too much capital was invested in a particular trading strategy resulting in very poor returns for the arbitrageurs. The case discussed in Stein (2009) involves an index rebalancing in late 2001. Contrary to expectations and past rebalancings, a strategy that was long stocks to be upweighted in the index and short stocks to be downweighted lost 6.18% on the day of the rebalance. Similarly, Khandani and Lo (2007) show that returns to a short-term reversal strategy, which had typically earned positive returns in the past, had a three-day return of -6.85% during the week of August 6, 2007. While these two case studies are illustrative and interesting, they do not document that excessive arbitrage activity can consistently reverse a previously documented cross-sectional pattern, which is my interest.

The theoretical models of Stein (2009) and Lundholm (2008), the arguments in Lo (2004), and these two case studies demonstrate the unintended impact that arbitrageurs can have on market prices. I hypothesize that an overcrowding of arbitrageurs may be detectable in the time-

series of returns for an aspect of the PEAD strategy. I specifically focus on the PEAD strategy and one particular aspect of it for reasons that I discuss next.

2.2 Post-earnings Announcement Drift

Ball and Brown (1968) first documented a phenomenon called post-earnings announcement drift (PEAD).[2] They show that prices continue to drift in the direction of the earnings news for a period of time after the announcement. Interest in this anomaly resurged after Bernard and Thomas (1989), who show that an implementable trading strategy based on PEAD (i.e., buying stocks in the highest decile of unexpected earnings and shorting stocks in the lowest decile) generates an 18% annualized return, during the quarter after the earnings announcement. Knowledge of the PEAD phenomenon has been widely disseminated (e.g., there is a relatively detailed discussion of it in the leading undergraduate textbook on investments Bodie et al. 2004).

The most popular explanation for the drift and the autocorrelation in earnings news is that investors underreact to earnings information.[3] For instance, Fama (1998) refers to PEAD as "the granddaddy of underreaction events." Ball and Bartov (1996) find that investors underestimate the magnitude of serial correlation in seasonally-differenced quarterly earnings by about 50%.[4] Also inconsistent with a risk-based explanation, Bernard and Thomas (1989) find that a hedge portfolio based on PEAD earned positive returns in 46 of 50 quarters and in all 13 years that they examine.

Relative to other anomalies, PEAD's long history, extensive documentation, wide dissemination, and evidence of a non-risk explanation make it an interesting anomaly for

[2] See Ball (1992), Bernard (1993), Kothari (2001), Richardson et al. (2010), and Taylor (2011) for literature reviews.
[3] Other explanations generally involve risk, arbitrage costs, and/or transaction costs (e.g., Ball 1978; Ball et al. 1993; Sadka 2006; Garfinkel and Sokobin 2007; Mendenhall 2004; Bhushan 1994; and Ng et al. 2008).
[4] Other papers on investors underestimation of the autocorrelation in seasonally-differenced quarterly earnings include: Rendleman, Jones, and Latane (1987), Bernard and Thomas (1990), and Soffer and Lys (1999).

arbitrageurs to pursue. However, for these same reasons concerns about a potentially overcrowded trade also arise. Consistent with increased arbitrage activity reducing the abnormal returns to the PEAD strategy, Johnson and Schwartz (2000), Richardson et al. (2010), and Chordia et al. (2013) find that the strategy has not been significantly profitable in recent years.[5] While these papers examine the abnormal returns in the weeks or months following the earnings announcement, one key finding from the PEAD literature that these studies do not examine is that a large proportion of the future abnormal returns occur at future earnings announcements, especially at the next earnings announcement (Bernard and Thomas 1989; Freeman and Tse 1989). For example, Bernard and Thomas (1989) find that 40%, 29%, and 25% of the 60-day drift occurs at the next earnings announcement for small, medium, and large firms, respectively.

I examine this aspect of PEAD because of its specificity as to when to expect the mispricing to correct itself (which creates a more direct link between past and future earnings information) and because a short return window reduces issues regarding the measurement of abnormal returns.[6] In addition to increasing the power of the empirical test, this setting is also relatively more attractive to arbitrageurs as they are likely to pursue opportunities where abnormal returns per unit of time are greatest. In order for arbitrageurs to implement the PEAD strategy, they must be able to profit from price declines for firms in the lowest decile of earnings news, I discuss this issue next.

2.3 PEAD, Transaction Costs, and Short Positions

[5] Zhang (2010) and Huang et al. (2012) find evidence consistent with overreaction to earnings information in two particular cases. Zhang (2010) finds evidence of it when firms had high amounts of his ex post measure of high frequency trading, and Huang et al. (2012) find evidence of it in when firms have greater headline salience in their earnings press release.

[6] Fama (1998) explains that the model of expected returns is not a significant issue for studies focusing on short return windows because expected returns over a short horizon (e.g., a few days) are close to zero.

One of the main explanations for the existence and persistence of PEAD (other than risk or underreaction) relates to difficulties in implementing the strategy, such as arbitrage costs and transaction costs (e.g., Bhushan 1994; Mendenhall 2004; Ng et al. 2008). Indeed, prior studies find that the drift is larger for firms with high implementation costs and small or nonexistent for firms with low implementation costs.[7] One of the difficulties in implementing the PEAD strategy is profiting on the price declines from the firms with extreme negative earnings news. A short position can be established either through short-selling or the purchase of put options. However, negative information is better reflected in the prices of firms with short positions (Diamond and Verrecchia 1987). Therefore, while short positions are necessary to implement the PEAD strategy, these actions are only possible in firms that are relatively more efficiently priced, and hence are less likely to exhibit PEAD.

Prior research has examined the relation between short-selling and PEAD. While these studies find evidence of short-selling activity related to PEAD, the data used in these studies is limited in terms of frequency (e.g., monthly short-selling data rather than daily data) and/or sample period length. For example, Christophe et al. (2004) provide evidence of increased short-selling just prior to earnings announcements of firms with low standardized unexpected earnings at their prior earnings announcement for a small sample of NASDAQ firms in the fall of 2000. Using daily data on short-selling (over a 21-month period), Berkman and McKenzie (2012) find that short-selling increases after negative earnings surprises, but that this short-selling is insufficient to eliminate PEAD over the following quarter. In contrast, Boehmer and Wu (2013) find that short-selling is sufficient to eliminate PEAD over the following month, using daily data on short-selling from January 2005 – June 2007. Lasser et al. (2010) use monthly short interest

[7] Proxies for arbitrage costs or transaction costs examined in prior research include: firm size (Foster et al. 1984), share price and trading volume (Bhushan 1994), firm volatility (Mendenhall 2004), and bid-ask spread (Ng et al. 2008).

data from 1992 – 2003 and find that heavily shorted firms with extreme positive earnings surprises experience a smaller price drift, while heavily shorted firms with extreme negative earnings surprises experience a larger price drift.[8]

Given the limited data on short-selling, options market data is preferable in examining the relation between short positions and PEAD because data is available on a daily basis since 1996 for all firms with exchange-listed options. Options market data is well-suited for the examination of hedge portfolio strategies, because it allows the researcher to identify whether a short position may have been inexpensively taken on a particular firm at a particular point in time. Furthermore, Johnson and So (2012) argue that short-sale costs (e.g., loan fees for the borrowed shares shorted and the number of shares available for shorting) can make the options market a more attractive venue for traders with negative views. In addition to avoiding these costs, traders may prefer the options market because of the increased leverage that options offer, the limited downside of options, and the lack of margin requirements for long calls and long puts. Consistent with the attractiveness of the options market for trading on earnings news, Philbrick and Stephan (1993) and Amin and Lee (1997) find that the open interest in options increases prior to earnings announcements.

Several papers find that options trading makes firms' stock prices more efficient (e.g., Jennings and Starks 1986; Skinner 1990; Mendenhall and Fehrs 1999, Truong and Corrado 2009). Truong and Corrado (2009) find that PEAD is lower over the following 60 trading days for firms with abnormal options trading volume around their earnings announcements.[9] While these papers suggest that exchange-traded options improve a firm's price efficiency, the

[8] Lasser et al. (2010) attribute their results to short covering following extreme earnings news regardless of the sign of the news.

[9] My results are not necessarily inconsistent with Truong and Corrado (2009), as I examine the short return window at the next earnings announcement rather than a long return window.

possibility remains that a portion of the large increase in options trading around earnings announcements in recent years is uniformed speculation (e.g., trading on cross-sectional anomalies without regard to fundamental values). For example, Roll et al. (2010) find that the amount options activity in the days prior to an earnings announcement has increased significantly over the 1996 - 2007 period, which is potentially indicative of overcrowded trades. To the extent that the option trades around earnings announcements are based on PEAD without regard to fundamental values, I expect the previously documented PEAD return pattern to reverse.

3. DATA

3.1 Sample Selection

I obtain quarterly earnings announcement dates and unadjusted quarterly earnings-per-share forecasts and actuals from I/B/E/S.[10] I require each earnings announcement to have at least one analyst earnings forecast since the previous earnings announcement in order to calculate an analyst-based earnings surprise. I obtain firms' balance sheet data and earnings dates from Compustat and firms' stock returns, trading volume, and market capitalizations from the Center for Research in Security Prices (CRSP).[11] I retain firms with ordinary common shares on NYSE, AMEX, or NASDAQ. I obtain data on exchange-traded options from OptionMetrics. To ensure a sample of earnings announcements with relatively active options trading, I restrict the main sample to earnings announcements for firms whose exchange-traded options have positive open

[10] I use the unadjusted data from I/B/E/S to avoid the problem of rounding found in the adjusted data due to stock splits (e.g., Baber and Kang 2002; Payne and Thomas 2003).

