



subject to continuous order matching to determine the executed price. Orders are executed in strict price then time priority. During the pre-opening periods, namely 9.30-10.00 in the morning and 14.00-14.30 in the afternoon, and the pre-closing period from 16.30-16.40, call market matching is used to determine morning and afternoon opening prices and closing price.

There are seven order types on the SET: market order, limit order, at-the-open order, at-the-close order, immediate-or-cancel order, fill-or-kill order, and iceberg order. The five best bid and ask prices can be seen by market participants. Whenever a trade occurs, the real-time traded volume and price of the trade are visible to all traders but the identity of the brokers and traders that executed the trade are not shown.

5. Data and Methodology

5.1 Data

The data used in the present study are obtained from two files. The first file is the order file, which represents the orders submitted for all securities traded through an automatic order matching system (AOM). A typical order record comprises a unique identification number, date and time of order submission/cancellation, order side (buy or sell), order price, the number of shares in an order, and the number of shares executed/unexecuted, and stock ticker name. Further, the order record indicates whether the order-submitting trader is a local individual (i.e., retail investor), foreign investor, local institution, or proprietary trader (i.e., broker). The second is the deal file, which records the transactions of orders submitted for all securities through the AOM, and provides the same information for matched buy orders and sell orders. From these two files, the limit order book was then constructed. Data from October 1, 2009 to December 30, 2009 were used in the present study. According to Ranaldo (2004), market conditions could have an impact on the relationship between the state of a limit order book and traders' order choices. Therefore, in order to control any potential effect of market conditions on our empirical investigation of the aggressiveness of order submission by different trader groups, a time period with no significant market movement should be selected. The market condition during our sample period is considered neutral. From **Figure 1**, though the SET index was on the rising trend during 2009 to 2010, the overall market return during our selected three-month period is merely +1.05%, with the SET index standing at 726.91 on October 1, 2009, and ending at 734.54 on December 30, 2009.



In order to ensure that our sample stocks are traded by all four investor types, this study examines only large firms. Specifically, the constituent stocks in the SET50 (where main criteria for stocks to be included are size and liquidity) are selected for the present study. In addition, the SET50 index is important because it is widely used as a benchmark by many index-tracking funds and as an underlying asset for futures and options. As expected, though our sample stocks constitute only 10% (50 stocks from the total of about 500 stocks), their market capitalization and trading volume account for about 75%. In summary, our final sample consists of approximately 3.63 million order submitted by all four investor groups for 50 liquid, large stocks in the SET during October to December 2009.

5.2 Methodology

Following Biais et al. 1995, Griffiths et al. 2000, and Ranaldo 2004, orders are classified into six categories based on their aggressiveness level. A category 6 order is the most aggressive order. Category 6 buy (sell) orders are orders with prices equal to or greater (less) than the current best ask (bid) quote and volumes to buy (sell) exceeding the number of shares available at the best ask (bid) quote. Category 6 orders are therefore immediately filled by the market depth at the best ask (bid) and by the further depth available at the higher (lower) quote in the order book. The remaining unexecuted portion, if any, of the category 6 orders remains in the book as limit orders standing at the best quotes. Category 5 orders are buy (sell) orders with prices matching the best ask (bid) price and volume less than the number of shares available at the best ask (bid) quote. Category 5 orders are therefore fully executed upon submission.

Category 4 orders are limit orders with prices inside the best bid-ask quotes. Category 3 buy (sell) orders are limit orders with prices equal to the current best bid (ask) price. Category 2 buy (sell) orders are limit orders with prices lower than (higher than) the current best bid (ask) price, but higher than (lower than) the fifth best bid (ask) price. Finally, the least aggressive buy (sell) orders, category 1 orders, are limit orders with prices below (above) the fifth best bid (ask) price.

According to this classification, Category 6 and 5 orders are considered market orders, because these orders are executed immediately upon submission. By contrast, category 4, 3, 2, and 1 orders are simply limit orders, because they cannot be executed immediately and wait in queue for execution in the order book.



