The timing of information arrival and overnight returns

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Abstract

This paper examines the information assimilation of overnight returns after positive or negative news arriving during RHT (regular-hours-trading) or AHT (after-hour-trading). We first show that overnight returns are informative of earnings news, and the effects are stronger on the first day after the announcement, as well as when the news is released AHT. Our results then suggest that positive (negative) overnight returns after good (bad) earnings news releases increase (decrease) CARs, with more pronounced effects for news released AHT. We further show that the market takes the timing of news release into account and reacts negatively to those released during AHT, causing significant under-performance in the subsequent CAR. Overall, these results support the view that it may be optimal to release all news during RHT when market participants are at their trading desks and are best able to assimilate the news.

Key words: Overnight returns; earnings announcement; CAR; after-hour trading.

JEL: G10; G19; G120

Information arrival and overnight returns

1. Introduction

Efficient stock prices that promptly reflect all available information through the trading process is essential to asset allocation in the economy. The advancement of information technology is rapidly shaping the landscape of stock market trading. One such example is the sharp increase in after-hours trading (AHT) activity[1] relative to that during regular-hours trading[2] (RHT). This has resulted in inflated opening price relative to closing price, and overnight returns compared to day returns, which intrigued financial market practitioners[3] and researchers to investigate the particular behaviour of stock return overnight. This article adds to prior studies to examine how positive or negative news arriving during RHT or AHT affect the process through which new information is absorbed into overnight returns.

Recent studies that examine overnight returns are conducted primarily from an investor behaviour perspective, postulating that the inflated opening prices often observed relative to closing prices are due to sentiment-driven trading of retail investors during the pre-open period (Akbas, Boehmer, Jiang, and Koch; Berkman, Koch, Tuttle, and Zhang 2012). These studies set a stage for overnight returns as a possible measure of firm-specific sentiment (Aboody, Even-Tov, Lehavy, and Trueman 2018). On the other hand, the advancement of technology has significantly upgraded financial market structures that enable more flexible trading venues and hours. As such, we see competing evidence on informed trading after hours, and that trades outside of regular trading hours significantly contribute to price discovery (Barclay and Hendershott 2003; Jiang, Likitapiwat, and McInish 2012). Building upon this evidence, we examine the information content of after-hour trades using overnight

[1] Cui and Gozluklu (2019) document there has been a substantial 1.4 times increase in the dollar trading volume during AHT, compared with days before 2007.

[2] The specified trading hours by an stcok exchange, such as 09:30–16:00 in the U.S.

[3] See Bloomgerg article titled "Dow Suffers Worst Streak Since 2016 Despite Best Dip-Buying In A Decade". The article notes that "over the past 10 sessions (or since the trade war resurfaced) the S&P 500 has averaged a drop of 0.5% overnight and a gain of 0.3% during the day. That 0.8 percentage point average gap over the two-week stretch constitutes the biggest disparity between poor overnight retreats and intraday advances since July 2009."

returns, which encapsulate trading activity from previous day's closing to the today's opening. From a different angle, Hendershott, Livdan, and Rösch (2020) have found that the capital asset pricing model (CAPM) holds only for overnight returns when the market is closed, not for open-to-close returns. They also show that the CAPM holds overnight on both announcement and non-announcement days, for individual stocks as well as various portfolios in the U.S. and internationally.

Prior literature from a microstructure perspective (Barclay and Hendershott 2003; Cole, Daigle, Van Ness, and Van Ness 2015; Cuñat and Groen-Xu 2017; Jiang et al. 2012; Martineau 2017) posit that trading activity and price discovery in AHT[4] lead to an informative opening price, implying that the close-to-open overnight return is informative. Our study extends this research to directly to examine the behaviour of overnight returns on news and non-news days. On news days specifically, we expect overnight returns to contain new information that arrives either during the day or overnight. We first test whether overnight returns contain information about the arrival timing and the content of earnings announcement. If they do, then we expect overnight returns to explain the post-earnings announcement drift (PEAD). This is tested in further analysis.

Our findings suggest that overnight returns contain information with respect to the timing as well the content of earnings announcement made both during and after regular trading hours. In addition, overnight returns on the earnings announcement day is also shown to predict post-announcement CARs. When examining overnight returns for news arriving in RHT as opposed to AHT, we observe a more pronounced predictive power of overnight returns with news arriving *after* hours. We then examine the extent of overnight returns' information content for good versus bad earnings news releases. For good news, the majority of overnight returns' predictive power of CAR is from the AHT arrivals. Whereas for bad news, we see overnight return's prediction completely attributable to the AHT arrival of news. This suggests that, for news arriving during RHT, investors are more responsive to bad news than to

[4] The two distinct AHT sessions during which all investors can trade are after market close (AMC) and before market open (BMO).

good news. The bad news is fully absorbed by the market before it closes, while a small portion of good news spills into after-hour trading, incorporated into overnight returns.

By extending literature on the price discovery role of AHT, this paper contributes to the research on the information content generally, by focusing on the role of overnight returns during AHT as part of daily returns. In contrast to Aboody et al.'s (2018) argument that overnight returns is a measure of firm-specific measure of sentiment, we find that overnight returns on the days of earnings arrival, regardless of the time of the day, reflect new information, and therefore predict future stock returns (CAR). To reconcile our results with those of Aboody et al. (2018), the latter focuses on the adjusted time-series overnight returns which are computed from smoothing daily returns into their weekly average returns, ~~whereas in the former~~ our unit of analysis is the overnight return in each trading day ~~and~~ with emphasize on news days, and aim to differentiate the level of information content in overnight returns for when news arrives during RHT versus AHT.

If overnight returns on the announcement day contain information about earnings, then we expect them to also explain subsequent PEAD. We examine this in further analysis. In particular, we investigate whether the subsequent CAR performance can be explained by the quantum of earnings surprise. Our results reveal that, while bad news exerts a greater downward pressure on subsequent CAR, for the same quantum of news, good or bad, AHT announcements underperform RHT announcements in subsequent CAR performance. Our results challenge the justification for managers to release news after hours generally, and that perhaps it may be optimal for them to release all news during RHT when market participants are at their trading desks.

To this end, our paper also contributes to research into the timing of corporate disclosures, which have been largely divisive. Some studies argue that firms strategically time their earnings announcement and try to hide bad news by announcing it in periods of low investor attention such as AHT (Gennotte and Trueman 1996; Segal and Segal 2016). Michaely, Rubin, and Vedrashko (2014) supports this view by arguing that announcing outside RHT gives investors time to digest the news, levelling the playing field for attentive and non-attentive investors, while announcing during RHT

enables managers to act opportunistically.[5] However, Cui and Gozluklu (2019) point out that proportionately, fewer bad earnings announcements are made during AHT relative to RHT. We find that, of the 82.63% earnings announcements made during AHT, more than half of them (57.7%) are good news. This is consistent with Cui and Gozluklu (2019), but not consistent with the argument that firms strategically time bad news announcements during AHT to give investors more time to digest the news.

2. Literature and hypothesis development

Barclay and Hendershott (2003) investigated the price discovery process in AHT on NASDAQ listed stocks, where both effective and realized bid-ask spreads are found larger during AHT than RHT. Martineau (2017) find that AHT attract all types of traders, retails as well as institutions,[6] and that in particular, small stocks with low institutional ownership and analyst or media coverage have lower probability of AHT following earnings announcements. Using buyer initiated odd-lot trades[7] to proxy for retail trades, Cui and Gozluklu (2019) show that the fraction of retail trading on average is lower during AHT relative to RHT. They also uncover that, further to prior studies documenting AHT activity around scheduled events such as earnings announcements (i.e., Cole et al., 2015), AHT activity increases around a wide range of price-sensitive corporate events both pre-scheduled and un-scheduled. Further supporting this is Jiang et al. (2012) arguing that a significant portion of price change and price discovery take place immediately after the earnings release. In light of the above evidence of pride discovery during AHT and especially around corporate events, it is natural to expect the overnight returns that encapsulate AHT activity to be also informative. Hence, we hypothesize that:

[5] Following this argument, Michaely et al. (2014) find corporate governance also plays a role in determing the timing of earnings announcements.

[6] Institutional investors are usually considered as a proxy for informed traders (Anand, Chakravarty and Martell 2002).

[7] As per the requirement of SEC, the old-lot trades are those containing less than 100 shares.

H1 Overnight returns on news days are informative of earnings announcement arriving during both RHT and AHT.

In a sample of S&P500 constituent stocks, Jiang et al. (2012) further show that 95% of their earnings announcements are made outside of RHT. Their findings of increased AHT trading volume and immediate price reaction to reflect the news suggest an efficient price discovery mechanism to after-hour information arrival. Martineau (2017) examined AHT response to after-hour earnings announcements and find similar results. In particular, the author shows evidence that, for large stocks in the recent data, price discovery after the announcement is complete by the open with AHT, while the process is delayed to 10am otherwise. For this reason, we expect overnight returns that contain AHT on earnings news to reflect future return in the market, and this effect is more pronounced when the news arrives after hours.

H2 Overnight returns on news days reflect future returns.

H2a The effects of overnight returns on future returns are more pronounced for announcements during AHT.

3. Data and Methods

3.1. Sample and Data

Financial data is obtained from Compustat fundamentals quarterly, stock price from CRSP daily, earnings announcement date/time stamp, analyst estimates and actual EPS from IBES. The sample period is from 1996-2016. The starting point of 1996 is when timestamps were commonly available in IBES. Following Aboody et al. (2018) the stock price must be at least $5 per share and the firm must have a minimum market capitalization of $10m.

As there are 240 trading days or more in a calendar year, but only 4 earnings announcement days in that same period, any possible association from overnight returns and overnight earnings announcements may be averaged out by the other trading days in a year. As such, we selected the announcement date itself and 5 days on each side [-5, +5], i.e. 11 trading days in total associated with

each quarterly earnings announcement with a minimum 10 trading days within this analysis period. Figure 1 illustrates this. From these trading days, we calculated 10 overnight returns. An additional restriction is that the overnight return must be calculated from two consecutive trading days without a non-trading day (weekend or public holiday) in between. This is to reduce the possibility of additional information arrival over those non-trading days which may contaminate our results.

