Volatility and the timing of earnings announcements

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Abstract

Approximately 95% of publicly traded firms announce earnings outside of regular trading hours, either in the pre-open (before the opening bell) or in the post-close (after the closing bell). We examine whether the timing of the announcement affects how quickly equity investors process the earnings information, as proxied by volatility. We hypothesize that earnings announced farther from regular trading hours and in the pre-open instead of the post-close period receive relatively less investor attention at the time of the announcement and are therefore associated with greater volatility in the days after the announcement. Consistent with our hypotheses, we find greater abnormal volatility in the days after earnings are announced for announcements made farther from regular trading hours and for earnings announced in the pre-open rather than the post-close. These volatility differences persist for at least three trading days following an earnings announcement. It cannot be explained by common determinants of volatility such as firm size, profitability, volume, earnings surprises, stock returns, or historical volatility, and is not driven by strategic announcement timing. Option trading strategies based on pre-open versus post-close announcements yield economically large returns, whereas trading strategies using equities yield economically insignificant returns.

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1. Introduction

A stream of research has attempted to provide insight into how the timing of earnings announcements affects the market's reaction to the announcement. The notion of differential reactions to earnings announcements based on their timing has been attributed to investor inattention. That is, prior research suggests that investors may under-react to information (Hong and Stein, 1999) because of inattention to, or distraction from, the information (Hirshleifer and Teoh, 2003).

In this study, we examine the market's response to earnings announcements based on the timing of earnings announcements issued outside of regular trading hours. As of December 2014, approximately 95 percent of publicly traded firms announce earnings outside of regular trading hours, either before the opening bell (pre-open, or PO) or after the closing bell (post-close, or PC). Despite the high propensity for firms to issue earnings announcements outside of trading hours, there is little insight into how the timing of these announcements affects the market reaction to the announcement. We therefore extend the literature by examining whether announcing earnings farther from regular trading hours or announcing earnings in the pre-open as opposed to the post-close period affects how quickly investors process the earnings news, as proxied by stock return volatility in the days after the earnings announcement.

We hypothesize that investors react less quickly to earnings announcements that are released farther from regular trading hours. Patell and Wolfson (1982) suggest that earnings released outside of regular trading hours receive less attention because traders are less likely to be at work. Expanding this argument suggests that the farther the earnings announcement is from regular trading hours, the more likely it is that investors are not at work and are distracted by other activities. We also hypothesize that the release of earnings prior to the open leads to a greater delay in the market reaction to earnings than the release of earnings after the close. This hypothesis is based on the notion that issuing earnings PC allows investors more time to process the information

prior to trading which allows for a quicker market reaction to earnings once the market opens.

We test these hypotheses by examining stock return volatility in the days after the earnings announcement. We examine stock return volatility for two reasons. First, because volatility is tightly linked to information (e.g., Pástor and Veronesi, 2009; Ross, 1989), it is a natural candidate for examining how the timing of disclosure impacts how and when information is processed by investors. All else equal, higher volatility on a day indicates more information processing as investors revise their beliefs and engage in trade; this activity moves prices and induces stock return volatility. We use volatility to investigate whether the amount of time between the earnings announcement and regular trading hours or whether announcing earnings PO versus PC affects how quickly investors process earnings information.

Second, understanding the behavior of volatility itself is of interest. It is a key input variable for portfolio selection, derivative pricing, and virtually all asset pricing models. Moreover, there now exists an active market for traded volatility that represents a large asset class in the modern economy (Bollerslev et al., 2009; Carr and Wu, 2009; Drechsler and Yaron, 2011). Option contracts allow us to design trading strategies to determine if investors price volatility differently for firms that announce earnings at different times. Given that news is a major driver of volatility (e.g., Engle and Ng, 1993), understanding how the timing of news relates to volatility is important.

Using a large sample of earnings announcements with precise timestamps from 2006 to 2014, we find that approximately 47 percent of the earnings announcements that occur outside of regular trading hours occur in the PO (within four and a half hours before the opening bell) and the remaining in the post-close (within four hours after the closing bell). We also find that: 1) earnings announced farther from regular trading hours are associated with significantly higher abnormal stock return volatility in the days after the announcement; and 2) that PO firms have significantly higher abnormal stock return volatility than PC firms in the days after the announcement. Remarkably, this higher

abnormal return volatility persists for at least three trading days after the announcement.

The difference in abnormal volatility we document is highly predictable and cannot be explained by a large set of determinants of volatility such as firm size, profitability, earnings surprises, stock returns, volume, spreads, or historical volatility. Moreover, the difference is not driven by the day of the week that the firm announces earnings, busy earnings announcement days, lead times for the earnings announcement, the delay between the earnings announcement and conference calls, analyst revisions, or news coverage. We also note that when we remove advanced or delayed announcements from our sample (e.g., Bagnoli et al., 2002; So and Weber, 2015), our results remain, and if anything they become stronger.

Given the finding that investors predictably process information deferentially depending on the timing of a disclosure, in our final set of empirical tests we use option contracts to determine if investors anticipate this predictable behavior. Specifically, we examine whether option-markets anticipate the differential volatility response for PO versus PC announcements. To do this, we construct two option-based trading strategies with payoffs that are directly linked to future stock return volatility: delta hedged returns (Bakshi and Kapadia, 2003) and straddle returns (Coval and Shumway, 2001; Goyal and Saretto, 2009). Presumably, if option traders correctly impound the predictable volatility spread between PO and PC announcements into option prices, then returns to these strategies should not be significantly different across PO and PC announcement portfolios. However, we find that each strategy that we examine generates economically large returns. Portfolios that go long volatility of PO announcements and short volatility of PC announcements generate daily returns that range from 0.3% to 2.3%, depending on the strategy used. Importantly, these option-based returns are not driven by underlying stock returns as similar portfolios based on equities result in returns that are not distinguishable from zero. Given how predictable the volatility spread is between PO and PC announcements, the returns to these option-based strategies suggest that option traders either do not fully understand this predictability or that there is a priced risk related

to earnings announcement timing that is present in traded volatility, but not in traded equity.

When we examine the association between abnormal stock returns on the earnings announcement date and the earnings surprise, we find a muted reaction to earnings for announcements released in the PO and farther from regular trading hours. In addition, using an intraperiod timeliness (IPT) metric, we find that the information in earnings is more slowly impounded into prices in the five days after the earnings announcement for earnings announced in the PO and farther from regular trading hours.

Our paper contributes to the growing literature that examines whether the timing of the earnings news affects the market reaction to the announcement. First, prior studies have found evidence consistent with strategic timing of earnings announcements in that a large proportion of bad news is announced in the PC on Fridays. However, the number of firms that actually announce during that time is relatively small (approximately 1.1 percent as reported by Michaely et al., 2016). Our finding that a remarkably simple difference between announcing earnings before or after the bell has an impact on stock return volatility is based on a large sample, is insensitive to Friday announcements and other strategic considerations, and is present across firms and through time. Second, because our finding is new to the literature, it offers new insights into how the timing of disclosure impacts information processing and asset prices. Third, by using forward-looking option contracts to construct trading strategies based on earnings announcement times, we shed new light on option traders' beliefs about impending information events and how information will be processed by equity markets.

The remainder of this paper is organized as follows. Section 2 reviews the prior literature. Section 3 discusses data and variable construct. Empirical results are discussed in Section 4. Section 5 concludes.

2. Literature Review and Hypotheses Development

There has been a gradual shift in the timing of earnings announcements over time. Earlier studies document a large proportion of firms announcing earnings during regular trading hours; however, recent studies show that, since at least the late 1990's, more than 90 percent of firms now announce earnings outside of regular trading hours. Consistent with this, we document that between 2006 and 2014, approximately 95 percent of firms announce outside of regular trading hours with a near 50-50 split between PO (47 percent) and PC (53 percent) announcements.

The reason for this shift is not entirely clear and rarely has been discussed in the prior literature. A potential explanation is that as financial markets have changed over time, announcement times have changed in response. If firms prefer to announce earnings when the proportion of sophisticated traders is highest, allowing information to be impounded into prices while noise traders are absent (Gennotte and Trueman, 1996; Jiang et al., 2012), then announcing outside of regular trading hours may be optimal and help to explain this trend in announcement times.

Patell and Wolfson (1982; 1984) examine earnings announcements and price reactions in the late 1970's and document that a large number of announcements took place during regular trading hours. However, this was a time period when markets had few day traders and after-hours trading was not widespread. Over time markets have changed; electronic day-trading by individuals is now common. Electronic Communication Networks (ECNs) and other Alternative Trading Systems (ATSs) have proliferated allowing after-hours trading to become more accessible and prevalent, particularly for sophisticated investors. Indeed Barclay and Hendershott (2003, 2004) examine after-hours trading and find that informed traders dominate the after-hours trading sessions.

Michaely et al. (2014) argue that Regulation Fair Disclosure (Reg FD) and the Sarbanes-Oxley Act (SOX), which mandate material disclosure to all market participants to allow equal access to information and to help reduce accounting-related fraud,

may have played a role in the reduction of regular trading hours announcements. The legislation promoted corporate governance, which Michaely et al. (2014) find is significantly associated with moving earnings announcements to the after hours. It is also possible that firms release earnings outside of regular trading hours to allow informed traders to process this information before regular hours, while still complying with Reg FD and SOX (Jiang et al., 2012). Whatever the reason, it is now a stylized fact that the vast majority of firms announce earnings outside of regular trading hours.

Exploring this fact, deHann et al. (2015) examine the differential response to earnings announcements released after versus during regular trading hours. They find a lower reaction to earnings announcements released after market close relative to earnings announcements released during trading hours and attribute the muted reaction to investor inattention. This is consistent with a stream of literature that suggests that investors may underreact to information (Hong and Stein, 1999) because of inattention to, or distraction from, the information (Hirshleifer and Teoh, 2003). Other empirical research is consistent with this notion. For example, DellaVigna and Pollet (2009) find a delayed reaction to earnings announcements released on Fridays, Hirshleifer et al. (2009) find a delayed response to earnings news on days with a greater number of earnings announcements (busy days), and Drake et al. (2015) document a delayed reaction to earnings announcements during March Madness.