Following Hausman et al. 1992, Griffiths et al. 2000, and Rinaldo 2004, the determinants of order aggressiveness are examined using an ordered probit analysis. The ordered probit model is appropriate since the order aggressiveness, our dependent variable, is classified into six levels, ranking from the most (i.e., 6) to the least (i.e., 1) aggressiveness. The explanatory variables of the order aggressiveness level includes the following; the market depth on the same side, the market depth on the opposite side, the relative depth, stock price volatility, the relative bid-ask spread, and two dummy variables (i.e., last aggressive dummy and buy dummy). The market depth at the same side (opposite side) is defined as the number of shares available at the best same-side (opposite-side) quote. The relative depth is defined as the ratio of the number of shares available at the five best same-side quotes to the number of shares available at the five best opposite-side quotes. Volatility is calculated as the standard deviation of the recent 20 quote-midpoint returns. The relative bid-ask spread is defined as the difference between the best bid and ask prices, divided by the mid-quote at the time of order submission. The last aggressive dummy is equal to one if the previous order is an aggressive order (i.e., category 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. This last aggressive dummy variable allows us to examine the existence of autocorrelation in aggressive orders. The buy dummy variable is equal to one if the current order is a buy order, and zero if a sell order. To control for potential differences between purchase and sale on order aggressiveness (Rinaldo 2004), the buy dummy is included into the ordered probit model.

In addition, in order to empirically examine the differences in the impact of the explanatory variables on the order aggressiveness among four investor groups in the SET, a separate ordered probit model is estimated for each investor group.

6. Empirical Results

6.1 Statistics of Limit Order Book and Order Submissions

Table 1 provides descriptive statistics of order-related variables and limit order book variables across 50 sample stocks. The number of shares in an order ranges from 820 to 257,680, with the averaged value of 20,109. Both market depth at the same side and at the opposite side have similar descriptive statistics. Depth at the five best same side quotes has similar descriptive statistics to that of depth at the five best opposite side quotes. The percentage relative spread on average is quite small, with the value of 0.587%. Overall, regarding the large



depth on both sides and the narrow spread, our 50 sample stocks are very liquid. This is plausible since our 50 stocks are constituents of the SET50 index.

Table 2 shows the summary statistics for all orders submitted for our 50 sample stocks. There are a total of 3,634,223 orders under our analyses. In Table 2, the aggressiveness of order submissions is classified into six categories, and shows the corresponding relative frequency of each aggressiveness category. Category 2 orders are the most frequent type of orders, constituting approximately 37%. Category 3 orders are the second-most frequent type of orders, constituting nearly 31%. Category 5 and Category 1 orders are the third-and fourth-most frequent types of orders, constituting 19.7% and 10.6% respectively. The most aggressive type of order, Category 6, represents only 1.5% of all orders submitted. Although small in terms of the number of orders, Category 6 orders are large in terms of order size, with the average number of shares in a typical Category 6 order being 176,913 shares. Category 6 orders have much larger average size, compared to the other categories, with at least roughly 5 times as large as the remaining other category orders. Category 4 orders (i.e., orders with prices improving the best quotes) are the least frequent orders, constituting only 0.2%. This suggests that the bid-ask spread of the stocks under our investigation prices usually is only one tick away, such that an incoming order with price improving the best quotes is a rare event. This is plausible since our sample stocks are the constituents of the SET50 index, where liquidity is one of the main quantitative criteria used to select stocks in and out of the index.

From Table 2, consistent with Handa et al. 2003 and Parlour 1998, investors are likely to use aggressive orders (e.g., Category 5 orders) when the market depth at the same side (2.2 million shares) is thicker than the market depth at the opposite side (1.1 million shares). Furthermore, investors are more inclined to place limit orders (e.g., Category 3 orders) when the market depth at the opposite side (1.8 million shares) is thicker than that at the same side (1.4 million shares). These results offer early empirical support for our Hypotheses 1 and 2 – that is, there is a positive (negative) relation between order aggressiveness and the market depth at the same side (opposite side). When considering the depth at all the five best bids and asks, it suggests again that investors are likely to use aggressive orders (i.e., Category 5 and 6 orders) when the five-best-quote depth at the same side is higher than the five-best-quote depth at the opposite side. This is consistent with Hypothesis 3. The relative spread tends to be higher during the time limit orders are placed than during the time market orders are placed. This observation suggests that, consistent with Hypothesis 5, investors tend to be



passive by using more limit orders when the bid-ask spread is wide. Consistent with our Hypothesis 4, volatility is higher at the time of Category 2 and 3 order submissions than at the time of Category 5 order submissions, except for the fact that Category 6 orders are placed when the volatility is relatively high. Finally, the average value of the Last Aggressive is higher among market orders than limit orders, thereby suggesting that, consistent with Hypothesis 6, aggressive orders tend to follow previous aggressive orders.

