Insider selling on public information: Evidence from competition with short sellers

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March 15, 2017

Abstract

This paper shows that insiders trade on public information just after earnings announcements. Using a sample of US stocks, we analyze insider trading in the context of short-selling activity and show that insiders sell significantly more often and more shares when short sellers are also highly active. Moreover, the speed of information dissemination is significantly higher when both insiders and short sellers sell intensively. Together, these findings imply that insiders' and short-sellers' signals are highly correlated. Previous literature has shown that short sellers possess superior information-processing skills that allow them to trade profitably after public-information releases. Our evidence suggests that insiders, just as short sellers, interpret publicly-available earnings news and sell when their stock is overpriced. Insiders tend to stop selling and even start buying when the stock is underpriced. Competition between the two types of informed traders increases the speed of information dissemination, which improves stock-market efficiency.

Keywords: Insider trading, Short selling, Informed trading, Earnings announcements
JEL Classification: G14, G19, G39, M41

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1 Introduction

Insider trading regulation in the US has tightened over time so that insiders are prohibited to trade before earnings announcements when they are likely to possess non-yet-disclosed material information (Bettis et al. 2000; Lee et al. 2014). As a result, insiders are allowed to trade after public announcements of earnings when information asymmetry between insiders and outside investors decreases significantly (Berkman et al. 2009; Brochet 2010). The Sarbanes-Oxley Act, which took effect in August 2002, further tightened the reporting requirements associated with insider transactions (Brochet 2010). Insiders are now required to report their trades within two business days from trading. Increased scrutiny from investors, media and regulators should lead to less opportunistic insider trading. As a result, a question arises of whether insiders are still able to use information in their advantage and what are the consequences of their trading for stock market efficiency.[1]

Even though tighter regulatory environment might restrict insiders using forward looking private information, insiders might still rely on their superior information processing skills. These skills are particularly useful when they trade after public information releases, such as earnings announcements. However, even when insider trades are concentrated in periods after earnings announcements, it is still possible insiders trade on foreknowledge of future cash flows. In fact, it is relatively difficult to differentiate whether insiders use information concerning foreknowledge of future cash flows or they rather react to mispricing of their stock after recent earnings announcements. In this paper, we disentangle these two potential sources of insider trading and argue that insiders' information advantage comes mostly from their superior information processing skills to detect mispriced stocks.

One way to differentiate which source of information insiders use when trading is to consider situations where insiders may compete for information advantage with other in-

[1] Quote from Lee et al. (2014): '[. . .] it remains unclear whether insiders are still earning abnormal profits from their transactions after their firms' adoption of restriction policies. This is a critical question that needs to be addressed since it determines whether academics should continue to use insider trading as a source of informed transactions in empirical studies, and whether professional investors would be incentivized to revise their active investment strategies based on insider trading. Moreover, the answer to the question would allow regulators and policy makers to evaluate the effectiveness of regulations on insider trading and follow-up enforcements.'

formed investors. Back et al. (2000) show that the presence of two types of informed traders may amplify the extent of competition and increase the speed of information revelation to the market, but only in case signals of the two types of informed traders are highly correlated. If the traders have weakly correlated signals, each will trade less intensively and the information will be revealed to the market less quickly than when there is only one informed trader.

In this spirit, we analyze insider trading in the context of short sellers' trading patterns around earnings announcements. Short sellers are informed traders with strong incentives to profit on their information advantage.[2] Moreover, Engelberg et al. (2012) show that short-sellers' information advantage around earnings announcements comes from their ability to analyze publicly available information. Their superior information processing when trading on news days translates into economically significant profits. We use Back et al. (2000) model prediction on informed trading competition to establish the nature of insider trading information advantage. If insiders compete for information advantage with short sellers after earnings announcements, we have a strong evidence that they trade, as short sellers, on stock mispricing rather than foreknowledge of long-lasting future information. This is because short-sellers' investment horizon is usually relatively short.[3] High correlation in informed signals would also suggest that, even though insiders trade in periods with the smallest possible information advantage concerning foreknowledge of price-sensitive (earnings) information, they are able to use their superior information processing skills to trade in their advantage.

Using a sample of US firms from July 2006 until December 2013 we show that both insiders and short sellers sell most intensively following earnings announcements. Furthermore, the higher is the short-selling potential, the higher are the odds that insiders and short sellers trade in the same stocks over the six days starting on the earnings an-

[2]See, for example, Asquith et al. (2005), Cohen et al. (2007), Boehmer et al. (2008), Diether et al. (2009).

[3]Boehmer et al. (2008) estimate the typical short seller's horizon to be 37 trading days. Gamble and Xu (2017) document similar estimates for retail short sellers. These numbers strongly suggest that short sellers are very unlikely to trade on long-lasting forward looking private information that would eventually be revealed in future earnings announcements.

nouncement date.[4] Importantly, we also find that when both types of informed traders sell intensively, the speed of information dissemination is substantially enhanced. This holds true irrespective of the direction of the earnings news. Nevertheless, faster price adjustment is concentrated in stocks with large (positive or negative) magnitude of earnings surprise suggesting that the two types of informed traders are trading together in stocks for which the market overreacts to positive news or underreacts to negative news. Based on Back et al. (2000), these results suggest that signals, which the two types of informed traders possess are highly correlated. Despite regulation forcing insiders to trade in short windows after earnings announcements, when they possess the smallest information advantage, insiders are able to use their superior information processing skills to identify overvalued stocks and sell with an advantage. High correlation of signals with short sellers also indicates that insiders do not trade based on long-lasting future material information.

To rule out possible alternative explanations of our results, we perform two set of tests. First, we explore the link between insider trading and future earnings news to confirm that insiders are very unlikely to trade on long-lasting future earnings news. We show that lower cumulative earnings surprises for four future quarters do not increase the odds of insider selling. Second, we test whether low post-earnings returns are solely due to excessive buying pressure right after the news. We find that irrespective of the level of buying pressure, stocks with high intensity of both types of informed traders together show lower future abnormal returns. Thus, we confirm that future abnormal returns are negative not only due to larger overpricing caused by larger buying pressure, but also due to the two types of informed traders facilitating price discovery by selling at the same time. Further, we run similar tests using dispersion in analysts' forecasts as an alternative measure that captures different levels of overpricing.[5] Supporting our findings, even for different levels of dispersion in analysts' forecasts, price adjustment is faster when insiders

[4] We also measure informed trading over 21 days starting on the earnings announcement date and our conclusions do not change.

[5] Miller (1977) shows that stocks are more overpriced when investors' opinions about firm's value diverge more, provided that short sales constraints are biding. In line with Miller (1977), Diether et al. (2002) use dispersion in analysts' forecasts as a measure of investors' disagreement and show that stocks with higher dispersion in analysts' forecasts earn lower future returns.

and short sellers sell the same stocks.

Our work is related to several papers that look at the relationship between trades by short sellers and other informed investors. Massa et al. (2015) is the closest paper to our analysis. They analyze how the potential presence of short sellers affects the incentives of insiders to trade on negative material information. They show that intensity and speed of insider sales in a given month increases with higher short selling potential in the previous month. Massa et al. (2015) conclude insiders and short sellers compete for trading on foreknowledge of the same private information. We adopt their methodology to test for competition and confirm that insiders and short sellers trade on the same information even around earning announcements. However, we are different from them in a number of points. First, while Massa et al. (2015) test for presence of competition between insiders and short sellers, we go further and identify the type of information that insiders use when trading. Second, Massa et al. (2015) focus on trading decisions by insiders who possess material information that is not yet disclosed to the market. We, instead, focus our analysis just after the release of earnings news when information advantage based on foreknowledge of material information is minimal. Informed traders have to rely on their superior interpretation of public information. Third, we measure insider and short selling trading activity contemporaneously using comparable measures and show the effect of simultaneous trading on future stock returns. Furthermore, different from Massa et al. (2015), we differentiate situations when insiders' and short sellers' possess different (or uncorrelated) signals and show that when the two types of informed traders disagree on their information processing, stocks prices adjust slower than when their signals are highly correlated (Back et al. 2000).

Another paper that is closely related to ours is Franzoni et al. (2015) who study the reaction of institutional investors to the presence of short sellers. They find that institutional investors possess different information than short sellers and, therefore, engage in a 'waiting game' – they trade less aggressively and split their trades across more brokers when short sellers are active in order to hide information and extract higher rent from their information. We are different because we focus on trading of corporate insiders who, as

we demonstrate, have highly correlated information with short sellers. Moreover, we use competition among informed traders only as a tool to identify the nature of information that insiders trade on.

Finally, Chakrabarty and Shkilko (2013) examine short sellers' informedness regarding recently completed insider sales. They find that short selling done by non-market makers increases by 26% on insider selling days. They also show that short sellers trade before the public announcement of insider sales which is consistent with short sellers becoming informed about insider sales ahead of the pubic announcement, perhaps from visible order flow. We focus primarily on trading in response to public information when insiders may not necessarily possess information advantage over short sellers. In contrast, insiders might even be disadvantaged due to trading bans during earnings announcement, which do not apply to short sellers. We show that short sellers and insiders actively compete on public information processing.

We contribute to the insider trading literature in two important ways. First, we contribute with new innovative evidence to the discussion on whether insider trades may be motivated by foreknowledge of future material information (Ke et al. 2003; Cheng et al. 2007) or by their ability to recognize when their stocks are mispriced (Piotroski and Roulstone 2005; Jenter 2005). Our results suggest that insider selling after earnings announcements is mostly based on their superior information processing skills that allow them to identify overpriced stocks.

Second, empirical literature finds little evidence that insider sales, in contrast to insider purchases, are profitable (Lakonishok and Lee 2001; Jeng et al. 2003). The main explanation for these findings is that insiders often sell for reasons other than information advantage, for example, for liquidity and/or diversification reasons (Lakonishok and Lee 2001; Cheng et al. 2007). Cohen et al. (2012) show that excluding repetitive insider selling that is more likely due to liquidity/diversification reasons leads to opportunistic insider sales to become profitable and conclude that opportunistic insider trades are driven by foreknowledge of future material information. Our analysis suggests that even though insiders may often sell due to liquidity or diversification needs, they still consider relative

mispricing of their stock and tend to sell when their stock is over- rather than under-priced. Insiders tend to abstain from selling when their stock price is low, they may even switch to buying when the price drops further. Thus, when insiders decide to sell, future returns are more negative relatively to when they abstain from trading or when they purchase extra shares.

Our paper also contributes to the debates on the information content of short sellers' trades and on competition between informed traders. Within the former area, Engelberg et al. (2012) and Boehmer and Wu (2013) argue that short sellers' transactions are driven by their ability to process public information better than other investors. We enhance this evidence by showing that short sellers frequently compete with insiders who are also good public information processors. Finally, our results are in line with the theoretical predictions of Holden and Subrahmanyam (1992), Foster and Viswanathan (1996) and Back et al. (2000) on competition among informed traders. We show that when insiders and short sellers trade together immediately after earnings announcements, they trade more aggressively and prices adjust faster than in stocks where they do not overlap in trading. Competition among informed traders with highly correlated signals when they trade using their ability to analyze publicly available information enhances stock market efficiency.

The remainder of the paper proceeds as follows. Section 2 provides a brief background and discusses our main hypotheses. Section 3 describes the data collection and provides summary statistics. Section 4 discusses our findings and Section 5 concludes.

2 Testable hypotheses

Back et al. (2000) show that the nature of competition among multiple informed traders depends on the correlation of their information signals. In the case traders' signals are uncorrelated, each trader will trade less intensely and private information will be incorporated into stock prices gradually, as in Kyle (1985). This happens not only because noise traders provide informed traders with a camouflage for their profitable trades, but also because the different informed traders are expected to be on the opposite sides of the

market more frequently. A given informed trader has an extra incentive to slow down his trading because a presence of another active informed trader on the opposite side of the market means that prices are likely to move in the favorable direction. Trading too fast would result in smaller profits. In contrast, when information signals become more correlated, all informed traders expect to be on the same side of the market more frequently, which provides an inducement to trade quickly. The common private information is then incorporated into stock prices significantly faster.[6] Although all the models of informed trading are framed around trading decisions based on foreknowledge of future material information, the predictions are equally valid in the context of information signals due to superior public-information processing skills.

Engelberg et al. (2012) show that a substantial portion of short sellers' information advantage comes from their ability to analyze publicly available information. On news-announcement days, short-selling activity increases and short sellers' future returns are also significantly higher. Taking this evidence together with the Back et al. (2000) model, we imply the nature of information for insider selling decisions after earnings announcements. If it is the case that insiders' and short sellers' information signals are highly correlated, the two types of traders compete for trading in the same stocks and following Back et al. (2000) should increase intensity of their trading. In contrast, less correlated signals should be associated with insiders and short sellers trading in different stocks and with lower intensity.

We conjecture that insiders are skillful public-information processors. In recent years, with increased insider-trading regulatory scrutiny and tighter corporate trading bans before earnings announcements, insiders' advantage with respect to foreknowledge of future material information has diminished. However, the tighter regulatory environment may not necessarily mean that insiders are not able to trade with information advantage. Insiders, instead, may focus more on their superior public information processing skills and concentrate their trading shortly after earnings announcements. This is in contrast to Ke et al. (2003) who argue that insiders sell in foreknowledge of economically significant neg-

[6]These results are in line with Holden and Subrahmanyam (1992) and Foster and Viswanathan (1996).

ative accounting disclosures as long as 2 years prior to the disclosure. If this was the case, insiders' and short sellers' signals would not be highly correlated because short sellers are very unlikely to trade based on foreknowledge of long-lasting future material information. The short sellers' trading horizon is usually less than two months (Boehmer et al. 2008; Gamble and Xu 2017)

Our initial testable hypothesis is related to the notion of the competition between insiders and short sellers. If insiders' and short sellers' signals are highly correlated, insiders will feel the threat from short sellers' higher selling activity, which they predict through the supply of shares available for lending in the period before earnings announcements (Massa et al. 2015). Therefore, we expect to observe a positive association between short-selling potential before the news and trading-intensity competition between insiders and short sellers after the announcement date.

Hypothesis 1: *Insiders and short sellers are more likely to trade intensively in the same stocks after earnings announcements when the short-selling potential is higher before the news release.*

We turn now to the question of information dissemination and price discovery, which is the second important implication in the Back et al. (2000) model. If both types of informed investors possess information that is negatively correlated with future stock returns, their trading should result in lower prices. The literature is, however, split concerning whether news events, such as earnings announcements, could represent profitable trading opportunities for informed investors. On the one hand, the publication of earnings is associated with a reduction in information asymmetry, which implies diminishing chances of profitable trading by informed investors (Diamond and Verrecchia 1987; Korajczyk et al. 1991; Berkman et al. 2009). On the other hand, earnings announcements may allow investors to make their own judgements concerning firm value and trade profitably (Kim and Verrecchia 1994; Brown et al. 2009; Engelberg et al. 2012). As investors disagree concerning interpretation of public announcements, information asymmetry increases on announcement days, which presents profitable trading opportunities for informed investors. Our second hypothesis conjectures information content of insiders' and short sellers' trades.

Hypothesis 2: *The future abnormal returns are lower for stocks with high-intensity selling by insiders and/or short sellers.*

When both types of informed traders possess highly correlated information signals, the common private information should get impounded into stock prices faster. Therefore, we expect to observe more negative future abnormal returns for stocks with both types of informed traders selling intensively together. In contrast, if insiders sell on foreknowledge of future earnings, their signal should be weakly correlated with the short sellers' short-term signal and, therefore, price discovery should be slower.

Hypothesis 3: *Stock prices dercrease faster for firms where insiders and short sellers sell intensively together after earnings announcements.*

3 Data

Our sample comprises firm-quarter information from July 2006 to December 2013 for 6,099 publicly-listed US firms. We consider all US common stocks that are traded on the NYSE, NASDAQ or AMEX exchanges.[7] We obtain quarterly earnings announcements from the COMPUSTAT quarterly data file and delete firm-quarters for which no COMPUSTAT data is available. COMPUSTAT is also source of information for earnings per share, book-to-market ratio, market capitalization, total assets and other accounting information. Insider trading data comes from Thomsom Financial Insider Filings that contain all insider trading activity as reported in Forms 3, 4 and 5 specified in the Security Exchange Act of 1934. The data set contains detailed information about all reported transactions including the trading date, reporting date, insider name, insider's position in their firm, number of shares traded, transaction price and transaction type (purchase or sale). We consider only open-market purchases and sales by officers and directors.[8] As insiders sometimes trade several times on the same day, we sum all insider transactions by the same director in the same direction (purchases/sales) within one day, but we keep transactions if in different direction even on the same day. Data on short selling and equity-lending supply is from

[7] We exclude non-US incorporated firms, or ADR, ETF and REITS.

[8] Trading by large block holders is in our view of different nature and based on different trading incentives.

Markit (who acquired Data Explorers). Equity-lending information in Markit is collected daily from 125 large custodians and 32 prime brokers in the industry and covers more than 85% of the equity-lending market. A more detailed description of the data set is in Saffi and Sigurdsson (2010). This core data on insider trading and short selling around earnings announcements is then also matched with stock-return data from CRSP, analyst forecast data from I/B/E/S and intraday trade and volume data from NYSE Trades and Quotes database (TAQ).