[11] Although I use I/B/E/S earnings announcement dates, I also require the Compustat earnings announcement date to either be the same day or the day after, in order to eliminate potential errors in earnings announcement dates.

interest and volume on the day before the earnings announcement.[12] My main sample contains 23,684 earnings announcements with active options from 1996 – October 2010, and my other sample contains 78,896 earnings announcements without active options over the same time period.[13] There are 2,854 unique firms in the active options sample and 6,310 unique firms in the sample without active options. Table 1 presents the number of firms and earnings announcements in the two samples by year.

3.2 Variable Measurement

The main variables of interest in this paper are measures of firms' news at their earnings announcements. I measure the news at a firm's earnings announcement using both a stock return-based measure and an earnings-based measure. The stock return-based measure, *EARet*, is the firm's two-day abnormal return at the current earnings announcement (e.g., Chan et al. 1996; Brandt et al. 2008). It captures all value-relevant news during the earnings announcement window. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the two-day earnings announcement window, [0, 1], where day 0 is the earnings announcement date in I/B/E/S.[14] The earnings-based measure, *ESurp*, is the firm's current earnings surprise based on the consensus analyst forecast (e.g., Doyle et al. 2006; Livnat and Mendenhall 2006). Specifically, it is the firm's actual earnings less the mean analyst

[12] For dates prior to November 28, 2000, I use the open interest from the previous day in OptionMetrics. Prior to this date, OptionMetrics reports open interest at the end of a given day, which in is not known until the following morning. After this date, OptionMetrics reports the open interest prior to the beginning of the trading day, which is the open interest at the end of the previous day. To clarify, I require firms to have positive open interest at the beginning of the day, on the day before the firm's earnings announcement.

[13] Van Buskirk (2011) examines 30,137 earnings announcements over a similar sample period. The difference in sample sizes is mainly due to my requirement of relatively active options trading. My sample size is consistent with Van Buskirk (2011), if this requirement is removed. Results in this paper are similar, albeit weaker, with the larger sample which suggests an important role for option liquidity in my analysis. Indeed, the results in my paper are stronger, if I exclude from the active options sample the earnings announcements in the lowest quartile of open interest each quarter.

[14] I adjust earnings announcement dates (i.e., add one trading day) for announcements that occur after the market close based on the I/B/E/S timestamp (Berkman and Truong 2009).

earnings forecast, scaled by the firm's stock price six days prior to the earnings announcement. In constructing the mean analyst forecast, I retain analyst forecasts issued after the previous earnings announcement and at least six days prior to the current earnings announcement. *LagEARet (LagESurp)* measures a firm's earnings news at its previous earnings announcement; it is the firm's *EARet* (*ESurp*) from the previous calendar quarter.

In addition to prior earnings news, several ex ante variables have been shown to predict earnings announcement returns. I use these variables as controls in my empirical tests. Freeman (1987), Chari et al. (1988), and Ball and Kothari (1991) find that small firms have higher earnings announcement returns than large firms. I measure *Size* as the firm's market capitalization six days before the current earnings announcement. La Porta et al. (1997) find that a significant portion of the difference in stock returns between value and glamour stocks is due to value stocks having higher earnings announcement returns than growth stocks. Consistent with La Porta et al. (1997), I distinguish between value and growth stocks using firms' market-to-book ratio, *M/B*. *M/B* is measured as the firm's *Size* divided by the firm's book value from the previous quarter. Sloan (1996) finds that a significant proportion of the abnormal returns to the accrual anomaly strategy are concentrated around future earnings announcements. He finds that firms with low past annual accruals have higher earnings announcement returns than firms with high past annual accruals.[15] I measure accruals using the statement of cash flows approach (e.g., Hribar and Collins 2002; Collins and Hribar 2000). *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets.

In recent years, several other earnings announcement return predictors have been documented. In addition to using the following variables as controls, I also use these variables in other tests as proxies for firm-specific investor sentiment (see Section 5.2). So and Wang

[15] Collins and Hribar (2000) document that the accrual anomaly trading strategy holds for quarterly data.

(2011), Landsman et al. (2011), and Aboody et al. (2013) find that the short window return immediately prior to a firm's earnings announcement is negatively associated with the announcement return. I measure the short window return prior to the earnings announcement, *PreEA5DayRet*, as the firm's abnormal return for the five trading days prior to their earnings announcement. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the five day period, [-5, -1].

Spread, *Skew*, and *O/S* are option market variables that have been shown to predict earnings announcement returns. I calculate these variables on the day prior to the earnings announcement based on a single set of a firm's options with the same expiration date. I use the set of options that are closest to expiration with at least (no more than) 15 (75) days to expiration.[16] Jin et al. (2012) and Atilgan (2012) find that firms with high option spreads outperform firms with low option spreads at their next earnings announcement.[17] Van Buskirk (2011), Jin et al. (2012), and Xing et al. (2010) find that option skews are negatively related to earnings announcement news. Johnson and So (2012) show that firms with high O/S (option volume relative to share volume) underperform firms with low O/S, and that this result holds at earnings announcements.

Spread and *Skew* are closely related, as they are alternative measures of the difference in the implied volatilities (IV) between a firm's call and put options. *Spread* is the firm's weighted average implied volatility spread. I calculate *Spread* as the implied volatility of a call for a given

[16] I exclude options expiring within 15 days for three reasons. First, some option trades near expiration are clearly uninformed (i.e., trades to roll forward to the next expiration). Second, it becomes increasingly difficult to compute *Skew* as the expiration date approaches because fixed increment strike prices makes it less likely to find both an at-the-money call and an out-of-the money put as expiration approaches for low volatility firms (i.e., there will be a systematic relation between the firms volatility and the expiration date of the options data used, if options very near expiration are included). Third, because option theta (the decrease in an option's value due to the passage of time) increases as expiration approaches some option traders will prefer not to purchase options near expiration. I exclude options with more than 75 days to expiration because arbitrageurs trading based on short-term earnings news are likely to prefer options close to expiration.

[17] Other work on volatility spreads predicting future returns that does not focus specifically on earnings announcements include Ofek et al. (2004) and Cremers and Weinbaum (2010).

strike price and expiration less the implied volatility of the put with the same strike price and expiration as the call, these differences are then weighted by the amount of open interest in all strike price pairs with the same expiration. While *Spread* examines the differences in implied volatilities across pairs of calls and puts, *Skew* examines the difference in implied volatilities between a single put and a single call. I measure *Skew* as the implied volatility of an out-of-the-money put (i.e., delta closest to -0.25, given a delta of [-0.375, -0.125]) less the implied volatility on an at-the-money call (i.e., delta closest to 0.5, given a delta of [0.375, 0.625]). I compute *O/S* as the ratio of option market volume to stock market volume on the day prior to the firm's earnings announcement.[18] To obtain an understanding of a firm's option activity prior to their earnings announcement, I calculate *OpenInt* as the firm's total open interest in all calls and puts for the given expiration examined.

3.3 Descriptive Statistics

Table 2 presents descriptive statistics, with the sample of earnings announcements with active options in Panel A and the earnings announcements for firms without active options in Panel B.[19] Firms with active options are large (mean *Size* of $13 billion), have high growth opportunities (mean *M/B* of 5.6), and have extensive options trading (mean *OpenInt* of 20,171 option contracts). Firms without active options are smaller (mean *Size* of $2.3 billion) and have lower growth opportunities (mean *M/B* of 3.1). For earnings announcements with active options, the mean *EARet* of 0.5% is quite a bit smaller than the mean *LagEARet* of 0.9% which suggests that firms with active options immediately prior to their current earnings announcement have a

[18] Option volumes are multiplied by 100 to account for the fact that one option contract represents 100 shares.
[19] *ESurp*, *LagESurp*, *Spread*, *Skew*, *O/S*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels to reduce the influence of outliers.

lower earnings announcement abnormal return than in their previous earnings announcement. This pattern is not evident in the sample of earnings announcements without active options, and is consistent with the Johnson and So (2012) argument that the options market allows investors to express negative private information. Consistent with Xing et al. (2010), Van Buskirk (2011), and Jin et al. (2012) the mean and median of *Skew* (*Spread*) are positive (negative) which indicates that firms' implied volatilities for puts exceeds their implied volatilities for calls immediately prior to their earnings announcement. The mean *O/S* of 7.9% indicates that, on average, the equivalent of 7.9% of a firm's share volume, traded in the firm's options with the selected expiration, on the day before the earnings announcement.