Table 3 shows the summary statistics for all orders submitted for our 50 sample stocks, classified by four investor groups. Of the total of 3,634,223 orders under investigation, 3,137,774 orders are submitted by individual investors, 304,448 orders by foreign investors, 109,199 orders by local institutions, and 82,802 orders by proprietary traders. This indicates that, in terms of the frequency of order submission, a group of individual investors is the most significant player in the SET.

Category 3 orders are the most common orders for foreign investors, local institutions, and proprietary traders, whereas Category 2 orders are the most common orders for individual investors. Foreign investors and proprietary traders are more likely to submit market orders than individual investors. Category 1 orders are rarely submitted by foreign investors, local institutions, and proprietary traders, compared with individual investors. For example, about 51% of all orders submitted by individual investors are limit orders behind the best quotes (i.e., Category 1 and 2). However, only about 14% to 30% of the orders placed by foreign investors, local institutions, and proprietary traders are orders with prices behind the best quotes. These findings suggest that retail investors are generally less aggressive in order submissions than the other three investor groups.

In addition, our Hypothesis 1 and 2 seem to be supported by each of the four investor groups. Each type of investors tends to submit an aggressive order (i.e., Category 5 and 6 orders) when the market depth on the same side is thicker than the market depth on the opposite side. On the other hand, when the market depth on the opposite side is thicker than the market depth on the same side, each type of investors tends to use a passive order (i.e., Category 1, 2, 3, and 4 orders). When considering the depth at all the five best bids and asks, it suggests that all four types tend to submit aggressive (passive) orders when the five-best-quote depth on the same side is larger (smaller) than the five-best-quote depth on the opposite side. This is again consistent with Hypothesis 3.



For individual investors, the relative spread tends to be higher when they decide to use limit orders than when they decide to use market orders. This observation suggests that, consistent with Hypothesis 5, when the bid-ask spread is wide (narrow), individual investors tend to be passive (aggressive) and use limit (market) orders. However, for the remaining three investor groups, it appears that when they use market orders, the spread is relatively wider. Across all four investor groups, consistent with Hypothesis 4, volatility is higher during the time limit orders (e.g., Category 2 and 3 orders) are submitted than during the time market orders (e.g., Category 5 orders) are placed, except for the fact that Category 6 orders are usually used when the volatility is relatively high.

Finally, Table 3 shows that, across all order aggressiveness categories, the spread faced by incoming orders of individual investors is always slightly wider than that faced by incoming orders of the other three investor groups. In other words, an incoming retail investor order with a particular aggressiveness level faces a wider spread than the other three groups' orders with the same aggressiveness level. These results show the possibility that a retail investor have a relatively higher risk of trading against informed traders, consistent with our hypothesis 7.

6.2 Determinants of Order Aggressiveness

The ordered probit model is used to empirically investigate the determinants of order aggressiveness. Table 4 presents the results of the ordered probit model for all orders submitted for the 50 sample stocks. From the ordered probit model, a positive (negative) coefficient indicates a positive (negative) relation between the order aggressiveness and the explanatory variable, because the most (least) aggressive level is defined as 6 (1).

The results in Table 4 indicate that the same-side (opposite-side) market depth is significantly, positively (negatively) related to order aggressiveness for all of the 50 sample stocks, thereby providing the empirical support for Hypothesis 1 and 2. Consistent with the existing theoretical model (e.g., Parlour 1998), these findings support the notion that market depth proxies for an order's execution probability, which, in turn, affect investors' decision on the order aggressiveness level. To elaborate, when the market depth at one side is thicker, an incoming limit order on the same side has a lower chance of execution. As a result, investors tend to place more aggressively priced order to enhance the execution probability of their order. By contrast, the execution probability of the incoming limit orders increases when the market depth on the opposite side is thicker. Therefore, investors are more likely to be passive



and prefer limit orders, when the market depth on the opposite side is thicker.