We hypothesize that investors react less quickly to earnings announcements that are released farther from regular trading hours. Patell and Wolfson (1982) suggest that earnings released outside of regular trading hours receive less attention because traders are less likely to be at work. Expanding this argument suggests that the farther the earnings announcement is from regular trading hours, the more likely it is that investors are not at work and are distracted by other activities. However, there are credible arguments for the null. Namely, there are traders all over the world in different time zones, suggesting that there may be sufficient traders available to react to the announcement. In addition, sophisticated investors likely have processes and procedures in place to react to earnings

announcements no matter when the announcement is made. Finally, there has been an increase in the disclosure of the anticipated earnings announcements such that investors should be aware of upcoming announcements. Despite the arguments for the null, we hypothesize that there is a delayed market response to earnings announcements that are released farther from regular trading hours given the research on limited attention (Hirshleifer et al., 2009; Drake et al., 2015) and the evidence that earnings announcements released outside of regular trading are associated with less attention (deHann et al., 2015). This leads to the first component of our first hypothesis:

H1a: There is a more delayed market reaction to earnings announcements that are released farther from regular trading hours.

We also hypothesize that PO earnings announcements lead to a greater delay in the market reaction to earnings than PC earnings announcements. This hypothesis is based on the notion that issuing earnings PC allows investors more time to process the information prior to trading which would allow for a quicker market reaction to earnings once the market opens. This leads to the second component of our first hypothesis:

H1b: There is a more delayed market reaction to earnings announcements that are released PO than to those released PC.

We examine volatility after the earnings announcement because it reflects belief revision and captures the market reaction to earnings news. Our hypotheses suggest that there is a delayed and longer-lived reaction to earnings and greater volatility for earnings announced farther from regular trading hours and earnings released in the PO. Based on this notion, we also hypothesize that an options (volatility) trading strategy based on the timing of the earnings announcement earns significant abnormal returns.

H2a: An options (volatility) trading strategy based on the distance of the earnings announcement to regular trading hours earns significant returns.

H2b: An options (volatility) trading strategy based on whether the earnings announcement is released PO vs PC earns significant returns.

3. Data and Variable Construction

3.1. Data

Our sample consists of a large panel of publicly traded companies over the period 2006 to 2014. Quarterly earnings announcement dates and times are provided by Wall Street Horizon (WSH). The sample begins in 2006 because this is the earliest year of any WSH dataset. WSH collects precise dates and times of earnings announcements and conference calls for firms that announce over primary source newswires. We use WSH instead of I/B/E/S because our research study requires highly accurate time stamps, and time stamps provided by I/B/E/S are often inaccurate (Bradley et al., 2014; Li, 2016; Michaely et al., 2014). We merge WSH data with Compustat, CRSP, TAQ, and I/B/E/S, dropping firm-quarters with a market capitalization less than $10 million or with an equity price less than $5. We also remove Canadian and delisted stocks, as identified by WSH, and limit our sample to firms with at least one trading session immediately following an earnings announcement. This final filter ensures that firms that announce Friday's in the PC are eliminated from our sample. Our final sample consists of 80,630 firm-quarters. In some of our analyses we use option contract data from OptionMetrics. For those tests our sample is reduced because not all firms have actively traded options and we are left with between 41,028 and 39,578 firm-quarters depending on the option strategy.

Figure 1 presents the intra-day distribution of the timing of earnings announcements as the fraction of our sample in half hour windows throughout the day. The figure shows that the vast majority of earnings announcements occur in the PO period (the four and a half hours prior to the market open at 9:30 AM) or the PC (the four hours after the market close at 4:00 PM).[1] In our sample we have dropped the small fraction of

[1]The distribution of announcement times for our sample is similar to that reported by Michaely et al. (2016).

announcements that occur outside of the PO and PC hours. In our empirical analyses we use a binary variable, PO, that is equal to one if the earnings announcement occurs in the pre-open, and zero if the announcement occurs in the post-close. We also use a continuous variable to measure the distance between the nearest open or close of regular trading hours and the earnings announcement time. $DIST$ is calculated as the absolute value of the amount of time, in hours, between the market close and the announcement time for PC announcements, or the market open and the announcement time for PO announcements. For example, announcements at 4:30 PM and 9:00 AM would both receive a $DIST$ value of 0.5.

3.2. Variable Construction

Various estimates of volatility have been used extensively as proxies for information around events (e.g., Bushee et al., 2011; Kirk and Markov, 2016; Matsumoto et al., 2011). The basic intuition is straight forward. Consider an investor who applies Bayes rule when setting equity prices. Such an investor makes revisions in beliefs about equity prices as news about future cash flows and discount rates arrives. Value-relevant news causes revisions in beliefs, which leads to revisions in stock prices. Estimated volatility represents a measure of variation in the belief revisions through time. If an earnings announcement is uninformative, all else equal, investors do not revise their beliefs and volatility is flat. If an event has information, prices move and volatility increases.

Consistent with this, Patell and Wolfson (1979, 1981) examine the behavior of option-implied as well as realized stock return volatility around earnings announcements. They find that implied volatility increases before earnings announcements, in anticipation that earnings news will carry value-relevant information that will increase stock price variability. Patell and Wolfson (1981) use *ex post* realized volatility as a proxy for information and indeed find that volatility increases on average following an earnings announcement. Our empirical tests of the information in the timing of earnings are similarly motivated: if traders have less time to process PO announcements and therefore delay their trading

in response to the announcement, then it is expected that volatility will be higher in the days after the announcement for PO versus PC announcements. Likewise, if announcing farther from regular trading hours is associated with inattention, we would expect the distance from regular trading hours to the announcment to be related to volatility.

Our main empirical tests rely on volatility that is estimated using intraday trading and quote data from TAQ. We calculate volatility from high frequency TAQ data for two reasons: 1) volatility estimated from intraday data is considered a superior measure of realized volatility than are estimates based on lower frequency data, such as daily or weekly returns (Bollerslev et al., 2009); 2) we are interested in volatility estimated over small windows around earnings events. TAQ data allows us to calculate volatility at high frequency, this is not possible with daily data provided by CRSP.

We calculate volatility as follows. For each firm we collect volume-weighted average prices (VWAPs) every minute from the TAQ execution files. We then construct volatility over daily regular trading hours by summing the squared one-minute log-returns and then taking the square root of the sum.[2] We also calculate abnormal volatility to control for common trends and persistence in firm-level volatility. We calculate abnormal volatility ($ABVOL$) as the ratio of current volatility to the average historical volatility over the same trading interval on the same trading day for the prior five weeks, excluding the week before the earnings announcement, minus 1 and multiplied by 100. This allows us to control for historical firm-level volatility behavior at identical trading times on non-earnings announcement days.[3]

In addition to volatility, we measure abnormal volume, abnormal returns, and abnormal bid-ask spreads around the earnings announcement. Abnormal volume ($ABVOLUME$) is the total trading volume during the regular hours period as obtained from TAQ, normalized using the same equation as $ABVOL$, i.e., dividing volume for firm i on day t

[2]We also calculate volatility for regular trading hours using mid-points instead of execution prices to ensure that our results are not driven by microstructure noise. We find that our results are virtually identical if we use mid points instead of execution prices.

[3]In untabulated robustness tests we find that varying the historical window we use to calculate historical volatility or using more sophisticated techniques, such as GARCH-based estimation, has little impact on our results.

by the average volume on the same day of the week over four prior weeks, subtracting 1 and multiplying by 100. Abnormal spread ($ABSPREAD$) is the mean bid-ask spread, calculated per minute from TAQ, throughout the trading day normalized as above. Abnormal returns ($ABRET$) are calculated daily using the Fama-French three factor model and are multiplied by 100.

In Table 1 we present summary statistics for the full sample.[4] Daily variables ($ABVOL$, $ABVOLUME$, $ABSPREAD$, and $ABRET$) are presented as the average of the three day period from 0 to +2, where day 0 is the first full trading day immediately following the release of earnings.[5] For PO announcers, day 0 is the exact same calendar day that earnings are announced, but for PC announcers, it is the following trading day. Mean abnormal volatility is 61.49, indicating volatility following the earnings announcement increases by approximately 61% compared to its historical volatility on the same days of the week. Likewise, volume almost triples (165.59), and average abnormal returns are slightly negative (-0.07), inconsistent with the prior literature that has documented, on average, an earnings announcement premium (Barber et al., 2013).

$SIZE$ is the natural log of the market capitalization of the firm (share price times total shares outstanding). The book-to-market ratio of the firm (BM) is calculated as the natural log of book value of equity divided by the market value of equity (share price times the common shares outstanding). Return on equity (ROE) is natural log of one plus the firm's net income divided by its book value of equity. Unexpected earnings (or an earnings surprise) (UE) is calculated as the earnings per share (EPS) from WSH, minus the median analyst forecast from I/B/E/S, scaled by the stock price at the end of the prior quarter, and multiplied by 100. If the firm has no analyst forecasts, the actual EPS from the same quarter, prior year is used. The mean and median UE are 0.00. NUE is an indicator equal to one if UE is negative, and zero otherwise. LEV is calculated as total liabilities divided by total assets. IO is calculated quarterly as the percentage of

[4]All variables are winsorized at the top and bottom 0.5%.

[5]When calculating the three day $ABVOL$, the sum of squared log returns is taken over the three day period before taking the square root for both the three day period of interest and the four reference periods.

shares owned by institutions required to make 13-f filings. We measure the announcement reporting lag ($REPLAG$) as the natural log of the number of days between the quarter end date and the earnings announcement date. The mean (median) analyst following ($ANALYSTS$) is 8.11 (6.00). Analyst dispersion ($DISP$) is the standard deviation of EPS forecasts that are used to calculate the consensus in I/B/E/S. We also calculate the historical volatility ($LAGVOL$) as the log of the average intra-day volatility over the prior six months and historical returns ($LAGRET$) as the average returns over the prior six months.

In our option-based tests we construct two different trading strategies with payoffs that are directly linked to future stock return volatility: delta hedged returns (Bakshi and Kapadia, 2003) and straddle returns (Coval and Shumway, 2001; Goyal and Saretto, 2009). Returns on delta hedge and straddle strategies are calculated as follows:

$$\text{Delta Hedge Return: } R^{DH}_{t+1} = \frac{O_{t+1} - \Delta_t S_{t+1}}{O_t - \Delta_t S_t} - 1, \tag{1}$$

$$\text{Straddle Return: } R^{S}_{t+1} = \frac{C_{t+1} + P_{t+1}}{C_t + P_t} - 1. \tag{2}$$

Here O_t represents the price of an option (a call or a put), C_t is the price of a call option and P_t is the price of a put option. S_t is the price of the stock.

All options data are obtained from the IvyDB OptionMetrics database. We select all options that have expirations at least three days following an earnings announcement. From these, we keep only those options that are closest to at-the-money and have the shortest expiration. For straddles, we construct put-call pairs, where the put and the call have identical expiration and strike prices.