[Insert Figure 1 here]

After considering missing values to calculate all variables, and the abovementioned restrictions firm size, stock price value and trading days, we have a sample of 432,192 overnight return observations, from 46,332 earnings announcement days.

3.2. Model specification

For the analysis of overnight returns and whether there was no earnings announcement arrival or if there was an earnings announcement that it arrived overnight or during trading hours (N = 432,192), the model is as follows:

$$overtn = \sum Controls + ea_{over} + ea_{day} + \sum SIC2 + \varepsilon \qquad (1)$$

where,

overrtn = stock return from the close of trading of one day to the start of trading of the subsequent day.
ea_over = Dummy variable 1, 0 otherwise, if earnings announcement made after close of trading from (1600) the previous day and before the start of trading (0930) of that day. If earnings announcement arrived between the close of trading to the start of trading the subsequent day.
ea_day = Dummy variable 1, 0 otherwise, if earnings announcement made during trading hours (0930-1600).

As the dummy variables for earnings announcement arrivals only contain 1 bit of information (0 or 1), we also use continuous variables to represent the news arrival and the content of the news surprise in substitute:

analystsurp_over = the quantum of analystsurp if the earnings announcement was made overnight.
analystsurp_over = the quantum of analystsurp if the earnings announcement was made during trading hours.

For our analysis of the overnight returns in relation to the earnings announcement arrival and its prediction of CAR subsequent to the earnings announcement (N = 46,332), the model is as follows:

$$CAR = \sum Controls + analystsurp + overrtn + ea_{over} + overrtn \times ea\_over + \sum SIC2 + \varepsilon \quad (2)$$

where, the additional variables are:

CAR = cumulative abnormal returns over [+1,+5], [+1,+10], [+1,+20], adjusted for market returns.
analystsurp= analyst forecast error, which is the difference between actual and mean analyst EPS from IBES, scaled by price at beginning of quarter.
analystsurp_neg= Dummy variable, 1 if the analyst surprise is ≤0, 0 otherwise.

The control variables are those found in various studies of overnight returns and are described in the Appendix. They are to control for other factors that may explain overnight returns. These include the possibility that a portion of the quantum of overnight returns are due to bid-ask bounce from illiquid stocks, and are proxied by size, because small firms are likely to be illiquid, and *dvolume*, which is a more direct proxy of illiquidity.

All panel regression models include industry (SIC2) fixed effects and are adjusted for clustered standard errors by firm and calendar year.

4. Results

4.1. Descriptive statistics

Table 1 includes summary statistics of all variables used in the study.

[Insert Table 1 here]

Table 2 presents the correlation statistics for the sample of 432,192 overnight return observations. The variables are defined in the Appendix.

[Insert Table 2 here]

4.2. Baseline regression

The baseline results on the determinants of overnight returns are presented in Table 3. We first examine the effect on overnight returns when the information arrival is measured by two dummy variables,

ea_day and *ea_over*, each is coded 1 if earnings announcement arrives during the day or after hour, respectively, and 0 otherwise. Shown in Models (1) to (3) is that, after controlling for firm-specific charactors and liqudiity factors on the market, the overnight return contains information about the arrival of new information (Model 1 and 2); and the day- versus overnight- arrival are both independently significant (Model 3). The positive coefficients suggest that market reacts positively to the arrival of new information overall, relative to the days with no earnings news..

We next use an alternative pair of measures for information arrival. This measure combines the content of information with its arrival time. Specifically, *analystsurp_over* represents the analyst earnings surprise when it is released after-hour (*analystsurp* × *ea_over*); and *analystsurp_day* represents the analyst earnings surprise when it is released during trading hours (*analystsurp* × *ea_day*). Estimated coefficients are presented in Models (4) to (6) of Table 3. This time we observe that the timing and the magnitude of new information captured in the new measures are positive and significant in explaining overnight returns. It is also noticed that, in Model (6), the coefficient on after-hour earnings arrival is more than twice of that on during-the-day earnings arrival. A Wald test reveals that the two coefficients are significantly different from each other (Chi Squared = 22.57), indicating that overnight returns are influenced more strongly by earnings news arriving after hours than during the day. This result is intuitive, because the overnight market reaction to after-hour release of earnings would be stronger, while the overnight market reaction to the trading-day release of earnings would be the residual price impact after investors actively trade to absorb news released durig the day. In addition, that there is some market reaction overnight to earnings releases during trading hours suggests that the market reaction to news during trading hours is incomplete.

Overall, the above results support our main hypothesis that stock overnight returns reflect news arrival. Overnight returns are seen higher on days with earnings news release than days with no news, and higher on days when news is released during AHT. That overnight returns contains earnings information naturally leads to the next hypothesis with respect to whether overnight returns are persistent overtime to predict future returns, depending on 1) the timing of news arrival, and 2) the type of the news. In the

next two sections, the cumulative abnormal returns (CARs) up to 20 days after the announcement are computed to address this issue.

[Insert Table 3 here]

4.3. Persistence of overnight returns and news arrival times

In view of the above finding that the overnight return reflects earnings news, we next focus on a smaller sample that only includes news days to examine the persistence of overnight returns. Using a total of 46,332 earnings announcements, Panel A of Table 4 shows the average overnight return is 20% on news days. Then the sample is partitioned by the sign of overnight returns on the day after the announcement is released. Computing the average CARs over 5, 10 and 20 trading days after the announcement for these two sub-samples, We observe in Panel B that, on average, positive (negative) overnight returns after earnings announcement generally lead to significantly positive (negative) CAR up to 20 days, a strong indicator of overnight returns are informative of future stock returns.

In Panel C of Table 4, we also partition the sample of earnings announcements by their time of arrival, and examine the average CAR over the same three event windows. Although on average CARs are negative irrespective of the news arrival time, of particular note is the observation that the average CAR of after-hour earnings news arrivals is substantially lower than that of trading hour arrivals, and that the difference is statistically significant across all event windows (last row of Table 4). This implies that the news arrival time may have leveraging power on the predictability of overnight returns on future stock returns.

[Insert Table 4 here]

We further support the univariate analysis with regression estimation. In addition to controling for any firm-stpecific characteristics and stock-level liquidity, the regression analysis also enables the examination of any marginal effect of overnight returns given a particular news arrival time. We hereby estimate equation (2) and present results in Table 5. In Models (1), (3) and (5), the coeffients on the overnight return variable (*overrtn*) and after-hour news arrival dummy variable (*ea_over*) are both

signifiant and in oposing signs. For instance, over the three event windows of 5, 10 and 20 days after the announcement, overnight returns (*overrtn*) are associated with higher CARs, while the after-hour earnings arrival (*ea_over*) exhibit a adverse effect on CARs.

The marginal effects are examined in Models (2), (4) and (6) when we include an interaction term between *overrtn* and *ea_over* to accertain if there is any incremental effect of overnight returns on CARs when earnings arrive after hours. The coefficients on the interaction term (*overrtn*:*ea_over*) are positive and significant, and greater in magnitude than those on *overrtn*, implying the majority of the explanatory power of overnight returns is from when earnings news arrives after hours. Taking Model (2) as an example, having a mean of 0.202, the overnight return with after-hour earnings arrival increases CAR(+1, +5) by 17.7 percent (0.202 × 0.878 = 0.177), and this figure is only 3.6 percent for overnight returns with trading-hour earnings arrival (0.202 × 0.176 = 0.036). These results confirm that overnight returns are persistent and informative of subsequent CARs, especially on days when earnings news arrives after hours.

[Insert Table 5 here]

4.4. Persistence of overnight returns with good and bad news

We next examine the persistence of overnight returns depending on the type of earnings news. This is motivated by the above finding that positive (negative) overnight returns is predictive of higher (lower) post-announcement CARs, an indication that the type of news also plays a role in the degree of overnight returns' informativeness, because positive returns are in general driven by good news, and vice versa. To further test this hypothesis, we perform analysis on sub-samples that have received good (analystsurp>0) and bad (analystsurp≤0) earnings news, respectively, and estimate equation (2). The estimated results over the three event windows are presented in Panels A, B and C of Table 6.

For the good news sample, we first see the effect of overnight returns on CARs persistently positive and persistent up to 20 days after the announcement (model 1). After incorporating the interactive term between *overrtn* and *ea_over*, we find that a larger fraction of the overnight return's persistence is

attributed to after-hour arrival of good news (model 2). For the bad news sample, we first see the effect of overnight returns on CARs persistently negative and persistent up to 20 days after the announcement (model 3). However, after incorporating the interactive term between *overrtn* and *ea_over*, we find that all of the overnight return's persistence is attributed to after-hour arrival of bad news (model 4). For example, over the (+1, +20) window in Model (4) of Panel C, the coefficient on *overrtn* is no longer significant, whereas that on *overrtn:ea_over* is negatively significant. This collectively suggest that on the announcement of bad news, overnight returns reduce CARs only if the news is announced to the market in AHT.

In conclusion, these findings confirm our hypothesis that the persistence of overnight returns also depends on the type of news. Apart from the general observation that overnight returns with good (bad) news arrival have positive (negative) influence on subsequent CAR, more interestingly we find that, overnight returns with bad news arriving during RHT has no effect on CAR at all. When we compare the effect of overnight return with bad news arriving during RHT versus AHR, this suggests that the market during RHT is more efficient in responding to such news via trading, while the market responds more slowly to incorporate AHT bad news.

[Insert Table 6 here]

5. Additional analysis - Earnings arrival time with good and bad news

In light of the above evidence on the informativeness and the predictive power of overnight returns on news days, it is intuitive to postulate that the earnings arrival time contains information itself, because naturally the management would have incentive to time the release of certain news so as to maximise their opportunities. In this section we explicitly investigate the information content of news arrival for the good and bad news.

