

So What Orders Do Informed Traders Use? Evidence from Quarterly Earnings Announcements

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Abstract

This paper examines what orders informed traders use before quarterly earnings announcements. In particular, we investigate whether informed traders prefer median orders and market orders right before quarterly earnings announcements. Quarterly earnings announcements are anticipated events. Because informed traders expect their information advantage will disappear after the announcements, this information event provides a unique opportunity to test whether informed traders become more impatient and use more aggressive orders when the announcement is approaching. Our results show that when the information will be released soon but there is still enough time for the execution (from day -10 to day -6), informed investors use small orders and limit orders to trade stealthily and reduce price risk. Within five days right before the announcements, informed investors trade more aggressively. They start using large market orders to ensure the execution and high profits. Our findings that informed traders change their preference for order type and order size over time shed new light on the ongoing debate on the order submission strategies by informed traders.

JEL Classification: G14

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1 Introduction

Order submission strategy is one of the important decisions traders must make. When an investor has superior information, he can choose to submit a market order or a limit order. Most market microstructure literature (for example, Harris (1998)) assumes that informed traders submit market orders to ensure the execution of their orders. On the contrary, Kaniel and Liu (2006) develop a model to show that when the information is long-lived, informed traders prefer limit orders in order to reduce the price risk. Currently, whether the informed traders prefer limit orders or market orders is still inconclusive. Similarly, there is also a disagreement with respect to the order size chosen by the informed traders. Kyle (1985), Barclay and Warner (1993), and Chakravarty (2001) suggest that informed traders trade strategically (spread trades over time) or stealthily (use median orders) to disguise their information. However, Easley and O'Hara (1987) suggest that the informed traders prefer to use large orders to make more profits. This argument is supported by Seppi (1992) who shows that block trades before earnings announcements contain information relevant to the upcoming news release. Motivated by the ongoing debate on whether informed traders use limit orders or market orders and whether informed traders use median orders or block orders, we investigate the orders submitted right before quarterly earnings announcements and test whether informed traders do prefer a certain order to another.

In this paper, we introduce an information event, the quarterly earnings announcement, into our study and focus on the period right before the announcements for three reasons. First, quarterly earnings announcements are scheduled events. During the period before the

announcements, the number of informed traders increases because investors expect the upcoming events and try to gather private information aggressively prior to the announcements. If informed traders have a specific preference, we can observe it more clearly during this period. Second, based on the direction of quarterly earnings announcements, we can classify an investor informed if he submits buy (sell) orders before good (bad) news. Prior studies usually infer the information content of trades from the movement of mid quotes or transaction prices. Without an information event, most papers assume that the informed traders' information will be incorporated into quotes or prices after a certain period of time, such as 30 minutes, one hour, or one day. In our paper, the specific announcement date gives us the timing when the information is reflected into the price directly. As a result, we can infer the information value of the informed trades more accurately. Third, because the informed traders' information advantages will disappear after the announcements, to make profits based on their private information, when the announcement is approaching, informed traders must trade more and more aggressively to ensure the order execution. This means the order chosen by the informed investors may change over time. The specific announcement date enables us to compare the order submission strategy during the period when the information is still long-lived with the strategy during the period when the information will be released very soon.

To our best knowledge, this is the first empirical study which shows informed traders change their preference over time. Prior studies usually show that limit orders contain more information and perform better than market orders (for example, Kaniel and Liu (2006) and Harris and Hasbrouck (1996)). However, most theoretical papers, for example Harris (1998), suggest that when the information decays very quickly, informed traders choose market orders

to guarantee the immediate execution. Our research design can identify the period when the information is short-lived and conduct the test for Harris (1998) and Kaniel and Liu (2006) directly.

Investigating 338,532 orders submitted within 40 days right before quarterly earnings announcements from 65 firms in the TORQ database, we find informed investors increase the use of limit orders from the non-announcement period (day -40 to day -11) to pre-announcement period (day -10 to day -1). This result is consistent with Kaniel and Liu (2006). Our finding also suggests that right before quarterly earnings announcements when everyone is very sensitive to informed trading, informed investors choose strategic trading and submit small orders, not median orders.

Examining whether investors change their preference over time before the quarterly earnings announcements, we find evidence supporting that investors become more and more impatient when the announcement is approaching. When the news will be released later but there is still enough time for the execution (period from day -10 to day -6), informed investors still use small orders and limit orders to trade stealthily and to reduce price risk. However, within five days right before the announcements, informed investors increase the use of large market orders to ensure the execution and high profits. We also find that when the announcement is approaching, traders who have more valuable information are more and more likely to submit large orders. In our paper, we find a positive relation between informed traders' information value and the use of limit orders, which is not consistent with Harris (1998) and Bloomfield, O'Hara, and Saar (2005). However, the positive relation is weakened when the announcement is coming soon. Together, our results are consistent with prior empirical studies and also indicate

that the assumptions of most theoretical papers do hold well when the information is really short-lived. Our findings that informed traders change their preference over time reconcile the debates on the order submission strategies by the informed traders and shed new light on the market microstructure literature.