Table 3 presents Pearson and Spearman rank correlations for these variables. Panel A presents the correlations for the sample of earnings announcements with active options. As expected, there is a strong positive relation between earnings and returns. Of main interest are the negative correlations between *EARet* and both *LagEARet* and *LagESurp*. These two sets of correlations are consistent with an overreaction to past earnings news and inconsistent with PEAD.[20] The strong positive correlation between *ESurp* and *LagESurp* is consistent with analysts' underreaction to earnings information (Abarbanell and Bernard 1992). There is also a strong correlation between *Spread* and *Skew*. This suggests that these two variables capture the same construct to a large degree, which is the extent to which the implied volatilities of calls differ from those of puts.[21] The strongly positive correlation between *Size* and *OpenInt* suggests that large firms tend to have relatively more options trading. Panel B presents the correlations for the sample of earnings announcements without active options. Similar to Panel A, there is

[20] Throughout the paper, when I refer to the autocorrelation in earnings news, I am referring to the correlation between *EARet* and *LagEARet* and the correlation between *EARet* and *LagESurp*.
[21] The correlation is negative because consistent with prior research I calculate *Spread* (*Skew*) using the difference in implied volatilities between calls (puts) and puts (calls).

evidence of analysts' underreaction to prior forecasts errors and a strong positive relation between earnings and returns. Unlike Panel A, there is evidence of PEAD due to the positive correlation between *EARet* and *LagEARet*. However, there is also evidence against PEAD because of the negative correlation between *EARet* and *LagESurp*.

4. MAIN RESULTS

4.1 Hedge Portfolio Returns

To examine the performance of the PEAD strategy at the next earnings announcement for my samples, I first study the abnormal returns to hedge portfolios based on the strategy. Table 4 presents the mean and median earnings announcement abnormal returns for decile portfolios and a hedge portfolio created based on prior earnings announcement news for each of the two samples.[22] Average portfolio returns are presented for three time periods: the full sample period (1996 - 2010), the first half of the sample period (1996 – 2003Q2), and the second half of the sample period (2003Q3 - 2010). The *Low (Past Losers)* portfolios take short positions in firms in the lowest decile of the previous quarter's earnings announcement news, the *High (Past Winners)* portfolios take long positions in firms in the highest decile of the previous quarter's earnings announcement news, and the *High - Low* portfolios are hedge portfolios that take long positions in firms in the highest decile of the previous quarter's earnings announcement news and short positions in firms in the lowest decile of the previous quarter's earnings announcement news.

In Panels A and B, the prior quarter's earnings news is determined by the prior earnings announcement abnormal return, *LagEARet*. Panel A presents the results for the sample of

[22] To conserve space, only the extreme deciles and the hedge portfolio are presented for the sample of earnings announcements without active options.

earnings announcements with active options. For these firms, I find that the *High – Low* hedge portfolio earns significantly negative abnormal returns during the full sample period and during both sub-periods. This is the opposite of what one would expect from the findings in prior research (e.g., Bernard and Thomas 1989; Freeman and Tse 1989). Rather than underreacting to the previous earnings announcement news it appears that investors are overreacting. Panel B presents the results for the sample of earnings announcements without active options. In contrast to Panel A, the returns in Panel B are consistent with PEAD for the full sample period and for the first sub-period.

In Panels C and D, the prior earnings news is determined by the prior earnings surprise, *LagESurp*. The results in Panel C are consistent with those in Panel A, but weaker (i.e., the hedge portfolio returns over the three periods are less negative when the deciles are based on the prior earnings surprise). Unlike Panel B, the results in Panel D are not consistent with a PEAD effect in the sample of earnings announcements without active options. Like Panels A and C, there is evidence in Panel D of the opposite of the PEAD effect during the second sub-period.

The results in Table 4 suggest that the *Low (Past Losers)* decile is driving the returns to the *High – Low* portfolio. For example, in the sample with active options the significantly positive returns in the lowest decile result in the significantly negative returns to the *High – Low* portfolio. This indicates that for these firms investors view the firms in the lowest decile too negatively and are positively surprised at the earning announcement (i.e., the opposite of the PEAD effect). On the other hand, for the sample without active options, investors view the firms in the lowest decile too positively and are negatively surprised at the earnings announcement (i.e., the PEAD effect). These findings are consistent with it being easier for negative information to be reflected in the prices of firms with options trading compared to firms without

options trading (Diamond and Verrecchia 1987). The difference in results for the lowest earnings news decile between the two samples is consistent with an excessive amount of negative information being reflected in the prices of firms with active options and a lack of negative information being reflected in the prices of firms without active options.

Figure 1 depicts the hedge portfolio returns by quarter for the firms without active options under each of the two definitions of past earnings news. Consistent with a PEAD effect in the first half of the sample period for earnings announcements without active options, the hedge portfolio return is positive in 22 (23) out of the 30 quarters during 1996 - 2003Q2 period when the prior earnings news is determined by *LagEARet* (*LagESurp*). In the second half of the sample period, there is no evidence of the PEAD effect, as the hedge portfolio return is only positive in 18 (9) out of the 30 quarters during the 2003Q3 – 2010 period. Figure 2 depicts the hedge portfolio returns by quarter for the sample with active options. Consistent with a reversal of the PEAD effect, the hedge portfolio has negative returns in 44 (38) out of the 60 quarters during the 1996 – 2010 sample period.

Overall, the analysis of the hedge portfolio returns indicates that an arbitrageur trading on the PEAD effect at firms' next earnings announcement would have done terribly in firms with active options trading. Not only would the arbitrageur not have earned positive abnormal returns, they actually would have earned significantly negative abnormal returns. These results are consistent with my hypothesis that the returns to a popular trading strategy can be significantly negative over a nontrivial period of time (e.g., 1996 – 2010 and 2003Q3 - 2010).

4.2 Regression Analysis

I next examine whether the reversal of past earnings information at the next earnings announcement for firms with active options holds after controlling for variables that have been shown to predict abnormal returns at earnings announcements. Table 5 presents the results of Fama and Macbeth (1973) multivariate and univariate regressions with *EARet* as the dependent variable. Results are presented for the same three time periods as Table 4.[23] All independent variables are transformed into decile rankings and scaled to have a range of 1, [-0.5, 0.5], and a mean of zero. Coefficients can be interpreted as the returns to a hedge portfolio that is long firms in the highest decile of the variable and short firms in the lowest decile.

Consistent with an earnings announcement premium the intercept is significantly positive in all six columns (e.g., Ball and Kothari 1991; Cohen et al. 2007; Barber et al. 2012). Similar to Panels A and C of Table 4 and inconsistent with the PEAD literature, both past earnings announcement returns and past earnings surprises are significantly negative during the overall sample period in both the multivariate (Column 1) and univariate regressions (Column 4). This result is driven by the second half of the sample period (Columns 3 and 6). There is no relation between abnormal announcement returns and past earnings news during the first half of the sample period (Columns 2 and 5). The difference in results between Panels A and C of Table 4 and Table 5 for the first half of the sample period is due to the fact that the hedge portfolios in Table 4 only consider the extreme deciles, while the regressions in Table 5 consider all ten deciles. In other words, the relation is significantly linear and monotonic in the second half of the sample period, but not in the first half (see Panels A and C of Table 4).

Consistent with recent work by So and Wang (2011), Landsman et al. (2011), and Aboody et al. (2013), a firms returns in the days immediately prior to its earnings announcement is a very

[23] To conserve space, the results of univariate regressions over the same sample period are presented in the same column.

strong predictor of the earnings announcement return. Both *Spread* and *Skew* are significant in the univariate regressions, but only *Spread* is significant in the multivariate regressions, which indicates that *Spread* subsumes the effect of *Skew* in my sample. Consistent with prior research there is some evidence of a relation between *Size, M/B,* and *O/S* and earnings announcement returns. I do not find a relation between *Accruals* and the earnings announcement return.

Overall, the regression analysis on the sample of earnings announcements with active options indicates that prior earnings news is a significantly negative predictor of earnings announcement returns even after controlling for other variables with predictive ability. In the second half of the sample period, *LagEARet* is the second most powerful predictor of the earnings announcement return after *PreEA5DayRet* (i.e., a hedge portfolio based on *LagEARet* (*PreEA5DayRet*) generates an average return of -1.12% (-1.87%)). None of the other variables generate average abnormal returns in excess of 1% during the 2003Q3 – 2010 period. While *LagEARet* and to a lesser extent *LagESurp* are powerful predictors of earnings announcement returns, they do so in a manner opposite to what one would expect assuming PEAD. Next, I examine possible explanations for the presence of this result in the active options sample during the 2003Q3 – 2010 period.

5. POTENTIAL EXPLANATIONS

5.1 More Extreme Reactions to Earnings Surprises

A possible explanation for the negative autocorrelation in earnings announcement news for firms with active options (i.e., evidence of the reverse of PEAD) is that investors have learned of their tendency to underreact at earnings announcements and are overcompensating in recent years, resulting in returns at earnings announcements that are too extreme (i.e., excessively

positive returns for extreme good earnings news and excessively negative returns for extreme bad earnings news). These excessive reactions are then corrected at the following earnings announcement causing the negative autocorrelation that I document.

To examine this possibility, I study the earnings announcement abnormal returns of firms in the extreme earnings surprise deciles during the two halves of my sample period for both samples. I split the sample period in half because the evidence in Panel B of Table 4 suggests that the PEAD effect is present for firms without active options during the first half of the sample period (but only when past earnings news is measured by *LagEARet*), but not during the second half of the sample period, and because the evidence in Table 5 suggests that the evidence against PEAD in firms with active options during the full sample period is driven by the second half of the sample period. I estimate the following model (firm and time subscripts suppressed) for firms in each of the extreme deciles of *LagESurp*:

$$LagEARet = \beta_1 + \beta_2 Options + \beta_3 Recent + \beta_4 Options*Recent + \beta_5 Size + \beta_6 Size*Recent + \beta_7 M/B + \beta_8 M/B*Recent + \beta_9 Accruals*Recent + \varepsilon \quad (1)$$

Options is an indicator variable equal to one for firms with active options, and zero otherwise. *Recent* is an indicator variable equal to one for earnings announcements occurring during the second half of the sample period (2003Q3 - 2010), and zero otherwise. I control for *Size*, *M/B*, *Accruals* (and their interactions with *Recent*) because past research indicates that these variables are associated with earnings announcement abnormal returns (e.g., Ball and Kothari 1991; La Porta et al. 1997; Sloan 1996).