From Table 4, the average value of the coefficients for the relative depth is negative and about 84% of the coefficients are statistically significant at 1%. This finding is not consistent with our Hypothesis 3, in which order aggressiveness is expected to be positively related to the relative depth measure. As discussed in Table 2, it appears that, consistent with our Hypothesis 3, aggressive orders (i.e., Category 5 and 6 orders) are used when the relative depth is high (i.e., the five-best-quote depth at the same side is relatively thicker than the five-best-quote depth at the opposite side). However, according to Hypothesis 3, passive orders will be submitted when the relative depth is low (i.e., the five-best-quote depth at the same side is relatively thinner than the five-best-quote depth at the opposite side); but this is not the case from Table 2. Consequently, this may cause a negative coefficient of the relative depth variable in Table 4.

The majority (about 73%) of the coefficients for the relative spread variable, as documented in Table 4, are negative and significant. Consistent with Hypothesis 5, this finding indicates that the order aggressiveness is negatively related to the relative spread. The relationship between order aggressiveness and volatility, however, is not consistent with our Hypothesis 4. The result in Table 4 shows that the order aggressiveness is positively related to volatility. As mentioned earlier in Table 2, the positive relation seems to be caused by the association of high volatility condition with the submission of Category 4 and 6 orders. As also suggested by Table 2, if we consider only the three most frequent order categories, Category 5, 3, and 2 orders, it appears that order aggressiveness is negatively related to volatility. That is, investors prefer to submit passive orders (e.g., Category 2 and 3 orders), rather than aggressive orders (e.g., Category 5 orders) when the volatility is high, in line with Hypothesis 4.

The coefficients for the *LastAgg* variable are positive and significant for all stocks, indicating a positive order persistence in term of aggressiveness levels. That is, there is a positive relation between the aggressiveness levels of the two consecutive orders on the same side. This is consistent with Biais et al. 1995, Parlour 1998, Hamao and Hasbrouck 1995, Rinaldo 2004, and Griffiths et al. 2000 in that an aggressive buy (sell) order tends to follow an aggressive buy (sell) order.

Table 5 reports the empirical results from the ordered probit model on the determinants of order aggressiveness for each of the four investor groups. Consistent with the findings in Table 3, each investor group's order submissions respond positively (negatively) to the market



depth at the same side (opposite side). That is, each group tends to be aggressive (passive) and place market (limit) orders when the market depth on the same-side (opposite-side) is relatively high.

The results in Table 5 present empirical evidence in support of our Hypothesis 7. That is, there exists an asymmetry between individuals' and other three institutional investors' order submissions. The coefficient values, in absolute terms, of *DepthBestSame* and *DepthBestOpp* are higher for foreign investors (0.282 and -0.308), local institutions (0.206 and -0.245), and brokers (0.856 and -1.510) than for individual investors (0.197 and -0.133). These results suggest that foreign investors, local institutions, and brokers all responds more strongly to changes in both their own market depth and opposite market depth than individual investors do. In other words, these three investor groups are more concerned about the thickness of the book on both sides, and therefore adjust their order submissions more promptly than do retail investors.

The findings for the effect of volatility and relative spread on each of the four investor groups' order aggressiveness are less conclusive and generally not statistically significant. Individual investors' order aggressiveness is positively and significantly related to volatility. On the other hand, for the remaining three investor groups, the empirical evidence concerning the direction or statistical significance of the relation between their order aggressiveness and volatility is inconclusive. For retail and foreign investors, there is a negative relation between the order aggressiveness and the relative spread at the time of their order submissions. By contrast, for local institutions and brokers, their order aggressiveness tends to be positively related to the relative spread.

From Table 5, the orders placed by both local institutions and brokers tend to have a higher probability of continuation than do those submitted by individual investors, as suggested by the coefficient values of *LastAgg* variable. Specifically, except for foreign investors, the coefficient values of the *LastAgg* variable for local institutions (0.543) and brokers (0.741) are much higher than that for retail investors (0.490). These findings indicate that local institutions and brokers are more likely to place the same-side aggressive orders than retail investors. Such order continuation was also previously found by Biais et al. 1995, Hamao and Hasbrouck 1995, and Griffiths et al. 2000. These studies suggest that order continuation is driven by information-based trading. Therefore, the finding that local institutions and brokers are more likely to place the same-side aggressive orders than retail investors supports our Hypothesis 7. This finding also supports the notion that institutional traders are informed



traders, while retail traders in general take the role of liquidity providers. Taken together, the evidence of a larger bid-ask spread and a lower order auto-correlation for individual investors' orders indicates that they more frequently act as liquidity suppliers when trading.