The rest of this paper proceeds as follows. Section 2 describes the research questions. Section 3 presents data and research design. The empirical results are shown in section 4 and section 5 concludes.

2 Research Questions

In this study, we investigate whether the informed traders prefer a certain size or type of orders before quarterly earnings announcements. Quarterly earnings announcements are scheduled events. Expecting the uncertainty and increasing information asymmetry around the announcement, both market makers and traders react to the upcoming events. Specialists reduce the market liquidity in response to the increasing adverse selection costs. Informed traders bid aggressively to execute profitable trades because their private information will become valueless after the news releases. Noisy traders will become hesitant to trade during this period to avoid being exploited by the informed traders¹.

Because the number of informed traders increases before the quarterly earnings announcements, investigating the order size and order type submitted during this period enables us to

¹Milgrom and Stokey (1982) provide models to show that facing the information asymmetry, uninformed traders do not trade. In an extreme case, the market will fail and there will be no trade in the market.

figure out the preference of informed traders. In this paper, we attempt to answer the following three questions:

1. Whether the informed traders use limit orders or market orders?

Traders must decide when to use market orders and when to use limited orders. Investors who place a market order can get the execution immediately but pay an implicit price for immediacy. Investors who submit a limit order earn the bid-ask spread but bear the risk of non-execution and adverse selection. Foucault, Kadan, and Kadel (2005) develop a model which shows that in equilibrium, patient traders tend to submit limit orders, whereas impatient traders submit market orders. Harris (1998) derives order submission strategies and argues that traders are patient when the information they have is long lived. However, if their information advantages decay quickly, they trade aggressively. Similarly, Kaniel and Liu (2006) also develop a model to show that the information horizon is positively related to the use of limit orders. When the possibility that the information is long lived is high, informed traders are more likely to place limit orders than market orders in order to reduce the price risk. These papers suggest that informed traders use limit orders when the private information does not become public very soon and choose market orders when the information is going to be released quickly.

Although the theoretical papers suggest that when the informed traders' information advantages are going to disappear, informed traders choose market orders, most empirical papers find evidence supports that limit orders perform better than market orders. Kaniel and Liu (2006) use the TORQ data and find that limit orders have more information content (measured by the price movement after trades) than market orders. Wald and

Horrigan (2005) also find that investors generally prefer slightly discounted limit orders to market orders. Even informed investors who expect returns to be positive often prefer to place a slightly discounted limit order because the probability of fill for such orders is high. Harris and Hasbrouck (1996) find that limit orders used by NYSE SuperDOT traders perform best, even after imputing a penalty for unexecuted orders, and after taking into account market order price improvement.

In this paper, we examine whether informed investors use limit orders when the announcement is still far away and whether the informed investors use market orders immediately before the quarterly earnings announcements. Because informed traders anticipate the scheduled announcements and know that their information will become useless after the announcement, introducing the earnings announcements provides a unique opportunity to test Harris (1998) and Kaniel and Liu (2006) directly and answer whether investors do change their preference of order type over time.

2. Whether the informed traders submit median-size orders or large-size orders?

When investors have superior information, they can choose to submit a large order in order to maximize profits and minimize costs. Harris (1998) argues that informed traders will trade more aggressively when the announcement is approaching. This implies that they will choose large orders. Easley and O'Hara (1987) also suggest that the informed traders prefer to trade larger amounts at any given price to make more profits. Seppi provides supportive evidence for Harris (1998) and Easley and O'Hara (1987). He finds that block prices before the quarterly earnings announcements (from day -6 to day -2) are correlated with the unexpected part of firms' quarterly earnings, which suggests that

block trades are more likely to be submitted by the informed traders.

Several studies, however, suggest that it is better for the informed traders to trade stealthily (submit a median order) right before quarterly earnings announcements when everybody is very sensitive to the informed trading. Anand, Chakravarty, and Martell (2005) argue that over time, specialists are able to deduce the trader type behind the order. If a specialist receives a large order and suspect that the order is placed by an informed trader, he can check the submitting broker's identity. As a result, right before quarterly earnings announcement, if the informed traders submit a large order, it is very possibly that their trading will be detected by the specialists. Kyle (1985) suggests that informed traders trade strategically (spread trades over time) to disguise their information. Barclay and Warner (1993) find the price movement of median orders is larger than that of large and small orders. They suggest that informed traders choose median orders to avoid being caught by the specialists. Chakravarty (2001) further confirm that the price movements caused by median trades are driven by institutional investors who are more likely to be informed than individual traders.