5.1. Univariate analysis

In univariate analysis, we perform a double sort of the announcement sample by the type of news (good, bad) and then by their arrival time. Results presented in Panel A and B of Table 7 show that, within our

sample period, around 57% of the earnings forecasts are underestimations (good news), while overestimations (bad news) account for 43%. The good and the bad news are shown to cause the post-event CAR to drift in the positive or negative direction significantly. With regard to the timing of the news release, we observe that, the majority of the news (around 80%) arrive after hours. For good news presented in Panel A, despite an initial up-spike, the market fully absorb the impact of such news released RHT in the first 20 days, whereas the AHR releases drives CAR further downwards. For bad news presented in panel B, apart from a negative market reaction observed, releasing it after hours exerts additional downward pressure on the price than releasing it during RHT. This is further confirmed by Figure 2 that depicts the average CAR over time against different news types and their arriving time. In addition, comparing the average earnings surprise, it is interesting that more extreme news is generally released during RHT.

Overall, the above findings are consistent with the notion that news is more easily absorbed and incorporated into prices if it is released during RHT. And the AHT-releasing news, good or bad, always leads to market under-performance, as if the market reads the timing of the release itself as an additional piece of bad news, and hence it drives CARs further downwards. From the management's perspective, the finding that the extreme news is timed to be announced during trading hours suggests they seem to be aware of the negative effect of AHT released news on the stock performance. However, it is intriguing to see majority of the news is chosen to be released during AHT (83% vs. 17%). We further discuss this in Section 5.3.

[Insert Table 7 here]

[Insert Figure 2 here]

5.2. Regression analysis

To further verify the above findings, regression analysis is conducted with the inclusion of controls for firm-specific characteristics and stock-level liquidity (Equation 3) in subsample containing good and bad earnings news, and the estimated results are presented in Table 8. Across all three CAR windows,

the coefficients for *ea_over* is found negative and significant for good news, confirming the negative effect of AHT-news causing market to respond negatively. The good and bad news leads to positive and negative future price performance. However, except for the CAR10 where the interaction term is significant at the 10% level, the results do not show that releasing news during AHT accentuates the price declines for bad news. In other words, bad news leads to future price declines and news release during AHT leads to future price declines independently of each other.

[Insert Table 8 here]

5.3. Quintile analysis for robustness

One alternative explanation to the above evidence of market underperformance to AHR earnings release is that, news released during AHR is simply worse than that released during RHT. To test this, the sample is first partitioned into positive and negative analyst surprises, and each of the two sub-samples are sorted into quintiles based on the size of the analyst surprises. These two sets of quintiles are labelled (5,4,3,2,1) for the positive analyst surprises, where quintile 5 has the largest positive analyst surprise and quintile 1 has the smallest positive analyst surprise. Similarly the negative analyst surprise sub-sample is sorted into (-1,-2,-3,-4,-5) where quintile -1 has the smallest negative analyst surprise and quintile -5 has the largest negative analyst surprise. These two sets of quintiles (10 portfolios), are further partitioned into those released during RHT and AHT.

Results are presented in Table 9 and the visualization in Figure 3. For the most positive analyst surprise quintile 5, we observe that the CARs are similar even though the AHR releases appear to start out better in the CAR[+1,+5] window but ends up slightly underperforming (slightly downward sloping) over the longer CAR window. For the second best positive analyst surprise quintile 4, the results are better in the shorter 5- and 10- day windows but end up similar in the 20- day window. Quintiles 3 and 2 start out around similar levels in the 5- day window, but end up much worse in the 20-day window. The positive surprise quintile 1, and all five quintiles for negative surprises (-1 to -5) underperform over all CAR windows where earnings is released overnight rather than during the trading day. The implication

seems to be that even for similar quantum of analyst surprise, the market seem to infer the timing of the earnings release itself as additional information, and in particular that AHT news releases signal adverse news as compared to RHT news releases. Cui et al. (2019) find similar market over-reaction to bad news when examining insider sale announcements.

[Insert Table 9 here]

[Insert Figure 3 here]

6. Conclusion

This paper examines the information content of stock overnight returns around days of earnings announcements. Specifically, we find that overnight returns are informative, and the effects are seen stronger on the day after the announcement, as well as when the news is released AHT. Then given that overnight returns reflect earnings news, we further examine whether overnight returns are persistent overtime and predictive of future returns, depending on 1) the timing of news arrival, and 2) the type of the news. Our results suggest that positive (negative) overnight returns after good (bad) earnings news releases increase (decrease) CARs, and this effect is more pronounced for news released AHT. In comparison, overnight returns with RHT arriving news reflect less information content because the market participants have the opportunity to respond instantaneously to absorb the news. In terms of information contained in the timing of the news, we show that, even though 83% of the earnings announcements are made during AHT, the market takes the timing of news release as additional and independent information, and reacts negatively to those released during AHT, causing significant under-performance in the subsequent CAR. Overall, these results support the view that it may be optimal to release all news during RHT when market participants are at their trading desks and are best able to assimilate the news.

REFERENCES

Aboody, D., O. Even-Tov, R. Lehavy, and B. Trueman. 2018. Overnight Returns and Firm-Specific Investor Sentiment. *Journal of Financial and Quantitative Analysis* 53 (2):485-505.

Akbas, F., E. Boehmer, C. Jiang, and P. D. Koch. *Overnight Returns, Daytime Reversals, and Future Stock Returns: The Risk of Investing in a Tug of War With Noise Traders.* Working Paper. January 1, 2019.

Barclay, M. J., and T. Hendershott. 2003. Price discovery and trading after hours. *The Review of Financial Studies* 16 (4):1041-1073.

Battalio, R. H., and R. R. Mendenhall. 2005. Earnings expectations, investor trade size, and anomalous returns around earnings announcements. *Journal of Financial Economics* 77 (2):289-319.

Berkman, H., P. D. Koch, L. Tuttle, and Y. J. Zhang. 2012. Paying Attention: Overnight Returns and the Hidden Cost of Buying at the Open. *Journal of Financial and Quantitative Analysis* 47 (4):715-741.

Cole, B., J. Daigle, B. Van Ness, and R. Van Ness. 2015. Do High Frequency Traders Care about Earnings Announcements? An Analysis of Trading Activity before, during, and after Regular Trading Hours. *The Handbook of High Frequency Trading. San Diego: Academic Press. Elsevier Inc*:255-270.

Cui, B., and A. E. Gozluklu. 2019. *Trading and Corporate News in After Hours Market.* Working Paper. University of Warwick. 6 May 2019. Available from https://warwick.ac.uk/fac/soc/wbs/subjects/finance/faculty1/arie_gozluklu/research/Draft_2019.pdf.

Cuñat, V., and M. Groen-Xu. 2017. *Night Fever: Investor Inattention and the Timing of Corporate Filings.* January 13, 2017. Available from https://ssrn.com/abstract=2870381.

French, K. R. 1980. Stock returns and the weekend effect. *Journal of Financial Economics* 8 (1):55-69.

Gennotte, G., and B. Trueman. 1996. The strategic timing of corporate disclosures. *The Review of Financial Studies* 9 (2):665-690.

Hendershott, T., D. Livdan, and D. Rösch. 2020. Asset pricing: A tale of night and day. *Journal of Financial Economics*: Forthcoming.

Jiang, C. X., T. Likitapiwat, and T. H. McInish. 2012. Information Content of Earnings Announcements: Evidence from After-Hours Trading. *Journal of Financial and Quantitative Analysis* 47 (6):1303-1330.

Kothari, S. P., A. J. Leone, and C. E. Wasley. 2005. Performance Matched Discretionary Accrual Measures. *Journal of Accounting and Economics* 39 (1):163.

Lou, D., C. Polk, and S. Skouras. 2018. *A tug of war: Overnight versus intraday expected returns.* Working Paper. February 2018. Available from http://personal.lse.ac.uk/polk/research/ATugOfWar20180508.pdf.

Martineau, C. 2017. How is earnings news transmitted to stock prices: Working Paper.

Michaely, R., A. Rubin, and A. Vedrashko. 2014. Corporate governance and the timing of earnings announcements. *Review of Finance* 18 (6):2003-2044.

Segal, B., and D. Segal. 2016. Are managers strategic in reporting non-earnings news? Evidence on timing and news bundling. *Review of Accounting Studies* 21 (4):1203-1244.

Wang, S. S., and M. Firth. 2004. Do bears and bulls swim across oceans? Market information transmission between greater China and the rest of the world. *Journal of International Financial Markets, Institutions and Money* 14 (3):235-254.