7. Conclusion

The present study empirically investigates the determinants of the trading aggressiveness in the Stock Exchange of Thailand, a pure order-driven market. Using an intraday data, the present study indicates that the state of the limit order book has a significant impact on a trader's order submission decisions, and that such impact is different between retail and institutional investors.

Specifically, our results shows that both sides of the book significantly influence traders' order submission decisions, and that traders dynamically respond to changes in the market depths on both sides (i.e., as the proxies for orders' execution probability). The depths on both sides of the book are informative. To elaborate, investors tend to be aggressive and place market orders when the market depth on the same side is thick and when the market depth on the opposite-side is thin, which is consistent with the crowding out mechanism. However, we do not find conclusive evidence that high volatility or large bid-ask spread encourages passive order submission and discourages aggressive order placement. Finally, the order sequence exhibits the so called diagonal effect, where an aggressive order tends to follow another previous aggressive order on the same side.

Further, the present study provides insights into the systematic differences in order submission decisions among four investor groups in the Stock Exchange of Thailand. Each investor group's order submissions respond positively (negatively) to the market depth on the same side (opposite side). That is, for each investor group, aggressive (passive) orders tend to be used during the period of thick market depth on the same side (opposite side). However, the results suggest that foreign investors, local institutions, and brokers all responds more strongly to changes in both their own market depth and opposite market depth than individual investors do.

In addition, our results indicate the possibility that a retail investor face a higher "picked-off" risk (a risk of trading against informed traders), as shown by the following two findings; first, the spread is always slightly larger for an incoming retail order with a particular aggressiveness level than for an incoming order with the same aggressiveness level from the



other three groups. Second, institutional investors' orders (i.e., local institutions and brokers) are more auto-correlated than are individual investors' orders. Specifically, institutional investors tend to submit consecutive same-side aggressive orders than do retail investors. These two findings on spread and order autocorrelation, along with the evidence that institutional investors respond more strongly to the changes in the market depth on both sides, support the notion that institutional traders are informed traders, while retail traders in general take the role of liquidity providers.

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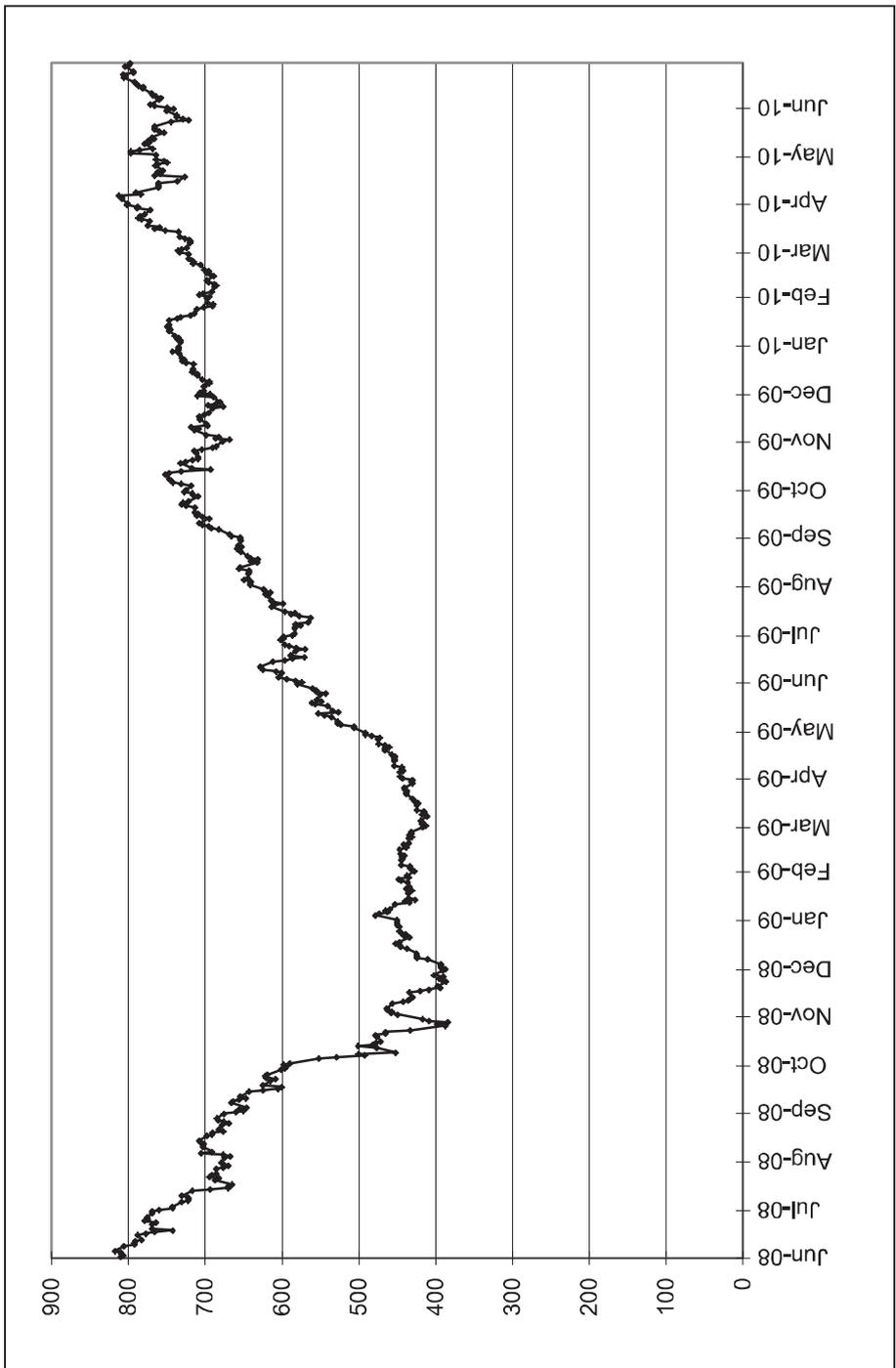
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Figure 1: The SET index movement from June 2008 to June 2010