In this paper, we also investigate whether the informed traders prefer median orders to large orders and whether they change their preference for order size over time. Although informed investors have incentive to divide their trades into several median orders, when their information advantage will decay quickly, there is not enough time for them to trade stealthily. They may choose to trade large orders to make a high profit as soon as possible as Seppi (1992) suggests. Therefore, we examine whether the informed traders are more and more likely to submit large orders when the announcement is approaching.

3. Whether the informed traders' information value is related to the choice of order type and order size?

Bloomfield, O'Hara, and Saar (2005) posit that the choice of limit orders versus market orders by the informed investors is related to the dynamic adjustment of prices to information. Informed traders take liquidity (submit market orders) when the value of their information is high and provide liquidity (submit limit orders) when the value of their information is low. Harris (1998) also shows that traders are most aggressive when their information advantages are larger. Because we have a specific information event, we can infer the information value by comparing the mid quote when the order is submitted with the mid quote after the quarterly earnings announcements. Based on Bloomfield, O'Hara, and Saar (2005) and Harris (1998), we should observe that investors who have larger information value submit large orders and market orders more often than small/median limit orders.

3 Data and Research Design

The main data used in this study is the system order database (SOD) file, consolidated transaction (CT) file, and consolidated quote (CQ) file from NYSE Trades, Orders, Reports, and Quotes (TORQ) database. The TORQ database includes intraday data for trade execution, quotes from market makers, and orders submitted through the NYSE's SuperDOT system, OARS (the opening automated reporting system) and ITS (the Intermarket Trading System) for 144 NYSE firms from November 1990 to January 1991. Because we investigate the order

submission before quarterly earnings announcements, our sample only includes firms which release their earnings during the sample period. From Compustat, we find 46 firms make earnings announcements during this period. We further look for the date of earnings announcements for the remaining 98 firms from LexisNexis newswire and find additional 32 firms which announce their financial reports between Nov. 1990 and Jan. 1991. To require at least 10-day data for the non-announcement period (from day -40 to day -11) and 10-day data for the pre-announcement period (from day -10 to day -1), we drop 13 firms which make the announcement in Nov. 1990. Our final sample contains 65 firms.

Following Kaniel and Liu (2006), we consider only regular market and limit orders and exclude stop orders, stop limit orders, market at close orders, and limit or better orders. We also delete the orders which are cancelled by investors and orders which are submitted during the period when the prevailing spread and depth are not available². The spread and depth are determined solely by the quote from NYSE specialists. During our sample period, there are 338,532 orders, including 244,275 orders in the non-announcement period and 94,257 orders in the pre-announcement period.

The summary statistics of the orders in our sample are reported in Table 1. We classify each order into one of the three size groups: large, median, and small. Large orders are orders with a size of 5,000 shares or more. Median orders have a size between 500 shares and 5,000 shares. The size of small orders is smaller than 500 shares. Panel A of Table 1 provides the average daily number of orders, average order size, percentage of limit orders, and percentage of individual investors for the three size groups. On average, there are about 432 large orders,

²These orders are usually submitted before 9:30 am.

3,710 median orders, and 4,322 small orders per day. The average order size is 9,147 shares for a large order, 1,352 shares for a median order, and 191 shares for a small order. When the order size becomes larger, investors use limit orders more frequently. 82.69% of large orders, 56.69% of median orders, and 28.42% of small orders are limit orders. This result suggests that when the order size is larger, investors care more about price risk than the speed of execution. In our sample, about 6.68% of the large orders, 24.87% of the median orders, and 57.97% of the small orders are submitted by individual investors.

To investigate what type of orders informed traders use, we need to identify who are informed traders. We assume that informed traders know the direction of the upcoming earnings announcements and trade based on their private information. That is, informed investors will submit buy (sell) orders before good (bad) news. On the contrary, noisy traders can place both buy and sell orders before good or bad news. As a result, people who trade in the correct direction can be informed or noisy traders; while people who trade in the wrong direction are only noisy traders. If a certain type of orders is more likely to have the correct direction than other types of orders, that is the one informed traders prefer. We determine the direction of the quarterly earnings announcements based on the 3-day cumulative market-adjusted return from day -1 to day 1. When the 3-day cumulative return is positive (negative), we assume the announcements conveys good (bad) news to the public.