Our key variables reflecting informed trading, all scaled by the number of shares outstanding, are (i) the number of shares sold and bought by insiders, *INsales* and *INpurchases*, and (ii) the daily number of stocks on loan, *relSS*, based on shorting transactions that are initiated on the most recent business day.[9] Figure 1 plots the three trading-activity variables 29 days around earnings announcements. As the magnitude of insider trades is considerably smaller relative to the size of short sales, we separate the two scales and place the range of *relSS* values on the left axis and of *INsales* and *INpurchases* on the right axis. We see that earnings announcements have a significant effect on selling patterns of both types of informed traders. In line with Engelberg et al. (2012), short sales increase sharply at day 0 and stay higher for up to 10 days. Insider sales, interestingly, peak only at day +3 and their trading on day +14 is still markedly higher compared to the pre-announcement level, which is not the case for short sales. Also, even though insiders trade smaller fractions of shares outstanding, their increase in selling relatively to the pre-announcement period is larger than for short sellers. It is apparent that short sellers are faster than insiders – their trades peak immediately on the announcement day, while insiders follow only three days later for both insider sales and purchases. This insider trading lag is most likely due to restrictive 'blackout' periods imposed on insiders by their employers in order to minimize their information advantage (Bettis et al. 2000; Cohen et al. 2012; Lee et al. 2014).[10]

[9]Markit also have data on the daily number of stocks that are on loan at different start dates, such as at 3, 7 and 30 days. We believe new stocks on loan within one business day better fits our purposes as we want to analyze short sales that are executed in response to earnings announcements.

[10]Bettis et al. (2000) survey 1915 members of the American Society of Corporate Secretaries regarding corporate policies and restrictions on insider trading. They find that 78% of firms in their sample have

Insert Figure 1 about here.

In Figure 2, we partition all earnings announcements into *good*, *bad* and *no news* according to terciles by the earnings-announcement market reaction. Thus, firm-quarters with good, bad and no news are firm-quarters with a 3-day earnings announcement abnormal return in the top, lowest and middle tercile, respectively. Figure 2 shows that, regardless of news direction, short-sellers' and insiders' activity still peaks at day 0 and day +3, respectively. Both types of informed traders are less active with no news. Short sellers increase their trading activity for both goof and bad news, while insiders are much more active only after good news. Insiders tend to be more contrarian traders (Sivakumar and Waymire 1994). We see that insiders do not trade sooner after earnings announcements even when they are very active after good news, which suggests that their trading lag is indeed due to their trading restrictions.

Insert Figure 2 about here.

As our analysis is built around earnings announcements and focussed on the ability of informed traders to interpret public information, we need to aggregate insider and short-selling activity following quarterly earnings announcements. We pick two alternative 'response periods'. First, we consider a response window of (0,+5) to reflect that informed trading should be relatively prompt and within five days from the earnings announcement the market should be aware of higher short-selling or insider-trading activity. As a sensitivity check, we also consider a longer response window of (0,+20) to reflect longer allowed trading periods for insiders (Bettis et al. 2000). Consequently, we compute the average daily relative number of shares sold (and bought) by insiders and the average daily relative number of shares on loan for the two response windows.

Table 1 shows firm-quarter summary statistics for all variables of interest. They are all defined in Appendix A. On average, insiders sell only 0.003% of their shares outstanding each day during the six days starting on the earnings announcement day. The quartile

explicit blackout periods. The most common policy is to ban any trading by insiders except during a trading window from day +3 through to day +12 after any quarterly earnings announcement.

numbers show that insider sales are quite rare. Indeed, as many as 82% of quarters have zero insider sales during the (0,+5) window. In contrast, short sellers are significantly more active traders. The average relative fraction of shares shorted is 0.16% and we see that only a quarter of firm-quarters has *relSS* smaller than 0.02%. In line with the literature, we see that insiders are even less active when it comes to their purchases. The average daily fraction of shares purchased is 0.001%. The average relative number of shares sold by the two types of insiders is smaller in the response period of (0,+20), reflecting the fact that both insiders and short sellers are more active closer to earnings announcements.

Insert Table 1 about here.

Further, Table 1 shows that the firms in our sample have on average 19% of their shares outstanding available for borrowing *(lendable)*, which indicates an active equity-lending market. Following Massa et al. (2015), we use *lendable* to measure the potential for future short-selling activity. The average firm in our sample has a market capitalization of USD2.97 billion, a book-to-market ratio of 0.69 and a negative change in earnings per share relatively to four quarters back of –0.37%, significant at the 1-percent level. Nevertheless, the average market reaction to the earnings announcement is 0.06%, which is significant, but not very large. The past 6-month return is 0.01% and the dispersion of analyst forecasts is 26%. The average daily fraction of buy-initiated volume over the total volume ($oimb^{+}$), which captures buying pressure during the (0,1) earnings-announcement window, is 48.93%.[11]

In order to test Hypothesis 1, we distinguish intensive informed trading using a set of dummy variables. First, we define firm-quarters with intensive insider selling. Table 1 shows that insiders are active only very rarely, in fact, only 18% of all firm-quarters experience any insider selling. This leads us to classify all quarters with any insider sales and no insider purchases during the response period into the intensive insider selling category *onlyIS*. Second, we identify also quarters with intensive insider purchases (*onlyIP*), as they represent a useful benchmark for insider sales. The complement of the two insider trading

[11] This is similar to Diether et al. (2009). Buy- and sell-initiated orders are defined using Lee and Ready (1991).

categories includes firm-quarters with both insider sales and purchases (*mixIT*) and firm-quarters without any insider trading activity (*noIT*). In following sections, we refer to the whole complement together as firm-quarters without any pure insider trading – *noPIT*. Finally, we define firm-quarters with intensive short selling (*high relSS*) as quarters with the relative number of shares shorted being in the top two terciles.[12]

Table 2 provides statistics for the interaction between intensive insider and short selling activity. Panel A, focusing on the six-day response window, shows that insiders and short sellers indeed sell together relatively frequently. Insiders are only selling (and not buying) in 16% of all quarters,[13] but in 14% of all quarters they sell together with intensive short selling. This represents 85% of all quarters with pure insider sales and is significantly higher than the 67% unconditional frequency of high relative short selling on the 1-percent level. We also see that insiders sell a larger average fraction of shares when trading in the high relative short-selling quarters (0.018% versus 0.016%, the difference is significant at the 5-percent level). This is not the case for quarters with both insider sales and purchases (*mixIT*) and these quarters are very infrequent (1%). Insider purchases are present in only 6% of quarters and are more likely with low short-selling activity. Finally, short selling without any insider trading activity covers 76% of all quarters reflecting the other side of the fact that insider trading is, in general, not very prevalent. Still, we see that without any presence of insider trading activity, short-selling intensity is slightly biased towards lower levels – the fraction of high relative short selling is 65.9%, which is significantly lower to the unconditional fraction of 67% at the 1-percent level. Moreover, conditional on high relative short selling, the average size of short-sellers' trades is significantly higher when they sell together with insiders (0.250%) than without insiders (0.227%). Panel B shows a similar picture of overlapping insider and short-seller trading for the (0,+20) response window.

Insert Table 2 about here.

[12] We opt for top two terciles instead of above median in order to have a more populated group of short selling that will reflect clearly also insider trading activity.

[13] Please note that *onlyIS* includes quarters when insiders sell but do not buy any shares, while *INsales* in Table 1 does not condition on no purchases.

Figure 3 illustrates graphically that the two types of informed traders sell indeed more when selling together. Panel A graphs the selling activity for 29 days around earnings announcements similar to Figure 1, but now conditional on the set of informed-trading categories from Table 2 within the response window of (0,+5). Note that *mixIT* is merged with *noIT* into one category of no pure insider trading (*noPIT*). We see that, when high, short selling activity peaks at day 0 regardless whether short sellers trade alone or together with insiders. Still, short sellers trade more when also insiders sell intensively at the same time. Similarly, insiders' sales peak at day +3 regardless of short-sellers' trading, but the peak is sharper when insiders sell together with high relative sort selling. We also see that the decreasing pattern for insider sales is somewhat more gradual when insiders sell with low versus high relative short selling. It suggests that insiders tend to spread their trades more when they do not face competition. Furthermore, the fact that insider sales peak at day +3 regardless of competition from short sellers strongly suggests that the insiders' lag in trading is caused by imposed blackout periods. Even when insiders have every reason to trade promptly, they start trading only on day +3 on average.

Insert Figure 3 about here.

In Panel B, the intensive selling categories are based on the response window of (0,+20). The peaks of trading are somewhat lower, which reflects the fact that the categories are based on a wider response window and include also selling after day +5.

Table 3 shows differences in firm characteristics across the full set of intensive trading categories based on the (0,+5) response window in Panel A and the (0,+20) response window in Panel B. The amount of shares available for lending is always larger for high relative short selling regardless of the insider trading category, but it is the largest when short sellers are highly active together with insider sales (26% in Panel A). Interestingly, lendable is also high when insiders sell while short selling is low (16%). It is the lowest with low short selling when insiders are buying (6%). Insiders tend to sell in large firms. In fact, firm size is the largest for insider sales with low short selling, while it is the smallest for insider purchases with low short selling (USD6.5 million versus USD0.8 million, respectively). In general, short sellers are more active in larger firms. The book-to-market

ratio is smallest when insiders sell and the largest when they buy shares. The same pattern of insiders selling high-valued firms versus buying low-valued firms is reflected in earnings per share, earnings-announcement abnormal return and 6-month past return. Firm valuations are still somewhat higher when insiders sell together with high versus low short selling.

The bottom part of Panel A shows future abnormal returns after the corresponding response window. They are calculated as the difference between the buy-and-hold raw return and its corresponding 5x5 size and book to market portfolio return over 21, 42, 63 and 126 days following the particular response window. Figure 4 clarifies the timings. The future abnormal returns do not show any clear patterns, which is probably due to the fact that future abnormal returns are very sensitive to the earnings-announcement market reaction. We control for the factor in the results section and get a more meaningful pattern. Panel B with a response window of (0,+20) provides a similar picture for all reported variables.

Insert Table 3 about here.

Table 3 also shows that characteristics of mixed insider trading firm-quarters are closer to the *noIT* firm-quarters, which justifies our focus on quarters with pure insider sales and purchases, *onlyIS* and *onlyIP*, respectively. In further tests, we merge the *mixIT* category together with *noIT* to form one reference category of no pure insider trading, *noPIT*. Nevertheless, the *mixIT* category is very small.

4 Results

4.1 Competition for informed trading

Table 2 shows that both insiders and short sellers trade the same company's stocks in around 14% of firm-quarters when their activity is aggregated over the (0,+5) response window and 24% when we extend the response window to (0,+20). This fraction is very high given insiders are selling in only 16% or 29% of all quarters when the response window is up to day +5 or +20, respectively. Moreover, both insiders' and short sellers'

trade sizes are higher when they trade together. We see that the univariate results support Hypothesis 1.

In order to test Hypothesis 1 in a regression setting, we test whether short-selling potential before earnings announcements predicts insider and short-selling intensity after the earnings releases. In line with the prediction, insiders should be compelled to trade more when the short-selling potential is higher. In Table 4, we regress the set of informed-trading categories introduced in section 3 on the short-selling potential and a set of control variables, such as firm size, book-to-market ratio and earnings per share. We estimate a multinomial logistic regression model with the group of low informed trading as a reference category.[14] As a result, Table 4 reports estimated coefficients for the following five outcomes of informed trading: (i) pure insider selling together with high short-selling intensity, *onlyIS & high relSS*; (ii) pure insider selling but low short-selling intensity, *onlyIS & low relSS*; (iii) pure insider buying together with high short-selling intensity, *onlyIP & high relSS*; (iv) pure insider buying but low short-selling intensity, *onlyIP & low relSS*; and (v) high short-selling intensity without pure insider trading, *high relSS & noPIT*. We aggregate informed trading over the response window of (0,+5).[15] The coefficients for all five categories should be interpreted relatively to the reference category of low informed trading. All variables are winsorized at the first and 99^{th} percentiles. We compute robust standard errors and allow them to cluster within firms and include year fixed effects.

Insert Table 4 about here.

In line with Hypothesis 1, higher short-selling potential increases the odds of insiders and short sellers trading intensively together, relatively to the reference category: the coefficient for *lendable* is positive and statistically significant for the first category in Table 4. In line with Massa et al. (2015), short-selling potential is significantly positive for all outcomes with high relative short selling; so also for categories 3 and 5. However,

[14] This is the group of firm-quarters that do not contain pure insider sales or pure insider purchases (*noPIT*) and, at the same time, have low short-selling intensity (*low relSS*). The mixed quarters are grouped together with no-insider-trading quarters because they do not indicate a clear trading direction.

[15] Table I.1 in the internet appendix runs the same specification with aggregation over (0,+20) relative to the earnings announcement. The results remain unchanged.

it is the highest for the first category when short sellers trade intensively together with insiders.[16] These results support the conjecture that insiders' and short sellers' signals are highly correlated, which in turn suggests that insiders, similarly to short sellers, sell with the advantage of superior public-information interpretation skills. Interestingly, high short-selling potential increases also the odds of insider selling when short sellers are not very active (category 2). So, relatively to the reference category of low informed trading, insiders sell when the potential for short selling is higher. The effect of *lendable* is negative for insider purchases with low short-selling intensity in category 4.

At the bottom of Table 4, we also report marginal effects of all explanatory variables on the probability of each outcome. We confirm that the short-selling potential increases the probability of insiders and short sellers trading intensively together: a one-unit increase in *lendable* increases the probability of the first category by 57% or, alternatively, a one-standard-deviation increase in lendable of 0.12 increases the probability of category 1 by 6.8%. Given the unconditional probability category 1 is 14%, this is a very sizable effect. In contrast, a one-standard-deviation increase in lendable decreases the probability of insider selling without intensive short selling in category 2 by 0.8% – insiders do not increase selling with *lendable* when not competing with short sellers. Finally, the marginal effect is 89% for category 5 with high short-selling intensity without insider trading, which translates into a one-standard-deviation effect of 10.6%. Note that the unconditional probability of category 5 is 50%.

The remaining control variables also reveal interesting results. To start with, the direction of the market reaction to the recent earnings announcement is quite an important factor determining the odds of informed-trading outcomes. A good earnings news increases the odds of both insider sales and/or intensive short selling. Still, the good news coefficient for the first category with insiders and short sellers selling together is the highest. Also, the average marginal effect of good news for this category is 5.0%, which is economically large. In contrast, good news does not increase the probability of insider selling without short sellers. The marginal effect is only 0.2% and is insignificant.

[16] A Wald-test for the difference between the coefficients being zero rejects the null at the 1-percent level.

A bad earnings news has a marginal effect on the probability of joint informed selling of –3.2%. A bad news also decreases the probability of insider selling without intensive short selling in category 2, but the size of the effect is only –1.2%. In contrast, high intensity of short selling without the presence of insider selling in category 5 is more likely with a negative earnings news, the marginal increase with bad news is a sizeable 6.4%. Insiders seem to avoid selling after bad news, perhaps due to higher legal jeopardy. The market perception of earnings news is also important for insider purchases, but opposite to intuition, the marginal effect of bad news on the probability of insider buying is stronger when short selling intensity is also high (2.0% for *high relSS* versus –0.1% for *low relSS*).

The coefficients for the book-to-market ratio and past return suggest that when insiders and short sellers trade together, they trade on average as contrarians. When short sellers trade actively on their own (category 5), they do not sell highly valued stock. High valuations increase the probability of both types trading together, but decrease the probability of short sellers and insiders trading intensively alone. A one-standard-deviation increase in the book-to-market ratio of 0.53 decreases the probability of the first category by 6.1%, while it increases the probability of category 2 with only insiders selling by 0.2% and of category 5 with only intensive short selling by 1.5%. Firm size increases the probability of short-selling intensity both with and without insiders selling at the same time. Insiders sell alone in firms that are a bit smaller. In line with the insider trading literature, insiders buy in relatively small firms. Finally, the earnings per share is, in contrast to the market reaction to the earnings announcement, not very significant. Importantly, comparing the marginal effect across the set of explanatory variables we see that the short-selling potential plays an important role in determining informed trading.

4.2 Predictability of future post-trading returns

Now we turn to testing Hypotheses 2 and 3, which conjecture that intensive selling by both insiders and short sellers are associated with more negative future returns. In Table 5, we regress post-trading abnormal returns, *postAR*, on our six informed-trading categories.[17]

[17]Returns are adjusted for the corresponding quintile size and book-to-market portfolio return and are compounded over over 1 to 6 months after earnings announcements. Figure 4 shows the timings. Table I.2

Panel A aggregates informed trading over the response window of (0,+5), while Panel B extends the response window to (0,+20). Again, as in Table 4, the reference category is the group of firm-quarters with low informed trading. All specifications control for the short-selling potential, earnings-news direction dummies and firm and year fixed effects.

Insert Table 5 about here.

First, Table 5 shows that insider selling is associated with more negative future abnormal returns over all horizons and for both response windows, while insider buying predicts more positive future returns. The two coefficients covering insider selling are significantly negative and the two coefficients covering insider purchases are significantly positive. All are relative to the category of low informed trading. Future returns are significantly more negative also for the category of intensive short selling without pure insider trading, except for the horizon of 1 month. All these coefficients are in line with Hypothesis 2: intensive informed selling by insiders or short sellers is associated with more negative future returns.