Appendix: Variable definitions

Variable	Definition	Notes	Reference
overrtn	Overnight return: previous close price to today's open price.	[CRSP: abs(openprc/cfacpr) / abs(prc_1/cfacpr_1) – 1]	
CAR	Cumulative abnormal returns over [+1,+5], [+1,+10], [+1,+20].		
ea_over	Dummy variable 1 if earnings announcement made that day after close of trading 1600 the previous day and before the start of trading of that day.		
ea_day	Dummy variable 1 if earnings announcement made that day during trading hours 0930-1600.	Some market reaction may occur overnight to earnings announcements during trading hours.	
dayofweek	Dummy variables for weekend; day-of-the-week values 1 to 7 (SAS values: Sun to Sat)	In the alternative to exclude Friday-to-Monday overnight returns. (Dummy variables for day-of-the-week or weekend effect (leave out Wed); or dummy for Friday-to-Monday overnight returns. In the alternative to exclude Friday-to-Monday overnight returns. French (1980); Wang and Firth (2004)}	French (1980) Wang and Firth (2004)
numest	Number of analysts following the stock.	[IBES: numest]	Battalio and Mendenhall (2005)
analystsurp	Analyst forecast error = difference between actual and mean analyst EPS from IBES, scaled by price at beginning of quarter	In substitution of EA dummies above. Proxy for informed investor price reaction. Such forecast errors should be correlated with informed investor activity. [IBES: actual – meanest]	
analystsurp_over	The quantum of analystsurp if the earnings announcement was made overnight.		
analystsurp_day	The quantum of analystsurp if the earnings announcement was made during trading hours.		
analystsurp_neg	Dummy variable, 1 if the analyst surprise ≤0 otherwise.		
analystdisp	Standard deviation of analyst forecast errors, scaled by price at beginning of quarter	Commonly used with analyst forecast errors, etc. [IBES: stdev]	

size	Log of market capitalization at beginning of year in millions of dollars.	Aboody uses at end of prior fiscal quarter and appears to be in million dollars. Battalio and Mendenhall in thousands.	Battalio and Mendenhall (2005) Aboody et al. (2018)
roa	Prior fiscal quarter's net income before extraordinary items divided by total assets at the beginning of that quarter.	[COMPUSTAT: = ibq / atq]	Aboody et al. (2018); Lou, Polk, and Skouras (2018) for roe
ep	Earnings-to-price, prior fiscal quarter net income per share before extraordinary items divided by price per share as of end of that quarter.		Aboody et al. (2018)
bm	Book value of equity divided by market value of equity the beginning of that quarter.	[COMPUSTAT/CRSP: = (atq - ltq) / abs(prc*shrout/1000)]	Aboody et al. (2018); Lou et al. (2018)
growth	Lagged asset growth		Lou et al. (2018)
accruals	Discretionary accruals in previous fiscal year.	Residual $\varepsilon_{t,}$ = $TA_t = \beta_0 + \beta_1 1 + \beta_1(\Delta Sales_t - \Delta Rec_t) + \beta_2 PPE_t + \beta_3 ROA_t + \varepsilon_t$ in cross-sectional regressions by 2-digit SIC industry code (minimum 20 firms, KLW use 10 firms)	Lou et al. (2018) Kothari, Leone, and Wasley (2005)
age	Number of years since firm first appeared on CRSP as at end of prior calendar quarter.		Aboody et al. (2018)
mom	Cumulative stock return over months t-4 to t-2.		Aboody et al. (2018); Lou et al. (2018)
dvolume	Average daily volume over months t-4 to t-2.		Battalio and Mendenhall (2005); Lou et al. (2018)
idvol	Idiosyncratic volatility (4-factor model) over months t-4 to t-2.		Lou et al. (2018)
indret	Cumulative industry mean return over months t-4 to t-2. Minimum 20 firms in 2-digit SIC.		Lou et al. (2018)
instown	Percentage held by institutions as at end of quarter.	From Thomson Reuters institutional data.	Aboody et al. (2018)

Figure 1 Earnings announcements and overnight returns

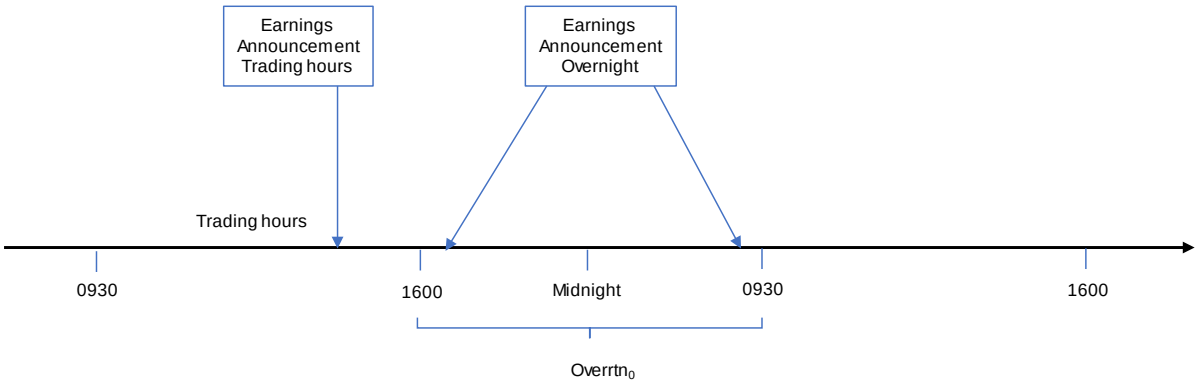
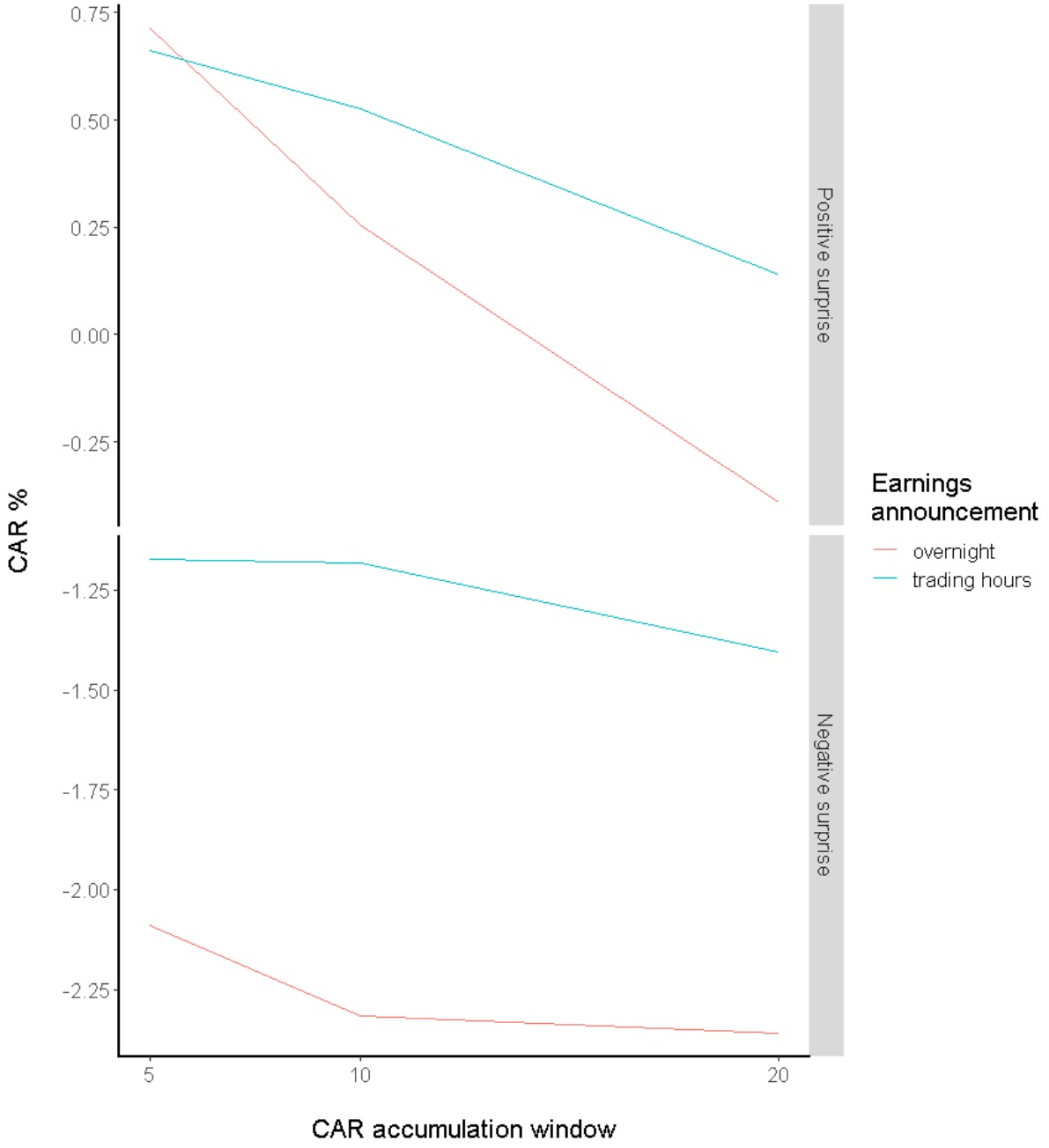
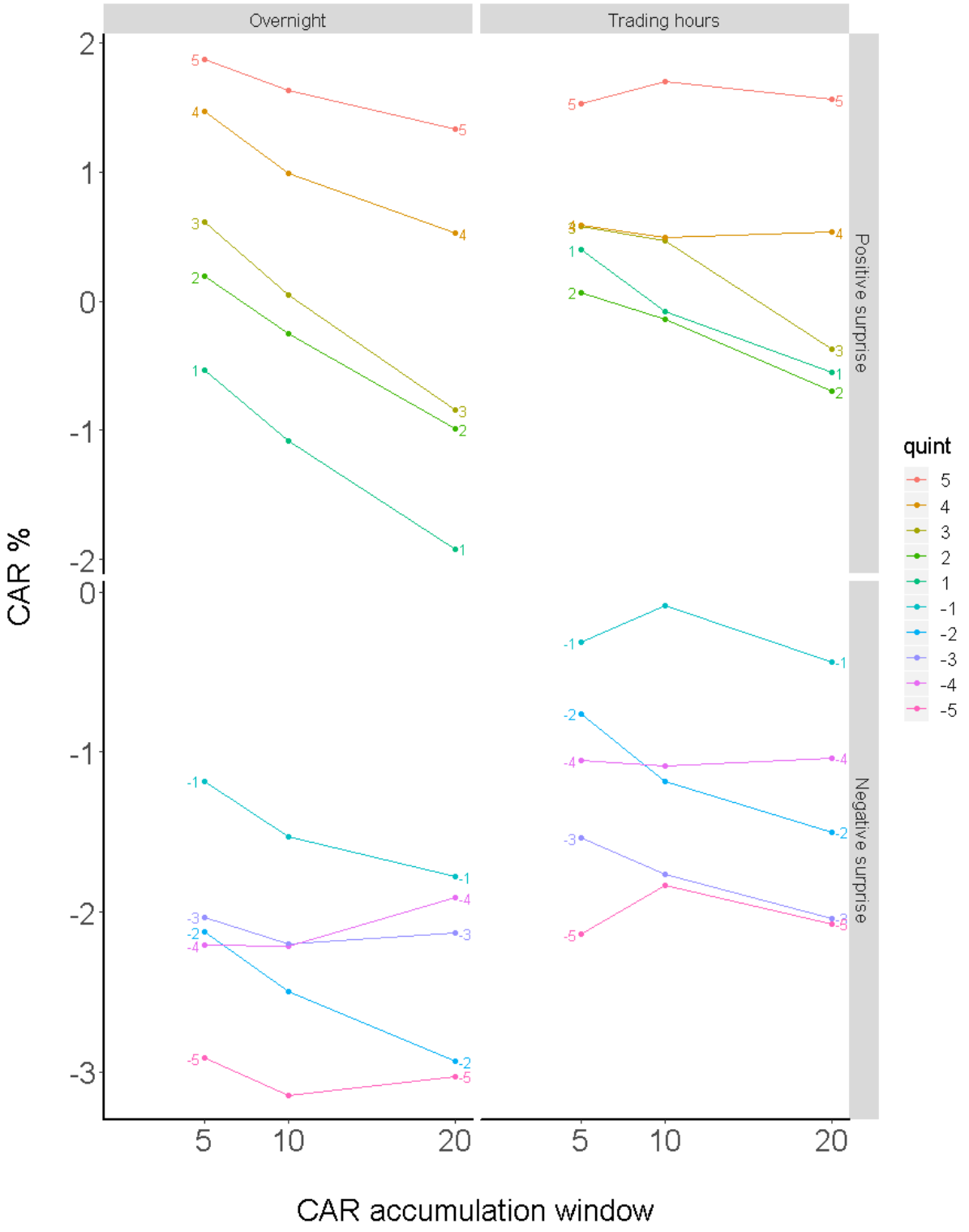