Panel B of Table 1 provides the percentage of orders with the correct direction over the entire sample period. We find large orders are more likely to have the correct direction than median and small orders. 48.71% of the large orders placed between day -40 and day -11 are in the same direction as the upcoming announcements; while only 44.05% of the small orders

are in the correct direction. Comparing market orders with limit orders, we find the difference between market orders and limit orders are small for large and median orders. For small orders, market orders are on the same side as the earnings announcement more frequently. For the orders submitted by individual investors, the percentages of order with the correct direction increases from 40.70% to 51.71% when the order size changes from small size to large size. However, for the orders from non-individual investors, the percentage of orders with the correct direction remains stable when the size of orders changes. Our result shows that individual investors who submit median and small orders do not have better information than non-individual investors. However, if individual investors place a large order, they may have superior information to non-individual investors.

In this study, we focus on the order placed during the pre-announcement period. Prior studies suggest that during this period, the information asymmetry is high because investors gather private information aggressively when the announcement is upcoming. If the number of informed traders increases from the non-announcement period to pre-announcement period, we can find the informed traders preference clearly by finding the differences between these two periods. Specifically, we do two-sample tests for proportions to test whether the percentage of a certain type of order changes from non-announcement period to pre-announcement. Following Kaniel and Liu (2006), we also run a multivariate probit regression to control other factors for orders submitted during the pre-announcement period. The regression model is as follows:

$$SD = \beta_0 + \beta_1LIMIT + \beta_2LARGE + \beta_3MEDIAN + \beta_4INDIVIDUAL \\ + \beta_5TRDINT + \beta_6SPREAD + \beta_7SDSIZE + \beta_8ODSIZE$$

$$+\beta_9 ADJRET + \beta_{10} ID, \tag{1}$$

where SD equals to one if a buy (sell) order is submitted before a good (bad) earnings announcement, and zero otherwise, $LIMIT$ equals to one if the order is a limit order, $LARGE$ is the dummy variable for orders with a size larger than or equal to 5,000 shares, $MEDIAN$ is the dummy variable for orders between 500 shares and 4999 shares, $INDIVIDUAL$ is one if the order is submitted by an individual (account type is “I”, “J”, or “K” in TORQ database), $TRDINT$ is the relative trading intensity (number of transaction, in terms of number of standard deviation from the average over the sample period) for the five time interval (9:30 am-10:00 am, 10:00 am-11:30 am, 11:30 am-2:00 pm, 2:00 pm-3:30 pm, and 3:30 pm-4:00 pm) within which the order is submitted, $SPREAD$ is the prevailing spread over the mid quote relative to the average over the sample period, $SDSIZE$ ($ODSIZE$) is the prevailing ask (bid) depth for a buy order and the prevailing bid (ask) for a sell order relative to average over the sample period, $ADJRET$ is the return during the 24 hours right before the order is submitted, and ID includes 64 dummy variables for 65 firms. In the regression model, we use the dummy variable for large and median orders, rather than the size of the orders directly because if the informed traders prefer median orders, the percentage of orders with the correct direction may not increase with the size of the orders. Based on our model, if informed investors prefer to submit median limit orders before earnings announcements, we should observe significant positive coefficients for $MEDIAN$ and $LIMIT$. If informed investors prefer to use large market orders, we should find a positive coefficient for $LARGE$ and negative coefficient for $LIMIT$.

To find whether informed traders become more and more impatient when the announce-

ment is approaching, we examine the changes of preference from the first five days of the pre-announcement period (day -10 to -6) to the second five days of the pre-announcement period (day -5 to day -1). We add a dummy variable ($PRE2$) for the second 5-day period and several interaction terms ($PRE2 * LIMIT$, $PRE2 * LARGE$, $PRE2 * MEDIAN$, and $PRE2 * INDIVIDUAL$) into the regression model to test whether informed traders' preference changes over time.

To test whether the informed traders trade more aggressively when their information value is higher, we use the difference between the prevailing mid quote at the time when order is submitted and the closing mid quote on day 1 ($INFOVAL$) to measure the information value. If the mid quote on day 1 is not available from the TORQ database, we replace it with the last trading price obtained from CRSP. We then construct a similar probit regression to investigate whether investors whose information value is higher are more likely to submit large market orders.