Table 1, Panel B presents the descriptive statistcs by distance to trading ($DIST$). We note that PO appears to be associated with distance to trading. Panel C of Table 1 presents the descriptive statistics for PO and PC announcements separately. We note that there are significant differences in firm and earnings announcement characteristics

based on PO versus PC announcements. Because of this, we perform analyses with firm fixed effects and propensity score matching.

Table 2 presents a correlation matrix of the variables used in the study. Consistent with intuition, abnormal volatility is positively correlated with volume, bid-ask spreads, and pre-open announcement (PO). It is negatively correlated with stock returns (consistent with Ang et al., 2006, 2009) and book-to-market.

4. Empirical Tests

Our main empirical focus is on examining the difference in stock return volatility for earnings announcements made farther from regular trading hours and for PO versus PC earnings announcements. We initially test whether announcing farther from regular trading hours and in the PO are significantly associated with abnormal volatility. We also examine option-based trading strategies to determine if option traders price options differently for PO and PC firms.

4.1. Abnormal Volatility

Panel A of Table 3 presents the mean difference in $ABVOL$, measured using daily volatility from intraday prices, between PO and PC firm-quarters over days 0 to +5 after the announcement , where day 0 is the first trading day following the announcement. Differences greater than zero indicate PO firms have higher abnormal volatility than PC firms on average, and differences less than zero indicate PC firms have higher volatility than PO firms. The differences support our first hypothesis related to PO earnings announcements: following an earnings announcement, PO firms have higher abnormal volatility than PC firms. Importantly, it is also clear that this is not a one-day phenomenon. PO announcers' volatility remains above the PC announcers' volatility for approximately three days following the announcement.

Panel B of Table 3 presents the mean daily $ABVOL$ across subsets of earnings announcements based on $DIST$, or the number of hours the earnings announcement is from

regular trading hours. The univariate statistics support our first hypothesis related to the market reaction to earnings announcements released farther from regular trading hours. Specifically, the table documents a decreasing trend in $ABVOL$ as distance increases in the days prior to the earnings announcement and an increasing trend in $ABVOL$ as distance increases in the days after the announcement. While we do not provide a hypothesis regarding the lower volatility prior to the earnings announcement for announcements farther from regular trading hours or in the PO, we control for the pre-announcement volatility in our analyses.

Table 4 presents a formal test of Table 3. In Table 4 Panel A, we measure $ABVOL$ as the cumulative abnormal volatility over days +0 to +2, where day zero is the first trading period following the earnings announcement. We regress $ABVOL$ on PO, $DIST$, and the interaction between PO and $DIST$ and with year and industry fixed effects. We include the interaction to determine if the relation between volatility, PO and $DIST$ is conditional upon PO and/or $DIST$.

It is possible the difference in volatility is simply a feature of the type of firm that discloses farther from regular trading hours or in the PO versus the PC. So we control for firm characteristics that could impact stock return volatility as well as proxies for firms' information environments. We control for size ($SIZE$), book-to-market (BM), return on equity (ROE), leverage (LEV), institutional ownership (IO), analyst following ($ANALYSTS$), analyst dispersion ($DISP$), historical volatility ($LAGVOL$), and historical returns ($LAGRET$). Size, book-to-market, leverage, and return on equity are all lagged one quarter, so the data are available prior to the announcement. The results show that all but three (firm size, leverage, and analyst forecast dispersion) of the firm-level control variables are significantly associated with abnormal volatility across all the models.

It is also possible that our results may be driven by other earnings announcement characteristics such as the abnormal volatility in the days prior to the earnings announcement, the magnitude of the earnings surprise that is announced, the sign of the earnings sur-

prise, or the earnings reporting lag. To consider this possibility, we include controls for abnormal volatility in the three days prior to the announcement ($ABVOL_{PRE}$), unexpected earnings (UE), an indicator variable for negative unexpected earnings (NUE), fourth quarter announcements ($Q4$), and the earnings reporting lag ($REPLAG$). The results show that these earnings announcement controls are significantly associated with abnormal volatility after the announcement.

Columns (1) through (3) include firm-level and earnings announcement characteristic controls while columns (4) through (6) also include controls for contemporaneous abnormal volume ($ABVOLUME$), abnormal returns ($ABRET$), and abnormal bid-ask spreads ($ABSPREAD$). In both specifications, the coefficient on PO and the coefficient on $DIST$ is positive and significant at the 1% level when included individually. In terms of economic significance, a firm announcing in PO has approximately 6.2% greater volatility (column 1) compared to its historical average than firms announcing in the PC. Likewise, a one hour increase in announcement time distance from regular trading hours is associated with 2.3% greater post-announcement volatility (column 2). When PO and $DIST$ are included in the same regression and interacted, PO remains significant in both columns 3 and 6. $DIST$ alone becomes insignificant in column 3, but remains significant at 10% in column 6. Likewise, the interaction of $PO * DIST$ is positive and significant in column 3, but insignificant in column 6. This suggests inattention due to distance may only matter for morning announcements, though the results are not entirely consistent.

In Table 4 Panel B, we perform the same tests but include firm fixed effects in the regression to ensure the results are not driven by a persistent firm-level characteristic not captured by our control variables. Again, the results confirm the finding that abnormal volatility for earnings announcements released farther from regular trading hours ($DIST$) and PO earnings announcements are higher in the days after the announcement. In untabulated analyses, we find consistent results with a first differences model, where a switch from PC to PO or an increase in distance predicts an increase in post-announcement abnormal volatility.

To ensure that our results are not driven by a single trading day, in untabulated analyses we run daily regressions of abnormal volatility for each day from day 0 to day 5 where day 0 is the first trading day following the earnings announcement. We include all of the control variables used in Table 4. The daily regressions are broadly consistent with the univariate findings in Table 3. Post-announcement abnormal volatility is positively associated with PO and $DIST$, but only on trading days, $t = 0$ through $t = +3$.

Despite including a number of firm and earnings announcement characteristics in our regression analysis, there is a possibility that these characteristics could drive our results. To ensure that this is not the case, we also perform a propensity score matching analysis. Specifically, we estimate a model to explain whether a firm releases earnings PO versus PC using all non-contemporaneous controls from Table 4 in the propensity score model. Panel A of Table 5 reports the differences in the characteristics between the PO and PC earnings announcements and Panel B reports the abnormal volatility results on the propensity score matched sample.

The results in Panel A show that the matching achieves covariate balance on all the variables except leverage and analyst coverage. These differences, though statistically significant, are small in absolute magnitude. Overall, the matching process appears reasonable and generates groups with similar characteristics. Table 5, Panel B shows that the results are robust to propensity score matching. Specifically, abnormal volatility in the days after the earnings announcement is significantly greater the farther the earnings announcement is from regular trading hours ($DIST$) and when the earnings announcement is in the PO.

4.2. Robustness Tests

4.2.1. Placebo Tests

As a robustness test to ensure that our findings are not driven by firm characteristics and differential trading behavior for firms that release earnings farther from regular trading hours or in the PO, we perform two placebo tests. The first examines the re-

lation between abnormal volatility and PO and $DIST$ during a non-announcement day which is 21 days prior to the earnings announcement day. The results of this pseudo-announcement test are reported in Panel A of Table 6. The second placebo test examines the relation around a Federal Reserve meeting announcement and is reported in Panel B of Table 6. We include the abnormal volatility in the following three days as the dependent variable and the same explanatory variables as in previous analyses. If the previous findings are not driven by firm characteristics, we expect no relation between abnormal volatility and PO or $DIST$. Consistent with this, in both placebo tests, we find insignificant relations between abnormal volatility and PO announcements and the distance from regular trading hours.

4.2.2. Other Earnings Announcement Characteristics

We also examine whether the relations between abnormal volatility and PO and $DIST$ are incremental to other earnings announcement timing characteristics that have been documented to be associated with investor inattention. Specifically, Hirshleifer et al. (2009) find investor underreaction to earnings announcements released on days with a greater number of earnings announcements from other firm and deHann et al. (2015) document greater attention to earnings announcements that receive more advanced warning. We therefore examine whether PO and $DIST$ provide incremental information content for abnormal volatility after controlling for earnings announcement frequency ($EAFREQ$) and lead time ($LEADTIME$). To calculate $EAFREQ$, we measure the number of contemporaneous earnings announcements on each day in Compustat and define decile cutoffs for the population. $EAFREQ$ is the decile number in which a given earnings announcement day falls. The results of the analysis including this control variable are reported in Panel A of Table 7. $LEADTIME$ is defined as the logged lead time (in days) between the date on which the firm schedules its earnings announcement date and the EA date itself, and the results including this variable in the regression are reported in Panel B of Table 7. We find that both PO and $DIST$ continue to be

significantly positively associated with abnormal volatility after controlling for $EAFREQ$ and after controlling for $LEADTIME$.

We also perform robustness tests (untabulated) to include characteristics of the earnings announcement that have been shown in prior research to be associated with the market's reaction to the announcement. Specifically, we reestimate the regressions in Table 4 with an indicator variable for earnings announcements that are released on the same day as the 10-K or 10-Q filing (Li and Ramesh, 2009), an indicator variable for earnings announcements released prior to audit completion (Bronson et al., 2011), and earnings announcements that are released with a management forecast included in the announcement (Anilowski et al., 2007). We find that our main result, namely greater abnormal volatility in the three days after the announcement for earnings announcements released farther from regular trading hours and in the PO, is robust to inclusion of these variables.

4.2.3. Alternative Information Releases

One possible explanation for our results is that additional public information releases, whether in the form of a conference call, annual or quarterly filing, analyst revision, or news story, are delayed for PO announcements compared to PC announcements, which might be a cause for a difference in volatility over the subsequent days. We perform three tests (untabulated) to address this concern. First, we examine the distribution of conference call times. For our sample, the vast majority of PO announcers hold the call on the same day as the announcement and PC announcers split between the same day they announce and the following trading day. Apart from this difference, we closely inspect the empirical distribution of the time between the earnings announcement and the conference call and find the distributions are similar. We also include the time between announcement and conference call as an additional control in our regression analysis and find that it has very little impact on our results. Second, we count the number of analyst revisions on each day following the announcement as a proxy for additional news that

might generate trading and find our results are robust to the inclusion of this variable as a control. Last, we collect from RavenPack news data and count the number of articles published on each day following the announcement, again finding our results are robust to this control. As a whole, it does not appear that public releases of other information are driving our result.

4.2.4. Predictability Over Time

Our sample period includes the financial crisis, a rapid increase in equity prices following the crisis, and continued expansion of algorithmic trading. To ensure that our results are not driven by a specific time period, we also performed empirical tests for each year in our sample period. Our results indicate that the strong positive associations between PO and $DIST$ and abnormal volatility is not driven by a single year. In fact, we find these significant relations with abnormal volatility for every year in our sample, aside from 2011.