Table 6 presents the results.[24] In the first (second) column, I estimate the model for firms in the lowest (highest) decile of *LagESurp*. The significantly negative intercept in the first column and the significantly positive intercept in the second column indicate that, on average, returns are

[24] In Tables 6, 7, and 8, the standard errors are clustered on two dimensions, firm and quarter.

significantly negative for firms with extremely low earnings surprises and significantly positive for firms with extremely high earnings surprises. The significantly positive coefficient on *Options* in both columns indicates that firms with active options tend to have higher earnings announcement abnormal returns than firms without active options. The significant coefficients on *Recent* indicate that earnings announcement returns have become more extreme, in the second half of the sample period. On average, earnings announcement abnormal returns are 2.11% more negative for firms in the lowest *LagESurp* decile and 1.96% more positive for firms in the highest *LagESurp* decile, in recent years. This is consistent with investors learning of past underreaction to extreme earnings surprises (i.e., learning about PEAD) and reacting more strongly at earnings announcements during the second half of the full sample period.[25]

The coefficient on the *Options* and *Recent* interaction, *Options*Recent*, indicates that, in recent years, earnings announcement abnormal returns are significantly more negative for firms with active options (on average, 1.12% more negative) compared to firms without active options. This is consistent with an increase in the purchases of put options and/or short-selling in firms with extremely negative earnings surprises and active options. These are the actions that an arbitrageur would take to exploit PEAD in firms with active options, and suggests that these actions are either impossible or too costly in firms without active options.

Overall, the results in this subsection indicate that returns at earnings announcements have become more extreme over the sample period in response to extreme earnings surprises for both firms with and without active options. These more extreme return reactions, in recent years, are especially true for firms with active options and extremely low earnings surprises. This is

[25] While this may also be consistent with more information being released at earnings announcements (Francis et al. 2002) such as management forecasts (Anilowski et al. 2007; Rogers and Van Buskirk 2013), conference calls (Bushee et al. 2003), segment disclosures (Botosan and Harris 2000), and balance sheets (Chen et al. 2002), in untabulated results, I do not find a change, over the two sub-periods, in the mean or median abnormal return for firms in the extreme deciles of *LagEARet*.

consistent with investors excessively expressing negative views in firms with active options and extremely low earnings surprises, and is at least part of the explanation for why, in recent years, I find the opposite of the PEAD effect in firms with active options.

5.2 Investor Positioning Immediately Prior to the Next Earnings Announcement

A second potential explanation is that there has been a change in investor behavior prior to the next earnings announcement in anticipation of the PEAD effect for firms with active options. To test this idea, I study how investor behavior immediately prior to the next earnings announcement depends on the previous earnings announcement's information. Specifically, I examine whether firm-specific investor sentiment immediately prior to the next earnings announcement is consistent with investors' anticipation of a PEAD effect.

I use *PreEA5DayRet*, *Skew*, *Spread*, and *O/S* to proxy for firm-specific investor sentiment. Aboody et al. (2013) view the short window return prior to an earnings announcement as a measure of firm-specific investor sentiment. Demand-based option pricing (e.g., Bollen and Whaley 2004; Garlenau et al. 2009) argues that demand for a particular option will increase the option's price and therefore increase its implied volatility. In other words, under demand-based option pricing one can infer whether puts or calls are in greater demand by examining their implied volatilities. Thus suggesting that *Spread* and *Skew* are potential measures of option investor sentiment (i.e., if puts (calls) are in greater demand option investors are more bearish (bullish). Johnson and So (2012) argue that short-sale costs in equity markets drive traders with negative news to trade in the options market. As a result, their measure of option market activity, O/S, has the potential to capture firm-specific investor sentiment, with high O/S indicating bearish sentiment.

To test for a relation between firm-specific investor sentiment (just prior to the next earnings announcement) and prior earnings announcement news, I estimate the following model (firm and time subscripts suppressed) with each of my four proxies of firm-specific investor sentiment as the dependent variable:

$$\begin{aligned} \textit{InvestorSentiment} = {} & \beta_1 + \beta_2 \textit{Recent} + \beta_3 \textit{LagESurp} + \beta_4 \textit{LagESurp*Recent} + \beta_5 \textit{LagEARet} + \\ & \beta_6 \textit{LagEARet*Recent} + \beta_7 \textit{Size} + \beta_8 \textit{Size*Recent} + \beta_9 \textit{M/B} + \beta_{10} \textit{M/B*Recent} \\ & + \beta_{11} \textit{Accruals} + \beta_{12} \textit{Accruals*Recent} + \varepsilon \end{aligned} \quad (2)$$

Table 7 presents the results. The dependent variables in the four columns are *PreEA5DayRet*, *Skew*, *Spread*, and *O/S*, respectively. In the first column, the significantly positive coefficient on *LagEARet*Recent* indicates that, in the second half of the full sample period, there are stock price increases in the five days prior to the next earnings announcement for firms that did well in terms of the abnormal announcement return at their prior earnings announcement. This is consistent with arbitrageurs buying and selling shares prior to an earnings announcement based on firms' abnormal returns at their prior earnings announcement (i.e., based on the PEAD strategy). In the second column, the significantly negative coefficient on *LagESurp*Recent* indicates that, in the second half of the full sample period, *Skew* is significantly more negative for firms with higher prior earnings surprise. Demand based option pricing suggests that the demand for calls exceeds the demand for puts for these firms with high prior earnings surprise, which is what one would expect if option traders are positioning themselves in anticipation of the PEAD effect prior to firms' earnings announcements. In other words, a greater demand for calls for firms with prior good earnings surprises and a greater demand for puts for firms with prior bad earnings surprises. I find a similar result with *Spread* as the dependent variable (i.e., in column 3, the coefficient on *LagESurp*Recent* is significantly

positive). In the fourth column, I find that *O/S* is significantly greater in the second sub-period, however, *O/S* is unrelated to past earnings announcement returns or past earnings surprise.

Overall, I find evidence that, in the second half of the full sample period, investor sentiment prior to the next earnings surprise depends on the information from the previous earnings announcements which is what one would expect if investors use knowledge of PEAD in stock and option trading. This suggests that investors are overly positioning themselves in a manner consistent with the expectation of the PEAD effect immediately prior to the next earnings announcement. This excessive sentiment is then corrected when the earnings news is released, resulting in reversals of prior earnings announcement news (i.e., the opposite of the PEAD effect).

5.3 Change in Analysts' Forecasting

A third conceivable explanation is that the serial correlation in firms' earnings surprises has become significantly negative. This could result from a change in the manner in which analysts' forecast earnings. If analysts overcompensate when forecasting after learning of their tendency to underreact to past earnings (e.g., Abarbanell and Bernard 1992), the autocorrelation in earnings surprises will become negative and would help explain the negative relation between earnings announcement returns and past earnings news (i.e., past abnormal earnings announcement returns or past earnings surprises). To assess this possibility, I estimate two variations of the following model (firm and time subscripts suppressed):

$$\begin{aligned} ESurp = {} & \beta_1 + \beta_2 Recent + \beta_3 LagESurp + \beta_4 LagESurp*Recent + \beta_5 LagEARet + \\ & \beta_6 LagEARet*Recent + \beta_7 Size + \beta_8 Size*Recent + \beta_9 M/B + \beta_{10} M/B*Recent + \\ & \beta_{11} Accruals + \beta_{12} Accruals*Recent + \varepsilon \end{aligned} \quad (3)$$

In the first column, I estimate the model on the full sample period for firms with active options. As in Table 3, I find a significantly positive relation between prior earnings surprises and future earnings surprises, and that this relation has not significantly changed during the two sub-periods. In other words, I find that the autocorrelation in firms' earnings surprises remains significantly positive, consistent with the PEAD literature and analysts' underreaction to prior forecast errors (Abarbanell and Bernard 1992). I also find that the past earnings announcement return was a positive predictor of the next earnings surprise during the first sub-period (i.e., significantly positive coefficient on *LagEARet*), but not during the second sub-period (i.e., the coefficient on *LagEARet* plus the coefficient on *LagEARet*Recent* is less than zero).

To more clearly assess the relation between *ESurp* and *LagEARet* in the second sub-period, in the second column, I estimate the model using only the second sub-period and find that there is a negative relation between *ESurp* and *LagEARet* after controlling for *LagESurp*. In other words, in recent years, after controlling for a firm's prior earnings surprise, a firm's prior earnings announcement return is negatively associated with the firm's next earnings surprise. This result is consistent with analysts overreacting to the other information in firms' earnings announcements that is unrelated to the earnings surprise. Although prior research indicates that additional disclosures at earnings announcements such as conference calls and management forecasts reduce PEAD (e.g., Kimbrough 2005; Wang 2008; Li and Tse 2008; Zhang 2012), the evidence in Table 8 suggests investor overreaction to firms' other disclosures at earnings announcements.[26]

In summary, analysts apparently still under-weight past earnings surprise information and now over-weight the non-earnings surprise information released at the earnings announcement

[26] It is also possible that analysts are overreacting to the announcement period returns, if returns play a role in analysts' earnings forecasts for the next quarter (e.g., Abarbanell 1991).

when forecasting next quarter's earnings. This overreaction to non-earnings surprise information released at the earnings announcement is consistent with the negative autocorrelation in earnings announcement news that I find for firms with active options.