4 Empirical Results

The results of the two-sample tests for proportions are presented in Table 2. We find the percentage of limit orders decreases by 2.89%, which is consistent with Handa and Schwartz (1996) who argue that submitting a limit order is equivalent to writing a free option. During the period right before the quarterly earnings announcements, the adverse selection cost is higher. As a result, people is less willing to place a limit order. Examining the difference between non-announcement period and pre-announcement period, we find the percentage of orders

with the correct direction increases by 6.03% for limit orders and also increases by 2.27% for market orders. This result suggests that the possibility of informed trading does increase when the announcement is approaching. During the non-announcement period, people who submit market orders trade in the right direction more often (by 1.48%) than those who submit limit orders. However, during the pre-announcement period, limit orders with the correct direction occurs more frequently (by 2.28%) than their counterpart of market orders. Our evidence supports that informed investors prefer limit orders to market orders before quarterly earnings announcements, which is consistent with Kaniel and Liu (2006).

About the order size preferred by the informed investors, we find from the non-announcement period to the pre-announcement period, informed investors increase the use of small orders more often than that of median orders and large orders. Although investors who place large orders are still more likely to trade in the correct direction than investors who submit median or small orders during both non-announcement period and pre-announcement, from the non-announcement period to pre-announcement period, the increase of informed trades is smaller for large orders than for non-large orders. Furthermore, during the non-announcement period, median orders are more likely to be in the same direction as the earnings announcement than non-median orders. However, during the pre-announcement period, non-median orders are more likely to have the correct direction than median orders. The pattern for small orders is opposite to that for median orders. Together, our results show that during the non-announcement period when the information is long lived, informed traders prefer large or median orders than small orders. However, during the pre-announcement period, when the market makers and other traders are very sensitive to the informed trading, informed traders still use larger or-

ders, but reduce the use of median orders and increase the submission of small trades at the same time.

In Table 3, we report the result for the probit regression during the pre-announcement period. The numbers in the bracket are marginal effects. For brevity, we do not report the results for firm dummies. In model (1), we determine the direction of earnings announcement based on the 3-day announcement returns. If the 3-day cumulative market-adjusted return is positive (negative), the announcement conveys good (bad) news. In model (2), we determine the informed trading based on the movement of mid quotes. The dependent variable equals to one if investors submit a buy (sell) order and the mid quote increases (decrease) from the time when the order is submitted to the time after the news is released (one day after the announcement day). In both models, we find consistent results for the preference of the informed traders. During this period, informed traders are more likely to submit limit orders. When the order type changes from market order to limit order, the possibility that the direction of the order is the same as the direction of the announcement increases by 1.61% for model (1) and by 3.18% for model (2). Median orders are less likely to be placed by the informed traders than large orders and small orders. When the order size change from small size to median size, the possibility of orders with the correct direction decreases by 1.74% in model (1) and by 2.18% for model (2). There is no significant difference between large orders and small orders. The results of multivariate probit regression in Table 3 are consistent with the univariate results in Table 2.

To examine whether investors become more and more impatient when the announcement is approaching, we add a dummy variable, PRE2, for the period from day -1 to day -5 and

several interaction terms into the probit regression. The results are shown in Table 4. Here we focus on the interaction terms which indicate the differences between the period (-10, -6) and the period (-5, -1). During the period from day -6 to day -10, informed investors are more likely to submit small and limit orders. When the announcement approaches, informed traders increase the use of large market orders. Compared with the possibility during the period (-10, -6), if a limit order is submitted during the period (-5, -1), the possibility that the order has the same direction as the upcoming news decreases by 1.76% in model (1) and by 8.50% in model (2). Similar, if a large order is submitted during the period (-5, -1), the possibility that the order has the same direction as the upcoming news increases by 5.86% in model (1) and by 14.00% in model (2). Our results show that informed traders use small limit orders when the news release is not urgent and then change to large market orders when the announcement is upcoming very soon.

In Table 5, we report the test whether the choice of order type and order size is related to the informed traders' information value. Inconsistent with Harris (1998) and Bloomfield, O'Hara, and Saar (2005), we do not find market orders are used more often when the informed traders' information value is higher. On the contrary, when the information value is higher, informed investors are more likely to submit a limit orders. When the traders' information value increases by 1%, the possibility of limit order increases by 0.2851%. When the announcement is approaching, the positive relation between the use of limit order and information value decreases by 20.23%. Similarly, about the choice of order size, we find that during the period (-10, -6) when the announcement is not urgent, there is still time for the execution of limit orders and stealth trading. Orders with higher information value are more likely to be small orders

and less likely to be large or median orders. However, when the announcement is approaching, traders who have more valuable information tend to submit large orders. Our results suggest that the timing of the earnings announcement, or the information horizon, is a more important factor of order choices than the information value. Although our results are more consistent with Kaniel and Liu (2006), from the changes from the first 5-day period (-10, -6) to the second 5-day period, we also find that most market microstructure theories, such as Harris (1998), hold better when the information is really short-lived.