Hypothesis 3 explores the patterns of future returns further and conjectures that price discovery is the fastest when the two types of informed sellers possess highly correlated signals. In order to confirm the conjecture, the coefficient for the joint intensive selling category should be the most negative. We see that the coefficient for category 1 is indeed the smallest and its differences with the other two negative coefficients are statistically significant on the 1-percent level.[18] Competition in selling makes future returns more negative – we see faster price discovery. In particular, abnormal returns for stocks with both intensive insider and short sales are 0.5% lower than for stocks with intensive short selling but no pure insider trading the first month after the announcement date and continue to be lower after 2, 3 and 6 months. The difference after 6 months increases to 5.5%.[19] They are also lower than for stocks with insider selling but less intensive short selling, with the gap increasing from 0.1% over 1 month to 2.2% over 6 months. We can conclude that when

shows results for future returns relatively to a four-factor model benchmark.

[18] A Wald-test for the difference between the coefficients being zero rejects the null at the 1-percent level for all specifications except the 1-month horizon in Panel A.

[19] Note that abnormal returns are not common-base adjusted – they represent the overall percentage return over the measured horizon, which means that they are not directly comparable.

informed traders sell without the presence of the other type of informed traders, future returns are still going down, but price discovery is slower.

So far, we are able to assess relative future performance across the informed-trading categories, but we are also interested in making general statements concerning profitability of informed trading. Therefore, at the bottom of the two panels in Table 5, we also report average marginal effects by the six informed-trading categories.[20] The marginal effects suggest that insiders and short sellers indeed profit on their sales. Future return of stocks that they both sell intensively together decreases by 1.1% over 1 month and by 4.6% over 6 months. Future returns are also significantly negative when insiders sell alone, but their magnitude is significantly smaller: –1% over 1 month, but only –2.3% over 6 months. Insiders profit also when buying their company stock. Their future return is 1.2% over 1 month regardless of whether they buy together with intensive short selling or not. Over 6 months, insiders gain 3.2% and 4.5% when they buy together with high and low relative short selling, respectively. This is the only category of high short-selling intensity where short sellers seem to lose money. Short sellers profit on their sales when trading intensively without pure insider trading: the future return is –0.5% over 1 month and decreases to –1.7% over 6 months. Clearly, profits are the highest when insiders and short sellers compete together.

In line with intuition, *lendable* as a proxy for short-selling potential is associated with lower future returns in all specifications. For example, the significantly negative coefficient for the 1-month future return in column 1 of Panel A indicates that a one-standard-deviation increase in the relative number of stocks available for lending before the earnings announcement of 0.12 is decreases future abnormal returns by 0.7%. A corresponding decrease for the 6-month return is 4.7%. This is an economically significant effect. In this context, it is important to highlight that our result of smaller future returns when both insiders and short sellers trade together holds indeed *after* controlling for the short-selling potential. The actual competition between short sellers and insiders results in smaller

[20] We compute the fitted value when the corresponding dummy variable is set to one while using sample average values for all remaining control variables.

future returns even after controlling for the short-selling potential.

The first graph in Figure 5 illustrates visually the negative effect of *lendable* on future abnormal returns across all six categories of informed trading for the horizon of 2 months and the (0,+5) response window.Higher short-selling potential translates into smaller future abnormal returns. We also see that future returns are the most negative for the category of intensive selling by both insiders and short sellers, denoted by the dotted line. Almost the whole line is below zero showing that informed traders earn positive profits. The gap to the next two categories is relatively large: future returns when insiders and short sellers trade alone are larger. The highest is the future return for insider purchases without intensive short selling (the dashed line), shortly followed by insider purchases with intensive short selling (the full black line).

Insert Figure 5 about here.

Figure 5 shows further 3 graphs, where we partition by the direction of the recent earnings-announcement market reaction. Comparing the 3 graphs, we see that the slope is slightly less negative for *no news* and more pronounced for *good* and *bad news*. Future return is more sensitive to the short-selling potential when the earnings surprise is larger. Also, all the lines in the graph for *good news* are shifted somewhat higher relatively to the graph with *bad news*: the future return is on average more positive. Overall, we confirm that the category of intensive informed trading by both insiders and short sellers gains the most negative future return and the gap to the next two categories is persistently large regardless of the earnings news.

In Table 6, we confirm the effect of earnings-news direction in a regression setting.We see that future abnormal returns are significantly lower in stocks with intensive trading by both insider and short sellers irrespective of the direction of the news. However, stronger price adjustments are concentrated mainly in stocks with positive and negative earnings news and less so in stocks without news. This suggests that, when selling intensively together, insiders and short sellers trade stocks with a strong market reaction to the recent earnings announcement. The fact that future returns are significantly lower after intensive informed selling for both good and bad earnings news also suggests that insiders and short

sellers sell stocks that experience an overreaction to a positive news and underreaction to a negative news. Finally, in line with our predictions, abnormal returns are significantly lower for both good and bad news stocks when both insiders and short sellers sell together.

Insert Table 6 about here.

4.3 Alternative explanations

Previous literature suggests that insiders trade on foreknowledge of future disclosures concerning sharp decline in firm future prospects (Ke et al. 2003; Piotroski and Roulstone 2005; Cheng et al. 2007). We argue that the fact that insiders compete for trading with short sellers, who have relatively short trading horizons, makes this kind of information advantage less likely. Nevertheless, it is still possible that earnings information released through current earnings announcements is correlated with future earnings news and insiders trade on this future information even though their selling seems to correlate with short selling. Therefore, in Table 7 we provide further analysis concerning the use of future earnings news as a source of insider trading advantage.

Similarly to Piotroski and Roulstone (2005), we take the cumulative return on assets ($cumROA$), cumulative earnings per share ($cumEPS$) and cumulative earnings announcement abnormal returns ($cumEAAR$) from the next quarter until the quarter one year ahead as a proxy for future earnings news.[21] Then, we test whether the future four-quarter earnings information affects the odds of insiders and/or short sellers trading shortly after the current earnings announcement. Table 7 reports estimation results for a multinomial logistic regression that regresses our set of informed-trading categories on all the variables used in section 4.1 (Table 4) plus the future-earnings proxies.[22] The reference category is again the group of firm-quarters with low informed trading. To save space, we report only results concerning the (0,+5) response window. Our results are confirmed when we replicate the analysis for the (0,+20) response window.

[21] In other words, we sum of ROA, EPS, EA abnormal returns over future four quarterly earnings announcements. Piotroski and Roulstone (2005) use future realized changes in return on assets as a proxy for future change in fundamentals.

[22] We replace the earnings-response dummy variables (good and bad news) with the earnings-announcement abnormal return.

Insert Table 7 about here.

We see that the cumulative EPS and cumulative earnings-announcement abnormal return significantly reduce the odds of insiders and short sellers trading together relative to the category of low informed trading. The coefficient for cumulative ROA is not significant.[23] This means that poorer future earnings information predicts higher odds of insiders and short sellers trading intensively together relatively to both types of informed traders selling with low intensity. The marginal *probability* effects at the bottom of Table 7, however, do not support a conjecture that joint insiders' and short sellers' trading is based on foreknowledge of future (one-year-ahead) cash flow. In fact, a one-standard-deviation decrease in cumulative EPS and cumulative earnings-announcement abnormal return do not significantly increase the probability of the first category. Moreover, the average marginal effect for the cumulative ROA has a significantly positive sign, indicating higher rather than lower future earnings when insiders and short sellers trade together. To profit on foreknowledge, informed sellers should exploit foreknowledge of future negative news. This result suggests that insiders and short sellers do not trade pro-actively together taking advantage of future earnings news, at least within the four future quarters.

We come to a similar conclusion with respect to the second category of insider selling with low relative short selling. The marginal effects for cumulative ROA and EPS are positive and significant, though small in magnitude. A one-standard-deviation decrease in cumulative ROA (EPS) decreases the probability of the second category by 0.6% (0.4%). The cumulative abnormal return effect is insignificant. Interestingly, our results suggest that the probability of intensive short selling without pure insider trading (category 5) increases with poor future earnings. We believe, this is because short sellers tend to trade more frequently after negative news announcements that might further extend into more negative news over the coming year. Insiders, who are more likely to be aware of negative future earnings disclosures, avoid selling to minimize the risk of legal prosecution.

Our second alternative interpretation concerns mispricing versus competition in trad-

[23] In Table I.3 the internet appendix, we also run specifications where we include only one of the future-earnings variables at the time. We get similar results to those reported in Table 7. This suggests that the correlation between the three future-earnings variables is relatively low.

ing. Section 4.2 shows that stock prices adjust faster in firms where insiders and short sellers trade intensively together, suggesting that they compete for trading on the same information. However, the large documented price adjustment may be driven by the level of overpricing rather than by competition. In other words, if some firms become more overpriced, their corresponding price correction should naturally be larger irrespective of any informed trading. Or putting the argument from the opposite side, if insiders and short sellers compete because they possess correlated information signals, their competition in trading should lead to smaller future abnormal returns regardless of the initial level of mispricing.

Controlling for different levels of overpricing is not simple, but we approach the challenge in two ways. First, similar to Diether et al. (2009), we distinguish different levels of overpricing using the fraction of purchase-initiated orders during the recent earnings announcement, $oimb^{+}$. This measure should, similarly to the positive component of order imbalance, capture temporary buying pressure: the larger the fraction of buy-initiated trades, the higher the market sentiment and, therefore, the larger the potential overpricing. Second, we take dispersion in analyst forecasts, *disp*, as a measure of divergence in investors' opinions. Following Miller (1977), with high divergence in investors' opinions, stock prices reflect valuations of the most optimistic investors who push the demand for the stock up and cause overpricing. In line with this argument, Diether et al. (2002) show that stocks with higher dispersion in analysts' forecasts earn significantly lower future returns.

In Table 8 we regress the future abnormal return on the set of informed-trading categories as in section 4.2, but now by quartiles of buying pressure. To save space, we report only results for the 2-month future abnormal returns, but our conclusions extend for all horizons as reported in Table 5.[24] The estimated coefficients across the four buying-pressure quartiles in Panel A confirm our conclusions concerning Hypothesis 3. Future abnormal returns are significantly the most negative in quarters where insiders and short sellers sell together across all four $oimb^{+}$ quartiles. Thus, we observe the effects of competition irrespective of buying pressure. In contrast, the coefficient for insider selling with

[24] See Table I.5 and I.6 in the internet appendix.

low relative short selling is significantly negative only in the highest quartile. This suggests lower future returns only with higher overpricing when insiders sell on their own without short sellers. The coefficient for short selling without insider sales is significantly negative in the top 3 quartiles, but the coefficients are significantly larger (less negative) than when short sellers agree with insiders in selling.

Insert Table 8 about here.

Panel B of Table 8 reports the results for quartiles by the dispersion in analysts' forecasts. It is worth mentioning two important drawbacks of dispersion in analysts' forecasts. First, the use of dispersion in analysts' forecasts may imply important biases. Small firms are generally not covered by many analysts and, therefore, we may have many missing observations. At the same time, smaller firms usually suffer higher information asymmetries, which may be associated with higher potential divergence in investors' opinions and result in higher earnings-announcement market reactions. This means that *disp* underestimates mispricing. Second, the measure does not capture divergence in investors' opinions during the short window of earnings announcements. Analysts' forecasts reflect expectations concerning the earnings news and, therefore, the measure captures analysts' divergence before the earnings announcement rather than investors' disagreement as a result of the news announcement. We are more interested in the latter rather than the former effect. Nevertheless, the results in Panel B again confirm our conclusions.[25] In particular, the future abnormal return is more negative when insiders and short sellers trade together and this holds across all the quartiles of *disp* but quartile 1 with the smallest mispricing.

5 Conclusions

In this paper, we study whether corporate insiders trade on superior interpretation of public information or rather on foreknowledge of private information. Due to recent trends in insider-trading regulation, we restrict our attention to periods immediately after earnings announcements when possibilities for short-term private information are substantially re-

[25] Note that the sample size shrinks significantly relative to the results in Panel B of Table 8.

duced. We identify the type of information insiders use by analyzing their trading activity in the context of trading activity of another group of informed traders – short sellers. From a theoretical point of view (Foster and Viswanathan (1996), Back et al. (2000)), the presence of another group of informed traders should increase the speed of insider trading if both groups' information is highly correlated. In contrast, if the correlation between informed signals is low, insiders should optimally slow down their trading in expectation that their rivals move prices in the opposite direction to their own signal.

We show that insiders increase their trading intensity in stocks with higher presence of short sellers. Furthermore, we find that when both types of informed traders sell intensively, the speed of information dissemination increases substantially. This implies that insiders and short sellers trade on highly correlated information. Given the recent evidence in the literature that short sellers tend to trade on superior public-information processing skills, we conclude that insiders trade, as short sellers, on overreaction to positive or underreaction to negative public (earnings) news.

We believe that high correlation of signals between insiders and short sellers helps to rule out the possibility that insiders trade on future material information because short sellers are known for their short trading horizons. Nevertheless, it could still be the case that the current public information is highly correlated with future material information and it is the future material information that triggers insider selling. To rule out this scenario, our analysis controls for future realized earnings surprises as a measure of insiders' foreknowledge. We find that lower future cumulative earnings surprises do not increase the odds of insider selling, neither with nor without intensive short selling. This result reinforces our conclusion that insiders are unlikely to trade on the foreknowledge of long-lasting future earnings news.

Finally, we test whether low future post-trading returns after joint high insider and short-selling activity is driven by excessive buying pressure right after the earnings news rather than competition in trading. We confirm that irrespective of the level of buying pressure, stocks with high intensity of both types of informed traders together show lower future abnormal returns. Future abnormal returns are negative not only due to larger

overpricing caused by larger buying pressure, but also due to the two types of informed traders facilitating faster price discovery by selling at the same time.

Our main contribution is to the debate on the nature of insider trading. We show that insiders are earning abnormal profits from their trades even after tightening of insider-trading regulation. Our evidence suggests that insider trading can still be regarded as a source of information and can serve as a proxy for informed transactions in empirical studies. However, contrary to conventional opinion that insiders profit from foreknowledge of material private information, we show that the nature of information used by insiders comes from superior processing of public news, at least in the period after earnings announcements when insiders have clearance to trade. This information processing skill is also beneficial for the stock-market quality because it helps to correct mispicing following earnings announcements and leads to higher information efficiency. Our evidence is, therefore, supportive of the effectiveness of insider-trading regulations that direct insider trading towards trading on public rather than private information.

Appendix A Variable definitions

Variable	Definition	Source
Bad news	Dummy variable equal to 1 for all firm-quarters in the lowest tercile of the 3-day earnings-announcement abnormal return and 0 otherwise.	CRSP, French's web site
B/M ratio	Book value of equity corresponding to the previous quarter over the market capitalization two days before the earnings announcement.	COMPUSTAT
CumROA, cumEPS, cumEAAR	Cumulative earnings per share, return on assets and earnings-announcement abnormal returns, respectively, correspond to the sum of the corresponding measure over the next 4 quarters (from quarter q+1 until the quarter q+4).	COMPUSTAT
Disp	Dispersion of analysts forecasts is the standard deviation of quarterly earnings-per-share forecasts for the current earnings announcement that are issued in the period between the last earnings announcement and two days prior to the current earnings announcement, divided by the absolute value of the median analyst forecast.	I/B/E/S
ΔEPS	Net earnings before extraordinary items per share less net earnings before extraordinary items per share in the same quarter 1 year sooner, scaled by the share price 2 days before the earnings announcement.	COMPUSTAT
EA abnormal return	Buy-and-hold abnormal stock return over 3 days around the last earnings announcement date $(-1, +1)$ estimated as the difference between the observed return and the return of a four-factor model based on Fama and French (1992) and Cahart (1997).	CRSP, French's web site
Good news	Dummy variable equal to 1 for all firm-quarters in the top tercile of the 3-day earnings-announcement abnormal return and 0 otherwise	CRSP, French's web site
High (low) relSS	High (low) relative short selling is a dummy variable equal to one for all firm-quarters the two top (bottom one) terciles of relative shares shorted aggregated over the response window of (0,+5) or (0,+20).	Markit(Dataexplorers) & Thomsom Financial
INsales	Insider sales is the average daily number of shares sold by insiders scaled by the number of shares outstanding, averaged over the two response windows of (0,+5) and (0,+20).	Thomsom Financial
INpurchases	Insider purchases is the average daily number of shares purchased by insiders scaled by the number of shares outstanding, averaged over the two response windows of (0,+5) and (0,+20).	Thomsom Financial
Lendable	The average daily number of shares available for lending over (-30, -3) relatively to the earnings announcement, scaled by the number of shares outstanding.	Markit(Dataexplorers).