4.3. Option-Based Returns

Given the strong relations between abnormal volatility and announcing in the PO versus the PC and the distance of the earnings announcement to regular trading hours, we examine whether option markets anticipate the differential volatility response based on PO and $DIST$. To do this, we construct two option-based trading strategies with payoffs that are directly linked to future stock return volatility that are common for trading on stock return volatility: delta hedged returns (Bakshi and Kapadia, 2003) and straddle returns (Coval and Shumway, 2001; Goyal and Saretto, 2009). The goal of looking at returns to these strategies is to determine if option traders impound the volatility spread based on PO and $DIST$ into option prices. If option traders anticipate this difference then returns to these strategies should not be significantly related to PO and $DIST$.

We test this two ways. First, we conduct regressions using both option return strategies as the dependent variable. Second, we form portfolios and determine if the returns to

these portfolios are sensitive to firm characteristics. Like our prior tests, our window of interest is from the announcement day ($t = 0$) to two days following the announcement ($t = +2$), which represents three trading days in total.

Table 8 presents return regressions analysis results for both option strategies as well as results for equity returns. For each strategy, we report the coefficient on PO and $DIST$ with the same controls as the previous analyses. Table 8 clearly shows that each option strategy has strong positive associations with PO and $DIST$ with economically meaningful magnitudes. For example, the average daily return for a PO earnings announcement is approximately 0.29% higher for the delta hedge and 2.27% higher for the straddle. The table also indicates that average stock returns are neither economically nor statistically associated with PO and $DIST$.

To ensure that our regression-based results are not being driven by idiosyncratic noise or the linear structure that is imposed by these tests, we also form portfolios. By forming portfolios, we are able to reduce the potential impact from idiosyncratic noise through the power of diversification and examine how returns to these portfolios vary with certain firm characteristics. Table 9 presents portfolio returns of a long position in PO firms and short position in PC firms, sorted on firm characteristics. Panel A shows the returns on equity and each option-based strategy sorted on firm size ($SIZE$). Panel B shows the same returns but sorts on historical volatility ($LAGVOL$). Panel C sorts on historical bid-ask spread ($LAGSPREAD$). The results tell a similar story as the regression results presented in Table 8. Returns on each of the option-based strategies are significant and are not sensitive to firm characteristics, but equity returns are unrelated to announcing in the PO or PC.

4.4. Market Return Reaction to Earnings Announcements

To provide additional insight into whether there is a delayed investor reaction to earnings announcements released farther from regular trading hours or in the PO, we examine the association between abnormal stock returns and the earnings surprise on the

day of the announcement and the intraperiod timeliness (IPT) of the reaction to earnings news in the five days after the announcement. Panel A of Table 10 reports the results of the announcement date returns, and Panel B reports the results of the IPT tests.

The dependent variable in the market reaction test (Panel A) is the size adjusted abnormal returns on the day of the earnings announcement.[6] We include the same explanatory variables as in the previous analyses. Given that prior research finds a lower market response to losses (Hayn, 1995), we include an interaction term, $UE * LOSS$, in the regression reported in the first set of columns. Prior research also documents a lower market response to bad earnings news (Kothari, 2001), and as such we include an interaction term, $UE * NUE$, in the second set of columns. To test for a muted reaction to announcements released in the PO, we include an interaction term for PO and UE ($PO*UE$). To test for a muted reaction to earnings announcements released farther from regular trading hours, we include an interaction term for $DIST$ and UE ($DIST * UE$). Consistent with a muted reaction to the earnings announcement, we find a significant negative coefficient on $PO * UE$ as well as$DIST * UE$.[7]

In Panel B of Table 10, we report the results of the IPT test. The IPT captures the speed with which information is incorporated into price after controlling for the price response to the information (Twedt, 2016; Butler et al., 2007). The dependent variable is the daily proportion of size-adjusted abnormal returns realized up to and including a given day, starting on day 0 (the day of the earnings announcement) and continuing through day +5. For each day, we calculate the cumulative buy-and-hold return from day 0 to that day, scaled by the cumulative abnormal return for the entire period. We then estimate the area under this curve for each earnings announcement, where a larger area indicates that the information is more quickly impounded into price.

We regress the IPT metric on PO and $DIST$ to test whether the market reacts less

[6]We measure returns from the market close immediately prior to which earnings are announced to the market close immediately after which earnings are announced.

[7]In Table 10, the contemporaneous controls do not include $ABRET$, as returns are the dependent variable.

quickly to earnings announced in the PO and farther from regular trading hours.[8] We include the same control variables as in the previous analyses. Consistent with a delayed reaction to earnings released farther from regular trading hours and in the PO, we find significant negative coefficients on PO and $DIST$.

Figure 2 provides graphical representation of the findings in Table 10. Panel A plots the IPT metric for the days around the earnings announcement based on the distance of the earnings announcement to regular trading hours. Panel B plots the IPT metric for PO and PC firms. The figures show that the graphical depiction of the IPT metric is consistent with the findings in Panel B of Table 10.

Overall, the findings of a muted reaction on the day of the announcement and a delayed reaction in the five days after the announcement for earnings released farther from regular trading hours and in the PO provides additional support for the notion that investors are less attentive to these earnings announcements.

5. Conclusion

This paper documents that earnings announcements released farther from regular trading hours and in the pre-open (before the opening bell) have higher abnormal volatility following the announcement relative to firms that announce closer to regular trading hours and in the post-close (after the bell). This volatility difference persists for at least three trading days following an earnings announcement and is highly predictable. It cannot be explained by common determinants of volatility such as firm size, profitability, volume, earnings surprises, stock returns, and historical volatility, and is not driven by strategic announcement timing. Option trading strategies based on pre-open versus post-close announcements and distance from regular trading hours yield economically large returns, whereas trading strategies using equities yield economically insignificant

[8]In this test, we truncate the sample at the top and bottom 1 percent of IPT value, as these observations are primarily firms with net six-day abnormal returns extremely close to zero. In these cases, the IPT measure is greatly inflated or deflated, as the total abnormal returns are the denominator in the measure.

returns. We also find a muted market reaction to unexpected earnings on the day of the announcement and slower incorporation of earnings news into prices over the five days after the announcement for earnings released farther from regular trading hours and in the PO. Collectively our results suggest that equity investors pay less attention and delay the processing of earnings information when earnings are announced farther from regular trading hours and in the pre-open. In addition, our results suggest that option traders are unable to fully unravel this predictable phenomenon.

Our paper conjectures that investors process information differently for firms that announce similar information farther from regular trading hours and in the morning (the pre-open) versus the evening (the post-close); however, we cannot fully explain why this happens. Research that can provide a more precise mechanism that can help us to understand our robust empirical results represents a fruitful area of future work.

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Figures

Figure 1: Sample Distribution of Earnings Announcement Times

Figure 1 plots the distribution of the earnings announcement times as the fraction of the total sample in half hour bins. Vertical dashed lines indicate the market open and close at 9:30 AM and 4:00 PM, respectively.

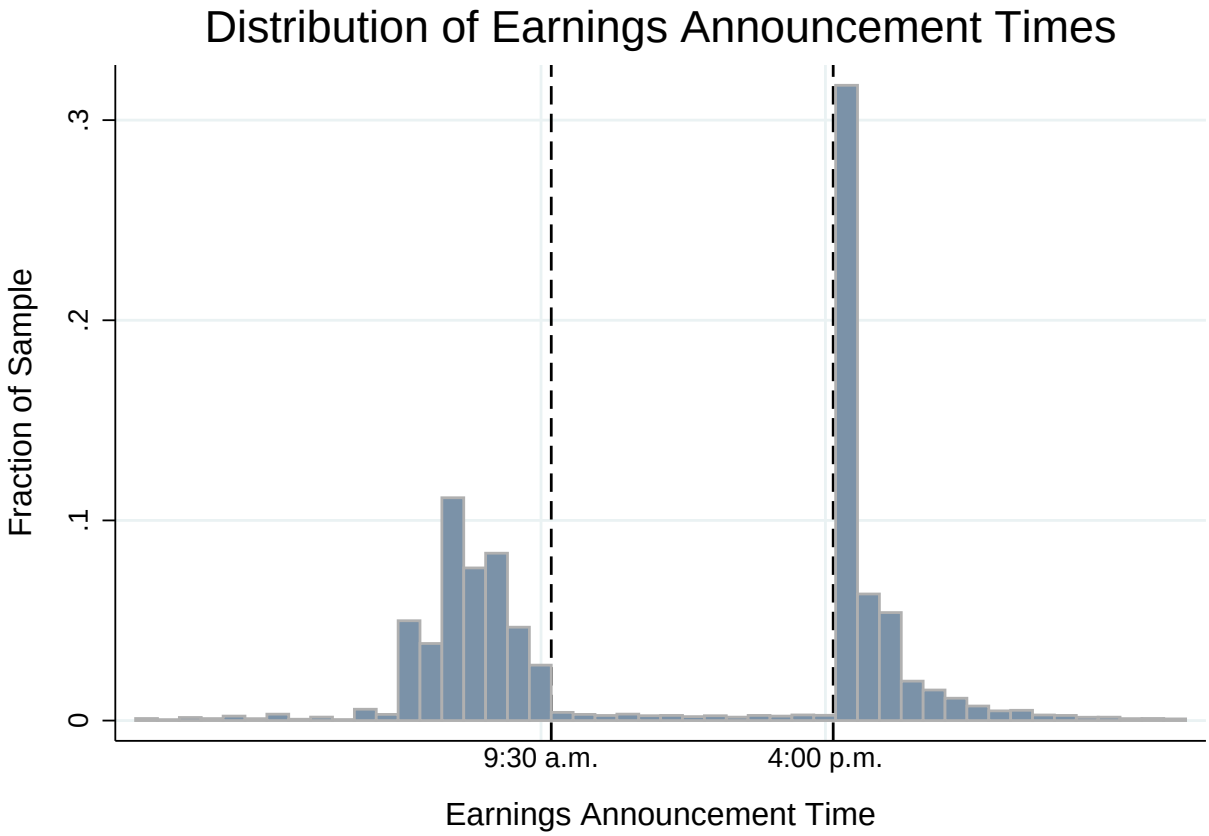
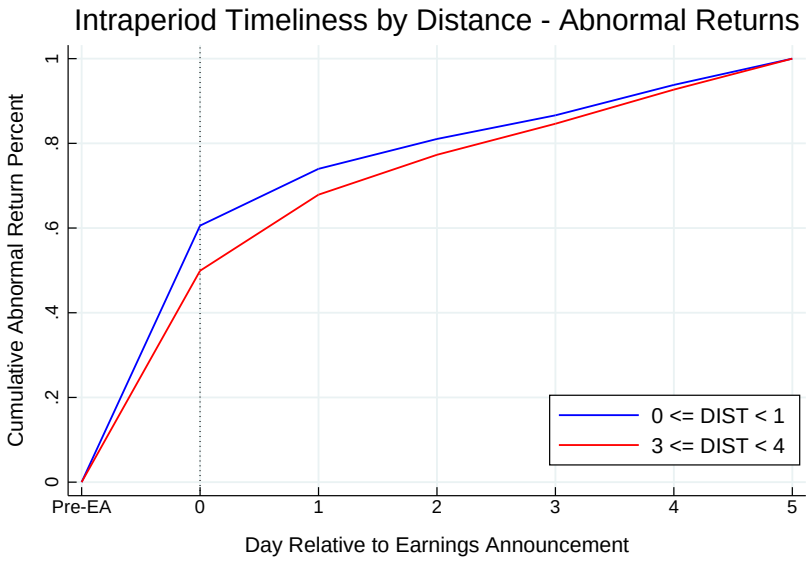