Figure 2 Earnings announcements surprise and CAR



This figure presents univariate analysis described in Table 4, by positive or negative analyst surprise. The cumulative abnormal returns (CAR) are calculated over 5, 10 and 20 trading days, respectively.

Figure 3 CAR by earnings announcements arrival and by quintiles



This figure presents quintile sort described in Table 10, by positive or negative analyst surprise. The respective quintile sorts are then partitioned by overnight or trading hour arrival and cumulative abnormal returns (CAR) are calculated over 5, 10 and 20 trading days, respectively.

Table 1 Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
size	432,192	6.526	1.473	3.665	5.470	7.454	10.581
roa	432,192	0.002	0.042	−0.208	−0.001	0.021	0.084
ep	432,192	0.003	0.029	−0.152	−0.001	0.016	0.067
bm	432,192	0.522	0.395	−0.151	0.255	0.687	2.158
growth	432,192	0.219	0.494	−0.409	−0.010	0.259	3.064
accruals	432,192	−0.008	0.096	−0.334	−0.052	0.035	0.329
age	432,192	14.339	15.038	0.000	4.192	18.417	90.562
mom	432,192	0.059	0.286	−0.546	−0.106	0.178	1.219
dvolume	432,192	0.715	1.333	0.007	0.085	0.688	8.680
idvol	432,192	0.028	0.015	0.007	0.017	0.035	0.080
indret	432,192	0.040	0.160	−0.396	−0.045	0.113	0.587
instown	432,192	0.559	0.318	0.000	0.329	0.824	1.000
numest	432,192	7.157	5.866	1	3	10	42
analystdisp	432,192	0.002	0.006	0.000	0.0002	0.002	0.049
analystsurp_over	432,192	−0.00002	0.004	−0	0	0	0
analystsurp_day	432,192	−0.00001	0.002	−0	0	0	0
ea_over	432,192	0.089	0.284	0	0	0	1
ea_day	432,192	0.019	0.135	0	0	0	1
overrtn	432,192	0.077	1.806	−6.950	−0.537	0.639	7.235

This table presents the descriptive statistics for the sample of 432,192 overnight return observations. The variables are defined in the Appendix.

Table 2 Correlation statistics

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1)	size	1.000***	0.157***	0.101***	-0.271***	-0.010***	-0.091***	0.356***	-0.119***	0.593***	-0.374***	-0.075***	0.296***	0.696***	-0.084***	0.011***	0.007***	0.011***	-0.020***	0.000
(2)	roa	0.146***	1.000***	0.706***	0.035***	0.003	-0.147***	0.115***	0.010***	0.013***	-0.260***	-0.011***	0.139***	0.084***	-0.248***	0.054***	0.027***	0.005**	-0.008***	0.006***
(3)	ep	0.092***	0.755***	1.000***	0.027***	0.016***	-0.015***	0.109***	0.038***	-0.039***	-0.245***	0.002	0.078***	0.029***	-0.260***	0.084***	0.039***	-0.001	0.002	0.013***
(4)	bm	-0.265***	-0.161***	0.172***	1.000***	-0.147***	0.061***	0.068***	0.069***	-0.099***	-0.034***	0.065***	-0.035***	-0.180***	0.060***	-0.008***	-0.005**	-0.010***	0.015***	-0.017***
(5)	growth	0.018***	0.250***	0.115***	-0.207***	1.000***	-0.037***	-0.149***	0.107***	-0.002	0.185***	0.027***	-0.079***	-0.018***	-0.021***	0.006***	0.005*	-0.001	0.000	0.034***
(6)	accruals	-0.090***	-0.173***	-0.035***	0.101***	-0.056***	1.000***	0.024***	-0.014***	-0.066***	0.047***	0.011***	-0.080***	-0.098***	0.069***	-0.004	0.004	-0.006***	0.010***	0.001
(7)	age	0.265***	0.100***	0.181***	0.142***	-0.172***	0.006***	1.000***	-0.041***	0.181***	-0.336***	-0.017***	0.080***	0.128***	-0.044***	-0.001	-0.001	-0.007***	0.007***	-0.020***
(8)	mom	-0.079***	0.077***	0.003**	0.056***	0.089***	-0.019***	-0.002	1.000***	-0.036***	0.119***	0.488***	-0.037***	-0.054***	-0.063***	0.015***	0.006***	0.001	0.001	0.009***
(9)	dvolume	0.765***	0.012***	-0.073***	-0.232***	0.009***	-0.070***	0.138***	-0.014***	1.000***	-0.041***	-0.019***	0.122***	0.595***	0.036***	0.001	0.001	0.014***	-0.026***	0.010***
(10)	idvol	-0.432***	-0.171***	-0.258***	-0.084***	0.100***	0.029***	-0.392***	-0.004***	-0.096***	1.000***	0.032***	-0.282***	-0.201***	0.114***	-0.008***	-0.007***	-0.010***	0.024***	0.046***
(11)	indret	-0.073***	0.002	-0.030***	0.058***	0.036***	0.006***	-0.004***	0.475***	-0.008***	-0.008***	1.000***	-0.025***	-0.012***	-0.024***	0.004	0.000	0.001	0.002	0.012***
(12)	instown	0.350***	0.100***	0.060***	-0.045***	-0.026***	-0.082***	0.156***	-0.004**	0.344***	-0.295***	-0.027***	1.000***	0.296***	-0.179***	0.013***	0.005**	0.017***	-0.029***	-0.016***
(13)	numest	0.703***	0.084***	0.007***	-0.205***	0.033***	-0.095***	0.076***	-0.037***	0.711***	-0.230***	-0.017***	0.385***	1.000***	-0.033***	0.012***	0.008***	0.014***	-0.023***	0.006***
(14)	analystdisp	0.001	-0.286***	-0.126***	0.135***	-0.166***	0.087***	-0.008***	-0.125***	0.157***	0.053***	-0.041***	-0.002	0.170***	1.000***	-0.038***	-0.007***	0.000	-0.002	0.003
(15)	analystsurp_over	0.027***	0.066***	0.054***	-0.017***	0.029***	-0.023***	-0.012***	0.031***	0.030***	-0.004***	0.010***	0.025***	0.033***	-0.033***	1.000***	0.000	-0.015***	0.001	0.110***
(16)	analystsurp_day	0.004***	0.027***	0.028***	-0.004***	0.013***	-0.002	-0.005***	0.010***	0.000	0.007***	0.002	0.000	0.007***	-0.014***	-0.003**	1.000***	0.001	-0.030***	0.023***
(17)	ea_over	0.011***	0.005***	-0.004**	-0.008***	0.000	-0.007***	-0.006***	0.003*	0.019***	-0.011***	0.002	0.018***	0.016***	0.003*	0.300***	-0.011***	1.000***	-0.043***	0.020***
(18)	ea_day	-0.020***	-0.007***	0.004***	0.012***	0.000	0.010***	0.006***	-0.004**	-0.033***	0.024***	-0.001	-0.031***	-0.025***	-0.009***	-0.013***	0.257***	-0.043***	1.000***	0.012***
(19)	overrtn	0.011***	0.023***	0.017***	-0.027***	0.036***	0.002	-0.024***	0.000	0.028***	0.039***	0.005***	-0.010***	0.016***	-0.004***	0.136***	0.031***	0.021***	0.012***	1.000***

This table presents the correlation statistics for the sample of 432,192 overnight return observations. The variables are defined in the Appendix.