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Variable	Definition	Source
MixIT	Mixed insider trading is a dummy variable equal to one for all firm-quarters with both insider purchases and sales aggregated over the response window of (0,+5) or (0,+20).	Thomsom Financial
NoIT	No insider trading is a dummy variable equal to one for all firm-quarters without any insider sales or purchases over the response window of (0,+5) or (0,+20).	Thomsom Financial
NoPIT	No pure insider trading is a dummy variable equal to one for all firm-quarters without any insider sales or purchases or containing only both insider purchases and sales over the response window of (0,+5) or (0,+20).	Thomsom Financial
No news	Dummy variable equal to 1 for all firm-quarters in the middle tercile of the 3-day earnings-announcement abnormal return and 0 otherwise	CRSP, French's web site
Oimb^{+}	The daily buy-order imbalance averaged over (0,1) window relatively to the earnings announcement, computed as the daily volume of buy-initiated transactions scaled by the total daily volume. Buy- and sell-initiated orders are defined using the Lee and Ready (1991) algorithm.	TAQ data
OnlyIS	A dummy variable equal to one for all firm-quarters with insider sales but no insider purchases over the response window of (0,+5) or (0,+20).	Thomsom Financial
OnlyIP	A dummy variable equal to one for all firm-quarters with insider purchases but no insider sales over the response window of (0,+5) or (0,+20).	Thomsom Financial
RelSS	Relative short selling is the average number of shares shorted within 1 business day scaled by the number of shares outstanding. In the analysis, it is averaged over the two response periods of (0,+5) and (0,+20).	Markit(Dataexplorers)
PastAR(6m)	The buy-and-hold market-adjusted stock return over 6 months ending 1 month before an earnings announcement. Returns are adjusted using the corresponding value weighted portfolio as downloaded from CRSP database.	CRSP, French's web site
PostAR(t_1,t_2)	The raw buy-and-hold stock return beginning t_1 and ending t_2 days after earnings announcement date adjusted for the corresponding 5x5 size and book to market portfolio return as downloaded from the Kenneth French web site or the market portfolio return.	CRSP, French's web site
Size	The market capitalization (stock price times the number of shares outstanding) 2 days before the earnings announcement. In regressions used in a logarithmic transformation.	COMPUSTAT

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Table 1: Summary statistics.

This table reports summary statistics for all the firms in our sample. We report informed trading statistics over two response periods, from day 0 to 5 and from day 0 to 20 after the earnings announcement date. All variables are defined in the Appendix A. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

Variable	# obs.	mean	standard dev.	p25	p50	p75
RelSS (0,+5)	102,149	0.164%	0.225%	0.019%	0.081%	0.215%
INsales (0,+5)	102,149	0.003%	0.015%	0.000%	0.000%	0.000%
INpurchases (0,+5)	102,149	0.001%	0.009%	0.000%	0.000%	0.000%
RelSS (0,+20)	102,149	0.149%	0.192%	0.025%	0.086%	0.196%
INsales (0,+20)	102,149	0.002%	0.008%	0.000%	0.000%	0.001%
INpurchases (0,+20)	102,149	0.001%	0.004%	0.000%	0.000%	0.000%
Lendable	102,149	18.57%	12.09%	7.82%	18.79%	27.97%
Size (millions)	101,733	2,964	7,236	133	531	2,098
B/M ratio	96,483	0.68	0.53	0.32	0.56	0.91
ΔEPS	101,364	-0.38%^{a}	8.05%	-0.82%	0.06%	0.71%
EA abnormal returns	102,149	0.06%^{b}	8.32%	-3.90%	-0.09%	3.86%
CumROA	102,149	-0.10%^{c}	16.43%	-0.37%	2.26%	6.61%
CumEPS	102,149	99.13%^{a}	200.53%	-6.00%	69.00%	190.00%
CumEAAR	81,200	0.71%^{a}	18.00%	-8.41%	0.28%	9.59%
PastAR(6m)	102,133	0.01%	4.57%	-2.47%	-0.11%	2.37%
Disp	63,204	25.94%^{a}	54.99%	4.16%	8.68%	21.05%
Oimb^{+} (0,+5)	100,239	48.93%^{a}	7.56%	46.56%	49.65%	52.25%

Table 2: Frequency and intensity of insider trading and short selling across the informed-trading categories.

This tables shows frequencies across eight groups of informed-trading categories. Panel A aggregates informed trading over the response window of (0,+5) relative to the earnings announcement, while Panel B aggregates over the response window of (0,+20). *OnlyIS* (*onlyIP*) is set to one for all firm-quarters with only insider sales (purchases) but no insider purchases (sales) and zero otherwise. *MixIT* is set to one for all firm-quarters with both insider sales and purchases and zero otherwise. *NoIT* is set to one for all firm-quarters without any insider transactions and zero otherwise. Finally, *high(low) relSS* is set to one for all firm-quarters in the top two terciles (bottom tercile) relative short sales during the corresponding response period. All variables are defined in Appendix A.

	Firm-quarter			Relative shares traded		
Category	# obs.	% of total	within-group fraction	relSS	INsales	INpurchases
			Panel A: response period (0,+5)			
OnlyIS & high relSS	14,151	13.9%	85.2%	0.250%	0.018%	
OnlyIS & low relSS	2,455	2.4%	14.8%	0.014%	0.016%	
MixIT & high relSS	770	0.8%	78.1%	0.267%	0.017%	0.008%
MixIT & low relSS	216	0.2%	21.9%	0.010%	0.018%	0.014%
OnlyIP & high relSS	3,995	3.9%	61.7%	0.245%		0.011%
OnlyIP & low relSS	2,479	2.4%	38.3%	0.007%		0.015%
NoIT & high relSS	51,431	50.3%	65.9%	0.227%		
NoIT & low relSS	26,652	26.1%	34.1%	0.009%		
Total	102,149					
			Panel B: response period (0,+20)			
OnlyIS & high relSS	24,896	24.4%	84.2%	0.221%	0.006%	
OnlyIS & low relSS	4,688	4.6%	15.8%	0.018%	0.006%	
MixIT & high relSS	4,166	4.1%	76.4%	0.216%	0.005%	0.002%
MixIT & low relSS	1,288	1.3%	23.6%	0.013%	0.005%	0.004%
OnlyIP & high relSS	6,882	6.7%	57.3%	0.204%		0.003%
OnlyIP & low relSS	5,126	5.0%	42.7%	0.010%		0.005%
NoIT & high relSS	34,414	33.7%	62.5%	0.203%		
NoIT & low relSS	20,689	20.3%	37.5%	0.012%		
Total	102,149					

Table 3: Firm characteristic across the informed-trading categories.

This table reports summary statistics across eight informed-trading categories. Panel A aggregates trading over the response window of (0,+5) relative to the earnings announcement, while Panel B aggregates over (0,+20). *OnlyIS* (*onlyIP*) is set to one for all firm-quarters with only insider sales (purchases) but no insider purchases (sales) and zero otherwise. *MixIT* is set to one for all firm-quarters with both insider sales and purchases and zero otherwise. *NoIT* is set to one for all firm-quarters without any insider transactions and zero otherwise. Finally, *high(low) relSS* is set to one for all firm-quarters in the top two terciles (bottom tercile) relative short sales during the corresponding response period. All variables are defined in Appendix A. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

		OnlyIS		MixIT		OnlyIP		NoIT	
Variables	Total	high relSS	low relSS	high relSS	low relSS	high relSS	low relSS	high relSS	low relSS
				Panel A: response window (0,+5)					
Lendable	18.54%	26.21%	15.83%	24.06%	10.13%	21.76%	6.43%	22.26%	8.12%
Size (millions)	2,964	4,840	6,503	4,271	3,667	1,894	792	2,990	1,906
B/M	0.68	0.46	0.63	0.55	0.82	0.76	1.01	0.64	0.87
ΔEPS	-0.38%	0.25%	0.27%	-0.36%	0.34%	-1.21%	-0.95%	-0.44%	-0.48%
Oimb^{+}(0,+5)	8.33%	5.49%	9.91%	5.78%	12.95%	6.37%	16.14%	6.25%	13.39%
Disp	0.26	0.20	0.17	0.26	0.30	0.30	0.37	0.27	0.30
PastAR(6m)	0.01%	1.30%^{a}	0.83%^{a}	0.64%^{a}	0.50%^{c}	-1.19%^{a}	-1.19%^{a}	0.00%	-0.48%^{a}
CumROA	-0.10%^{c}	4.71%^{a}	4.03%^{a}	2.71%^{a}	0.40%	-2.36%^{a}	-3.96%^{a}	0.06%	-2.73%^{a}
CumEPS	99.13%^{a}	176.46%^{a}	165.01%^{a}	134.23%^{a}	92.65%^{a}	46.61%^{a}	28.95%^{a}	103.68%^{a}	56.70%^{a}
CumEAAR	0.71% ^{a}	0.97%^{a}	0.47%	0.93%	-0.29%	1.41%^{a}	1.63%^{a}	0.28%^{b}	1.26%^{a}
EA abnormal returns	0.06% ^{a}	2.35%^{a}	1.64%^{a}	0.05%	0.25%	-3.02%^{a}	-0.82%^{a}	-0.31%^{a}	-0.06%
PostAR(+5,+25)	-0.51%^{a}	-0.20%^{b}	-0.42%^{b}	0.08%	0.31%	0.85%^{a}	0.04%	-0.28%^{a}	-1.37%^{a}
PostAR(+5,+46)	-0.39%^{a}	0.21% ^{b}	0.04%	0.16%	0.29%	0.92%^{a}	-0.82%	0.00%	-1.64%^{a}
PostAR(+5,+67)	-0.65%^{a}	0.03%	-0.36%	-0.80%	0.27%	0.36%	-1.00%^{b}	-0.32%^{a}	-1.77%^{a}
PostBHAR(+5,+130)	-0.98%^{a}	0.15%	-0.32%	-0.45%	0.66%	1.16%^{a}	-2.49%^{a}	-2.62%^{a}	-0.55%^{a}
				Panel B: response window (0,+20)					
Lendable	18.54%	25.96%	14.16%	23.69%	9.28%	21.69%	6.27%	21.46%	7.30%
Size (millions)	2,964	4,494	5,556	4,071	2,953	1,792	7,33	2,711	1,668
B/M ratio	0.68	0.48	0.67	0.57	0.86	0.77	1.01	0.67	0.88
ΔEPS	-0.38%	0.16%	0.33%	-0.09%	-0.44%	-1.23%	-0.95%	-0.57%	-0.49%
Oimb^{+}(0,+20)	8.57%	5.66%	10.75%	5.90%	14.33%	6.51%	16.40%	6.52%	14.01%
Disp	0.26	0.21	0.18	0.25	0.23	0.30	0.39	0.29	0.33
PastAR(6m)	0.01%	1.05%^{a}	0.60%^{a}	0.34%^{a}	0.01%	-1.10%^{a}	-1.05%^{a}	-0.18%^{a}	-0.51%^{a}
EA abnormal returns	0.06%^{a}	1.37%^{a}	1.13%^{a}	-0.11%	0.20%	-2.08%^{a}	-0.53%^{a}	-0.43%^{a}	-0.08%
CumROA	-0.10% ^{c}	3.93%^{a}	2.90%^{a}	1.51%	0.10%	-2.95%^{a}	-3.60%^{a}	-0.78%	-3.01%^{a}
CumEPS	99.13% ^{a}	165.35%^{a}	146.51%^{a}	133.12%	90.60%^{a}	43.79%^{a}	31.92%^{a}	92.42%^{a}	48.64%^{a}
CumEAAR	0.71% ^{a}	0.88%^{a}	0.65%	0.80%	2.31%	0.63%^{a}	2.18%^{a}	0.11%^{a}	1.07%^{a}
PostAR(+20,+40)	0.01%	0.57%^{a}	-0.05%	0.28%^{c}	-1.13%^{a}	0.37%^{b}	-1.02%^{a}	0.33% ^{a}	-0.99%^{a}
PostAR(+20,+61)	-0.13%^{a}	0.45%^{a}	0.14%	-0.18%	-1.18%^{b}	-0.17%	-0.83%^{a}	0.12%	-1.00%^{a}
PostAR(+20,+82)	-0.59%^{a}	0.18%^{c}	-0.21%	-0.60%^{b}	-0.72%	-0.65%^{b}	-0.87%^{b}	-0.48%^{a}	-1.67%^{a}
PostBHAR(+20,+145)	-0.76%^{a}	0.12%	0.27%	-0.59%	-1.29%^{c}	-0.42%	-1.80%^{a}	-2.24%^{a}	-0.52%^{a}

Table 4: Multinomial logistic regression: informed-trading categories.

This table reports estimation results for a multinomial logistic regression, where the dependent variable is a categorical variable measuring short and insider selling intensity in the response window of (0,+5) relative to the earnings announcement. The reference category is the group of firm-quarters, which do not contain pure insider sales or pure insider purchases and, at the same time, have low short-selling intensity. We have 96228 firm-quarters. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Category 1 onlyIS & high relSS		Category 2 onlyIS & low relSS		Category 3 onlyIP & high relSS		Category 4 onlyIP & low relSS		Category 5 high relSS & noPIT	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Lendable	15.498^{a}	(0.290)	5.957^{a}	(0.345)	12.006^{a}	(0.244)	11.587^{a}	(0.311)	-2.403^{a}	(0.557)
Bad news	0.043	(0.036)	-0.273^{a}	(0.059)	0.395^{a}	(0.026)	0.773^{a}	(0.048)	0.105^{c}	(0.056)
Good news	0.704^{a}	(0.034)	0.318^{a}	(0.052)	0.289^{a}	(0.026)	0.094^{c}	(0.053)	-0.140^{b}	(0.058)
Size	0.437^{a}	(0.019)	0.302^{a}	(0.022)	0.265^{a}	(0.015)	0.178^{a}	(0.020)	-0.119^{a}	(0.025)
B/M	-1.487^{a}	(0.062)	-0.351^{a}	(0.062)	-0.498^{a}	(0.036)	-0.203^{a}	(0.049)	0.215^{a}	(0.045)
PastRET(6m)	5.026^{a}	(0.329)	3.731^{a}	(0.470)	-0.538^{b}	(0.235)	-4.872^{a}	(0.450)	-1.171^{a}	(0.450)
ΔEPS	-0.157	(0.194)	0.098	(0.302)	-0.444^{a}	(0.133)	-0.278	(0.244)	0.064	(0.201)
Constant	-5.794^{a}	(0.131)	-4.266^{a}	(0.164)	-3.088^{a}	(0.094)	-5.665^{a}	(0.157)	-2.031^{a}	(0.148)
χ^2	11,004									
PseudoR^2	0.208									
					Average marginal effects					
Lendable	0.566^{a}	(0.016)	-0.064^{a}	(0.007)	0.079^{a}	(0.007)	-0.155^{a}	(0.013)	0.887^{a}	(0.003)
Bad news	-0.032^{a}	(0.003)	-0.012^{a}	(0.001)	0.020^{a}	(0.002)	-0.001	(0.001)	0.064^{a}	(0.004)
Good news	0.050^{a}	(0.003)	0.002	(0.001)	-0.007^{a}	(0.002)	-0.006^{a}	(0.001)	-0.004	(0.004)
Size	0.023^{a}	(0.001)	0.002^{a}	(0.000)	-0.002^{a}	(0.001)	-0.005^{a}	(0.001)	0.012^{a}	(0.004)
B/M	-0.115^{a}	(0.006)	0.003	(0.002)	0.012^{a}	(0.002)	0.009^{a}	(0.001)	0.029^{a}	(0.004)
PastRET(6m)	0.598^{a}	(0.029)	0.083^{a}	(0.011)	-0.202^{a}	(0.016)	-0.025^{b}	(0.010)	-0.463^{a}	(0.002)
ΔEPS	0.022	(0.019)	0.008^{c}	(0.007)	0.000	(0.009)	0.005	(0.004)	-0.075^{b}	(0.002)

Table 5: Post-trading abnormal returns.

This table reports estimation results for regressions of future abnormal returns on the informed-trading categories. In all specifications, the dependent variable is the size and book-to-market adjusted abnormal return. Panel A aggregates informed trading over the response window of (0,+5) and then measures abnormal returns over 1, 2, 3 and 6 months starting on day +5 relatively to the earnings announcement. Panel B is based on the response window of (0,+20) with abnormal returns starting on day +20 (see Figure 4). We have 93377 firm-quarter observations. All specifications include fixed firm and time effects. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels. The bottom of both panels reports fitted *postAR* values, which are computed without standardization of variables.