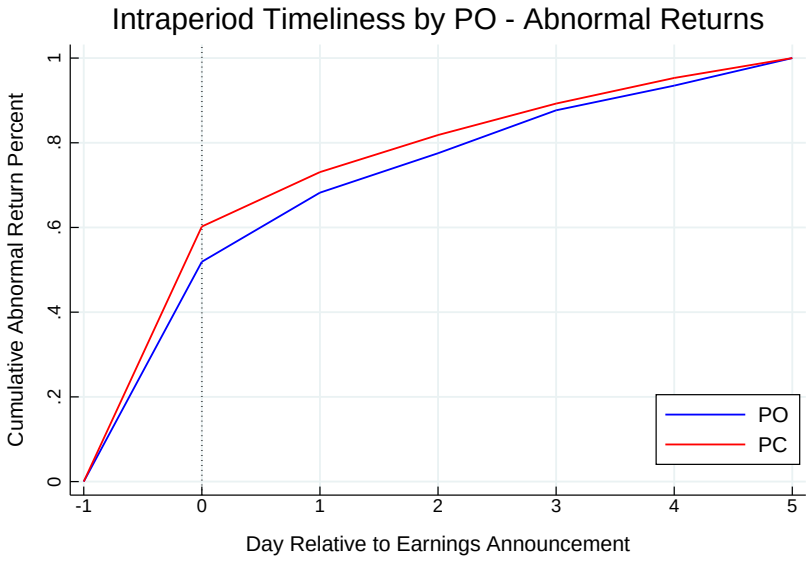
Figure 2: Intraperiod Timeliness of Abnormal Returns

Figure 2 plots the cumulative abnormal returns as a percent of total abnormal returns over days 0 through 5 following the earnings announcement. Panel A presents the plot by announcement distance for firms that announce within one hour of the closest market open or close and three to four hours from the nearest open or close. Panel B presents the plot by PO versus PC announcement.

(a) Panel A: Intraperiod Timeliness by Distance



(b) Panel B: Intraperiod Timeliness by PO



Tables

Table 1: Panel A, Summary Statistics

Table 1 presents summary statistics for key variables used in our study. Panel A presents the summary statistics for the full sample. Panel B presents the mean values by announcement time distance from the nearest open or close ($DIST$). Panel C presents the univariate differences between PO and PC announcements. PO is an indicator equal to 1 if the firm announces in the pre-open period and 0 if the firm announces in the post-close. $DIST$ is the amount of time, in hours, between the earnings announcement time and the nearest open or close of regular trading hours. $ABVOL$ represents abnormal volatility over the three day period from day 0 to +2, where day 0 is the first trading day after earnings are announced. $ABVOLUME$ is abnormal volume from day 0 to +2. $ABRET$ is the cumulative abnormal return over day 0 to +2, calculated using the Fama-French three factor model, times 100. $ABSPREAD$ is the average abnormal spread measured from day 0 to +2. $SIZE$ is the natural log of the firm's market value of equity (share price times the common shares outstanding). BM is the natural log of the book value of equity divided by the market value of equity. ROE is the natural log of one plus net income divided by the book value of equity. UE is the unexpected earnings of the firm, calculated as the realized earnings per share less the consensus median estimate, scaled by the share price. LEV is the leverage of the firm, calculated as total liabilities divided by total assets. IO is the percentage of the firm's shares owned by institutions required to make 13-f filings. $REPLAG$ is the natural log of the number of days between the fiscal quarter end date and the earnings announcement date. $ANALYSTS$ is the number of analysts following the firm, measured as the number who contribute to the consensus EPS estimate prior to the earnings announcement. $DISP$ is the standard deviation of the analyst EPS forecasts that make up the consensus forecast. $LAGVOL$ is the mean daily volatility from -183 to -7 days prior to the earnings announcement. $LAGRET$ is the sum of the daily log returns over the period -183 to -7 days prior to the earnings announcement..

	N	Mean	StDev	P25	P50	P75
PO	80,630	0.47	0.50	0.00	0.00	1.00
$DIST$	80,630	1.26	1.17	0.00	1.00	2.00
$ABVOL$	80,630	61.49	71.50	16.71	45.23	86.02
$ABVOLUME$	80,630	165.59	246.50	18.25	95.01	221.93
$ABRET$	80,630	-0.07	7.27	-4.13	-0.18	3.89
$ABSPREAD$	80,630	-1.04	25.20	-15.53	-1.68	10.03
$SIZE$	80,630	7.10	1.60	5.92	6.95	8.09
BM	80,630	-1.11	0.99	-1.65	-0.97	-0.42
ROE	80,630	0.02	0.08	0.01	0.02	0.04
UE	80,630	0.00	0.02	0.00	0.00	0.00
NUE	80,630	0.34	0.47	0.00	0.00	1.00
LEV	80,630	0.50	0.24	0.32	0.50	0.68
IO	80,630	0.67	0.30	0.49	0.73	0.88
$REPLAG$	80,630	3.45	0.33	3.22	3.47	3.64
$ANALYSTS$	80,630	8.11	6.80	3.00	6.00	11.00
$DISP$	80,630	0.05	0.06	0.01	0.03	0.05
$LAGVOL$	80,630	0.28	0.84	-0.29	0.27	0.81
$LAGRET$	80,630	0.00	0.30	-0.14	0.02	0.16

Table 1: Panel B, Summary Statistics by Distance to Trading

	Hours from Trading (→)				
	0-1	1-2	2-3	3-4	4-5+
N	37,009	18,315	17,085	7,259	866
PO	0.11	0.66	0.87	0.86	1.00
$DIST$	0.21	1.36	2.34	3.34	4.62
$ABVOL$	59.69	60.75	65.19	64.13	58.74
$ABVOLUME$	195.21	137.67	144.26	137.81	148.71
$ABRET$	-0.08	-0.08	-0.04	-0.04	0.12
$ABSPREAD$	-2.61	0.46	0.19	0.27	-0.94
$SIZE$	6.91	7.07	7.41	7.42	7.39
BM	-1.17	-0.95	-1.20	-1.08	-0.91
ROE	0.01	0.02	0.02	0.02	0.02
UE	0.00	0.00	0.00	0.00	0.00
NUE	0.00	0.00	0.00	0.00	0.00
LEV	0.47	0.54	0.52	0.54	0.48
IO	0.66	0.65	0.69	0.68	0.63
$REPLAG$	3.45	3.46	3.45	3.46	3.51
$ANALYSTS$	8.33	6.98	8.73	8.40	8.39
$DISP$	0.04	0.05	0.05	0.06	0.05
$LAGVOL$	0.22	0.30	0.32	0.38	0.37
$LAGRET$	0.01	-0.02	-0.01	-0.01	-0.06

Table 1: Panel C, Summary Statistics by PO and PC

	PO		PC			
	N	Mean	N	Mean	Diff	t-stat
$DIST$	37,814	2.06	42,816	0.54	1.52	242.57
$ABVOL$	37,814	64.69	42,816	60.16	4.53	8.53
$ABVOLUME$	37,814	136.53	42,816	197.31	-60.78	-34.43
$ABRET$	37,814	-0.08	42,816	-0.18	0.10	1.64
$ABSPREAD$	37,814	0.65	42,816	-2.54	3.19	17.95
$SIZE$	37,814	7.35	42,816	6.89	0.46	40.82
BM	37,814	-1.12	42,816	-1.11	-0.01	-1.45
ROE	37,814	0.02	42,816	0.01	0.01	10.86
UE	37,814	0.00	42,816	0.00	0.00	-8.52
NUE	37,814	0.36	42,816	0.32	0.04	11.64
LEV	37,814	0.53	42,816	0.48	0.04	25.97
IO	37,814	0.67	42,816	0.66	0.01	3.35
$REPLAG$	37,814	3.44	42,816	3.46	-0.02	-6.41
$ANALYSTS$	37,814	8.29	42,816	7.96	0.33	6.76
$DISP$	37,814	0.05	42,816	0.04	0.01	14.66
$LAGVOL$	37,814	0.33	42,816	0.23	0.11	17.60
$LAGRET$	37,814	-0.01	42,816	0.00	-0.01	-5.54

Table 2: Correlation Matrix

Table 2 reports the correlation matrix of key variables used in the analysis and other common firm-level characteristics. See Table 1 for variable definitions. * denotes statistical significant at the 10% level.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	PO	1.00																
(2)	$DIST$	0.73*	1.00															
(3)	$ABVOL$	0.03*	0.04*	1.00														
(4)	$ABVOLUME$	-0.17*	-0.14*	0.25*	1.00													
(5)	$ABRET$	-0.00	0.00	-0.03*	-0.05*	1.00												
(6)	$ABSPREAD$	0.10*	0.08*	0.26*	-0.14*	0.21*	1.00											
(7)	$SIZE$	0.17*	0.11*	-0.01*	-0.15*	-0.01*	0.10*	1.00										
(8)	BM	0.03*	0.05*	-0.08*	-0.07*	0.00	0.00	-0.20*	1.00									
(9)	ROE	0.04*	0.04*	0.05*	0.03*	0.07*	0.04*	0.23*	-0.09*	1.00								
(10)	UE	-0.03*	-0.03*	0.00	0.01*	0.13*	0.05*	0.02*	-0.05*	0.31*	1.00							
(11)	LEV	0.05*	0.04*	0.01	0.01	-0.23*	-0.09*	-0.07*	0.10*	-0.20*	-0.40*	1.00						
(12)	IO	0.18*	0.17*	-0.01	-0.14*	0.01*	0.06*	0.28*	0.02*	0.03*	-0.05*	0.06*	1.00					
(13)	$REPLAG$	0.01	0.03*	0.06*	0.06*	0.04*	-0.00	-0.03*	-0.02*	0.06*	-0.01	-0.03*	-0.04*	1.00				
(14)	$ANALYSTS$	-0.04*	0.00	0.01*	0.04*	-0.01	-0.04*	-0.34*	0.03*	-0.14*	-0.03*	0.09*	-0.13*	-0.04*	1.00			
(15)	$DISP$	-0.01	-0.02*	-0.04*	-0.06*	0.01	0.05*	0.64*	-0.12*	0.10*	0.01*	-0.08*	0.09*	0.06*	-0.29*	1.00		
(16)	$LAGVOL$	0.08*	0.09*	-0.05*	-0.08*	-0.02*	0.03*	0.08*	0.22*	-0.11*	-0.14*	0.14*	0.19*	0.02*	0.06*	0.00	1.00	
(17)	$LAGRET$	0.04*	0.04*	-0.05*	-0.03*	0.00	0.02*	0.30*	-0.19*	0.15*	-0.02*	-0.02*	0.00	0.13*	-0.07*	0.20*	0.24*	1.00

Table 3: Panel A, Abnormal Volatility by Trading Day for PO and PC firms

Table 3 Panel A presents the univariate daily $ABVOL$ from day 0 to +5, where day 0 is the first regular hours trading day after which earnings are announced, by PO. See Table 1 for variable definitions. Panel B presents the daily $ABVOL$ by the announcement time distance from the nearest open or close of regular trading hours.