**Table 1: Descriptive Statistics of Order-Related and Limit-Order-Book-Related Variables**

This table shows the descriptive statistics of order-related variables and the limit order book across 50 sample stocks on the SET during October to December 2009. “Order Size” is the number of shares in an order. “Market Depth at Same (Opposite)” is the number of shares available at the best quote on the same side (opposite side) at the order submission time. “Depth at Five Best Same (Opposite)” is the number of shares available at all the five best quotes on the same side (opposite side) at the order submission time. “Volatility” is calculated as the standard deviation of the most recent 20 quote-midpoint returns, multiplied by 100. “Spread” is the percentage relative spread, defined as the difference between the best bid and ask prices, divided by the quote-midpoint at the order submission time, multiplied by 100. “Last Aggressive” is the average value of a last aggressiveness dummy variable, equal to one if the previous order is an aggressive order (i.e., category of 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. “Buy” is the average value of a buy dummy variable, with value of one if the current order is a buy order, and zero if a sell order.

Variables	Mean	Std	Min	Max	N
Order Size	20,109	38,548	820	257,680	50
Market Depth at Same	888,479	2,967,113	3,810	20,627,088	50
Market Depth at Opposite	822,883	2,797,003	3,670	19,466,379	50
Depth at Five Best Same	5,944,446	18,708,247	20,585	129,071,971	50
Depth at Five Best Opposite	5,604,375	18,457,064	21,264	127,876,181	50
Volatility	0.051	0.031	0.007	0.140	50
Spread	0.587	0.170	0.293	0.929	50
Last Aggressive	0.061	0.011	0.032	0.091	50
Buy	0.515	0.038	0.432	0.611	50