	PostAR(+5,+25)		PostAR(+5,+46)		PostAR(+5,+67)		PostAR(+5,+130)	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
				Panel A: response window (0,+5)				
OnlyIS & high relSS	-0.005^{a}	(0.001)	-0.014^{a}	(0.002)	-0.027^{a}	(0.004)	-0.058^{a}	(0.004)
OnlyIS & low relSS	-0.004^{b}	(0.002)	-0.006^{b}	(0.003)	-0.018^{a}	(0.005)	-0.036^{a}	(0.005)
OnlyIP & high relSS	0.017^{a}	(0.002)	0.014^{a}	(0.003)	0.013^{a}	(0.006)	0.019^{a}	(0.006)
OnlyIP & low relSS	0.018^{a}	(0.003)	0.020^{a}	(0.004)	0.025^{a}	(0.007)	0.032^{a}	(0.007)
High relSS & noPIT	0.000	(0.001)	-0.005^{a}	(0.002)	-0.012^{a}	(0.003)	-0.030^{a}	(0.003)
Lendable	-0.058^{a}	(0.008)	-0.112^{a}	(0.012)	-0.189^{a}	(0.027)	-0.389^{a}	(0.027)
Bad news	-0.005^{a}	(0.001)	-0.006^{a}	(0.001)	-0.003^{c}	(0.002)	-0.001	(0.002)
Good news	0.004^{a}	(0.001)	0.007^{a}	(0.001)	0.007^{a}	(0.002)	0.009^{a}	(0.002)
R-squared	0.008		0.010		0.014		0.021	
				Fitted postAR values				
OnlyIS & high relSS	-0.011^{a}	(0.001)	-0.014^{a}	(0.001)	-0.025^{a}	(0.001)	-0.046^{a}	(0.001)
OnlyIS & low relSS	-0.010^{a}	(0.002)	-0.006^{b}	(0.003)	-0.016^{a}	(0.003)	-0.023^{a}	(0.003)
OnlyIP & high relSS	0.012^{a}	(0.002)	0.014^{a}	(0.003)	0.015^{a}	(0.003)	0.032^{a}	(0.003)
OnlyIP & low relSS	0.012^{a}	(0.003)	0.019^{a}	(0.004)	0.028^{a}	(0.005)	0.045^{a}	(0.005)
High relSS & noPIT	-0.005^{a}	(0.000)	-0.005^{a}	(0.001)	-0.009^{a}	(0.001)	-0.017^{a}	(0.001)
Low relSS & noPIT	-0.006^{a}	(0.001)	-0.000	(0.001)	-0.002^{c}	(0.001)	0.013^{a}	(0.001)

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Variables	PostAR(+20,+40) coeff.	s.e.	PostAR(+20,+61) coeff.	s.e.	PostAR(+20,+82) coeff.	s.e.	PostAR(+20,+145) coeff.	s.e.
				Panel B: response window (0,+20)				
Constant	0.003^{c}	(0.002)	0.019^{a}	(0.003)	0.037^{a}	(0.003)	0.069^{a}	(0.006)
OnlyIS & high relSS	-0.004^{a}	(0.001)	-0.016^{a}	(0.002)	-0.030^{a}	(0.003)	-0.072^{a}	(0.004)
OnlyIS & low relSS	-0.001	(0.002)	-0.006^{a}	(0.002)	-0.016^{a}	(0.003)	-0.030^{a}	(0.004)
OnlyIP & high relSS	0.004^{b}	(0.002)	-0.000	(0.003)	-0.003	(0.003)	-0.012^{b}	(0.005)
OnlyIP & low relSS	0.007^{a}	(0.002)	0.016^{a}	(0.003)	0.022^{a}	(0.004)	0.031^{a}	(0.005)
High relSS & noPIT	-0.002	(0.001)	-0.010^{a}	(0.002)	-0.018^{a}	(0.002)	-0.043^{a}	(0.004)
Lendable	-0.041^{a}	(0.008)	-0.107^{a}	(0.012)	-0.176^{a}	(0.015)	-0.340^{a}	(0.027)
BAD news	-0.002^{b}	(0.001)	-0.001	(0.001)	0.001	(0.002)	0.004^{c}	(0.002)
GOOD news	0.004^{a}	(0.001)	0.006^{a}	(0.001)	0.003^{b}	(0.001)	0.006^{a}	(0.002)
R-squared	0.004		0.009		0.012		0.020	
				Fitted postAR values				
OnlyIS & high relSS	-0.003^{a}	(0.001)	-0.010^{a}	(0.001)	-0.022^{a}	(0.001)	-0.046^{a}	(0.001)
OnlyIS & low relSS	0.000	(0.001)	-0.000	(0.002)	-0.008^{b}	(0.002)	-0.004	(0.002)
OnlyIP & high relSS	0.006^{a}	(0.002)	0.006^{b}	(0.002)	0.004	(0.003)	0.014^{a}	(0.003)
OnlyIP & low relSS	0.008^{a}	(0.002)	0.022^{a}	(0.003)	0.030^{a}	(0.003)	0.057^{a}	(0.003)
High relSS & noPIT	0.001	(0.001)	0.006^{a}	(0.001)	0.008^{a}	(0.002)	0.026^{a}	(0.002)
Low relSS & noPIT	-0.001	(0.001)	-0.004^{a}	(0.001)	-0.010^{a}	(0.001)	-0.017^{a}	(0.001)

Table 6: Post-trading abnormal returns by earnings news.

This table reports estimation results for regressions of future abnormal returns on the informed-trading categories partitioned by the direction of earnings market reaction. The dependent variable in all specifications is the size and book-to-market adjusted abnormal return. The categories of *good*, *bad* and *no news* are defined based on terciles of earnings-announcement abnormal return over the (-1,+1) window. We aggregate informed trading over the response window of (0,+5) and measure abnormal returns over 1, 2, 3 and 6 months starting on day +5 relatively to the earnings announcement (see Figure 4). We have 93377 firm-quarter observations. All specifications include fixed firm and time effects. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Good news			No news			Bad news		
	PostAR			PostAR			PostAR		
Variables	(+5,+25)	(+5,+46)	(+5,+67)	(+5,+25)	(+5,+46)	(+5,+67)	(+5,+25)	(+5,+46)	(+5,+67)
Constant	0.019^{a}	0.030^{a}	0.056^{a}	0.007^{a}	0.009^{b}	0.019^{a}	0.013^{a}	0.020^{a}	0.039^{a}
	(0.003)	(0.005)	(0.006)	(0.003)	(0.004)	(0.005)	(0.003)	(0.005)	(0.006)
OnlyIS & high relSS	-0.007^{a}	-0.019^{a}	-0.037^{a}	-0.003	-0.008^{b}	-0.013^{a}	-0.003	-0.013^{a}	-0.025^{a}
	(0.003)	(0.004)	(0.005)	(0.002)	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)
OnlyIS & low relSS	-0.003	-0.002	-0.019^{a}	-0.007^{b}	-0.006	-0.016^{a}	-0.003	-0.011^{c}	-0.019^{b}
	(0.004)	(0.005)	(0.007)	(0.003)	(0.004)	(0.005)	(0.005)	(0.007)	(0.008)
OnlyIP & high relSS	0.016^{a}	0.020^{a}	0.010	0.012^{a}	0.009^{c}	0.007	0.024^{a}	0.016^{a}	0.020^{a}
	(0.005)	(0.007)	(0.009)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.006)
OnlyIP & low relSS	0.020^{a}	0.026^{a}	0.030^{a}	0.016^{a}	0.014^{a}	0.019^{a}	0.020^{a}	0.021^{a}	0.028^{a}
	(0.006)	(0.008)	(0.010)	(0.004)	(0.005)	(0.006)	(0.005)	(0.007)	(0.009)
High relSS & noPIT	-0.003	-0.010^{a}	-0.021^{a}	-0.000	-0.004^{c}	-0.007^{b}	0.003	-0.005	-0.009^{b}
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.004)
Lendable	-0.064^{a}	-0.140^{a}	-0.238^{a}	-0.029^{b}	-0.067^{a}	-0.126^{a}	-0.077^{a}	-0.123^{a}	-0.196^{a}
	(0.014)	(0.021)	(0.027)	(0.014)	(0.020)	(0.025)	(0.015)	(0.022)	(0.028)
Observations	31,134	31,134	31,134	31,013	31,013	31,013	31,230	31,230	31,230
R-squared	0.011	0.013	0.019	0.004	0.004	0.007	0.008	0.010	0.014

Table 7: Multinomial logistic regression considering future earnings information.

This table reports estimation results for a multinomial logistic regression, where the dependent variable is a categorical variable measuring short and insider selling intensity in the response window of (0,+5) relative to the earnings announcement. The reference category is the group of firm-quarters, which do not contain pure insider sales or pure insider purchases and, at the same time, have low short-selling intensity. *CumROA*, *cumEPS* and *cumEAAR* are the cumulative return on assets, earnings per share and earnings announcements abnormal returns from the next quarter *(q+1)* until the quarter one year ahead *(q+4)*, respectively. The regression uses 77,532 observations and includes time fixed effects. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors clustered within firms are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Category 1 onlyIS & high relSS		Category 2 onlyIS & low relSS		Category 3 onlyIP & high relSS		Category 4 onlyIP & low relSS		Category 5 high relSS & noPIT	
	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
CumROA	0.245	(0.184)	1.201^{a}	(0.241)	-0.205	(0.181)	0.074	(0.185)	-0.510^{a}	(0.111)
CumEPS	-0.100^{a}	(0.016)	0.012	(0.019)	-0.199^{a}	(0.019)	0.002	(0.023)	-0.131^{a}	(0.014)
CumEAabnormal returns	-0.179^{a}	(0.106)	-0.300^{a}	(0.165)	0.162	(0.121)	-0.027	(0.129)	-0.227^{a}	(0.074)
EA abnormal returns	4.169^{a}	(0.181)	2.973^{a}	(0.291)	-3.546^{a}	(0.254)	-0.906^{a}	(0.261)	0.025	(0.126)
Lendable	16.043^{a}	(0.318)	5.319^{a}	(0.375)	12.141^{a}	(0.336)	-2.348^{a}	(0.598)	12.861^{a}	(0.270)
Size	0.467^{a}	(0.022)	0.243^{a}	(0.027)	0.254^{a}	(0.023)	-0.160^{a}	(0.029)	0.328^{a}	(0.018)
B/M ratio	-1.526^{a}	(0.068)	-0.372^{a}	(0.069)	-0.272^{a}	(0.053)	0.208^{a}	(0.052)	-0.547^{a}	(0.041)
PastRET(6m)	5.609^{a}	(0.371)	3.738^{a}	(0.546)	-4.331^{a}	(0.486)	-1.404^{a}	(0.519)	0.266	(0.269)
ΔEPS	-0.124	(0.243)	0.027	(0.388)	0.169	(0.282)	-0.047	(0.267)	-0.318^{a}	(0.179)
Constant	-5.666^{a}	(0.147)	-3.756^{a}	(0.179)	-5.666^{a}	(0.166)	-1.767^{a}	(0.162)	-3.226^{a}	(0.106)
χ^2	19218									
Pseudo R^2	0.219									
				Average marginal effects						
CumROA	0.068^{a}	(0.017)	0.031^{a}	(0.005)	0.003	(0.006)	0.004	(0.004)	-0.134^{a}	(0.003)
CumEPS	0.002	(0.001)	0.002	(0.000)	-0.004^{a}	(0.001)	-0.001^{b}	(0.001)	-0.013^{a}	(0.004)
CumEAabnormal returns	0.000	(0.009)	-0.004	(0.003)	0.014^{b}	(0.004)	0.001	(0.003)	-0.032^{b}	(0.002)
EA abnormal returns	0.457^{a}	(0.016)	0.055^{a}	(0.006)	-0.170^{a}	(0.010)	-0.023^{a}	(0.006)	-0.287^{a}	(0.002)
Lendable	0.537^{a}	(0.017)	-0.072^{a}	(0.007)	0.076^{a}	(0.008)	-0.163^{ba}	(0.015)	-0.922^{a}	(0.003)
Size	0.020^{a}	(0.001)	0.000^{a}	(0.001)	-0.001	(0.001)	-0.007^{a}	(0.001)	-0.019^{a}	(0.004)
B/M ratio	-0.115^{a}	(0.006)	0.002^{a}	(0.001)	0.011^{a}	(0.002)	0.010^{a}	(0.001)	0.028^{a}	(0.004)
PastRET(6m)	0.594^{a}	(0.032)	0.066^{a}	(0.011)	-0.216^{a}	(0.019)	-0.038^{b}	(0.012)	-0.346^{a}	(0.002)
ΔEPS	0.013	(0.023)	0.004	(0.009)	0.016	(0.011)	0.001	(0.006)	-0.060^{a}	(0.003)

Table 8: Post-trading abnormal returns across mispricing quartiles.

This table reports future abnormal returns partitioned by quartiles of buy-order imbalance, $oimb^{+}$, in Panel A and dispersion in analysts' forecasts, *disp*, in Panel B. The dependent variable in all specifications is the raw buy-and-hold return adjusted by the buy-and-hold return for the corresponding size and book-to-market portfolio. The return is aggregated over the (+5,+46) window. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+5,+46)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel A: estimation coefficients by $Oimb^{+}$ quartiles			
Constant	0.004	0.033^{a}	0.018^{a}	0.025^{a}
	(0.005)	(0.006)	(0.006)	(0.005)
OnlyIS & high relSS	-0.014^{b}	-0.020^{a}	-0.013^{a}	-0.018^{a}
	(0.005)	(0.004)	(0.004)	(0.004)
OnlyIS & low relSS	-0.001	-0.007	-0.008	-0.019^{a}
	(0.006)	(0.006)	(0.006)	(0.006)
OnlyIP & high relSS	0.027^{a}	-0.001	0.003	0.011^{a}
	(0.007)	(0.006)	(0.007)	(0.007)
OnlyIP & low relSS	0.018^{a}	0.017	0.004	0.022^{a}
	(0.006)	(0.011)	(0.012)	(0.007)
High relSS & noPIT	-0.005	-0.011^{a}	-0.008^{b}	-0.008^{b}
	(0.003)	(0.004)	(0.004)	(0.003)
Bad news	-0.006^{b}	-0.004	-0.004^{a}	-0.013^{a}
	(0.003)	(0.002)	(0.002)	(0.003)
Good news	0.014^{a}	0.004	0.002	0.006^{b}
	(0.003)	(0.002)	(0.002)	(0.003)
Lendable	-0.107^{a}	-0.112^{a}	-0.088^{a}	-0.162^{a}
	(0.029)	(0.023)	(0.023)	(0.026)
Observations	21,803	23,367	23,627	22,227
R-squared	0.012	0.011	0.008	0.013

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	Dependent variable: postAR(+5,+46)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel B: estimation coefficients by disp quartiles			
Constant	0.009	0.009	0.023^{a}	0.030^{a}
	(0.006)	(0.007)	(0.008)	(0.010)
OnlyIS & high relSS	0.002	-0.008^{a}	-0.014^{a}	-0.018^{a}
	(0.003)	(0.005)	(0.005)	(0.006)
OnlyIS & low relSS	-0.006	-0.004	-0.001	-0.001
	(0.004)	(0.007)	(0.008)	(0.012)
OnlyIP & high relSS	0.021^{a}	0.005	0.015^{a}	0.021^{b}
	(0.007)	(0.007)	(0.008)	(0.009)
OnlyIP & low relSS	0.026^{b}	0.010	0.035^{a}	0.021^{a}
	(0.012)	(0.015)	(0.013)	(0.013)
High relSS & noPIT	0.002	-0.001	-0.004	-0.002
	(0.003)	(0.004)	(0.005)	(0.005)
BAD news	-0.000	0.000	-0.002	-0.009^{b}
	(0.002)	(0.003)	(0.003)	(0.004)
GOOD news	0.001	0.001	0.007^{b}	0.004
	(0.002)	(0.003)	(0.003)	(0.004)
Lendable	-0.067^{a}	-0.048^{a}	-0.125^{a}	-0.187^{a}
	(0.025)	(0.027)	(0.031)	(0.037)
Observations	14,565	14,496	14,283	14,196
R-squared	0.014	0.005	0.013	0.021

Figure 1: Daily shares traded by insiders and short sellers around earnings announcements.

The figure shows the relative number of shares sold and purchased by insiders (*INsales* and *INpurchases*) together with the relative number of shares shorted (*relSS*) around earnings announcements. All the shares traded are scaled by the number of shares outstanding.

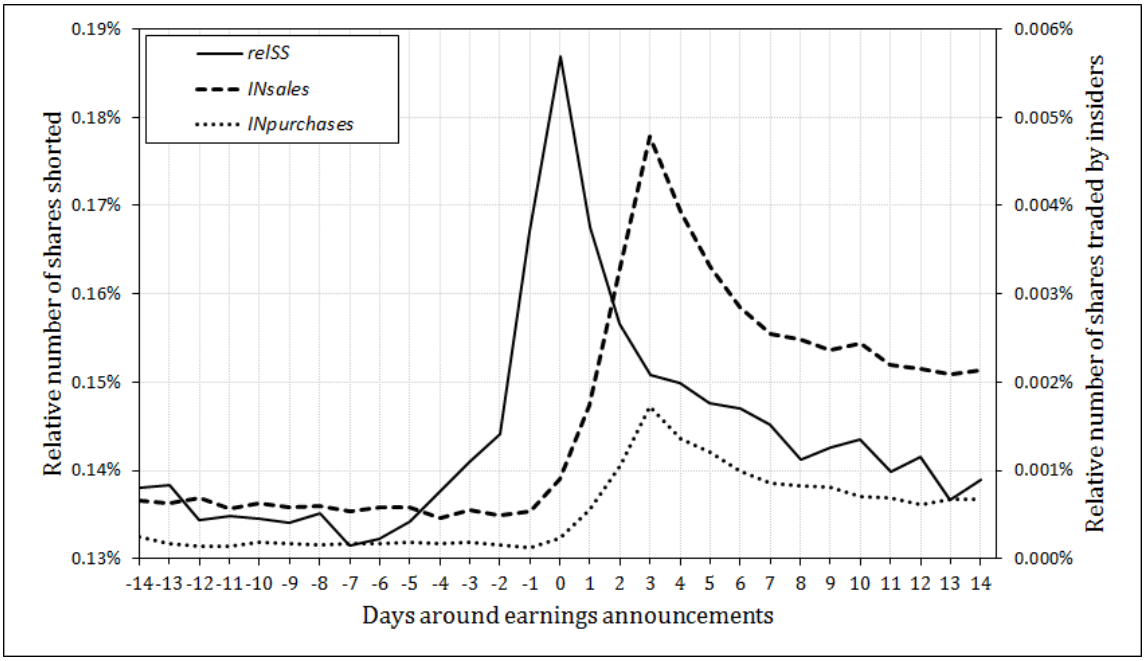


Figure 2: Daily shares traded by insiders and short sellers around earnings announcements categorized by earnings news.