	PO		PC			
	N	Mean	N	Mean	Diff	t-stat
$t = +0$	37,813	109.014	42,817	106.153	2.861	3.709
$t = +1$	37,813	38.538	42,817	29.598	8.94	19.6
$t = +2$	37,813	21.494	42,817	20.477	1.017	2.476
$t = +3$	37,813	17.336	42,817	15.975	1.361	3.567
$t = +4$	37,813	14.997	42,817	14.571	0.426	1.138
$t = +5$	37,813	14.807	42,817	14.681	0.126	0.328

Table 3: Panel B, Abnormal Volatility by Trading Day and Distance to Regular Trading Hours

	Hours from Trading (→)					
	0-1	1-2	2-3	3-4	4-5+	Non-parameteric trend z-value
N	37,009	18,315	17,085	7,259	866	
$t = +0$	106.86	103.17	112.31	111.29	101.15	3.81
$t = +1$	29.95	36.24	37.99	36.75	36.72	17.46
$t = +2$	20.31	21.63	21.48	21.31	20.40	3.92
$t = +3$	15.86	17.56	17.18	16.61	16.06	3.87
$t = +4$	14.18	15.53	14.92	15.31	16.39	3.40
$t = +5$	14.49	14.93	14.70	15.74	13.44	1.75

Table 4: Panel A, Post-Announcment Abnormal Volatility Regressions

Table 4 presents the results of regressions of $ABVOL$ on PO and $DIST$. Panel A presents the post-announcement abnormal volatility measured from day 0 to +2, where day zero is the first trading day after earnings are announced, without firm fixed effects. Panel B presents the same regressions with firm fixed effects. See Table 1 for variable definitions. . $Q4$ is an indicator equal to 1 if it is the firm's fiscal fourth quarter, and 0 otherwise. Standard errors are clustered by earnings announcement date. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
PO	6.20***		3.11***	7.21***		4.71***
	(6.95)		(2.59)	(9.00)		(4.24)
$DIST$		2.30***	0.34		2.63***	0.79*
		(7.85)	(0.79)		(10.03)	(1.95)
$PO \times DIST$			1.26**			0.66
			(2.23)			(1.23)
$ABVOLUME$				0.08***	0.08***	0.08***
				(26.46)	(26.39)	(26.48)
$ABRET$				-0.82***	-0.82***	-0.82***
				(-15.96)	(-15.96)	(-15.97)
$ABSPREAD$				0.86***	0.86***	0.86***
				(19.23)	(19.35)	(19.23)
$ABVOL_{PRE}$	0.50***	0.49***	0.50***	0.35***	0.35***	0.35***
	(20.47)	(20.52)	(20.48)	(20.15)	(20.21)	(20.16)
UE	-53.17***	-53.04***	-52.82***	-45.63***	-45.47***	-45.03***
	(-3.43)	(-3.42)	(-3.41)	(-3.12)	(-3.11)	(-3.08)
NUE	4.85***	4.89***	4.87***	3.84***	3.91***	3.84***
	(7.75)	(7.84)	(7.78)	(6.69)	(6.84)	(6.69)
$SIZE$	-0.33	-0.24	-0.37	0.84***	0.94***	0.79***
	(-1.30)	(-0.95)	(-1.47)	(3.30)	(3.70)	(3.11)
BM	-3.64***	-3.66***	-3.64***	-3.17***	-3.21***	-3.20***
	(-11.83)	(-11.92)	(-11.81)	(-11.34)	(-11.48)	(-11.39)
ROE	26.30***	26.27***	26.36***	21.24***	21.27***	21.20***
	(7.96)	(7.97)	(7.99)	(7.10)	(7.12)	(7.09)
LEV	1.34	1.44	1.35	3.15***	3.26***	3.07***
	(1.03)	(1.11)	(1.04)	(2.70)	(2.78)	(2.61)
IO	20.19***	19.92***	20.06***	19.81***	19.53***	19.70***
	(19.10)	(18.81)	(18.97)	(18.27)	(18.05)	(18.18)
$REPLAG$	8.21***	7.92***	8.09***	8.38***	8.04***	8.27***
	(3.59)	(3.46)	(3.54)	(4.23)	(4.07)	(4.17)
$Q4$	-5.03**	-4.98**	-5.00**	-5.79***	-5.69***	-5.77***
	(-2.53)	(-2.50)	(-2.51)	(-3.50)	(-3.45)	(-3.49)
$ANALYSTS$	0.18***	0.18***	0.18***	0.10**	0.09**	0.10**
	(3.52)	(3.46)	(3.52)	(2.02)	(1.96)	(2.13)
$DISP$	2.07	2.12	1.98	-2.31	-2.26	-2.38
	(0.48)	(0.50)	(0.47)	(-0.59)	(-0.58)	(-0.61)
$LAGVOL$	-2.58***	-2.61***	-2.56***	-3.10***	-3.14***	-3.10***
	(-6.11)	(-6.18)	(-6.08)	(-7.94)	(-8.04)	(-7.94)
$LAGRET$	5.54***	5.58***	5.58***	-0.62	-0.57	-0.56
	(4.10)	(4.14)	(4.13)	(-0.53)	(-0.50)	(-0.49)
# Observations	80,630	80,630	80,630	80,630	80,630	80,630
R^2	0.15	0.15	0.15	0.28	0.27	0.28
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Panel B, Post-Announcement Abnormal Volatility Regressions with Firm Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)
PO	5.98***		5.50***	6.52***		6.84***
	(5.30)		(3.09)	(6.26)		(4.09)
$DIST$		1.69***	0.99*		1.61***	0.94*
		(4.31)	(1.75)		(4.39)	(1.78)
$PO \times DIST$			-0.38			-0.75
			(-0.43)			(-0.92)
$ABVOLUME$				0.08***	0.08***	0.08***
				(25.24)	(25.21)	(25.24)
$ABRET$				-0.82***	-0.82***	-0.82***
				(-15.99)	(-15.96)	(-15.97)
$ABSPREAD$				0.89***	0.89***	0.89***
				(19.44)	(19.47)	(19.44)
$ABVOL_{PRE}$	0.50***	0.49***	0.50***	0.34***	0.34***	0.34***
	(19.95)	(19.96)	(19.96)	(20.20)	(20.21)	(20.20)
UE	7.37	7.62	7.37	5.02	5.35	5.02
	(0.43)	(0.45)	(0.43)	(0.30)	(0.32)	(0.30)
NUE	5.74***	5.71***	5.72***	4.44***	4.43***	4.42***
	(8.99)	(8.96)	(8.96)	(7.46)	(7.44)	(7.43)
$SIZE$	6.70***	6.79***	6.73***	6.82***	6.93***	6.86***
	(5.15)	(5.21)	(5.17)	(6.03)	(6.11)	(6.06)
BM	-1.11	-1.12	-1.11	-1.72***	-1.74***	-1.73***
	(-1.58)	(-1.59)	(-1.59)	(-2.61)	(-2.62)	(-2.62)
ROE	-2.50	-2.42	-2.41	-2.52	-2.46	-2.46
	(-0.58)	(-0.57)	(-0.56)	(-0.63)	(-0.61)	(-0.61)
LEV	13.88***	13.83***	13.82***	5.92*	5.89*	5.84*
	(3.66)	(3.64)	(3.64)	(1.68)	(1.68)	(1.66)
IO	5.65**	5.62**	5.69**	3.26	3.22	3.31
	(2.54)	(2.53)	(2.56)	(1.61)	(1.59)	(1.63)
$REPLAG$	1.86	1.90	1.83	4.55**	4.61**	4.51**
	(0.77)	(0.79)	(0.75)	(2.01)	(2.03)	(1.99)
$Q4$	-2.84	-2.89	-2.87	-4.33***	-4.36***	-4.35***
	(-1.51)	(-1.53)	(-1.52)	(-2.65)	(-2.67)	(-2.66)
$ANALYSTS$	0.56***	0.55***	0.56***	0.37***	0.36***	0.37***
	(4.61)	(4.54)	(4.60)	(3.23)	(3.16)	(3.24)
$DISP$	7.13	6.97	7.06	5.96	5.80	5.89
	(1.25)	(1.22)	(1.24)	(1.12)	(1.09)	(1.10)
$LAGVOL$	-6.00***	-6.02***	-6.02***	-4.75***	-4.77***	-4.77***
	(-7.26)	(-7.27)	(-7.27)	(-6.91)	(-6.94)	(-6.93)
$LAGRET$	3.15*	3.18**	3.16*	-2.94**	-2.91**	-2.93**
	(1.95)	(1.97)	(1.95)	(-2.19)	(-2.17)	(-2.18)
# Observations	80,630	80,630	80,630	80,630	80,630	80,630
R^2	0.25	0.25	0.25	0.36	0.36	0.36
Year and Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Panel A, Propensity Score Matching

Table 5 presents the results of the matching model and regressions of $ABVOL$ on PO and $DIST$. Panel A presents the covariate balance of the sample after matching. Panel B presents the regressions of $ABVOL$ on PO and $DIST$ using the matched sample. Standard errors are clustered by the earnings announcement date. See Table 1 for variable definitions. T-stats are in parentheses. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