Table 3 Overnight returns and earnings announcements

	(1)	(2)	(3)	(4)	(5)	(6)
dayofweek	−0.006	−0.006	−0.006	−0.006	−0.005	−0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
size	0.015***	0.015***	0.015***	0.015***	0.015***	0.015***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
roa	0.080	0.087	0.083	0.120	0.080	0.115
	(0.111)	(0.111)	(0.111)	(0.113)	(0.108)	(0.110)
ep	1.617***	1.605***	1.611***	0.993***	1.555***	0.937***
	(0.215)	(0.217)	(0.216)	(0.163)	(0.224)	(0.164)
bm	−0.044*	−0.045*	−0.044*	−0.044*	−0.044*	−0.044*
	(0.025)	(0.026)	(0.026)	(0.025)	(0.026)	(0.025)
growth	0.081***	0.081***	0.081***	0.081***	0.081***	0.081***
	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)
accruals	0.046	0.045	0.046	0.046	0.043	0.043
	(0.033)	(0.033)	(0.033)	(0.032)	(0.033)	(0.032)
age	−0.001**	−0.001**	−0.001**	−0.001**	−0.001**	−0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
mom	−0.031**	−0.030*	−0.030*	−0.038**	−0.031**	−0.038**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
dvolume	0.003	0.003	0.003	0.003	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
idvol	6.151***	6.069***	6.104***	5.968***	6.108***	5.962***
	(1.012)	(0.999)	(1.003)	(1.007)	(1.012)	(1.011)
indret	0.154	0.153	0.153	0.157	0.154	0.158
	(0.113)	(0.112)	(0.112)	(0.113)	(0.112)	(0.114)
instown	−0.037	−0.034	−0.036	−0.038	−0.036	−0.038
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
numest	0.002*	0.002*	0.002*	0.002	0.002*	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
analystdisp	1.573**	1.643**	1.611**	2.164***	1.591**	2.147***
	(0.694)	(0.687)	(0.690)	(0.636)	(0.662)	(0.604)
ea_over	0.132***		0.135***			
	(0.050)		(0.051)			
ea_day		0.149***	0.161***			
		(0.054)	(0.056)			
analystsurp_over				54.335***		54.378***
				(4.493)		(4.488)
analystsurp_day					23.046***	23.467***
					(3.747)	(3.702)
Num. obs.	432192	432192	432192	432192	432192	432192
Adj. R^2 (full model)	0.005	0.004	0.005	0.016	0.005	0.016
Adj. R^2 (proj model)	0.004	0.004	0.004	0.015	0.004	0.016

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

The table presents regressions of overnight returns against a dummy variable of whether earnings announcement was released overnight (ea_over) or during trading hours (ea_day), or the analyst earnings surprise of the earnings announcement if released overnight (analystsurp_over) or during trading hours (analystsurp_day). The models include industry (SIC2) fixed effects and are adjusted for clustered standard errors by firm and calendar year. The variables are defined in the Appendix.

Table 4 Overnight returns, and time of earnings announcement

N = 46,332	Overnight return		CAR [+1, +5]		CAR [+1, +10]		CAR [+1, +20]	
A: Earnings announcement day								
Overnight return	0.202	***	-0.417	***	-0.728	***	-1.11	***
t-stats	12.7		-9.82		-13.8		-15.8	
B: +ve vs -ve overnight return								
Overnight return > 0	2.665	***	1.749	***	1.457	***	1.093	***
t-stats	171.74		29.91		19.90		11.15	
Overnight return ≤ 0	-2.251	***	-2.575	***	-2.905	***	-3.296	***
t-stats	-143.53		-44.23		-39.78		-33.67	
(1) – (2)	4.916	***	4.325	***	4.363	***	4.390	***
t-stats	222.82		52.41		42.18		31.68	
C: Earnings Arrival time								
(1) After-hour arrival	0.196	***	-0.472	***	-0.831	***	-1.222	***
t-stats	10.60		-9.97		-14.34		-15.94	
(2) Trading-hour arrival	0.231	***	-0.158	*	-0.237	*	-0.551	***
t-stats	8.94		-1.65		-1.87		-3.21	
(1) – (2)	-0.035		-0.314	***	-0.595	***	-0.672	***
t-stats	-1.10		-2.94		-4.28		-3.57	

This table presents a univariate analysis of overnight returns and the associated mean cumulative abnormal returns (CAR) over 5, 10 and 20 trading days, respectively, related to the earnings announcement arrival itself. It is also partitioned by the sign of overnight returns and whether the earnings announcement arrived overnight or during trading hours. The variables are defined in the Appendix.

Table 5 CAR, overnight returns and analyst surprise

	(1)CAR[1,5]	(2)CAR[1,5]	(3)CAR[1,10]	(4)CAR[1,10]	(5)CAR[1,20]	(6)CAR[1,20]
dayofweek	0.081***	0.080**	0.099***	0.098***	0.185***	0.185***
	(0.030)	(0.032)	(0.037)	(0.037)	(0.056)	(0.055)
size	−0.012	−0.017	−0.123	−0.128	−0.352*	−0.357*
	(0.057)	(0.056)	(0.087)	(0.086)	(0.206)	(0.204)
roa	1.822	2.008	4.855***	5.039***	8.652***	8.845***
	(1.517)	(1.521)	(1.665)	(1.707)	(2.616)	(2.708)
ep	1.994	2.117	1.608	1.730	0.039	0.166
	(2.448)	(2.340)	(3.722)	(3.629)	(4.429)	(4.352)
bm	0.852***	0.850***	1.402***	1.399***	2.058***	2.056***
	(0.105)	(0.111)	(0.184)	(0.187)	(0.357)	(0.358)
growth	−0.480***	−0.464***	−0.696***	−0.679***	−0.700*	−0.683*
	(0.065)	(0.064)	(0.108)	(0.105)	(0.417)	(0.415)
accruals	−2.591***	−2.595***	−3.564***	−3.568***	−3.496***	−3.501***
	(0.528)	(0.527)	(0.605)	(0.629)	(0.716)	(0.739)
age	0.007***	0.007**	0.011***	0.011***	0.017**	0.017**
	(0.002)	(0.003)	(0.004)	(0.004)	(0.007)	(0.007)
mom	−4.779***	−4.793***	−8.992***	−9.006***	−16.740***	−16.754***
	(0.378)	(0.373)	(0.588)	(0.583)	(0.712)	(0.703)
dvolume	−0.117*	−0.116*	−0.187	−0.186	−0.282**	−0.280**
	(0.064)	(0.063)	(0.118)	(0.117)	(0.127)	(0.124)
idvol	−24.181***	−23.457***	−38.974***	−38.259***	−66.998**	−66.249**
	(6.907)	(6.699)	(14.700)	(14.390)	(31.233)	(30.806)
indret	0.177	0.236	1.670	1.728	4.090***	4.151***
	(0.521)	(0.549)	(1.083)	(1.114)	(1.482)	(1.481)
instown	0.505***	0.527***	0.462*	0.485*	0.582	0.605
	(0.161)	(0.162)	(0.253)	(0.258)	(0.553)	(0.559)
numest	0.030*	0.031**	0.065**	0.066**	0.117**	0.118***
	(0.015)	(0.015)	(0.028)	(0.028)	(0.046)	(0.045)
analystdisp	0.494	1.972	5.364	6.824	9.797	11.324
	(8.392)	(8.180)	(9.302)	(9.434)	(15.634)	(16.198)
analystsurp	19.633***	20.204***	25.118***	25.683***	25.438**	26.029**
	(6.900)	(6.641)	(8.254)	(8.022)	(11.569)	(11.212)
overrtn	0.985***	0.176***	1.008***	0.209***	1.031***	0.196**
	(0.028)	(0.030)	(0.033)	(0.066)	(0.034)	(0.099)
ea_over	−0.346**	−0.547***	−0.635***	−0.833***	−0.761**	−0.968***
	(0.135)	(0.121)	(0.169)	(0.183)	(0.337)	(0.346)
overrtn:ea_over		0.878***		0.867***		0.907***
		(0.031)		(0.063)		(0.098)
Num. obs.	46332	46332	46332	46332	46332	46332
Adj. R^2 (full model)	0.165	0.173	0.151	0.156	0.156	0.159
Adj. R^2 (proj model)	0.164	0.172	0.149	0.154	0.154	0.157

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

The table presents regressions of cumulative abnormal returns (CAR) over 5, 10 and 20 trading days, respectively, against overnight returns, dummy variable of whether earnings announcement was released overnight (ea_over) or during trading hours (ea_day), and analyst earnings surprise. The models include industry (SIC2) fixed effects and are adjusted for clustered standard errors by firm and calendar year. The variables are defined in the Appendix.

Table 6 CAR, overnight returns and negative surprise in good&bad news sub-samples

Panel A CAR [+1,+5]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	−0.051	−0.048	−0.259***	−0.258***
	(0.055)	(0.055)	(0.045)	(0.042)
size	−0.089	−0.090	−0.071	−0.062
	(0.103)	(0.100)	(0.065)	(0.061)
roa	0.822	1.121	−0.971	−1.177
	(2.639)	(2.662)	(2.165)	(2.046)
ep	5.250	5.237	0.651	0.629
	(3.865)	(3.813)	(2.712)	(2.690)
bm	0.933***	0.943***	−0.751***	−0.735***
	(0.165)	(0.166)	(0.207)	(0.204)
growth	−0.603***	−0.578***	0.355**	0.347**
	(0.105)	(0.101)	(0.152)	(0.153)
accruals	−3.443***	−3.515***	1.027*	1.007*
	(0.817)	(0.840)	(0.544)	(0.555)
age	0.002	0.002	−0.016***	−0.016***
	(0.003)	(0.003)	(0.004)	(0.005)
mom	−4.754***	−4.766***	5.118***	5.142***
	(0.381)	(0.366)	(0.441)	(0.454)
dvolume	−0.150*	−0.153**	0.075	0.065
	(0.078)	(0.076)	(0.073)	(0.073)
idvol	−29.957***	−27.900***	18.885*	20.050**
	(7.226)	(7.203)	(9.658)	(9.430)
indret	0.424	0.494	−0.028	−0.082
	(0.884)	(0.936)	(0.819)	(0.788)
instown	0.573***	0.571***	−0.250	−0.329
	(0.208)	(0.206)	(0.234)	(0.231)
numest	0.029	0.033*	−0.029	−0.028
	(0.018)	(0.020)	(0.022)	(0.022)
analystdisp	−39.721***	−39.324***	−23.764**	−25.383**
	(14.864)	(15.123)	(12.041)	(11.753)
analystsurp	33.931**	35.219***	−18.481**	−18.703**
	(14.155)	(13.544)	(7.388)	(7.361)
overrtn	1.008***	0.165***	−0.878***	−0.031
	(0.038)	(0.058)	(0.026)	(0.069)
ea_over	−0.621**	−1.236***	0.127	−0.190
	(0.310)	(0.241)	(0.229)	(0.242)
overrtn:ea_over		0.914***		−0.935***
		(0.054)		(0.062)
Num. obs.	26558	26558	19774	19774
Adj. R^2 (full model)	0.170	0.178	0.128	0.137
Adj. R^2 (proj model)	0.167	0.175	0.122	0.131