6. CONCLUSION

While several papers present evidence on the disappearance or reduction of various cross-sectional anomalies (e.g., Chordia et al. 2013; Green et al. 2011; Richardson et al. 2010; McLean and Pontiff 2012), I document a reversal of one of these anomalies over a significant period of time. Specifically, I find the opposite of PEAD at firms' next earnings announcement during the 2003Q3 – 2010 period for firms with active exchange-traded options. The reversal of the PEAD pattern that I document is economically and statistically significant, and this new pattern is the second most powerful predictor of earnings announcement abnormal returns for firms with active options during the 2003Q3 – 2010 period. Within the set of firms with active options prior to their earnings announcement, firms in the highest decile of past earnings announcement abnormal returns (past earnings surprise) underperform firms in the lowest decile by -1.59% (-0.78%) during the 2003Q3 – 2010 period. I find that this reversal effect is mainly driven by the short side of the famous PEAD strategy (i.e., firms with poor past earnings news perform surprisingly well at their following earnings surprise, potentially because of an overcrowding of short positions by arbitrageurs using the PEAD strategy). This helps explain why the reversal pattern that I document occurs solely in firms with active options (i.e., because arbitrageurs can easily take short positions in these firms compared to firms without active options).

The result that I document is consistent with the models of Stein (2009) and Lundholm (2008) in which arbitrageurs trade too aggressively based on relative value strategies without

concern for fundamental values and without knowledge of the extent of other arbitrageurs' activities. I find evidence consistent with arbitrageurs learning about PEAD and taking excessive action to exploit PEAD. For example, I find that, in recent years, stock returns are more extreme in response to extreme earnings surprises, and that investors are positioning themselves immediately prior to the next earnings announcement in anticipation of PEAD (i.e., buying shares or call options of past earnings announcement winners and selling-short or buying put options of past earnings announcement losers). I also find that, in recent years, analysts are apparently overreacting to non-earnings information released at firms' earnings announcements.

One remaining issue is why the reversal pattern that I document is present over such an extended period of time. For a previously documented return pattern to reverse, at least one of the following is required: arbitrageurs are slow to realize that the trading strategy is not working or new arbitrageurs replace any old arbitrageurs that have given up on the trading strategy. It is not clear why at least one of these requirements is being met in the case of PEAD at the next earnings announcement, and if or when they will no longer be met. Therefore, how long this new reversal pattern will persist is unclear, but an important lesson from this paper is that investors should not blindly follow trading strategies.

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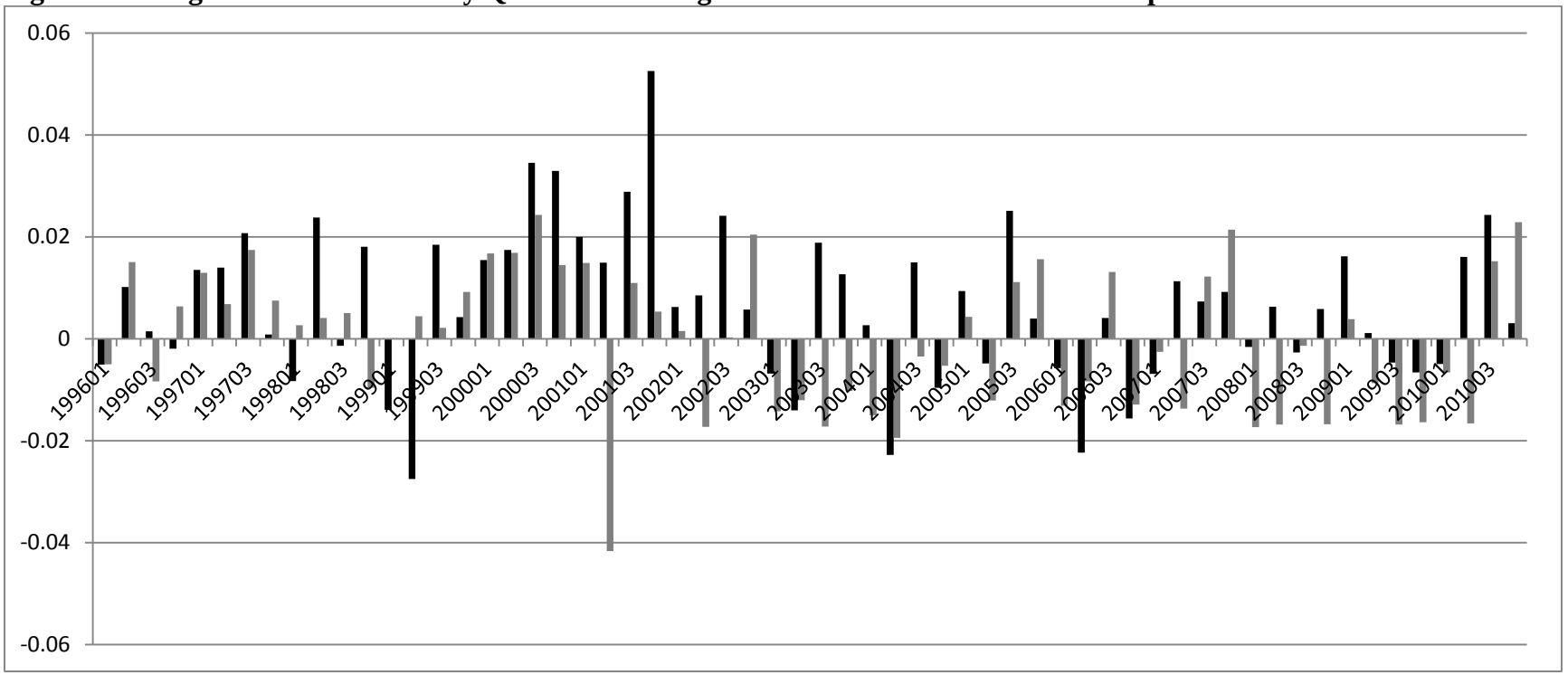
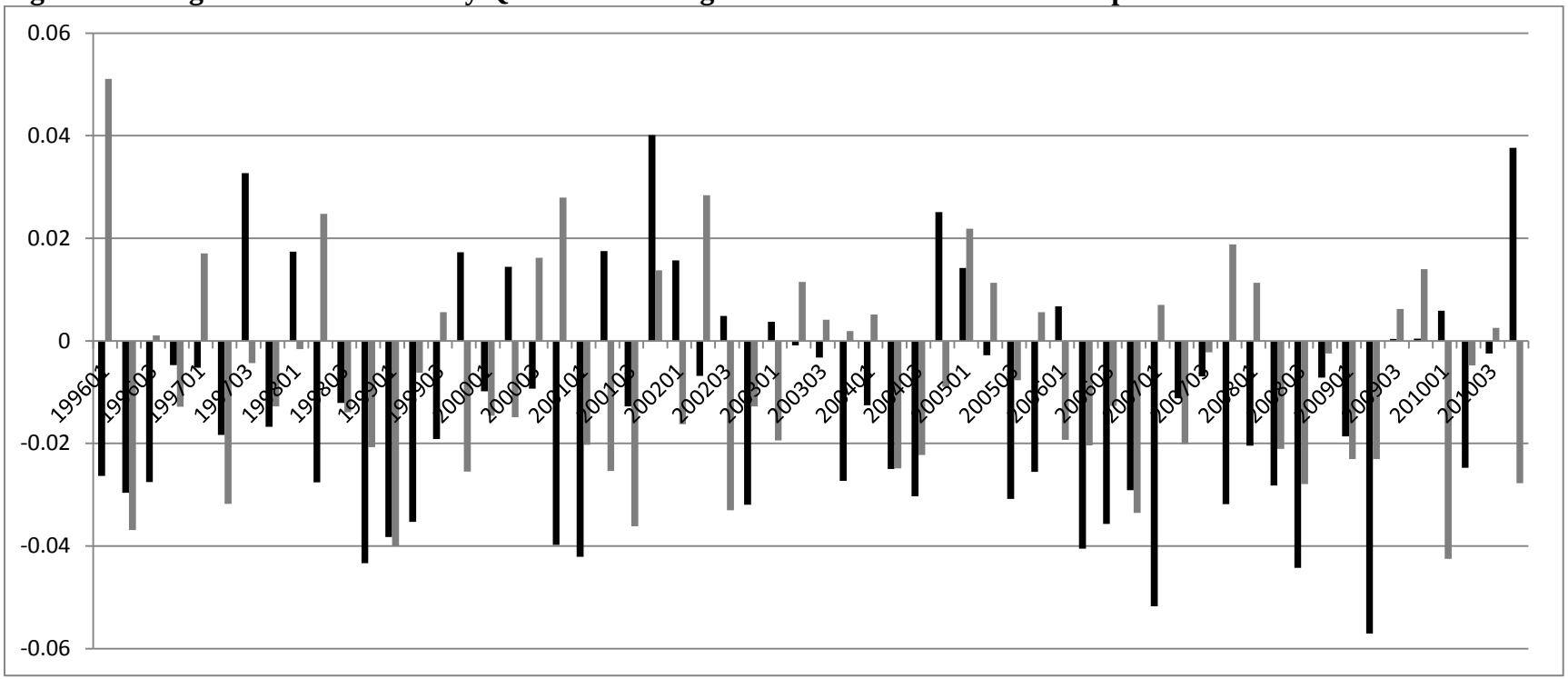
Figure 1 – Hedge Portfolio Returns by Quarter - Earnings Announcements without Active Options



This figure depicts the abnormal returns by quarter to a hedge portfolio taking a long position in prior earnings announcement winners and a short position in prior earnings announcement losers, at the next earnings announcement in firms without active options. The black series takes long (short) positions in firms in the highest (lowest) decile of earnings announcement abnormal returns from the prior calendar quarter. Earnings announcement abnormal returns are measured as the firm's two-day market-adjusted stock return at the earnings announcement. The gray series takes long (short) positions in firms in the highest (lowest) decile of earnings surprises from the prior calendar quarter. Earnings surprises are measured as the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. The hedge portfolios take equal sized positions on the long and short side. Firms are equally weighted within the long or short side of the portfolio in each quarter. On the day prior to the earnings announcement, these firms meet at least one of the following conditions: no exchange-traded options listed, no option volume, or no open interest in their exchange-traded options.