	PO		PC			
	N	Mean	N	Mean	Diff	t-stat
$DIST$	29,773	2.04	29,773	0.64	1.40	185.47
$ABVOL$	29,773	63.62	29,773	59.28	4.33	7.32
$SIZE$	29,773	7.00	29,773	7.02	-0.02	-1.48
BM	29,773	-1.08	29,773	-1.07	0.00	-0.39
ROE	29,773	0.02	29,773	0.02	0.00	-0.86
UE	29,773	0.00	29,773	0.00	0.00	0.26
NUE	29,773	0.35	29,773	0.35	0.00	-0.32
LEV	29,773	0.51	29,773	0.52	-0.01	-2.40
IO	29,773	0.66	29,773	0.66	0.00	-0.66
$REPLAG$	29,773	3.47	29,773	3.46	0.00	0.46
$ANALYSTS$	29,773	7.85	29,773	7.75	0.10	1.77
$DISP$	29,773	0.05	29,773	0.05	0.00	-0.79
$LAGVOL$	29,773	0.28	29,773	0.28	0.00	-0.24
$LAGRET$	29,773	-0.01	29,773	-0.01	0.00	0.00

Table 5: Panel B, Abnormal Volatility Regressions with PSM Sample

	(1)	(2)	(3)	(4)	(5)	(6)
PO	5.89***		2.31*	6.81***		3.59***
	(6.42)		(1.85)	(8.20)		(3.10)
$DIST$		2.29***	0.27		2.58***	0.59
		(7.38)	(0.59)		(9.38)	(1.37)
$PO \times DIST$			1.57***			1.17**
			(2.62)			(2.05)
$ABVOLUME$				0.08***	0.08***	0.08***
				(26.02)	(25.98)	(26.04)
$ABRET$				-0.83***	-0.83***	-0.83***
				(-15.57)	(-15.58)	(-15.59)
$ABSPREAD$				0.86***	0.86***	0.86***
				(19.67)	(19.76)	(19.66)
$ABVOL_{PRE}$	0.50***	0.50***	0.50***	0.35***	0.35***	0.35***
	(20.20)	(20.26)	(20.22)	(19.45)	(19.52)	(19.47)
UE	-72.54***	-71.19***	-72.52***	-53.56***	-52.00***	-53.33***
	(-4.21)	(-4.14)	(-4.22)	(-3.45)	(-3.35)	(-3.43)
NUE	4.77***	4.77***	4.81***	3.73***	3.75***	3.76***
	(6.81)	(6.81)	(6.85)	(5.68)	(5.72)	(5.72)
$SIZE$	0.38	0.31	0.38	1.37***	1.27***	1.35***
	(1.14)	(0.92)	(1.13)	(4.28)	(3.97)	(4.23)
BM	-3.63***	-3.69***	-3.61***	-3.22***	-3.30***	-3.22***
	(-10.56)	(-10.73)	(-10.46)	(-9.98)	(-10.22)	(-9.94)
ROE	26.79***	26.78***	26.99***	21.70***	21.73***	21.86***
	(6.89)	(6.90)	(6.95)	(6.10)	(6.13)	(6.16)
LEV	2.28	2.08	2.44	4.31***	4.05***	4.40***
	(1.48)	(1.34)	(1.58)	(3.06)	(2.86)	(3.12)
IO	20.60***	20.31***	20.34***	19.72***	19.44***	19.49***
	(17.13)	(16.95)	(16.91)	(15.77)	(15.62)	(15.59)
$REPLAG$	7.76***	7.58***	7.61***	7.98***	7.75***	7.83***
	(3.34)	(3.26)	(3.27)	(4.00)	(3.90)	(3.92)
$Q4$	-5.26**	-5.29***	-5.21**	-5.96***	-5.96***	-5.92***
	(-2.58)	(-2.59)	(-2.55)	(-3.57)	(-3.58)	(-3.55)
$ANALYSTS$	0.12*	0.14**	0.11*	0.06	0.08	0.05
	(1.90)	(2.18)	(1.72)	(0.95)	(1.31)	(0.84)
$DISP$	1.65	1.42	1.52	-3.08	-3.37	-3.21
	(0.35)	(0.30)	(0.32)	(-0.71)	(-0.78)	(-0.74)
$LAGVOL$	-3.07***	-3.10***	-3.07***	-3.47***	-3.51***	-3.47***
	(-6.59)	(-6.66)	(-6.58)	(-8.03)	(-8.12)	(-8.04)
$LAGRET$	5.23***	5.34***	5.28***	-0.94	-0.81	-0.88
	(3.70)	(3.79)	(3.74)	(-0.77)	(-0.67)	(-0.73)
# Observations	59,546	59,546	59,546	59,546	59,546	59,546
R^2	0.15	0.15	0.15	0.28	0.28	0.28
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Panel A, Non-Earnings Announcement Date Placebo Tests

Table 6 presents the results of non-earnings announcement date placebo tests. Panel A presents the results of regressing $ABVOL$ on PO and $DIST$ using a placebo date 21 calendar days prior to the actual earnings announcement date. Panel B replaces the earnings announcement date with a common event, the Federal Reserve meeting announcement dates. See Table 1 for variable definitions. Standard errors are clustered by earnings announcement date. T-stats are in parentheses. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
PO	-0.30		-0.23	0.17		0.34
	(-0.63)		(-0.36)	(0.36)		(0.54)
$DIST$		-0.06	0.07		0.08	0.17
		(-0.43)	(0.32)		(0.52)	(0.74)
$PO \times DIST$			-0.09			-0.20
			(-0.28)			(-0.68)
$ABVOLUME$				0.04***	0.04***	0.04***
				(7.49)	(7.50)	(7.49)
$ABRET$				-0.16**	-0.16**	-0.16**
				(-2.54)	(-2.54)	(-2.54)
$ABSPREAD$				0.12***	0.12***	0.12***
				(4.45)	(4.45)	(4.45)
$ABVOL_{PRE}$	0.41***	0.41***	0.41***	0.37***	0.37***	0.37***
	(25.69)	(25.69)	(25.69)	(23.85)	(23.85)	(23.85)
UE	-2.79	-2.73	-2.75	0.38	0.38	0.44
	(-0.30)	(-0.29)	(-0.29)	(0.04)	(0.04)	(0.05)
NUE	0.08	0.08	0.08	0.25	0.25	0.24
	(0.25)	(0.24)	(0.25)	(0.82)	(0.82)	(0.80)
$SIZE$	-0.58***	-0.59***	-0.58***	-0.37**	-0.37**	-0.37**
	(-3.47)	(-3.55)	(-3.48)	(-2.20)	(-2.20)	(-2.22)
BM	0.25	0.25	0.25	0.23	0.23	0.23
	(1.44)	(1.43)	(1.41)	(1.40)	(1.40)	(1.36)
ROE	2.23	2.22	2.21	1.87	1.87	1.84
	(1.25)	(1.24)	(1.24)	(1.09)	(1.09)	(1.07)
LEV	0.63	0.61	0.61	0.33	0.33	0.30
	(0.92)	(0.88)	(0.89)	(0.50)	(0.49)	(0.44)
IO	-1.93***	-1.92***	-1.93***	-2.01***	-2.02***	-2.00***
	(-3.37)	(-3.34)	(-3.36)	(-3.53)	(-3.53)	(-3.51)
$REPLAG$	-2.28*	-2.27*	-2.28*	-0.58	-0.59	-0.58
	(-1.94)	(-1.93)	(-1.94)	(-0.51)	(-0.52)	(-0.51)
$Q4$	1.82*	1.81*	1.82*	1.89*	1.89*	1.89*
	(1.78)	(1.77)	(1.77)	(1.95)	(1.95)	(1.95)
$ANALYSTS$	0.00	0.00	0.00	0.00	0.00	0.00
	(0.09)	(0.13)	(0.13)	(0.02)	(0.02)	(0.09)
$DISP$	-2.84	-2.85	-2.84	-1.38	-1.38	-1.37
	(-1.24)	(-1.24)	(-1.24)	(-0.62)	(-0.62)	(-0.62)
$LAGVOL$	1.86***	1.86***	1.86***	1.51***	1.51***	1.51***
	(6.12)	(6.12)	(6.11)	(5.24)	(5.23)	(5.22)
$LAGRET$	-2.35***	-2.35***	-2.35***	-3.20***	-3.20***	-3.20***
	(-2.64)	(-2.64)	(-2.64)	(-3.57)	(-3.57)	(-3.57)
# Observations	80,597	80,597	80,597	79,554	79,554	79,554
R^2	0.21	0.21	0.21	0.25	0.25	0.25
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Panel B, FED Announcment Placebo Tests

	(1)	(2)	(3)	(4)	(5)	(6)
PO	0.18		0.90	-0.03		0.54
	(0.40)		(1.29)	(-0.08)		(0.84)
$DIST$		-0.16	-0.22		-0.13	-0.06
		(-0.97)	(-0.73)		(-0.78)	(-0.20)
$PO \times DIST$			-0.20			-0.24
			(-0.55)			(-0.61)
$ABVOLUME$				0.06***	0.06***	0.06***
				(8.05)	(8.05)	(8.05)
$ABRET$				0.03**	0.03**	0.03**
				(2.32)	(2.30)	(2.30)
$ABSPREAD$				0.52***	0.52***	0.52***
				(22.56)	(22.54)	(22.57)
$ABVOL_{PRE}$	0.32***	0.32***	0.32***	0.25***	0.25***	0.25***
	(12.45)	(12.45)	(12.45)	(8.81)	(8.81)	(8.81)
UE	-16.80**	-17.08**	-17.08**	-19.85**	-19.99**	-19.95**
	(-2.04)	(-2.07)	(-2.07)	(-2.38)	(-2.39)	(-2.38)
NUE	0.50	0.52	0.51	0.23	0.23	0.22
	(1.07)	(1.10)	(1.07)	(0.50)	(0.52)	(0.50)
$SIZE$	0.22	0.25	0.24	0.44*	0.45**	0.45**
	(1.00)	(1.15)	(1.10)	(1.96)	(2.02)	(2.00)
BM	0.23	0.25	0.24	0.23	0.24	0.23
	(1.15)	(1.23)	(1.20)	(1.20)	(1.25)	(1.21)
ROE	6.10***	6.14***	6.12***	4.91**	4.93**	4.88**
	(2.99)	(3.00)	(3.01)	(2.37)	(2.37)	(2.36)
LEV	2.28***	2.36***	2.30***	2.93***	2.97***	2.92***
	(2.58)	(2.69)	(2.61)	(3.40)	(3.44)	(3.38)
IO	-0.72	-0.73	-0.72	1.30	1.31	1.32
	(-0.85)	(-0.86)	(-0.84)	(1.60)	(1.60)	(1.62)
$REPLAG$	-2.71**	-2.69**	-2.66**	-2.29**	-2.28**	-2.27**
	(-2.23)	(-2.22)	(-2.19)	(-1.99)	(-1.98)	(-1.97)
$Q4$	-1.51	-1.51	-1.52	-0.25	-0.25	-0.26
	(-1.60)	(-1.60)	(-1.61)	(-0.29)	(-0.29)	(-0.30)
$ANALYSTS$	-0.11***	-0.11***	-0.11***	-0.09**	-0.09**	-0.09**
	(-2.87)	(-3.00)	(-2.92)	(-2.47)	(-2.54)	(-2.46)
$DISP$	-7.35***	-7.27***	-7.32***	-8.54***	-8.50***	-8.51***
	(-2.76)	(-2.73)	(-2.76)	(-3.26)	(-3.25)	(-3.26)
$LAGVOL$	1.60***	1.59***	1.59***	1.19***	1.18***	1.18***
	(5.09)	(5.07)	(5.07)	(3.80)	(3.79)	(3.79)
$LAGRET$	-1.55**	-1.55**	-1.55**	-3.39***	-3.39***	-3.40***
	(-2.32)	(-2.33)	(-2.33)	(-4.92)	(-4.92)	(-4.92)
# Observations	243,668	243,668	243,668	236,158	236,158	236,158
R^2	0.20	0.20	0.20	0.27	0.27	0.27
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Other Earnings Announcement Timing Characteristics