5 Conclusion

In this paper, we examine what type and size of orders informed traders use. Specifically, we investigate whether informed traders use median market orders before quarterly earnings announcements. Introducing earnings announcements allows us to infer the informed trades based on a real information event. Furthermore, because the informed traders' information advantage will disappear after the announcements, we can test whether the informed traders become impatient and use the market orders more frequently when the announcement is approaching.

Our findings suggest that when the information is going to be announced but there is still time for the execution, informed investors choose small limit orders to reduce price risk and to trade stealthily to reduce the transactions costs. Our results support stealth trading before the announcement but do not support that informed traders use median orders. We find during this period, informed traders avoid using median orders. When the announcement is approaching, the informed investors increase the use of large market orders to ensure the

execution and maximize their profits.

Our paper contributes to market microstructure literature in that we find informed investors prefer different types of orders during different periods and reconcile the disputes on informed traders' preference for order type and order size. Our results indicate that the assumptions of the theoretical papers hold well when the information is really short-lived. Our results support many existing studies and shed new light on the informed traders' order submission strategies.

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Table 1 Summary Statistics

This table provides summary statistics for the 338,532 orders submitted within 40 days right before quarterly earnings announcements from 65 firms which reported earnings in Dec. 1990 and Jan. 1991. Panel A reports the characteristics of orders for the sample. Panel B shows the percentage of orders with same direction as the upcoming quarterly earnings announcement. Large order is the order with a size of 5,000 shares or larger. Median order is the order with a size between 500 shares and 5,000 shares. The size of a small order is smaller than 500 shares. The average daily # of orders is the average daily number of orders over all 65 firms. Average order size is the average size over the whole sample. % of limit order, and % of individual investors are percentages of orders for the entire sample.

Panel A: Summary statistics

Order Size	Large Order	Median Order	Small Order
Avg. daily # of orders	431.88	3,709.85	4,321.58
Avg. order size	9,147.09	1,351.62	191.34
% of limit order	82.69%	56.69%	28.42%
% of individual investors	6.68%	24.87%	57.97%

Panel B: Percentage of orders with the same direction as the earnings announcements

Order Size	Large Order	Median Order	Small Order
All	48.71%	47.66%	44.05%
Limit order	48.46%	47.51%	41.43%
Market order	49.81%	47.85%	45.10%
Individual investors	51.71%	46.62%	40.70%
Non-individual investors	48.49%	48.00%	48.72%

Table 2 Test for Changes of Proportion from Non-announcement Period to Pre-announcement Period

This table provides tests for changes of proportion from non-announcement period (-40, -11) to pre-announcement period (-10, -1). Large order is the order with a size of 5,000 shares or larger. Median order is the order with a size between 500 shares and 5,000 shares. The size of a small order is smaller than 500 shares. Same-direction orders are buy (sell) orders before good (bad) news. The non-announcement period is the period from 11 days before the announcement to 40 days before the announcement. The pre-announcement period is from 10 days before the announcement to the day before the announcement. ***, **, and * indicate that a number is significant different from zero at 1%, 5%, and 10%, respectively from a two-sample test for equality of proportions.

		Pre-announcement Period (%)	Non- announcement Period (%)	Difference (Pre - Non)
Limit vs Market	% of Limit orders	41.49	44.38	-2.89 ^{***}
	Limit orders with correct direction	50.00	43.97	6.03 ^{***}
	Market orders with correct direction	47.72	45.45	2.27 ^{***}
	Difference (Limit - Market)	2.28 ^{***}	-1.48 ^{***}	
Large vs Non-large	% of Large orders	5.14	5.09	-0.05
	Large orders with correct direction	50.31	48.08	2.23 ^{***}
	Non-large orders with correct direction	48.57	44.61	3.96 ^{***}
	Difference (Large - Non-large)	1.74 ^{**}	3.47 ^{***}	
Median vs Non- median	% of median orders	42.46	44.37	-1.91 ^{***}
	Median orders with correct direction	47.79	47.61	0.18 ^{***}
	Non-median orders with correct direction	49.30	42.54	6.76 ^{***}
	Difference (Median - Non-median)	-1.51 ^{***}	5.07 ^{***}	
Small vs Non-small	% of small orders	52.41	50.54	1.87 ^{***}
	Small orders with correct direction	49.21	41.98	7.23 ^{***}
	Non-small orders with correct direction	48.07	47.66	0.41
	Difference (Small - Non-small)	1.14 ^{***}	-5.68 ^{***}	