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Panel B CAR [+1,+10]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	−0.028	−0.026	−0.273***	−0.272***
	(0.071)	(0.069)	(0.045)	(0.042)
size	−0.213	−0.214	0.027	0.035
	(0.152)	(0.149)	(0.095)	(0.092)
roa	3.653	3.951	−4.715	−4.917
	(3.081)	(3.121)	(3.407)	(3.357)
ep	6.223	6.210	3.580	3.558
	(4.383)	(4.255)	(4.701)	(4.731)
bm	1.522***	1.532***	−1.238***	−1.223***
	(0.246)	(0.254)	(0.248)	(0.240)
growth	−0.848***	−0.823***	0.505***	0.497***
	(0.167)	(0.163)	(0.191)	(0.190)
accruals	−4.384***	−4.455***	2.185***	2.166***
	(0.739)	(0.787)	(0.696)	(0.703)
age	0.009*	0.009	−0.016**	−0.016**
	(0.005)	(0.005)	(0.007)	(0.007)
mom	−8.895***	−8.908***	9.314***	9.338***
	(0.609)	(0.592)	(0.620)	(0.636)
dvolume	−0.249**	−0.252**	0.100	0.090
	(0.124)	(0.121)	(0.139)	(0.139)
idvol	−50.363***	−48.312***	26.442	27.583*
	(14.901)	(14.664)	(16.323)	(16.110)
indret	2.244*	2.314*	−1.021	−1.074
	(1.340)	(1.404)	(1.229)	(1.198)
instown	0.596***	0.595***	−0.075	−0.152
	(0.226)	(0.228)	(0.349)	(0.353)
numest	0.059*	0.063*	−0.070**	−0.069**
	(0.032)	(0.033)	(0.028)	(0.028)
analystdisp	−45.124**	−44.728**	−47.471***	−49.058***
	(20.995)	(21.294)	(15.206)	(15.010)
analystsurp	41.203**	42.487**	−36.022***	−36.240***
	(19.441)	(18.733)	(8.803)	(8.879)
overrtn	1.049***	0.208***	−0.892***	−0.062
	(0.051)	(0.055)	(0.034)	(0.153)
ea_over	−0.969***	−1.582***	0.357	0.047
	(0.324)	(0.297)	(0.275)	(0.302)
overrtn:ea_over		0.912***		−0.916***
		(0.062)		(0.139)
Num. obs.	26558	26558	19774	19774
Adj. R^2 (full model)	0.162	0.167	0.121	0.127
Adj. R^2 (proj model)	0.158	0.163	0.116	0.122

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Panel C CAR [+1,+20]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	0.030	0.033	−0.408***	−0.407***
	(0.092)	(0.091)	(0.066)	(0.064)
size	−0.470	−0.471*	0.228*	0.237*
	(0.288)	(0.286)	(0.133)	(0.131)
roa	8.368*	8.672*	−8.341**	−8.565**
	(4.442)	(4.507)	(4.024)	(4.077)
ep	1.414	1.401	3.592	3.567
	(5.910)	(5.767)	(5.043)	(5.024)
bm	2.133***	2.143***	−1.973***	−1.956***
	(0.364)	(0.374)	(0.467)	(0.456)
growth	−0.887	−0.861	0.438*	0.430*
	(0.641)	(0.640)	(0.255)	(0.253)
accruals	−5.357***	−5.430***	0.599	0.577
	(1.244)	(1.297)	(0.977)	(0.997)
age	0.010	0.010	−0.030***	−0.029***
	(0.008)	(0.008)	(0.010)	(0.010)
mom	−16.388***	−16.401***	17.322***	17.349***
	(0.749)	(0.740)	(0.785)	(0.778)
dvolume	−0.346**	−0.348***	0.191	0.180
	(0.137)	(0.134)	(0.160)	(0.159)
idvol	−91.399***	−89.301***	39.304	40.571
	(33.915)	(33.394)	(27.592)	(27.262)
indret	4.649***	4.721***	−3.474*	−3.532*
	(1.378)	(1.430)	(2.061)	(2.013)
instown	0.396	0.395	−0.527	−0.613
	(0.556)	(0.562)	(0.559)	(0.561)
numest	0.106**	0.110**	−0.132***	−0.130***
	(0.051)	(0.052)	(0.039)	(0.038)
analystdisp	−54.497	−54.091	−75.765***	−77.526***
	(34.780)	(34.940)	(22.153)	(22.581)
analystsurp	44.736	46.050*	−48.544***	−48.785***
	(28.148)	(27.196)	(11.099)	(10.923)
overrtn	1.122***	0.263***	−0.872***	0.049
	(0.048)	(0.092)	(0.048)	(0.174)
ea_over	−1.349***	−1.976***	0.238	−0.106
	(0.420)	(0.442)	(0.397)	(0.419)
overrtn:ea_over		0.933***		−1.017***
		(0.109)		(0.158)
Num. obs.	26558	26558	19774	19774
Adj. R^2 (full model)	0.173	0.176	0.132	0.136
Adj. R^2 (proj model)	0.170	0.173	0.129	0.133

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

The tables present regressions of cumulative abnormal returns (CAR) over 5, 10 and 20 trading days, respectively, against overnight returns, dummy variable of whether earnings announcement was released overnight (ea_over). It is partitioned into Good news (analystsurp>0) and Bad news analystsurp≤0) sub-samples. For the Bad news sub-sample, CAR is resigned in the negative. The models include industry (SIC2) fixed effects and are adjusted for clustered standard errors by firm and calendar year. The variables are defined in the Appendix.

Table 7 CAR and analyst surprise

N = 46,332	% of Total	Mean surprise		CAR [+1, +5]		CAR [+1, +10]		CAR [+1, +20]	
A: Positive analyst surprise									
All	57.32%	0.004	***	0.705	***	0.300	***	-0.302	***
t-stats		84.81		12.62		4.33		-3.27	
After-hour arrival	47.71%	0.0041	***	0.714	***	0.255	***	-0.391	***
t-stats		76.97		11.53		3.35		-3.87	
Trading-hour arrival	9.61%	0.0045	***	0.661	***	0.527	***	0.140	
t-stats		35.68		5.16		3.10		0.61	
After-hour – Trading-hour		-0.0004	***	0.052		-0.272		-0.530	**
t-stats		-3.27		0.37		-1.46		-2.11	
B: Negative analyst surprise									
All	42.68%	-0.006	***	-1.924	***	-2.110	***	-2.185	***
t-stats		-59.75		-30.14		-26.40		-20.47	
After-hour arrival	34.92%	-0.0060	***	-2.091	***	-2.316	***	-2.359	***
t-stats		-53.63		-29.31		-26.26		-20.10	
Trading-hour arrival	7.76%	-0.0065	***	-1.172	***	-1.182	***	-1.405	***
t-stats		-26.37		-8.28		-6.29		-5.47	
After-hour – Trading-hour		0.0005	*	-0.920	***	-1.134	***	-0.954	***
t-stats		1.71		-5.80		-5.46		-3.38	

This table presents a univariate analysis of the mean analyst surprise, and cumulative abnormal returns (CAR) over 5, 10 and 20 trading days, respectively related to the earnings announcement arrival itself. It is partitioned by the sign of analyst earnings surprise, and whether the earnings announcement arrived overnight or during trading hours.

Table 8 Overnight returns, and analyst surprise, by Good and Bad news sub-samples

Panel A CAR [+1,+5]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	−0.051	−0.051	−0.320***	−0.320***
	(0.055)	(0.055)	(0.077)	(0.083)
size	−0.089	−0.089	−0.080	−0.080
	(0.103)	(0.104)	(0.082)	(0.085)
roa	0.822	0.854	−1.544	−1.552
	(2.639)	(2.621)	(2.384)	(2.352)
ep	5.250	5.240	1.559	1.568
	(3.865)	(3.867)	(3.353)	(3.302)
bm	0.933***	0.936***	−0.653***	−0.653***
	(0.165)	(0.164)	(0.174)	(0.174)
growth	−0.603***	−0.604***	0.273*	0.273*
	(0.105)	(0.104)	(0.159)	(0.160)
accruals	−3.443***	−3.449***	0.249	0.248
	(0.817)	(0.812)	(0.522)	(0.522)
age	0.002	0.002	−0.018***	−0.018***
	(0.003)	(0.003)	(0.005)	(0.005)
mom	−4.754***	−4.753***	4.855***	4.855***
	(0.381)	(0.381)	(0.473)	(0.474)
dvolume	−0.150*	−0.150*	0.082	0.082
	(0.078)	(0.078)	(0.074)	(0.078)
idvol	−29.957***	−29.989***	8.850	8.860
	(7.226)	(7.213)	(8.800)	(8.833)
indret	0.424	0.417	−0.251	−0.251
	(0.884)	(0.891)	(0.833)	(0.833)
instown	0.573***	0.573***	−0.026	−0.026
	(0.208)	(0.208)	(0.271)	(0.271)
numest	0.029	0.029	−0.033	−0.033
	(0.018)	(0.018)	(0.027)	(0.033)
analystdisp	−39.721***	−39.123***	−27.213*	−27.310*
	(14.864)	(14.461)	(14.880)	(15.566)
overrtn	1.008***	1.008***	−0.806***	−0.806***
	(0.038)	(0.037)	(0.032)	(0.032)
ea_over	−0.621**	−0.538	0.051	0.040
	(0.310)	(0.331)	(0.300)	(0.379)
analystsurp	33.931**	48.806*	−22.349***	−21.462***
	(14.155)	(29.523)	(7.445)	(7.019)
ea_over:analystsurp		−18.635		−1.128
		(24.804)		(11.044)
Num. obs.	26558	26558	13808	13808
Adj. R^2 (full model)	0.170	0.170	0.110	0.110
Adj. R^2 (proj model)	0.167	0.167	0.103	0.102