Table 7 presents the results of regressions of abnormal volatility on *PO* and *DIST* including additional controls for investor attention. Panel A controls for the number of other earnings announcements on the same day using *EAFREQ*, calculated as the decile of the number of concurrent announcements on the same day. Panel B controls for the amount of lead time the firm provides when scheduling their earnings announcement using *LEADTIME*, calculated as the natural log of the number of days between the date on which the firm schedules its earnings announcement and the announcement date. Controls represent the same controls used in Table 4 in columns 1-3. Contemporaneous controls represent *ABVOLUME*, *ABRET*, and *ABSPREAD*. See Table 1 for variable definitions. Standard errors are clustered by earnings announcement date. T-stats are in parentheses. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

(a) Panel A: Earnings Frequency

	(1)	(2)	(3)	(4)	(5)	(6)
PO	6.33***		3.39***	7.27***		4.85***
	(7.12)		(2.84)	(9.09)		(4.38)
DIST		2.33***	0.40		2.64***	0.82**
		(7.97)	(0.92)		(10.10)	(2.02)
PO × *DIST*			1.14**			0.60
			(2.01)			(1.12)
EAFREQ	1.16***	1.13***	1.15***	0.52	0.48	0.52
	(2.97)	(2.88)	(2.94)	(1.62)	(1.49)	(1.60)
# Observations	80,630	80,630	80,630	80,630	80,630	80,630
R^2	0.15	0.15	0.15	0.28	0.27	0.28
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Contemporaneous Controls	NO	NO	NO	Yes	Yes	Yes
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

(b) Panel B: Lead Time

	(1)	(2)	(3)	(4)	(5)	(6)
PO	6.64***		4.98***	7.78***		6.53***
	(7.19)		(3.88)	(9.36)		(5.46)
DIST		2.36***	0.73		2.76***	1.22***
		(7.83)	(1.42)		(10.21)	(2.59)
PO × *DIST*			0.25			-0.30
			(0.39)			(-0.50)
LEADTIME	0.90**	0.84**	0.88**	1.19***	1.11***	1.18***
	(2.32)	(2.16)	(2.26)	(3.29)	(3.09)	(3.25)
# Observations	71,521	71,521	71,521	71,521	71,521	71,521
R^2	0.15	0.15	0.15	0.27	0.27	0.27
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Contemporaneous Controls	No	No	No	Yes	Yes	Yes
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Returns on Equity and Volatility Regressions

Table 8 presents results of regressions of equity and option strategy returns on PO and $DIST$. Delta Hedge and Straddle represent the return on a delta hedge and straddle position, respectively. Equity represents returns on traded equity. Controls represent the same controls used in Table 4 in columns 1-3. See Table 1 for variable definitions. Standard errors are clustered by earnings announcement date. T-stats are in parentheses. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Delta Hedge			Straddle			Equity		
PO	0.29***		0.17**	2.27***		1.98***	0.13		0.13
	(5.22)		(2.20)	(7.48)		(3.91)	(1.17)		(0.90)
$DIST$		0.13***	0.09**		0.86***	0.57**		0.04	0.01
		(6.13)	(2.45)		(7.32)	(2.46)		(1.21)	(0.21)
$PO \times DIST$			-0.02			-0.30			-0.00
			(-0.32)			(-0.99)			(-0.04)
# Observations	41,028	41,028	41,028	39,578	39,578	39,578	80,630	80,630	80,630
R^2	0.01	0.01	0.01	0.02	0.02	0.02	0.07	0.07	0.07
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Portfolio Returns on Equity and Volatility Sorted on Characteristics

Table 9 presents returns to hedged portfolios that are long PO firms and short PC firms, sorted on market capitalization ($SIZE$), historical volatility ($LAGVOL$), and historical bid-ask spreads ($LAGSPREAD$). Delta Hedge and Straddle represent the return on a delta hedge and straddle position, respectively. See Section 4.3 for details on the specific return strategies. See Table 1 for variable definitions. Equity represents returns on traded equity. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

(a) Panel A: Equity and Volatility Returns Sorted on Size

		Delta Hedge		Straddle		Equity	
		Mean	t-stat	Mean	t-stat	Mean	t-stat
$SIZE(\downarrow)$	1 (Low)	0.40***	2.25	2.04***	2.42	0.16	1.16
	2	0.43***	3.89	2.60***	4.33	-0.21	-1.52
	3	0.37***	4.35	3.13***	6.08	0.17	1.34
	4	0.41***	5.92	2.82***	5.79	0.05	0.42
	5 (High)	0.16***	2.99	1.87***	4.08	-0.06	-0.65

(b) Panel B: Equity and Volatility Returns Sorted on Historical Volatility

		Delta Hedge		Straddle		Equity	
		Mean	t-stat	Mean	t-stat	Mean	t-stat
$LAGVOL(\downarrow)$	1 (Low)	0.22***	4.25	3.02***	6.10	-0.06	-0.74
	2	0.28***	4.07	3.37***	6.64	0.07	0.69
	3	0.31***	3.70	2.10***	3.89	-0.13	-1.07
	4	0.44***	4.19	3.46***	5.98	0.25	1.77
	5 (High)	0.45***	3.32	2.17***	3.45	0.00	-0.03

(c) Panel C: Equity and Volatility Returns Sorted on Historical Bid-Ask Spreads

		Delta Hedge		Straddle		Equity	
		Mean	t-stat	Mean	t-stat	Mean	t-stat
$LAGSPREAD(\downarrow)$	1 (Low)	0.40***	6.16	3.46***	7.88	0.10	0.85
	2	0.39***	5.38	2.77***	5.74	-0.14	-1.14
	3	0.29***	3.51	2.58***	4.87	0.12	0.98
	4	0.25***	2.73	2.29***	3.91	0.02	0.16
	5 (High)	0.24**	1.97	2.63***	2.97	0.04	0.37

Table 10: Market Return Reaction to Earnings Announcements

Table 10 presents two tests on the relation between the market's reaction to the earnings announcement and PO and $DIST$. Panel A regresses the announcement day abnormal returns on PO and $DIST$ and the interactions of PO and $DIST$ with UE. Panel B regresses the intraperiod timeliness measure (IPT) on PO and $DIST$. See Section 4.4 for further discussion of the IPT measure. $LOSS$ is an indicator equal to 1 if the firm reports negative net income, and 0 otherwise. Controls represent the same controls used in Table 4 in columns 1-3. Contemporaneous controls represent $ABVOLUME$, $ABRET$, and $ABControlsrepresentthesamecontrolsusedin Table[tab : PA_Regressions_Cont]incolumns 1-3. Contemporaneouscontrolsrepresent ABVOLUME, ABRET, and ABSPREAD. SPREAD$. See Table 1 for remaining variable definitions. Standard errors are clustered by earnings announcement date. T-stats are in parentheses. *, **, and *** denote two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

(a) Panel A: Announcement Day Abnormal Returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$PO \times UE$	-0.14***		-0.14***		-0.10***		-0.11***	
	(-3.44)		(-3.62)		(-2.64)		(-2.83)	
$DIST \times UE$		-0.07***		-0.07***		-0.03*		-0.03*
		(-4.01)		(-3.94)		(-1.95)		(-1.89)
PO	0.00		-0.00***		0.00***		-0.00	
	(1.28)		(-3.15)		(2.99)		(-1.37)	
$DIST$		0.00		-0.00***		0.00		-0.00*
		(0.01)		(-3.06)		(1.41)		(-1.66)
UE	0.95***	0.98***	0.93***	0.95***	0.35***	0.34***	0.37***	0.37***
	(23.82)	(22.87)	(23.62)	(22.61)	(8.62)	(8.06)	(9.41)	(8.78)
$LOSS$	-0.01***	-0.01***	-0.01***	-0.01***				
	(-11.54)	(-11.56)	(-11.26)	(-11.24)				
$LOSS \times UE$	-0.48***	-0.48***	-0.48***	-0.48***				
	(-11.37)	(-11.50)	(-11.71)	(-11.84)				
NUE					-0.04***	-0.04***	-0.03***	-0.03***
					(-56.42)	(-56.27)	(-54.47)	(-54.38)
$NUE \times UE$					-0.16***	-0.16***	-0.19***	-0.19***
					(-3.32)	(-3.31)	(-4.18)	(-4.20)
# Observations	80,630	80,630	80,630	80,630	80,630	80,630	80,630	80,630
R^2	0.04	0.04	0.08	0.08	0.08	0.08	0.11	0.11
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Contemporaneous Controls	No	No	Yes	Yes	No	No	Yes	Yes
Year and Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(b) Panel B: Intraperiod Timeliness of Returns

	(1)	(2)	(3)	(4)
PO	-0.19***		-0.12**	
	(-3.91)		(-2.46)	
$DIST$		-0.07***		-0.04**
		(-3.21)		(-2.16)
# Observations	77,992	77,992	77,992	77,992
R^2	0.00	0.00	0.01	0.01
Controls	Yes	Yes	Yes	Yes
Contemporaneous Controls	No	No	Yes	Yes
Year and Industry FE	Yes	Yes	Yes	Yes