The figure shows the number of shares traded by insiders (*INsales* and *INpurchases*) and the number of shares shorted (*relSS*) around earnings announcements scaled by the number of shares outstanding. *good*, *bad* and *no* news are firms with a 3-day earnings announcements abnormal return (window (-1,+1)) in the top, lowest and middle tercile of the returns for all the quarters respectively.

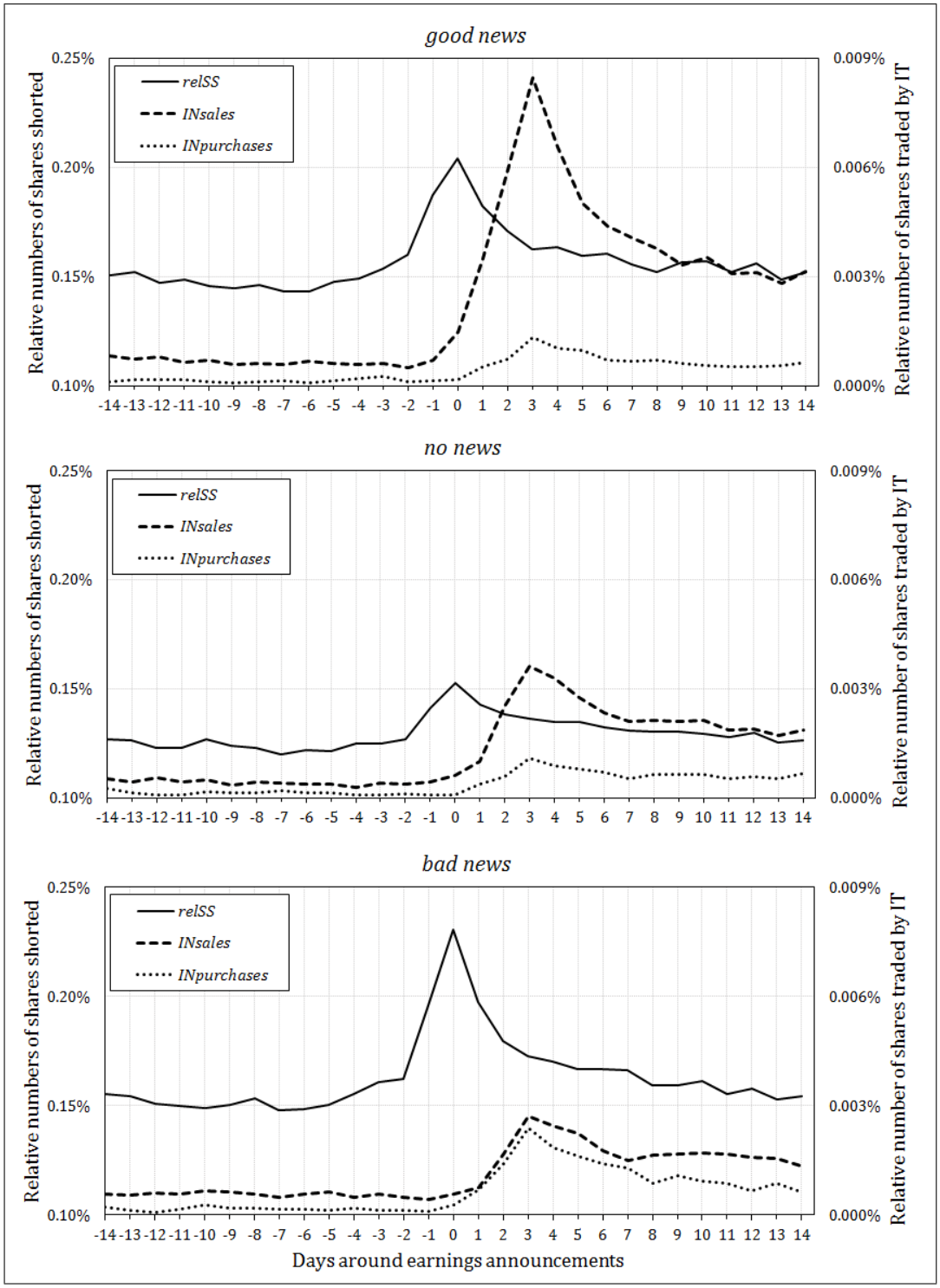


Figure 3: Daily shares traded by insiders and short sellers around earnings announcements categorized by informed trading type.

The figure shows the relative number of shares traded by insiders (*INsales* and *INpurchases*) and the relative number of shares shorted (*relSS*) partitioning by the informed trading categories. In Panel A the categories are formed considering the response period (0,+5), and in Panel B the response period (0,+20). *OnlyIS & high(low) relSS* is a firm-quarter with only insider sales and high (low) intensity of short sales during the informed trading response period. *MixIT & high(low) relSS* is a firm-quarter with both insider sales and purchases together high (low) intensity of short sales during the informed trading response period. *NoIT & high(low) relSS* is a firm-quarter with no insider trading and high (low) intensity of short sales during the informed trading response period.

Panel A: (0,+5) the response period

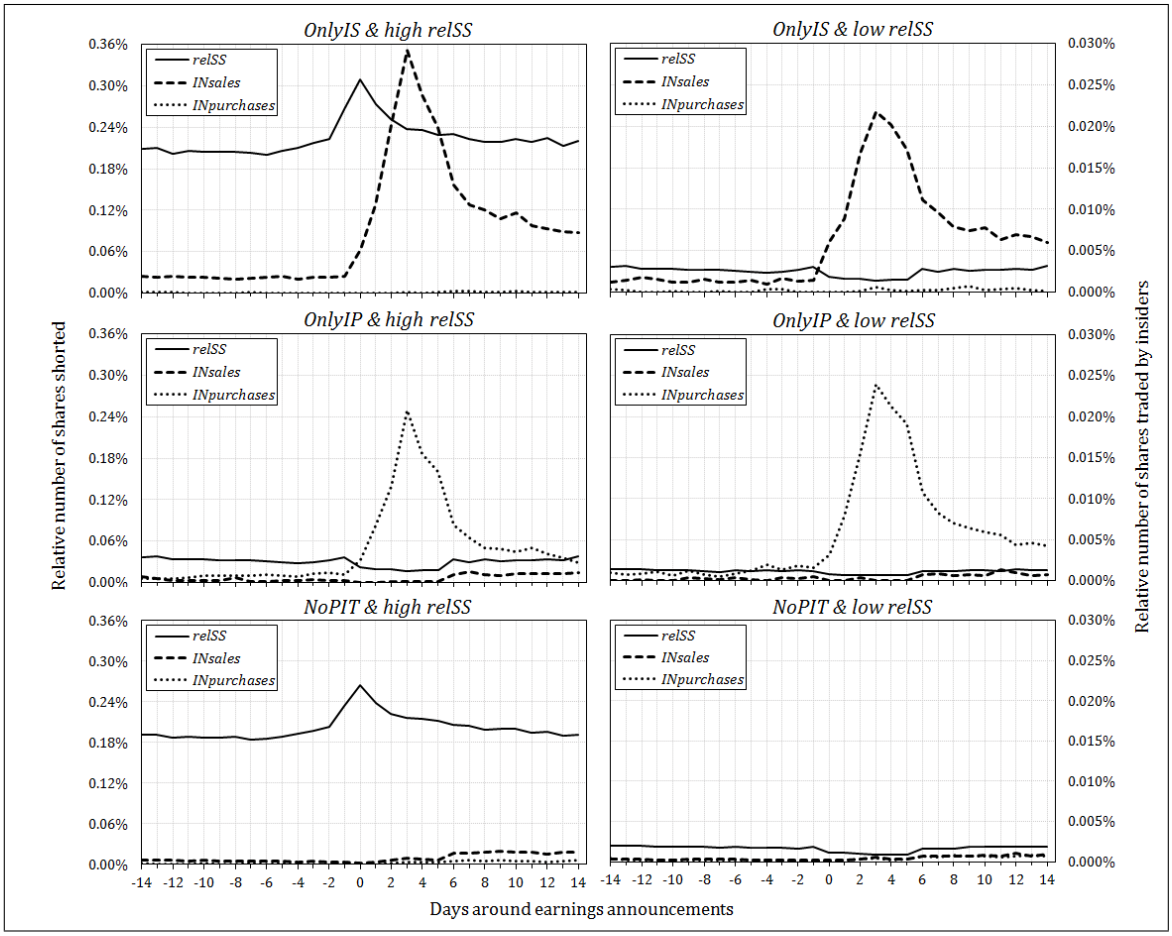


Figure 3 continued.

Panel B: (0,+20) the response period

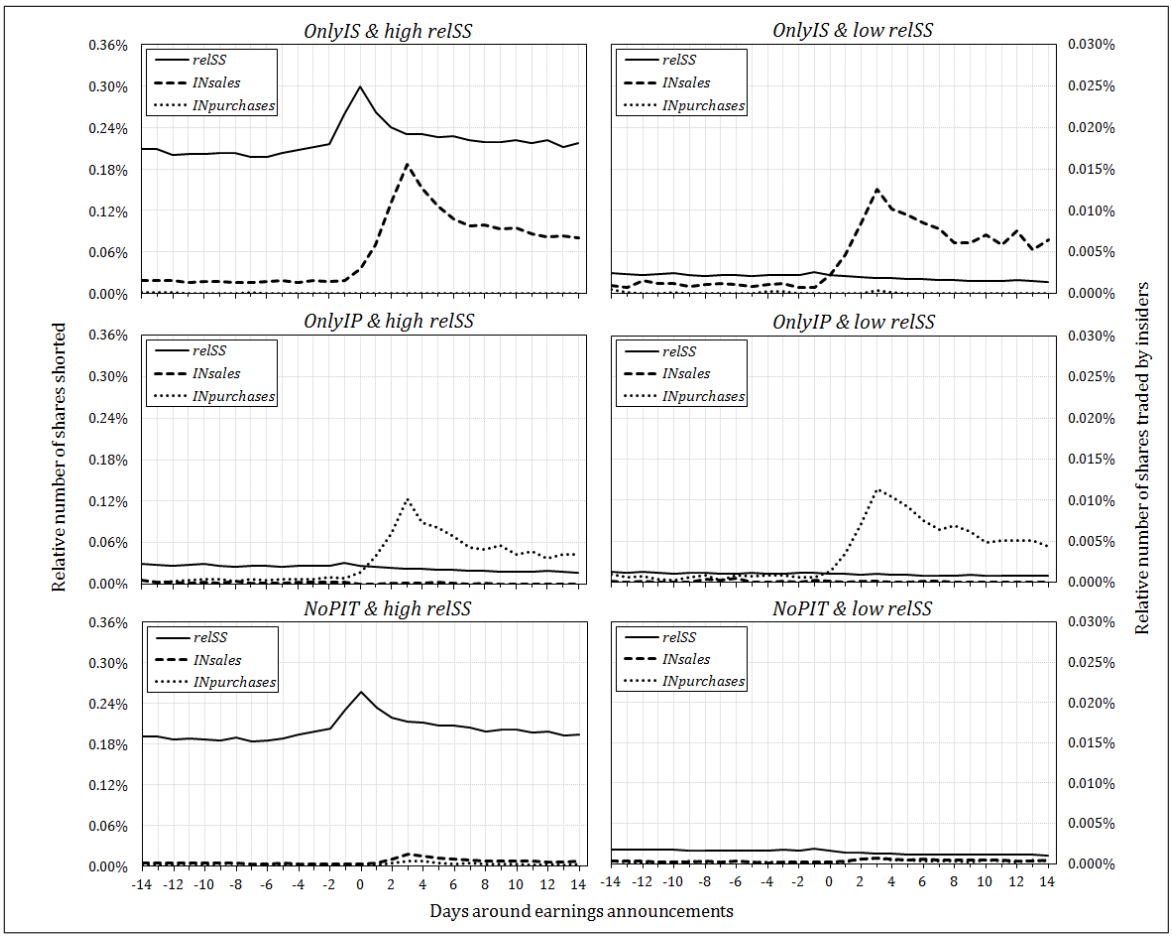


Figure 4: Timings of earnings announcements and related abnormal returns

This figure shows relative timings of aggregate informed trading during the response window and future post-trading abnormal returns. Everything is arranged relatively to the earnings announcement that is set as day 0. We take into account only trading days. Accordingly, we establish (i) the earnings-announcement window, which starts on day -1 and ends on day +1; (ii) the response window when insiders and short sellers trade, which starts on day 0 and ends on day +5 (+20); and (iii) the future-return window, which starts on day +5 (+20) and runs up to day +130 (+145).

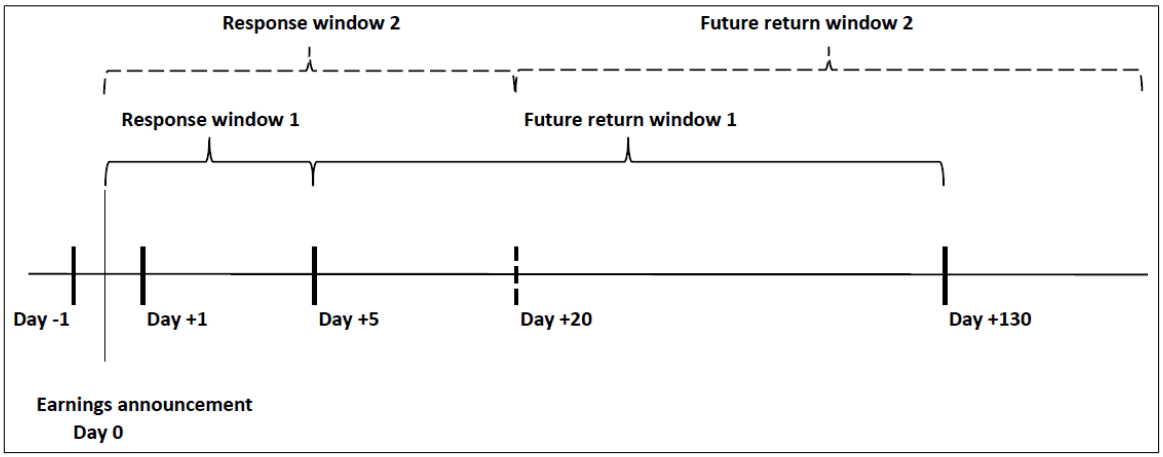
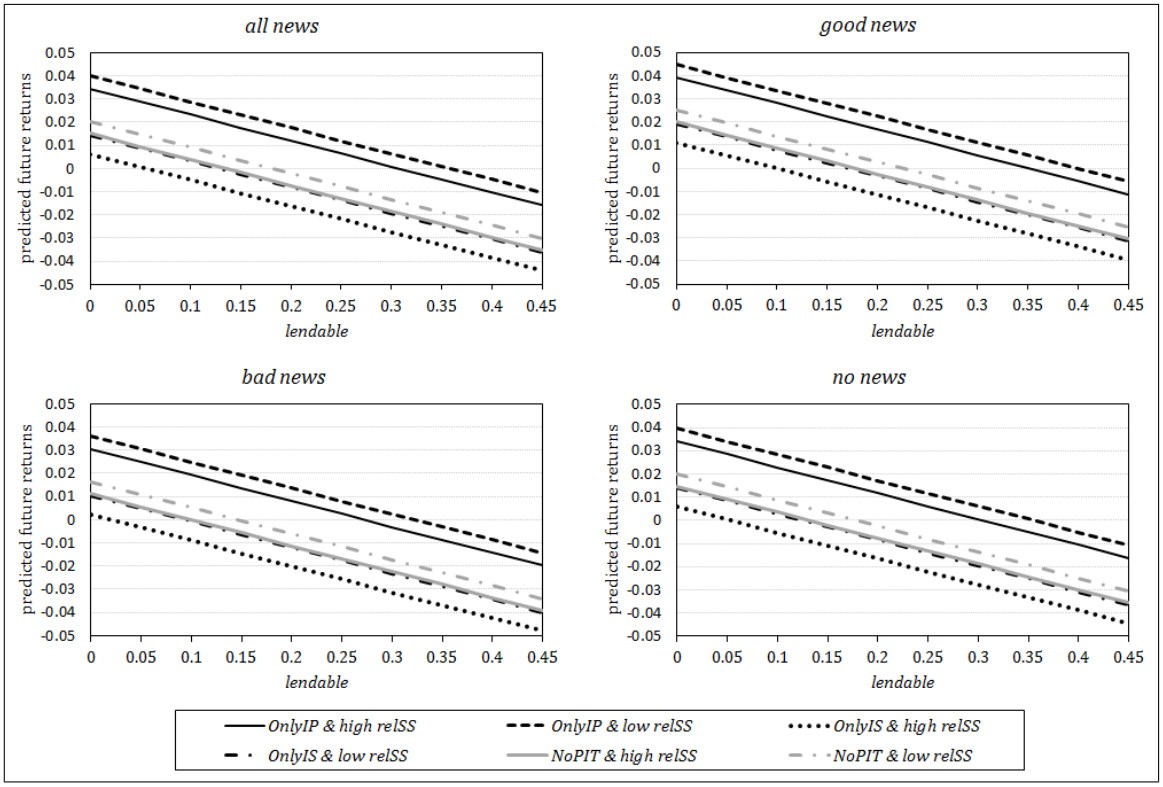


Figure 5: Predicted future abnormal returns at different levels of *lendable*

This figure shows the average predicted future abnormal returns by the informed-trading categories at different values of *lendable*. Average predicted values are obtained after the regression results in Table 5. We display graphs on predicted future abnormal returns only for the horizon of 2 months (+5,+46) with the response window of (0,+5).