Table 3 Probit Regression for Informed Trading for the Pre-announcement Period

This table provides the results for probit regressions. The sample includes orders submitted within 10 days right before quarterly earnings announcements. In model (1), the dependent variable equals to one if a buy (sell) order is submitted before a good (bad) earnings announcement, and zero otherwise. In model (2), the dependent variable equals to one if the midquote after the earnings announcement is higher (lower) than the midquote when a buy (sell) is placed. The independent variables are as follows: LIMIT equals to one if the order is a limit order, LARGE is the dummy variable for orders larger than or equal to 5,000 shares, MEDIAN is the dummy variable for orders between 500 shares and 5,000 shares, INDIVIDUAL is one if the order is submitted by an individual investor, TRDINT is the relative trading intensity (number of transaction, in terms of number of standard deviation from the average over the sample period) for the time interval (9:30 am-10:00 am, 10:00 am-11:30 am, 11:30 am-2:00 pm, 2:00 pm-3:30 pm, and 3:30 pm-4:00 pm) within which the order is submitted. SPREAD is the prevailing spread over the midquote relative to the average over the sample period, SDSIZE (ODSIZE) is the prevailing ask (bid) depth for a buy (sell) order and the prevailing bid for a sell order relative to average over the sample period, and ADJRET is the return during the 24 hours right before the order is submitted. The regression also includes 64 dummies for 65 firms. For breviation, the estimates for firm dummies are not reported. ***, **, and * indicate that a number is significant different from zero at 1%, 5%, and 10%, respectively from a two-tailed t test. Numbers in the bracket are marginal effects.

	Model (1)	Model (2)
# Obs	94,257	94,257
Intercept	-0.1730 ^{***}	-0.1635 ^{***}
LIMIT	0.0420 ^{***} [1.61%]	0.0846 ^{***} [3.18%]
LARGE	0.0017 [0.07%]	-0.0146 [-0.55%]
MEDIAN	-0.0456 ^{***} [-1.74%]	-0.0579 ^{***} [-2.18%]
INDIVIDUAL	-0.0286 ^{***} [-1.10%]	-0.0818 ^{***} [-3.08%]
TRDINT	0.0286 ^{***} [1.09%]	0.0006 [0.02%]
SPREAD	-0.0072 [-0.27%]	0.0251 ^{***} [0.94%]
SDSIZE	-0.0279 ^{***} [-1.07%]	-0.0277 ^{***} [-1.04%]
ODSIZE	0.0173 ^{***} [0.66%]	0.0116 ^{***} [0.44%]
ADJRET	-3.4968 ^{***} [-133.75%]	8.9978 ^{***} [338.51%]

Table 4 Probit Regression for Informed Trading for the Pre-announcement Period

This table provides the results for probit regressions during the pre-announcement period (-10, -1). We focus on the difference between the first five days and the seconde five days. In model (1), the dependent variable equals to one if a buy (sell) order is submitted before a good (bad) earnings announcement, and zero otherwise. In model (2), the dependent variable equals to one if the midquote after the earnings announcement is higher (lower) than the midquote when a buy (sell) is placed. The independent variables are as follows: PRE2 equals one if the order is submitted during the 5 days right before earnings announcements (-5, -1) , LIMIT equals to one if the order is a limit order, LARGE is the dummy variable for orders larger than or equal to 5,000 shares, MEDIAN is the dummy variable for orders between 500 shares and 5,000 shares, INDIVIDUAL is one if the order is submitted by an individual investor, TRDINT is the relative trading intensity (number of transaction, in terms of number of standard deviation from the average over the sample period) for the time interval (9:30 am-10:00 am, 10:00 am-11:30 am, 11:30 am-2:00 pm, 2:00 pm-3:30 pm, and 3:30 pm-4:00 pm) within which the order is submitted. SPREAD is the prevailing spread over the midquote relative to the average over the sample period, SDSIZE (ODSIZE) is the prevailing ask (bid) depth for a buy (sell) order and the prevailing bid ror a sell order relative to average over the sample period, and ADJRET is the return during the 24 hours right before the order is submitted. The regression also includes 64 dummies for 65 firms. For breviation, the estimates for firm dummies are not reported. ***, **, and * indicate that a number is significant different from zero at 1%, 5%, and 10%, respectively from a two-tailed t test. Numbers in the bracket are marginal effects.