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Panel B CAR [+1,+10]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	−0.028	−0.029	−0.363***	−0.362***
	(0.071)	(0.072)	(0.080)	(0.080)
size	−0.213	−0.213	0.051	0.053
	(0.152)	(0.153)	(0.114)	(0.115)
roa	3.653	3.748	−6.713*	−6.840*
	(3.081)	(3.048)	(3.653)	(3.585)
ep	6.223	6.193	5.999	6.148
	(4.383)	(4.368)	(5.508)	(5.386)
bm	1.522***	1.530***	−1.026***	−1.025***
	(0.246)	(0.243)	(0.194)	(0.199)
growth	−0.848***	−0.850***	0.300	0.297
	(0.167)	(0.165)	(0.221)	(0.219)
accruals	−4.384***	−4.399***	2.052***	2.026***
	(0.739)	(0.729)	(0.541)	(0.544)
age	0.009*	0.009*	−0.017**	−0.017**
	(0.005)	(0.005)	(0.008)	(0.008)
mom	−8.895***	−8.894***	9.098***	9.097***
	(0.609)	(0.609)	(0.675)	(0.674)
dvolume	−0.249**	−0.248**	0.089	0.088
	(0.124)	(0.124)	(0.123)	(0.124)
idvol	−50.363***	−50.460***	12.633	12.807
	(14.901)	(14.846)	(13.972)	(13.928)
indret	2.244*	2.224*	−1.132	−1.118
	(1.340)	(1.347)	(1.374)	(1.372)
instown	0.596***	0.598***	0.150	0.154
	(0.226)	(0.226)	(0.375)	(0.377)
numest	0.059*	0.059*	−0.086***	−0.086***
	(0.032)	(0.034)	(0.032)	(0.033)
analystdisp	−45.124**	−43.363**	−45.451**	−47.079**
	(20.995)	(19.983)	(18.341)	(18.348)
overrtn	1.049***	1.050***	−0.833***	−0.833***
	(0.051)	(0.050)	(0.039)	(0.039)
ea_over	−0.969***	−0.725*	0.243	0.072
	(0.324)	(0.398)	(0.322)	(0.363)
analystsurp	41.203**	85.036*	−41.411***	−26.484***
	(19.441)	(44.229)	(7.759)	(8.710)
ea_over:analystsurp		−54.915		−18.972*
		(36.859)		(10.529)
Num. obs.	26558	26558	13808	13808
Adj. R^2 (full model)	0.162	0.162	0.110	0.110
Adj. R^2 (proj model)	0.158	0.158	0.103	0.103

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Panel C CAR [+1,+20]

	(1) Good	(2) Good	(3) Bad	(4) Bad
dayofweek	0.030	0.030	−0.482***	−0.481***
	(0.092)	(0.092)	(0.064)	(0.066)
size	−0.470	−0.470	0.226	0.227
	(0.288)	(0.290)	(0.174)	(0.173)
roa	8.368*	8.476*	−10.564**	−10.679**
	(4.442)	(4.420)	(4.899)	(4.818)
ep	1.414	1.380	4.427	4.561
	(5.910)	(5.902)	(5.780)	(5.644)
bm	2.133***	2.142***	−1.586***	−1.586***
	(0.364)	(0.369)	(0.399)	(0.397)
growth	−0.887	−0.890	0.255	0.252
	(0.641)	(0.639)	(0.268)	(0.268)
accruals	−5.357***	−5.375***	0.376	0.352
	(1.244)	(1.233)	(0.924)	(0.925)
age	0.010	0.010	−0.026**	−0.026**
	(0.008)	(0.007)	(0.012)	(0.013)
mom	−16.388***	−16.387***	17.292***	17.290***
	(0.749)	(0.747)	(0.983)	(0.982)
dvolume	−0.346**	−0.345**	0.186	0.185
	(0.137)	(0.139)	(0.182)	(0.182)
idvol	−91.399***	−91.509***	21.300	21.457
	(33.915)	(33.853)	(24.252)	(24.240)
indret	4.649***	4.627***	−3.932*	−3.919*
	(1.378)	(1.375)	(2.095)	(2.089)
instown	0.396	0.398	−0.284	−0.281
	(0.556)	(0.558)	(0.630)	(0.631)
numest	0.106**	0.106**	−0.145***	−0.145***
	(0.051)	(0.051)	(0.041)	(0.042)
analystdisp	−54.497	−52.480	−76.097***	−77.572***
	(34.780)	(33.471)	(24.215)	(23.938)
overrtn	1.122***	1.123***	−0.800***	−0.800***
	(0.048)	(0.048)	(0.053)	(0.053)
ea_over	−1.349***	−1.069**	0.162	0.006
	(0.420)	(0.532)	(0.409)	(0.454)
analystsurp	44.736	94.930	−56.392***	−42.872**
	(28.148)	(63.145)	(9.530)	(17.098)
ea_over:analystsurp		−62.884		−17.183
		(49.305)		(20.585)
Num. obs.	26558	26558	13808	13808
Adj. R^2 (full model)	0.173	0.173	0.124	0.124
Adj. R^2 (proj model)	0.170	0.170	0.120	0.120

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

The table presents regressions of cumulative abnormal returns (CAR) over 5, 10 and 20 trading days, respectively, against overnight returns, dummy variable of whether earnings announcement was released overnight (ea_over), and analyst earnings surprise (analystsurp). It is partitioned into Good news (analystsurp>0) and Bad news analystsurp≤0) sub-samples. For the Bad news sub-sample, CAR is resigned in the negative. The models include industry (SIC2) fixed effects and are adjusted for clustered standard errors by firm and calendar year. The variables are defined in the Appendix.

Table 9 CAR by earnings announcements arrival and by quintiles

Panel A: Good news arrival (analyst surprise > 0)

	N	Average surprise		CAR [+1, +5]		CAR [+1, +10]		CAR [+1, +20]	
Sort by overnight arrival									
Quintile 5	4327	0.015	***	1.871	***	1.627	***	1.330	***
		74.49		12.17		8.40		5.16	
4	4429	0.003	***	1.469	***	0.984	***	0.523	**
		289.43		10.60		5.82		2.34	
3	4383	0.002	***	0.610	***	0.047		-0.844	***
		347.08		4.52		0.28		-3.89	
2	4502	0.001	***	0.192		-0.251		-0.990	***
		309.38		1.44		-1.55		-4.59	
1	4465	0.000	***	-0.530	***	-1.084	***	-1.915	***
		150.15		-4.14		-6.89		-9.10	
Sort by trading hours arrival									
Quintile 5	984	0.015	***	1.528	***	1.693	***	1.560	***
		36.12		4.99		4.10		2.78	
4	883	0.003	***	0.589	**	0.492		0.531	
		129.77		2.04		1.33		1.06	
3	928	0.002	***	0.575	**	0.465		-0.375	
		160.56		2.16		1.32		-0.80	
2	810	0.001	***	0.065		-0.143		-0.698	
		131.81		0.22		-0.37		-1.31	
1	847	0.000	***	0.395		-0.084		-0.554	
		66.31		1.46		-0.23		-1.14	

B: Bad news arrival (analyst surprise ≤ 0)

	N	Average surprise(1)		CAR [+1, +5]		CAR [+1, +10]		CAR [+1, +20]	
Sort by overnight arrival									
Quintile -1	3187	0.000		-1.183	***	-1.528	***	-1.781	***
				-7.81		-8.12		-7.05	
-2	3326	0.000	***	-2.124	***	-2.495	***	-2.932	***
		-46.72		-13.37		-13.29		-12.03	
-3	3265	-0.001	***	-2.033	***	-2.198	***	-2.133	***
		-167.05		-13.47		-11.66		-8.66	
-4	3222	-0.004	***	-2.207	***	-2.211	***	-1.910	***
		-174.61		-13.78		-11.29		-7.27	
-5	3177	-0.026	***	-2.912	***	-3.146	***	-3.026	***
		-61.13		-16.72		-14.07		-9.96	
Sort by trading hours arrival									
Quintile -1	768	0.000		-0.314		-0.086		-0.436	
				-1.12		-0.23		-0.85	
-2	629	0.000	***	-0.761	**	-1.181	***	-1.501	***
		-21.12		-2.38		-2.65		-2.63	
-3	690	-0.001	***	-1.538	***	-1.766	***	-2.038	***
		-76.10		-4.75		-4.20		-3.54	
-4	733	-0.004	***	-1.053	***	-1.087	***	-1.036	***
		-83.34		-3.44		-2.65		-1.80	
-5	777	-0.025	***	-2.140	***	-1.835	***	-2.073	***
		-30.12		-6.23		-4.10		-3.34	

This table presents quintile sorts by positive or negative analyst surprise. The respective quintile sorts are then partitioned by overnight or trading hour arrival and cumulative abnormal returns (CAR) are calculated over 5, 10 and 20 trading days, respectively. Note (1): The analyst surprise of all observations in this portfolio is zero. As such, there is no statistical variation within this portfolio for the mean analyst surprise.