Internet appendix to

"Insider selling on public information: Evidence from competition with short sellers"

(not for publication)

This appendix presents supplementary results not included in the main body of the paper.

Table I.1: Multinomial logistic regression: informed-trading categories with (0,+20) response window.

This table reports estimation results for a multinomial logistic regression, where the dependent variable is a categorical variable measuring short and insider selling intensity in the response window of (0,+20) relative to the earnings announcement. The reference category is the group of firm-quarters, which do not contain pure insider sales or pure insider purchases and, at the same time, have low short-selling intensity. We have 96228 firm-quarters. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Category 1 onlyIS & high relSS		Category 2 onlyIS & low relSS		Category 3 onlyIP & high relSS		Category 4 onlyIP & low relSS		Category 5 high relSS & noPIT	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
Lendable	15.498^{a}	(0.290)	5.957^{a}	(0.345)	11.587^{a}	(0.311)	-2.403^{a}	(0.557)	12.006^{a}	(0.244)
BAD news	0.043	(0.036)	-0.273^{a}	(0.059)	0.773^{a}	(0.048)	0.105^{a}	(0.056)	0.395^{a}	(0.026)
GOOD news	0.704^{a}	(0.034)	0.318^{a}	(0.052)	0.094^{a}	(0.053)	-0.140^{b}	(0.058)	0.289^{a}	(0.026)
Size	0.437^{a}	(0.019)	0.302^{a}	(0.022)	0.178^{a}	(0.020)	-0.119^{a}	(0.025)	0.265^{a}	(0.015)
B/M	-1.487^{a}	(0.062)	-0.351^{a}	(0.062)	-0.203^{a}	(0.049)	0.215^{a}	(0.045)	-0.498^{a}	(0.036)
PastRET(6m)	5.026^{a}	(0.329)	3.731^{a}	(0.470)	-4.872^{a}	(0.450)	-1.171^{a}	(0.450)	-0.538^{b}	(0.235)
ΔEPS	-0.157	(0.194)	0.098	(0.302)	-0.278	(0.244)	0.064	(0.201)	-0.444^{a}	(0.133)
Constant	-5.794^{a}	(0.131)	-4.266^{a}	(0.164)	-5.665^{a}	(0.157)	-2.031^{a}	(0.148)	-3.088^{a}	(0.094)
χ^2	11004									
PseudoR^2	0.208									
					Average marginal effects					
Lendable	0.921^{a}	(0.021)	-0.139^{a}	(0.012)	0.134^{a}	(0.010)	-0.308^{a}	(0.024)	0.521^{a}	(0.026)
BAD news	-0.032^{a}	(0.004)	-0.017^{a}	(0.002)	0.022^{a}	(0.002)	-0.008	(0.002)	0.059^{a}	(0.004)
GOOD news	0.040^{a}	(0.003)	0.001	(0.002)	-0.011^{a}	(0.002)	-0.012^{a}	(0.002)	-0.002	(0.004)
Size	0.032^{a}	(0.002)	0.003^{a}	(0.001)	-0.005^{a}	(0.001)	-0.010^{a}	(0.001)	0.006^{a}	(0.002)
B/M	-0.164^{a}	(0.007)	0.009	(0.002)	0.023^{a}	(0.003)	0.020^{a}	(0.002)	0.059^{a}	(0.007)
PastRET(6m)	0.726^{a}	(0.034)	0.105^{a}	(0.015)	-0.319^{a}	(0.021)	-0.021	(0.014)	-0.500^{a}	(0.041)
ΔEPS	0.041	(0.023)	0.034^{a}	(0.009)	0.019	(0.012)	0.007	(0.006)	-0.085^{b}	(0.027)

Table I.2: Post-trading abnormal returns: four-factor benchmark

This table reports estimation results for regressions of future abnormal returns on the informed-trading categories. In all specifications, the dependent variable is the abnormal return which is calculated using the four-factor model as the benchmark. Panels A aggregates informed trading over the response window of (0,+5) and then measures abnormal returns over 1, 2, 3 and 6 months starting on day +5 relatively to the earnings announcement. Panel B is based on the response window of (0,+20) with abnormal returns starting on day +20 (see Figure 4). We have 102475 firm-quarter observations. All specifications include fixed firm and time effects. All variables are defined in Appendix A and winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels. The bottom of both panels reports fitted *postAR* values.

	PostAR(+5,+25)		PostAR(+5,+46)		PostAR(+5,+67)		PostAR(+5,+130)	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
				Panel A: response window (0,+5)				
Constant	0.010^{a}	(0.002)	0.024^{a}	(0.003)	0.041^{a}	(0.004)	0.081^{a}	(0.008)
OnlyIS & high relSS	-0.016^{a}	(0.001)	-0.033^{a}	(0.002)	-0.057^{a}	(0.003)	-0.117^{a}	(0.005)
OnlyIS & low relSS	-0.011^{a}	(0.002)	-0.019^{a}	(0.003)	-0.039^{a}	(0.004)	-0.082^{a}	(0.007)
OnlyIP & high relSS	0.018^{a}	(0.002)	0.018^{a}	(0.004)	0.012^{b}	(0.005)	0.012	(0.008)
OnlyIP & low relSS	0.022^{a}	(0.003)	0.028^{a}	(0.005)	0.033^{a}	(0.006)	0.046^{a}	(0.010)
High relSS & noPIT	-0.004^{a}	(0.001)	-0.012^{a}	(0.002)	-0.026^{a}	(0.003)	-0.059^{a}	(0.005)
Lendable	-0.079^{a}	(0.009)	-0.168^{a}	(0.014)	-0.266^{a}	(0.020)	-0.497^{a}	(0.037)
Bad news	-0.004^{a}	(0.001)	-0.005^{a}	(0.001)	-0.002	(0.002)	-0.002	(0.003)
Good news	0.007^{a}	(0.001)	0.012^{a}	(0.001)	0.013^{a}	(0.002)	0.016^{a}	(0.003)
Observations	102,475		102,475		102,475		102,475	
R-squared	0.007		0.008		0.010		0.016	
				Fitted postAR values				
OnlyIS & high relSS	-0.017^{a}	(0.001)	-0.027^{a}	(0.001)	-0.043^{a}	(0.002)	-0.085^{a}	(0.003)
OnlyIS & low relSS	-0.011^{a}	(0.002)	-0.013^{b}	(0.003)	-0.025^{a}	(0.004)	-0.051^{a}	(0.006)
OnlyIP & high relSS	0.018^{a}	(0.002)	0.023^{a}	(0.003)	0.026^{a}	(0.004)	0.043^{a}	(0.007)
OnlyIP & low relSS	0.022^{a}	(0.003)	0.034^{a}	(0.005)	0.047^{a}	(0.006)	0.078^{a}	(0.010)
High relSS & noPIT	-0.005^{a}	(0.000)	-0.006^{a}	(0.001)	-0.012^{a}	(0.001)	-0.027^{a}	(0.002)
Low relSS & noPIT	-0.001^{a}	(0.001)	0.006^{a}	(0.001)	-0.014^{a}	(0.002)	0.032^{a}	(0.003)

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	PostAR(+20,+40)		PostAR(+20,+61)		PostAR(+20,+82)		PostAR(+20,+145)	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
				Panel B: response window (0,+20)				
Constant	0.009^a	(0.002)	0.025^a	(0.003)	0.046^a	(0.004)	0.088^a	(0.008)
OnlyIS & high relSS	-0.011^a	(0.002)	-0.036^a	(0.003)	-0.060^a	(0.003)	-0.131^a	(0.006)
OnlyIS & low relSS	-0.009^a	(0.002)	-0.025^a	(0.003)	-0.043^a	(0.004)	-0.082^a	(0.006)
OnlyIP & high relSS	0.011^a	(0.002)	0.005	(0.004)	0.003	(0.005)	-0.008	(0.008)
OnlyIP & low relSS	0.012^a	(0.003)	0.023^a	(0.004)	0.029^a	(0.005)	0.049^a	(0.008)
High relSS & noPIT	-0.003^a	(0.002)	-0.017^a	(0.002)	-0.031^a	(0.003)	-0.071^a	(0.006)
Lendable	-0.077^a	(0.009)	-0.153^a	(0.015)	-0.242^a	(0.021)	-0.443^a	(0.038)
Bad news	-0.001	(0.001)	-0.001	(0.001)	-0.000	(0.002)	0.002	(0.003)
Good news	0.004^a	(0.001)	0.008^a	(0.001)	0.007^a	(0.002)	0.009^a	(0.003)
Observations	102,095		102,095		102,095		102,095	
R-squared	0.004		0.008		0.010		0.017	
				Fitted postAR values				
OnlyIS & high relSS	-0.010^a	(0.001)	-0.024^a	(0.001)	-0.039^a	(0.002)	-0.082^a	(0.003)
OnlyIS & low relSS	-0.008^a	(0.002)	-0.013^b	(0.002)	-0.021^a	(0.004)	-0.033^a	(0.006)
OnlyIP & high relSS	0.013^a	(0.002)	0.017^a	(0.003)	0.024^a	(0.004)	0.040^a	(0.007)
OnlyIP & low relSS	0.013^a	(0.002)	0.035^a	(0.004)	0.051^a	(0.006)	0.097^a	(0.010)
High relSS & noPIT	-0.001^a	(0.001)	-0.005^a	(0.001)	-0.010^a	(0.001)	-0.022^a	(0.002)
Low relSS & noPIT	0.001^a	(0.001)	0.012^a	(0.002)	0.021^a	(0.002)	0.049^a	(0.003)

Table I.3: Multinomial logistic regression considering future earnings information: alternative specifications.

This table reports estimation results for a multinomial logistic regression, where the dependent variable is a categorical variable measuring short and insider selling intensity in the response window of (0,+5) relative to the earnings announcement. The reference category is the group of firm-quarters, which do not contain pure insider sales or pure insider purchases and, at the same time, have low short-selling intensity. We show three different regressions for each of the future earnings information measures. *CumROA* in Panel A, *cumEPS* in Panel B and *cumEAAR* in Panel C are the cumulative return on assets, earnings per share and earnings announcements abnormal returns from the next quarter *(q+1)* until the quarter one year ahead *(q+4)*, respectively. The regression includes time fixed effects. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Robust standard errors clustered within firms are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Category 1 onlyIS & high relSS		Category 2 onlyIS & low relSS		Category 3 onlyIP & high relSS		Category 4 onlyIP & low relSS		Category 5 high relSS & noPIT	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
					Panel A					
CumROA	-0.008	(0.029)	0.297^{a}	(0.043)	-0.183^{a}	(0.025)	0.031	(0.028)	-0.197^{a}	(0.016)
EA abnormal return	0.336^{a}	(0.013)	0.228^{a}	(0.021)	-0.328^{a}	(0.020)	-0.079^{a}	(0.020)	-0.017^{c}	(0.009)
Lendable	1.899^{a}	(0.035)	0.720^{a}	(0.042)	1.432^{a}	(0.038)	-0.292^{a}	(0.068)	1.492^{a}	(0.030)
Size	0.858^{a}	(0.038)	0.552^{a}	(0.044)	0.393^{a}	(0.039)	-0.242^{a}	(0.049)	0.552^{a}	(0.031)
B/M	-0.776^{a}	(0.034)	-0.166^{a}	(0.034)	-0.089^{a}	(0.027)	0.111^{a}	(0.025)	-0.251^{a}	(0.020)
PastRET(6m)	0.253^{a}	(0.016)	0.168^{a}	(0.023)	-0.206^{a}	(0.022)	-0.063^{a}	(0.022)	-0.002	(0.011)
ΔEPS	-0.022	(0.017)	-0.004	(0.028)	-0.010	(0.021)	0.007	(0.018)	-0.038^{a}	(0.012)
Constant	-1.234^{a}	(0.055)	-1.668^{a}	(0.063)	-2.449^{a}	(0.093)	-3.038^{a}	(0.094)	0.492^{a}	(0.038)
Observations	77,532		χ^2	11440						
CumROA marginal effect	0.016^{a}	(0.003)	0.010^{a}	(0.001)	-0.003^{b}	(0.001)	0.002^{b}	(0.001)	-0.040^{a}	(0.003)
					Panel B					
CumEPS	-0.183^{a}	(0.027)	0.086^{a}	(0.030)	-0.406^{a}	(0.031)	0.033	(0.037)	-0.312^{a}	(0.023)
EA abnormal return	0.339^{a}	(0.014)	0.240^{a}	(0.021)	-0.318^{a}	(0.020)	-0.077^{a}	(0.020)	-0.018^{c}	(0.009)
Lendable	1.889^{a}	(0.035)	0.714^{a}	(0.042)	1.410^{a}	(0.038)	-0.287^{a}	(0.068)	1.469^{a}	(0.030)
Size	0.911^{a}	(0.039)	0.520^{a}	(0.049)	0.510^{a}	(0.040)	-0.236^{a}	(0.050)	0.633^{a}	(0.031)
B/M	-0.809^{a}	(0.034)	-0.197^{a}	(0.034)	-0.130^{a}	(0.027)	0.119^{a}	(0.024)	-0.277^{a}	(0.020)
PastRET(6m)	0.251^{a}	(0.016)	0.172^{a}	(0.023)	-0.197^{a}	(0.021)	-0.060^{a}	(0.022)	-0.005	(0.011)
ΔEPS	-0.016	(0.017)	-0.001	(0.027)	0.004	(0.021)	0.005	(0.018)	-0.029^{b}	(0.013)
Constant	-1.220^{a}	(0.054)	-1.643^{a}	(0.063)	-2.453^{a}	(0.093)	-3.027^{a}	(0.094)	0.490^{a}	(0.038)
Observations	96,228		χ^2	11440						
CumEPS marginal effect	0.008^{a}	(0.002)	0.007^{a}	(0.001)	-0.007^{b}	(0.001)	0.003^{b}	(0.001)	-0.041^{a}	(0.003)

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	Category 1 onlyIS & high relSS		Category 2 onlyIS & low relSS		Category 3 onlyIP & high relSS		Category 4 onlyIP & low relSS		Category 5 high relSS & noPIT	
Variables	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.	coeff.	s.e.
					Panel C					
CumEAAR	-0.050^a	(0.019)	-0.028	(0.028)	-0.017	(0.022)	-0.003	(0.022)	-0.079^a	(0.013)
EA abnormal return	0.336^a	(0.015)	0.255^a	(0.024)	-0.325^a	(0.021)	-0.074^a	(0.021)	-0.018^c	(0.010)
Lendable	1.980^a	(0.039)	0.666^a	(0.046)	1.495^a	(0.041)	-0.293^a	(0.073)	1.577^a	(0.033)
Size	0.828^a	(0.040)	0.540^a	(0.046)	0.316^a	(0.042)	-0.311^a	(0.054)	0.495^a	(0.033)
B/M	-0.846^a	(0.037)	-0.205^a	(0.037)	-0.132^a	(0.029)	0.112^a	(0.027)	-0.300^a	(0.022)
PastRET(6m)	0.252^a	(0.018)	0.192^a	(0.025)	-0.251^a	(0.023)	-0.064^a	(0.024)	-0.016	(0.013)
ΔEPS	-0.015	(0.020)	0.006	(0.030)	-0.002	(0.025)	-0.004	(0.022)	-0.038^a	(0.014)
Constant	-1.199^a	(0.058)	-1.546^a	(0.064)	-2.406^a	(0.097)	-3.019^a	(0.100)	0.477^a	(0.042)
Observations	77,532		χ^2	18566						
CumEAAR marginal effect	0.002	(0.002)	0.000	(0.001)	0.000^b	(0.001)	0.001	(0.001)	-0.011^a	(0.003)

Table I.4: Post-trading abnormal returns across buy-order imbalance quartiles: other time horizons.