	Model (1)	Model (2)
Intercept	-0.1532 ^{***}	-0.2021 ^{***}
PRE2	-0.0361 ^{**} [-1.38%]	0.0624 ^{***} [2.34%]
LIMIT	0.0650 ^{***} [2.48%]	0.1987 ^{***} [7.46%]
LARGE	-0.0799 ^{***} [-3.06%]	-0.2173 ^{***} [-8.16%]
MEDIAN	-0.0537 ^{***} [-2.05%]	-0.0699 ^{***} [-2.63%]
INDIVIDUAL	-0.0145 [-0.55%]	-0.0870 ^{***} [-3.27%]
PRE2*LIMIT	-0.0461 ^{***} [-1.76%]	-0.2264 ^{***} [-8.50%]
PRE2*LARGE	0.1532 ^{***} [5.86%]	0.3728 ^{***} [14.00%]
PRE2*MEDIAN	0.0168 [0.64%]	0.0238 [0.89%]
PRE2*INDIVIDUAL	-0.0273 [-1.04%]	0.0098 [0.37%]
TRDINT	0.0292 ^{***} [1.12%]	0.0008 [0.03%]
SPREAD	-0.0078 [-0.30%]	0.0248 ^{***} [0.93%]
SDSIZE	-0.0274 ^{***} [-1.05%]	-0.0278 ^{***} [-1.04%]
ODSIZE	0.0176 ^{***} [0.67%]	0.0106 ^{**} [0.40%]
ADJRET	-3.4903 ^{***} [-133.42%]	9.0030 ^{***} [338.09%]

Table 5 Probit Regression for the selection of orders

This table provides the results for probit regressions during the pre-announcement period (-10, -1). We focus on the difference between the first five days and the seconde five days. In model (1), the dependent variable equals to one if a buy (sell) order is submitted before a good (bad) earnings announcement, and zero otherwise. In model (2), the dependent variable equals to one if the midquote after the earnings announcement is higher (lower) than the midquote when a buy (sell) is placed. The sample period is from day -10 to day -1. The independent variables are as follows: PRE2 equals one if the order is submitted during the 5 days right before earnings announcements (-5, -1) , LIMIT equals to one if the order is a limit order, LARGE is the dummy variable for orders larger than or equal to 5,000 shares, MEDIAN is the dummy variable for orders between 500 shares and 5,000 shares, INDIVIDUAL is one if the order is submitted by an individual investor, TRDINT is the relative trading intensity (number of transaction, in terms of number of standard deviation from the average over the sample period) for the time interval (9:30 am-10:00 am, 10:00 am-11:30 am. 11:30 am-2:00 pm, 2:00 pm-3:30 pm, and 3:30 pm-4:00 pm) within which the order is submitted. SPREAD is the prevailing spread over the midquote relative to the average over the sample period, SDSIZE (ODSIZE) is the prevailing ask (bid) depth for a buy (sell) order and the prevailing bid for a sell order relative to average over the sample period, and ADJRET is the return during the 24 hours right before the order is submitted. The regression also includes 64 dummies for 65 firms. For breviation, the estimates for firm dummies are not reported. ***, **, and * indicate that a number is significant different from zero at 1%, 5%, and 10%, respectively from a two-tailed t test. Numbers in the bracket are marginal effects.

Dependent variable	LIMIT	LARGE	MEDIAN	SMALL
Intercept	-0.9986***	-1.1821***	0.1066***	-0.3972***
PRE2	-0.0209 [-0.71%]	0.0685*** [0.64%]	-0.0306*** [2.55%]	0.0005 [0.02%]
INFOVAL	0.8357*** [28.51%]	-0.2262* [-2.10%]	-0.5003*** [28.51%]	0.5776*** [19.70%]
LARGE	1.5821*** [53.98%]			
MEDIAN	0.6978** [23.81%]			
INDIVIDUAL	0.1629*** [5.56%]	-1.1208*** [-10.39%]	-0.8138*** [-5.27%]	1.0219*** [34.86%]
PRE2*INFOVAL	-0.5929*** [-20.23%]	0.0551** [5.11%]	-0.0483 [2.55%]	-0.1034 [-3.53%]
PRE2*LARGE	-0.2733*** [-9.32%]			
PRE2*MEDIAN	0.0103 [0.35%]			
PRE2*INDIVIDUAL	-0.0267 [-0.91%]	-0.0144 [-0.13%]	0.0706*** [4.18%]	-0.0465*** [-1.59%]
TRDINT	-0.0557*** [-1.90%]	0.0107* [0.10%]	0.0018 [-0.61%]	-0.0047 [-0.16%]
SPREAD	0.0394** [1.34%]	0.0539*** [0.50%]	0.0254*** [0.35%]	-0.0517*** [-1.76%]
SDSIZE	-0.0269*** [-0.92%]	-0.0080 [-0.07%]	-0.0425*** [-0.36%]	0.0446*** [1.52%]
ODSIZE	0.0003 [0.01%]	0.0312*** [0.29%]	-0.0066 [-0.39%]	-0.0012 [-0.04%]
ADJRET	-5.2930*** [-180.60%]	-1.2005*** [-11.13%]	-1.2510*** [30.89%]	1.6660*** [56.83%]