Figure 2 – Hedge Portfolio Returns by Quarter - Earnings Announcements with Active Options



This figure depicts the abnormal returns by quarter to a hedge portfolio taking a long position in prior earnings announcement winners and a short position in prior earnings announcement losers, at the next earnings announcement in firms with active options. The black series takes long (short) positions in firms in the highest (lowest) decile of earnings announcement abnormal returns from the prior calendar quarter. Earnings announcement abnormal returns are measured as the firm's two-day market-adjusted stock return at the earnings announcement. The gray series takes long (short) positions in firms in the highest (lowest) decile of earnings surprises from the prior calendar quarter. Earnings surprises are measured as the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. The hedge portfolios take equal sized positions on the long and short side. Firms are equally weighted within the long or short side of the portfolio. Positions are only taken in firms with positive option volume and open interest on the day before the current earnings announcement.

Table 1
Earnings Announcement Samples

Year	Earnings Announcements with Active Options	Earnings Announcements without Active Options
1996	690	3,186
1997	960	2,965
1998	1,083	2,903
1999	1,363	3,406
2000	1,535	3,246
2001	1,425	3,271
2002	1,419	4,576
2003	1,276	6,199
2004	1,393	7,047
2005	1,349	8,226
2006	1,569	7,656
2007	1,969	7,577
2008	2,959	6,741
2009	2,649	6,431
2010	2,045	5,466
Total	23,684	78,896

This table presents the number of earnings announcements with and without active exchange-traded options by year. Earnings announcements that have positive open interest and volume on the day before the earnings announcement are classified as earnings announcements with active options, all other earnings announcements are classified as earnings announcements without active options. There are 2,854 unique firms in the active options sample and 6,310 unique firms in the sample without active options. The sample period is 1996 – October 2010.

Table 2
Descriptive Statistics

Variable	N	Mean	Std. Dev.	25th	Median	75th
Panel A: Earnings Announcements with Active Options						
EARet	23,864	0.5%	8.4%	-3.7%	0.3%	4.6%
LagEARet	23,864	0.9%	9.2%	-3.7%	0.6%	5.4%
ESurp	23,864	-0.03%	0.99%	-0.07%	0.04%	0.16%
LagESurp	23,864	0.00%	0.89%	-0.07%	0.04%	0.17%
Spread	23,864	-1.2%	5.6%	-2.8%	-0.7%	1.0%
Skew	23,864	5.0%	6.1%	1.8%	3.9%	7.0%
O/S	23,864	7.9%	11.9%	1.1%	3.5%	9.4%
PreEA5DayRet	23,864	1.0%	7.5%	-2.5%	0.6%	3.9%
Size	23,864	$13.0 B	$ 29.0 B	$ 1.1 B	$ 3.2 B	$ 10.7 B
M/B	23,864	5.6	12.0	1.9	3.3	5.9
Accruals	23,864	-0.027	0.069	-0.055	-0.019	0.005
OpenInt	23,864	20,171	57,268	1,419	4,816	17,484
Panel B: Earnings Announcements without Active Options						
EARet	78,896	-0.1%	9.4%	-4.1%	-0.1%	4.0%
LagEARet	78,896	-0.1%	9.1%	-4.1%	-0.1%	3.8%
ESurp	78,896	-0.39%	4.56%	-0.22%	0.02%	0.19%
LagESurp	78,896	-0.26%	3.55%	-0.20%	0.02%	0.29%
PreEA5DayRet	78,896	0.3%	7.8%	-3.0%	-0.1%	2.9%
Size	78,896	$ 2.3 B	$ 6.4 B	$ 0.2 B	$ 0.6 B	$ 1.7 B
M/B	78,896	3.1	5.3	1.3	2.1	3.4
Accruals	78,896	-0.029	0.078	-0.053	-0.018	0.003

This table presents descriptive statistics for the two earnings announcement samples. Panel A (Panel B) presents descriptive statistics for the sample of earnings announcements with (without) active options. *EARet* is the firm's two-day abnormal return at the earnings announcement. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the two-day earnings announcement period, [0, 1], where day 0 is the earnings announcement date in I/B/E/S. *LagEARet* is the firm's *EARet* from the previous calendar quarter. *ESurp* is the firm's earnings surprise. Specifically, it is the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. *LagESurp* is the firm's *ESurp* form the previous calendar quarter. The option variables: *Spread*, *Skew*, *O/S*, and *OpenInt* are calculated on the day prior to the earnings announcement based on a single set of the firm's options with the same expiration. The set of options examined are the ones closest to expiration with at least (no more than) 15 (75) days to expiration. *Spread* is calculated as the implied volatility of a call for a given strike price and expiration less the implied volatility of the put with the same strike price and expiration as the call, these differences are then weighted by the amount of open interest in all strike price pairs with the same expiration. *Skew* is the implied volatility of an out-of-the-money put (i.e., delta closest to -0.25, given a delta of [-0.375, -0.125]) less the implied volatility on an at-the-money call (i.e., delta closest to 0.5, given a delta of [0.375, 0.625]). *O/S* is the ratio of option market volume to stock market volume on the day prior to the firm's earnings announcement. *PreEA5DayRet* is the firm's abnormal return for the five trading days prior to their earnings announcement. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. *OpenInt* is the firm's total open interest in all call and put options for the given expiration examined. *EARet*, *LagEARet*, *ESurp*, *LagESurp*, *Spread*, *Skew*, *O/S*, and *PreEA5DayRet* are all expressed as percentages. *ESurp*, *LagESurp*, *Spread*, *Skew*, *O/S*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels.

Table 3
Pearson and Spearman Correlations

Panel A: Earnings Announcements with Active Options

Variable	*EARet*	*LagEARet*	*ESurp*	*LagESurp*	*Spread*	*Skew*	*O/S*	*PreEA5DayRet*	*Size*	*M/B*	*Accruals*	*OpenInt*
EARet	1.00	-0.04***	0.09***	-0.03***	0.04***	-0.01	-0.01	-0.09***	-0.02***	-0.02***	0.01	-0.02***
LagEARet	-0.03***	1.00	0.05***	0.13***	0.01	-0.00	0.00	0.03***	-0.02**	0.02**	-0.01**	-0.03***
ESurp	0.19***	0.08***	1.00	0.36***	0.04***	-0.11***	0.00	0.00	0.01	0.02**	-0.04***	-0.02***
LagESurp	-0.03***	0.23***	0.33***	1.00	0.03***	-0.08***	0.02***	-0.02***	0.01	0.01**	-0.02***	-0.02**
Spread	0.04***	0.01	0.02**	0.03***	1.00	-0.64***	-0.04***	-0.08***	0.04***	-0.01	-0.02***	0.01
Skew	-0.01	0.00	-0.02***	-0.02***	-0.53***	1.00	0.02***	0.03***	-0.08***	-0.04***	-0.01	0.03***
O/S	-0.02***	0.00	0.06***	0.06***	-0.01**	0.00	1.00	-0.01	0.09***	0.03***	0.00	0.27***
PreEA5DayRet	-0.10***	0.01**	0.06***	0.01	-0.07***	0.01*	0.00	1.00	-0.03***	0.00	-0.01*	-0.01
Size	-0.02**	0.00	-0.03***	-0.03***	0.06***	-0.14***	0.19***	-0.07***	1.00	0.07***	0.01	0.41***
M/B	-0.02***	0.06***	-0.01*	0.01	-0.01	-0.13***	0.10***	-0.02***	0.15***	1.00	-0.06***	0.00
Accruals	0.01**	0.00	-0.06***	-0.05***	-0.01	-0.01**	-0.01	-0.01	-0.01	-0.04***	1.00	-0.01
OpenInt	-0.03***	-0.03***	0.00	0.00	0.00	0.07***	0.54***	-0.05***	0.52***	0.03***	-0.05***	1.00