This table reports future abnormal returns partitioned by quartiles of buy-order imbalance ($oimb^{+}$). The dependent variable in all specifications is the raw buy-and-hold return adjusted by the buy-and-hold return for the corresponding size and book-to-market portfolio. The returns are aggregated over the 3 months in Panel A, (+5,+67) window, and 6 months in Panel B, (+5,+130) window. Both Panels aggregate informed trading over the response window of (0,+5) relatively to the earnings announcement (see Figure 4). All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+5,+67)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
		Panel A		
Constant	0.011^{c}	0.056^{a}	0.044^{a}	0.040^{a}
	(0.007)	(0.008)	(0.008)	(0.006)
OnlyIS & high relSS	-0.030^{a}	-0.032^{a}	-0.028^{a}	-0.026^{a}
	(0.007)	(0.005)	(0.005)	(0.005)
OnlyIS & low relSS	-0.017^{b}	-0.020^{b}	-0.025^{a}	-0.028^{a}
	(0.007)	(0.008)	(0.007)	(0.008)
OnlyIP & high relSS	0.018^{b}	-0.000	0.002	0.016^{c}
	(0.009)	(0.008)	(0.008)	(0.009)
OnlyIP & low relSS	0.028^{a}	-0.003	0.002	0.033^{a}
	(0.007)	(0.015)	(0.015)	(0.009)
High relSS & noPIT	-0.016^{a}	-0.014^{a}	-0.016^{a}	-0.013^{a}
	(0.004)	(0.004)	(0.005)	(0.004)
BAD news	-0.004	0.003	-0.005	-0.011^{a}
	(0.003)	(0.003)	(0.003)	(0.004)
GOOD news	0.017^{a}	0.001	-0.002	0.007^{b}
	(0.004)	(0.003)	(0.003)	(0.003)
Lendable	-0.203^{a}	-0.200^{a}	-0.144^{a}	-0.243^{a}
	(0.037)	(0.029)	(0.029)	(0.033)
Observations	21,803	23,367	23,627	22,227
R-squared	0.016	0.019	0.012	0.016

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	Dependent variable: postAR(+5,+130)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
		Panel B		
Constant	0.046^{a}	0.083^{a}	0.079^{a}	0.065^{a}
	(0.011)	(0.012)	(0.012)	(0.009)
OnlyIS & high relSS	-0.069^{a}	-0.052^{a}	-0.054^{a}	-0.059^{a}
	(0.009)	(0.007)	(0.007)	(0.008)
OnlyIS & low relSS	-0.031^{a}	-0.022^{c}	-0.049^{a}	-0.042^{a}
	(0.010)	(0.012)	(0.010)	(0.012)
OnlyIP & high relSS	0.024^{c}	0.014	0.012	0.032^{a}
	(0.013)	(0.011)	(0.011)	(0.012)
OnlyIP & low relSS	0.028^{a}	0.016	0.035	0.038^{a}
	(0.011)	(0.021)	(0.022)	(0.012)
High relSS & noPIT	-0.036^{a}	-0.023^{a}	-0.031^{a}	-0.031^{a}
	(0.006)	(0.006)	(0.006)	(0.006)
Bad news	-0.001	0.004	-0.003	-0.011^{b}
	(0.005)	(0.004)	(0.004)	(0.005)
Good news	0.020^{a}	0.003	0.001	0.008^{c}
	(0.005)	(0.004)	(0.004)	(0.004)
Lendable	-0.475^{a}	-0.378^{a}	-0.281^{a}	-0.433^{a}
	(0.057)	(0.044)	(0.045)	(0.053)
Observations	21,803	23,367	23,627	22,227
R-squared	0.020	0.026	0.023	0.023

Table I.5: Post-trading abnormal returns across dispersion in analysts' forecasts quartiles: other time horizons.

This table reports future abnormal returns partitioned by quartiles of buy-order imbalance ($oimb^{+}$). The dependent variable in all specifications is the raw buy-and-hold return adjusted by the buy-and-hold return for the corresponding size and book-to-market portfolio. The returns are aggregated over the 3 months in Panel A, (+5,+67) window, and 6 months in Panel B, (+5,+130) window. Both Panels aggregate informed trading over the response window of (0,+5) relatively to the earnings announcement (see Figure 4). All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+5,+67)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
		Panel A		
Constant	0.010	0.021^{b}	0.039^{a}	0.072^{a}
	(0.008)	(0.009)	(0.010)	(0.012)
OnlyIS & high relSS	-0.004	-0.013^{b}	-0.023^{a}	-0.034^{a}
	(0.004)	(0.006)	(0.007)	(0.008)
OnlyIS & low relSS	-0.011^{c}	-0.006	-0.007	-0.015
	(0.006)	(0.008)	(0.011)	(0.014)
OnlyIP & high relSS	0.019^{b}	0.015^{c}	0.024^{b}	0.028^{b}
	(0.008)	(0.009)	(0.010)	(0.011)
OnlyIP & low relSS	0.014	0.008	0.065^{a}	0.030^{c}
	(0.016)	(0.018)	(0.016)	(0.016)
High relSS & noPIT	0.001	0.001	-0.006	-0.011^{c}
	(0.004)	(0.005)	(0.006)	(0.007)
BAD news	0.004	0.003	0.004	-0.006
	(0.003)	(0.004)	(0.004)	(0.005)
GOOD news	-0.001	-0.005	0.005	0.001
	(0.003)	(0.003)	(0.004)	(0.005)
Lendable	-0.083^{b}	-0.073^{b}	-0.161^{a}	-0.337^{a}
	(0.032)	(0.036)	(0.039)	(0.047)
Observations	14,565	14,496	14,283	14,196
R-squared	0.014	0.009	0.015	0.032

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	Dependent variable: postAR(+5,+130)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
		Panel B		
Constant	-0.001	-0.029^{a}	-0.057^{a}	-0.082^{a}
	(0.006)	(0.008)	(0.010)	(0.012)
OnlyIS & high relSS	-0.011	-0.007	-0.031^{c}	-0.037^{c}
	(0.008)	(0.012)	(0.016)	(0.020)
OnlyIS & low relSS	0.050^{a}	0.040^{a}	0.035^{b}	0.021
	(0.011)	(0.012)	(0.014)	(0.016)
OnlyIP & high relSS	0.037	0.026	0.076^{a}	0.040^{c}
	(0.023)	(0.025)	(0.025)	(0.024)
OnlyIP & low relSS	0.003	-0.004	-0.017^{b}	-0.040^{a}
	(0.006)	(0.007)	(0.009)	(0.010)
High relSS & noPIT	0.009^{b}	0.009^{c}	0.001	0.000
	(0.004)	(0.005)	(0.006)	(0.007)
BAD news	-0.001	-0.000	0.005	0.004
	(0.004)	(0.005)	(0.006)	(0.007)
GOOD news	-0.166^{a}	-0.173^{a}	-0.374^{a}	-0.580^{a}
	(0.050)	(0.056)	(0.061)	(0.070)
Lendable	0.007	0.037^{a}	0.083^{a}	0.121^{a}
	(0.012)	(0.013)	(0.016)	(0.018)
Observations	14,565	14,496	14,283	14,196
R-squared	0.024	0.015	0.028	0.045

Table I.6: Post-trading abnormal returns across mispricing quartiles: informed-trading categories with (0,+20) response window.

This table reports future abnormal returns partitioned by quartiles of buy-order imbalance, $oimb^{+}$, in Panel A and dispersion in analysts' forecasts, *disp*, in Panel B. The dependent variable in all specifications is the raw buy-and-hold return adjusted by the buy-and-hold return for the corresponding size and book-to-market portfolio. The return is aggregated over the (+20,+61) window. All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+20,+61)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel A: estimation coefficients by $Oimb^{+}$ quartiles			
Constant	0.005	0.024^{a}	0.026^{a}	0.019^{a}
	(0.005)	(0.007)	(0.006)	(0.005)
OnlyIS & high relSS	-0.016^{a}	-0.018^{a}	-0.016^{a}	-0.018^{a}
	(0.005)	(0.004)	(0.005)	(0.004)
OnlyIS & low relSS	-0.005	-0.004	-0.004	-0.013^{a}
	(0.005)	(0.005)	(0.005)	(0.005)
OnlyIP & high relSS	0.007	-0.001	-0.007	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)
OnlyIP & low relSS	0.021^{a}	-0.002	0.011	0.017^{a}
	(0.005)	(0.009)	(0.010)	(0.006)
High relSS & noPIT	-0.012^{a}	-0.013^{a}	-0.012^{a}	-0.012^{a}
	(0.004)	(0.004)	(0.004)	(0.004)
BAD news	-0.003	0.004^{c}	-0.003	-0.007^{b}
	(0.003)	(0.002)	(0.003)	(0.003)
GOOD news	0.013^{a}	0.002	-0.001	0.008^{a}
	(0.003)	(0.002)	(0.002)	(0.003)
Lendable	-0.109^{a}	-0.112^{a}	-0.099^{a}	-0.121^{a}
	(0.030)	(0.023)	(0.023)	(0.027)
Observations	21,803	23,367	23,627	22,227
R-squared	0.011	0.013	0.011	0.010

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	Dependent variable: postAR(+20,+61)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel B: estimation coefficients by disp quartiles			
Constant	0.008	0.011	0.022^{a}	0.025^{b}
	(0.007)	(0.008)	(0.009)	(0.010)
OnlyIS & high relSS	-0.006	-0.007	-0.014^{b}	-0.018^{a}
	(0.005)	(0.005)	(0.006)	(0.007)
OnlyIS & low relSS	-0.005	-0.003	-0.003	-0.008
	(0.005)	(0.007)	(0.007)	(0.009)
OnlyIP & high relSS	-0.006	-0.004	0.022^{a}	0.006
	(0.007)	(0.007)	(0.007)	(0.008)
OnlyIP & low relSS	-0.002	0.026^{b}	0.028^{b}	0.026^{b}
	(0.010)	(0.011)	(0.012)	(0.011)
High relSS & noPIT	-0.010^{b}	-0.002	-0.003	-0.006
	(0.005)	(0.005)	(0.006)	(0.006)
Bad news	0.002	0.000	0.002	0.002
	(0.002)	(0.003)	(0.003)	(0.004)
Good news	0.004	-0.002	0.002	0.008^{b}
	(0.002)	(0.003)	(0.003)	(0.004)
Lendable	-0.029	-0.065^{b}	-0.136^{a}	-0.158^{a}
	(0.027)	(0.028)	(0.032)	(0.040)
Observations	14,565	14,496	14,283	14,196
R-squared	0.014	0.009	0.012	0.020

Table I.7: Post-trading abnormal returns across buy-order imbalance quartiles: four-factor benchmark.

This table reports future abnormal returns partitioned by quartiles of buy-order imbalance ($oimb^{+}$). The dependent variable in all specifications is the raw buy-and-hold return adjusted by the 4 factor model benchmark. Panel A aggregates informed trading over the response window of (0,+5) and then measures abnormal returns over 3 months starting on day +5 relatively to the earnings announcement. Panels B is based on the response window of (0,+20) with abnormal returns starting on day +20 (see Figure 4). All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+5,+46)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel A: response window (0,+5)			
Constant	0.023^{a}	0.024^{a}	0.016^{b}	0.035^{a}
	(0.007)	(0.007)	(0.007)	(0.005)
OnlyIS & high relSS	-0.040^{a}	-0.033^{a}	-0.026^{a}	-0.036^{a}
	(0.007)	(0.005)	(0.005)	(0.005)
OnlyIS & low relSS	-0.020^{a}	-0.017^{b}	-0.018^{a}	-0.027^{a}
	(0.007)	(0.008)	(0.007)	(0.007)
OnlyIP & high relSS	0.031^{a}	0.010	0.011	0.007
	(0.009)	(0.008)	(0.008)	(0.008)
OnlyIP & low relSS	0.027^{a}	0.021	0.018	0.029^{a}
	(0.007)	(0.015)	(0.015)	(0.009)
High relSS & noPIT	-0.018^{a}	-0.011^{a}	-0.008^{b}	-0.014^{a}
	(0.004)	(0.004)	(0.004)	(0.004)
BAD news	-0.005	-0.003	-0.005	-0.012^{a}
	(0.003)	(0.003)	(0.003)	(0.003)
GOOD news	0.018^{a}	0.010^{a}	0.004^{c}	0.009^{a}
	(0.004)	(0.003)	(0.003)	(0.003)
Lendable	-0.149^{a}	-0.167^{a}	-0.153^{a}	-0.207^{a}
	(0.036)	(0.027)	(0.025)	(0.030)
Observations	23,659	25,835	26,023	24,291
R-squared	0.012	0.008	0.006	0.011

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	Dependent variable: postAR(+20,+61)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel B: response window (0,+20)			
Constant	0.013^{b}	0.007	0.034^{a}	0.050^{a}
	(0.006)	(0.008)	(0.010)	(0.011)
OnlyIS & high relSS	-0.007^{c}	-0.014^{a}	-0.036^{a}	-0.044^{a}
	(0.004)	(0.005)	(0.006)	(0.008)
OnlyIS & low relSS	-0.016^{a}	-0.009	-0.015	-0.032^{b}
	(0.005)	(0.007)	(0.010)	(0.014)
OnlyIP & high relSS	0.018^{a}	0.014^{c}	0.028^{a}	0.028^{a}
	(0.007)	(0.008)	(0.009)	(0.011)
OnlyIP & low relSS	0.024	0.015	0.042^{a}	0.018
	(0.015)	(0.016)	(0.015)	(0.016)
High relSS & noPIT	-0.001	-0.001	-0.009^{c}	-0.012^{c}
	(0.003)	(0.005)	(0.006)	(0.007)
BAD news	0.002	-0.000	-0.007^{c}	-0.009^{c}
	(0.002)	(0.003)	(0.004)	(0.005)
GOOD news	0.005^{b}	0.008^{a}	0.006	0.004
	(0.002)	(0.003)	(0.004)	(0.004)
Lendable	-0.114^{a}	-0.116^{a}	-0.201^{a}	-0.277^{a}
	(0.027)	(0.032)	(0.039)	(0.043)
Observations	16,062	15,986	15,822	15,562
R-squared	0.010	0.007	0.012	0.012

Table I.8: Post-trading abnormal returns across dispersion in analysts forecasts quartiles: four-factor benchmark.

This table reports future abnormal returns partitioned by quartiles of dispersion in analysts' forecasts, *disp*. The dependent variable in all specifications is the raw buy-and-hold return adjusted by the 4 factor model benchmark. Panel A aggregates informed trading over the response window of (0,+5) and then measures abnormal returns over 3 months starting on day +5 relatively to the earnings announcement. Panels B is based on the response window of (0,+20) with abnormal returns starting on day +20 (see Figure 4). All variables are defined in Appendix A, winsorized at the 1^{st} and 99^{th} percentiles. Standard errors are reported in parentheses. ^{a}, ^{b} and ^{c} indicate significance at the one-, five- and ten-percent levels.

	Dependent variable: postAR(+5,+46)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel A: response window (0,+5)			
Constant	0.020^{a}	0.015^{c}	0.032^{a}	0.030^{a}
	(0.007)	(0.008)	(0.008)	(0.006)
OnlyIS & high relSS	-0.055^{a}	-0.032^{a}	-0.031^{a}	-0.031^{a}
	(0.006)	(0.005)	(0.005)	(0.005)
OnlyIS & low relSS	-0.028^{a}	-0.018^{a}	-0.025^{a}	-0.032^{a}
	(0.006)	(0.007)	(0.007)	(0.006)
OnlyIP & high relSS	0.003	0.007	0.003	0.006
	(0.008)	(0.007)	(0.007)	(0.008)
OnlyIP & low relSS	0.026^{a}	0.007	0.019	0.026^{a}
	(0.006)	(0.012)	(0.013)	(0.007)
High relSS & noPIT	-0.027^{a}	-0.016^{a}	-0.015^{a}	-0.013^{b}
	(0.005)	(0.005)	(0.005)	(0.005)
BAD news	0.000	0.003	-0.003	-0.007^{c}
	(0.003)	(0.003)	(0.003)	(0.004)
GOOD news	0.018^{a}	0.007^{b}	-0.000	0.011^{a}
	(0.004)	(0.003)	(0.003)	(0.003)
Lendable	-0.148^{a}	-0.137^{a}	-0.164^{a}	-0.186^{a}
	(0.039)	(0.028)	(0.028)	(0.031)
Observations	23,502	25,796	25,986	24,212
R-squared	0.015	0.006	0.007	0.009

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	Dependent variable: postAR(+20,+61)			
Variables	quartile 1	quartile 2	quartile 3	quartile 4
	Panel B: response window (0,+20)			
Constant	0.004	0.040	0.196^{a}	0.289^{a}
	(0.028)	(0.035)	(0.044)	(0.051)
OnlyIS & high relSS	-0.071^{a}	-0.132^{a}	-0.231^{a}	-0.341^{a}
	(0.016)	(0.020)	(0.026)	(0.031)
OnlyIS & low relSS	-0.041^{b}	-0.110^{a}	-0.146^{a}	-0.156^{a}
	(0.016)	(0.023)	(0.028)	(0.038)
OnlyIP & high relSS	0.029	0.017	0.029	-0.056^{c}
	(0.023)	(0.024)	(0.033)	(0.033)
OnlyIP & low relSS	0.042	0.065^{c}	0.104^{a}	0.115^{a}
	(0.037)	(0.035)	(0.039)	(0.040)
High relSS & noPIT	-0.036^{b}	-0.063^{a}	-0.107^{a}	-0.176^{a}
	(0.016)	(0.020)	(0.026)	(0.028)
BAD news	0.016^{c}	0.005	-0.011	0.006
	(0.008)	(0.010)	(0.013)	(0.014)
GOOD news	-0.000	0.003	-0.014	-0.008
	(0.007)	(0.009)	(0.012)	(0.014)
Lendable	-0.400^{a}	-0.384^{a}	-0.806^{a}	-1.293^{a}
	(0.116)	(0.135)	(0.157)	(0.184)
Observations	16,038	15,958	15,784	15,528
R-squared	0.017	0.017	0.029	0.042