Panel B: Earnings Announcements without Active Options

Variable	*EARet*	*LagEARet*	*ESurp*	*LagESurp*	*PreEA5DayRet*	*Size*	*M/B*	*Accruals*
EARet	1.00	0.01***	0.09***	-0.01**	-0.07***	0.00	-0.01***	0.00
LagEARet	0.02***	1.00	0.06***	0.08***	0.01**	0.01**	0.03***	0.00
ESurp	0.27***	0.11***	1.00	0.17***	0.00	0.03***	0.04***	0.00
LagESurp	0.00	0.27***	0.28***	1.00	-0.05***	0.03***	0.04***	0.00
PreEA5DayRet	-0.07***	0.01***	0.08***	0.03***	1.00	-0.01***	-0.01***	-0.01***
Size	0.05***	0.09***	0.09***	0.09***	-0.01***	1.00	0.09***	0.02***
M/B	0.00	0.08***	0.08***	0.12***	-0.01*	0.32***	1.00	-0.01***
Accruals	0.00	-0.01*	-0.07***	-0.06***	-0.01***	0.00	0.00	1.00

This table presents Pearson (Spearman) correlation coefficients above (below) the diagonal for the two earnings announcement samples. Panel A (Panel B) presents the correlation coefficients for the earnings announcements with (without) active options sample. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the two-day earnings announcement period, [0, 1], where day 0 is the earnings announcement date in I/B/E/S. *LagEARet* is the firm's *EARet* from the previous calendar quarter. *ESurp* is the firm's earnings surprise. Specifically, it is the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. *LagESurp* is the firm's *ESurp* form the previous calendar quarter. The option variables: *Spread*, *Skew*, *O/S*, and *OpenInt* are calculated on the day prior to the earnings announcement based on a single set of the firm's options with the same expiration. The set of options examined are the ones closest to expiration with at least (no more than) 15 (75) days to expiration. *Spread* is calculated as the implied volatility of a call for a given strike price and expiration less the implied volatility of the put with the same strike price and expiration as the call, these differences are then weighted by the amount of open interest in all strike price pairs with the same expiration. *Skew* is the implied volatility of an out-of-the-money put (i.e., delta closest to -0.25, given a delta of [-0.375, -0.125]) less the implied volatility on an at-the-money call (i.e., delta closest to 0.5, given a delta of [0.375, 0.625]). *O/S* is the ratio of option market volume to stock market volume on the day prior to the firm's earnings announcement. *PreEA5DayRet* is the firm's abnormal return for the five trading days prior to their earnings announcement. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the five day period, [-5, -1]. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. *OpenInt* is the firm's total open interest in all call and put options for the given expiration examined. *ESurp*, *LagESurp*, *Spread*, *Skew*, *O/S*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Table 4
Time-series Mean of Portfolio Returns

Time Period	1996 – 2010 60 Quarters		1996 - 2003Q2 30 Quarters		2003Q3 – 2010 30 Quarters	
Panel A: Returns to Decile Portfolios of *LagEARet* - Earnings Announcements with Active Options						
Low (Past Losers)	1.43%***	[1.37%]	1.34%***	[1.22%]	1.51%***	[1.63%]
2	0.54%**	[0.46%]	0.44%	[0.35%]	0.64%**	[0.53%]
3	0.64%***	[0.67%]	0.53%**	[0.67%]	0.74%***	[0.68%]
4	0.30%	[0.23%]	0.29%	[0.29%]	0.31%	[0.22%]
5	0.42%***	[0.51%]	0.64%***	[0.81%]	0.21%	[0.26%]
6	0.10%	[0.18%]	0.08%	[0.31%]	0.12%	[0.10%]
7	0.37%**	[0.39%]	0.60%**	[0.74%]	0.15%	[0.19%]
8	0.21%	[0.07%]	0.40%	[0.08%]	0.01%	[0.01%]
9	0.17%	[-0.14%]	0.63%**	[0.80%]	-0.28%	[-0.50%]
High (Past Winners)	0.14%	[0.08%]	0.37%	[0.41%]	-0.08%	[-0.09%]
High - Low	-1.29%***	[-1.27%]	-0.98%**	[-1.10%]	-1.59%***	[-1.95%]
Panel B: Returns to Decile Portfolios of *LagEARet* - Earnings Announcements without Active Options						
Low (Past Losers)	-0.81%***	[-0.82%]	-1.18%***	[-0.99%]	-0.44%**	[-0.40%]
High (Past Winners)	-0.16%	[-0.16%]	-0.16%	[-0.05%]	-0.16%	[-0.24%]
High - Low	0.65%***	[0.60%]	1.02%***	[1.18%]	0.28%	[0.35%]
Panel C: Returns to Decile Portfolios of *LagESurp* - Earnings Announcements with Active Options						
Low (Past Losers)	0.79%***	[0.65%]	0.89%***	[0.62%]	0.68%***	[0.75%]
2	0.60%***	[0.69%]	0.46%	[0.58%]	0.73%***	[0.83%]
3	0.67%***	[0.62%]	0.88%***	[0.96%]	0.47%**	[0.51%]
4	0.40%**	[0.41%]	0.05%	[0.16%]	0.75%***	[0.76%]
5	0.40%**	[0.34%]	0.40%	[0.49%]	0.41%**	[0.31%]
6	0.66%***	[0.67%]	0.78%***	[0.73%]	0.54%**	[0.56%]
7	0.37%*	[0.04%]	0.53%	[0.14%]	0.21%	[0.04%]
8	0.34%**	[0.37%]	0.59%**	[0.58%]	0.08%	[0.17%]
9	0.02%	[0.02%]	0.48%	[0.57%]	-0.43%*	[-0.32%]
High (Past Winners)	0.06%	[-0.07%]	0.22%	[0.04%]	-0.10%	[-0.34%]
High - Low	-0.73%***	[-1.08%]	-0.67%**	[-1.28%]	-0.78%**	[-0.62%]
Panel D: Returns to Decile Portfolios of *LagESurp* - Earnings Announcements without Active Options						
Low (Past Losers)	-0.42%**	[-0.50%]	-0.47%*	[-0.42%]	-0.36%	[-0.54%]
High (Past Winners)	-0.45%***	[-0.39%]	-0.10%	[-0.09%]	-0.80%***	[-0.75%]
High - Low	-0.03%	[0.09%]	0.37%	[0.52%]	-0.44%*	[-0.85%]

This table presents mean and median (in brackets) earnings announcement abnormal returns for decile portfolios created based on prior earnings announcement news. Portfolio returns are presented for three time periods: the full sample period (1996 - 2010), the first half of the sample period (1996 – 2003Q2), and the second half of the sample period (2003Q3 - 2010). The *Low (Past Losers)* portfolios take long positions in firms in the lowest decile of the prior quarter's earnings announcement news, the *High (Past Winners)* portfolios take long positions in firms in the highest decile of the prior quarter's earnings announcement news, and the *High - Low* portfolios are hedge portfolios that take long positions in firms in the highest decile of the prior quarter's earnings announcement news and short positions in firms in the lowest decile of the prior quarter's earnings announcement news. In Panel A, the prior quarter's earnings news is determined by *LagEARet*. *LagEARet* is the firm's two-day abnormal return at the earnings announcement from the prior calendar quarter. In Panel B, the prior earnings news is determined by *LagESurp*. *LagESurp* is the firm's earnings surprise from the prior calendar quarter. ***, **, and * indicate that the mean is significant at 1%, 5%, and 10% levels, respectively.

Table 5
Predicting Earnings Announcement Returns for Firms with Active Options

	Prior Literature	(1) Multivariate 1996-2010	(2) Multivariate 1996-2003Q2	(3) Multivariate 2003Q3-2010	(4) Univariate 1996-2010	(5) Univariate 1996-2003Q2	(6) Univariate 2003Q3-2010
Intercept	+	0.43%*** [5.41]	0.53%*** [4.44]	0.33%*** [3.19]	0.43%*** [5.47]	0.53%*** [4.47]	0.33%*** [3.23]
LagEARet	+	-0.69%*** [-3.12]	-0.26% [-0.76]	-1.12%*** [-4.24]	-0.89%*** [-3.93]	-0.43% [-1.16]	-1.36%*** [-5.62]
LagESurp	+	-0.44%** [-2.35]	-0.26% [-0.80]	-0.63%*** [-3.16]	-0.66%*** [-3.53]	-0.30% [-0.96]	-1.01%*** [-5.66]
Spread	+	0.92%*** [3.54]	1.21%* [3.00]	0.63%* [1.93]	1.09%*** [5.33]	1.42%*** [4.68]	0.76%*** [2.86]
Skew	-	-0.05% [-0.20]	0.13% [0.29]	-0.22% [-1.18]	-0.60%*** [-3.41]	-0.83%** [-2.70]	-0.36%** [-2.26]
O/S	-	-0.12% [-0.60]	-0.18% [-0.58]	-0.06% [-0.23]	-0.38%* [-1.98]	-0.47% [-1.66]	-0.30% [-1.11]
PreEA5DayRet	-	-2.55%*** [-10.39]	-3.23%*** [-8.34]	-1.87%*** [-7.42]	-2.42%*** [-10.70]	-3.05%*** [-8.96]	-1.80%*** [-6.99]
Size	-	-0.47%** [-2.17]	-0.23% [-0.61]	-0.71%*** [-3.32]	-0.36%* [-1.86]	-0.13% [-0.40]	-0.59%** [-2.79]
M/B	-	-0.43%* [-1.80]	-0.62% [-1.70]	-0.25% [-0.78]	-0.53%** [-2.20]	-0.67%* [-1.88]	-0.38% [-1.19]
Accruals	-	0.06% [0.29]	0.11% [0.34]	0.00% [0.02]	0.09% [0.42]	0.15% [0.44]	0.02% [0.11]
N		60	30	30	60	30	30

This table presents the results of Fama-Macbeth multivariate and univariate regressions with *EARet* as the dependent variable. Results are presented for three time periods: the full sample period (1996 - 2010), the first half of the sample period (1996 – 2003Q2), and the second half of the sample period (2003Q3 - 2010). To conserve space, univariate results for regressions over the same time period are presented in the same column. All independent variables are transformed into decile rankings and scaled to have a range of 1, [-0.5, 0.5], and a mean of zero. *EARet* is the firm's two-day abnormal return at the earnings announcement. Specifically, it is the compounded return for the firm less the compounded return for the CRSP value-weighted index over the two-day earnings announcement period, [0, 1], where day 0 is the earnings announcement date in I/B/E/S. *LagEARet* is the firm's *EARet* from the previous calendar quarter. *ESurp* is the firm's earnings surprise. Specifically, it is the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. *LagESurp* is the firm's *ESurp* form the previous calendar quarter. The option variables: *Spread*, *Skew*, *O/S*, and *OpenInt* are calculated on the day prior to the earnings announcement based on a single set of the firm's options with the same expiration. The set of options examined are the ones closest to expiration with at least (no more than) 15 (75) days to expiration. *Spread* is calculated as the implied volatility of a call for a given strike price and expiration less the implied volatility of the put with the same strike price and expiration as the call, these differences are then weighted by the amount of open interest in all strike price pairs with the same expiration. *Skew* is the implied volatility of an out-of-the-money put (i.e., delta closest to -0.25, given a delta of [-0.375, -0.125]) less the implied volatility on an at-the-money call (i.e., delta closest to 0.5, given a delta of [0.375, 0.625]). *O/S* is the ratio of option market volume to stock market volume on the day prior to the firm's earnings announcement. *PreEA5DayRet* is the firm's abnormal return for the five trading days prior to their earnings announcement. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. Time-series means are presented in percentage format for presentation purposes. t-statistics are in brackets. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Table 6
Market Reaction to Extreme Earnings Surprises over Time

	(1) Lowest *LagESurp* Decile	(2) Highest *LagESurp* Decile
Intercept	-2.41%***	2.12%***
	[-8.29]	[4.80]
Options	2.11%***	1.11%**
	[3.44]	[2.38]
Recent	-2.11%***	1.96%***
	[-5.80]	[3.56]
*Options*Recent*	-1.12%*	0.96%
	[-1.77]	[1.47]
Size	0.0001	-0.0005***
	[1.60]	[-2.88]
*Size*Recent*	0.0003*	-0.0003
	[1.91]	[-1.23]
M/B	-0.0001	0.0005
	[-0.33]	[1.14]
*M/B*Recent*	0.0007	-0.0003
	[1.63]	[-0.58]
Accruals	0.0004	0.0091
	[0.01]	[0.28]
*Accruals*Recent*	-0.0197	-0.0191
	[-0.66]	[-0.48]
N	10,313	10,206
Adj. R^2	1.38%	1.31%

This table presents the results of regressions with *LagEARet* as the dependent variable. In the first (second) column the regression model is estimated for firms in the lowest (highest) decile of *LagESurp*. *LagEARet* is the firm's two-day abnormal return at the earnings announcement from the prior calendar quarter. *LagESurp* is the firm's earnings surprise from the prior calendar quarter. *Options* is an indicator variable equal to one for firms with active options, and zero otherwise. *Recent* is an indicator variable equal to one for earnings announcements occurring during the second half of the sample period (2003Q3-2010), and zero otherwise. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. Standard errors are clustered on two dimensions, firm and quarter. *LagESurp*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels. t-statistics are in brackets. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Table 7
Relation between Firm-specific Investor Sentiment and Prior Earnings News over Time

	(1) *PreEA5DayRet*	(2) *Skew*	(3) *Spread*	(4) *O/S*
Intercept	1.72***	4.58***	-1.15***	4.16***
	[5.72]	[9.74]	[-9.90]	[22.30]
Recent	-1.09***	1.15	-0.33	4.77***
	[-3.20]	[1.41]	[-1.18]	[9.46]
LagESurp	-42.80*	4.13	-18.30	-0.17
	[-1.67]	[0.22]	[-1.06]	[-0.01]
*LagESurp*Recent*	27.99	-75.73***	43.25*	8.08
	[0.81]	[-3.09]	[1.92]	[0.47]
LagEARet	-0.27	0.77	-0.44	0.18
	[-0.22]	[0.93]	[-0.54]	[0.28]
*LagEARet*Recent*	4.31*	-0.36	1.14	1.00
	[1.95]	[-0.33]	[1.05]	[0.76]
Size	-0.013***	-0.006***	0.004***	0.023***
	[-3.34]	[-2.77]	[3.39]	[2.57]
*Size*Recent*	0.008*	-0.020***	0.008***	0.038**
	[1.82]	[-4.72]	[3.45]	[2.30]
M/B	0.001	-0.013	-0.011**	0.035***
	[0.13]	[-1.56]	[-2.51]	[3.16]
*M/B*Recent*	-0.012	-0.002	0.010*	0.037
	[-0.86]	[-0.14]	[1.77]	[0.75]
Accruals	-0.569	-3.47*	-1.20	-0.138
	[-0.38]	[-1.68]	[-1.14]	[-0.12]
*Accruals*Recent*	-1.72	5.04	-0.87	3.79
	[-0.85]	[1.55]	[-0.48]	[0.97]
N	23,684	23,684	23,684	23,684
Adj. R^2	0.77%	2.27%	0.45%	4.38%

This table presents the results of regressions with a proxy of firm-specific investor sentiment as the dependent variable. The dependent variables in the four columns are *PreEA5DayRet*, *Skew*, *Spread*, and *O/S*, respectively. *PreEA5DayRet* is the firm's abnormal return for the five trading days prior to their earnings announcement. The option variables: *Skew*, *Spread*, and *O/S* are calculated on the day prior to the earnings announcement based on a single set of the firm's options with the same expiration. The set of options examined are the ones closest to expiration with at least (no more than) 15 (75) days to expiration. *Skew* is the implied volatility of an out-of-the-money put (i.e., delta closest to -0.25, given a delta of [-0.375, -0.125]) less the implied volatility on an at-the-money call (i.e., delta closest to 0.5, given a delta of [0.375, 0.625]). *Spread* is calculated as the implied volatility of a call for a given strike and expiration less the implied volatility of the put with the same strike and expiration as the call, these differences are then weighted by the amount of open interest in the pair. *O/S* is the ratio of option market volume to stock market volume on the day prior to the firm's earnings announcement. *Recent* is an indicator variable equal to one for earnings announcements occurring during the second half of the sample period (2003Q3-2010), and zero otherwise. *LagESurp* is the firm's earnings surprise from the prior calendar quarter. *LagEARet* is the firm's two-day abnormal return at the earnings announcement from the prior calendar quarter. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. *LagESurp*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels. Standard errors are clustered on two dimensions, firm and quarter. t-statistics are in brackets. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Table 8
Explaining the Current Earnings Surprise Using Past Information over Time

	(1) 1996-2010	(2) 2003Q3-2010
Intercept	-0.0764***	-0.0337
	[-4.24]	[-0.88]
Recent	0.0428	
	[1.01]	
LagESurp	0.2658***	0.4227***
	[10.02]	[2.97]
*LagESurp*Recent*	0.1576	
	[1.10]	
LagEARet	0.4058***	-0.2657*
	[4.92]	[-1.82]
*LagEARet*Recent*	-0.6716***	
	[-4.04]	
Size	0.0002**	0.0003*
	[1.60]	[1.65]
*Size*Recent*	0.0002	
	[0.62]	
M/B	0.0007*	0.0015
	[1.86]	[0.93]
*M/B*Recent*	0.0008	
	[0.48]	
Accruals	-0.4021***	-0.4976**
	[-4.58]	[-2.54]
*Accruals*Recent*	-0.0955	
	[-0.45]	
N	23,684	14,623
Adj. R^2	13.35%	13.82%

This table presents the results of regressions with *ESurp* as the dependent variable. In the first column the regression is estimated for the full sample period (1996 – 2010). In the second, the regression is estimated for the second half of the sample period (2003Q3 – 2010). *ESurp* is the firm's earnings surprise. Specifically, it is the firm's actual earnings less the mean analyst forecast, scaled by the firm's stock price six days prior to the earnings announcement. *Recent* is an indicator variable equal to one for earnings announcements occurring during the second half of the sample period (2003Q3 - 2010), and zero otherwise. *LagESurp* is the firm's earnings surprise from the prior calendar quarter. *LagEARet* is the firm's two-day abnormal return at the earnings announcement from the prior calendar quarter. *Size* is the firm's market capitalization six days prior to the earnings announcement in billions of dollars. *M/B* is the firm's *Size* divided by the firm's book value. *Accruals* is the firm's income before extraordinary items less cash flow from operating activities, scaled by average total assets. Standard errors are clustered on two dimensions, firm and quarter. *LagESurp*, *Size*, *M/B*, and *Accruals* are winsorized at the 1% and 99% levels. t-statistics are in brackets. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.