Table 2: Descriptive Statistics of Order Submissions

This table shows the descriptive statistics of all orders submitted for 50 stocks on the SET during October to December 2009. Six levels of order aggressiveness are classified as follows; Level 6 are market buy (sell) orders with prices equal to or greater (less) than the current best ask (bid) quote and volumes to buy (sell) exceeding the number of shares available at the best ask (bid) quote. Level 5 orders are buy (sell) orders with prices matching the best ask (bid) price and volume less than the number of shares available at the best ask (bid) quote. Level 4 orders are limit orders with prices inside the best bid-ask quotes. Level 3 buy (sell) orders are limit orders with prices equal to the current best bid (ask) price. Level 2 buy (sell) orders are limit orders with prices lower than (higher than) the current best bid (ask) price, but higher than (lower than) the best fifth bid (ask) price. Level 1 orders are limit orders with prices below (above) the fifth best bid (ask) price. “Market Depth at Same (Opposite)” is the number of shares available at the best quote on the same side (opposite side) at the order submission time. “Depth at Five Best Same (Opposite)” is the number of shares available at all the five best quotes on the same side (opposite side) at the order submission time. “Volatility” is calculated as the standard deviation of the most recent 20 quote-midpoint returns, multiplied by 100. “Spread” is the percentage relative spread, defined as the difference between the best bid and ask prices, divided by the quote-midpoint at the order submission time, multiplied by 100. “Last Aggressive” is the average value of a last aggressiveness dummy variable, equal to one if the previous order is an aggressive order (i.e., category of 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. “Buy” is the average value of a buy dummy variable, with value of one if the current order is a buy order, and zero if a sell order.



Aggressiveness Level.	Number of Orders	% of all orders	Number of shares in an order	Market Depth at Same	Market Depth at Opposite	Depth at five best same	Depth at five best opposite	Volatility (%)	Spread (%)	Last Aggressive	Buy
6	54,272	1.5%	176,913	1,016,280	99,489	5,487,637	4,575,789	0.075	0.529	0.155	0.487
5	717,446	19.7%	30,269	2,218,049	1,112,178	11,321,614	10,660,776	0.025	0.548	0.111	0.567
4	6,715	0.2%	14,379	267,077	252,677	1,409,402	1,468,824	0.120	1.057	0.102	0.516
3	1,115,712	30.7%	31,824	1,483,986	1,855,373	11,142,496	11,452,197	0.035	0.555	0.040	0.555
2	1,353,263	37.2%	23,607	1,676,382	1,690,156	11,849,657	10,708,256	0.026	0.562	0.044	0.466
1	386,815	10.6%	16,096	1,139,304	1,132,941	8,135,392	7,246,120	0.023	0.507	0.041	0.426
Total	3,634,223										



Table 3: Descriptive Statistics of Order Submissions by Investor Groups

This table shows the descriptive statistics of the orders submitted for 50 stocks on the SET during October to December 2009, classified by investor types. There are four investor groups in the SET, namely, individual investors (Panel A), foreign investors (Panel B), local institutions (Panel C), and proprietary traders (Panel D). Six levels of order aggressiveness are classified as follows; Level 6 are market buy (sell) orders with prices equal to or greater (less) than the current best ask (bid) quote and volumes to buy (sell) exceeding the number of shares available at the best ask (bid) quote. Level 5 orders are buy (sell) orders with prices matching the best ask (bid) price and volume less than the number of shares available at the best ask (bid) quote. Level 4 orders are limit orders with prices inside the best bid-ask quotes. Level 3 buy (sell) orders are limit orders with prices equal to the current best bid (ask) price. Level 2 buy (sell) orders are limit orders with prices lower than (higher than) the current best bid (ask) price, but higher than (lower than) the best fifth bid (ask) price. Level 1 orders are limit orders with prices below (above) the fifth best bid (ask) price. “Market Depth at Same (Opposite)” is the number of shares available at the best quote on the same side (opposite side) at the order submission time. “Depth at Five Best Same (Opposite)” is the number of shares available at all the five best quotes on the same side (opposite side) at the order submission time. “Volatility” is calculated as the standard deviation of the most recent 20 quote-midpoint returns, multiplied by 100. “Spread” is the percentage relative spread, defined as the difference between the best bid and ask prices, divided by the quote-midpoint at the order submission time, multiplied by 100. “Last Aggressive” is the average value of a last aggressiveness dummy variable, equal to one if the previous order is an aggressive order (i.e., category of 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. “Buy” is the average value of a buy dummy variable, with value of one if the current order is a buy order, and zero if a sell order.



Aggressiveness level	Number of Orders	% of all orders	Number of shares in an order	Market Depth at Same	Market Depth at Opposite	Depth at five best same	Depth at five best opposite	Volatility (%)	Spread (%)	Last Aggressive	Buy
Panel A: Individual Investors											
6	28,727	0.9%	192,823	1,274,615	108,653	6,860,498	5,661,932	0.078	0.551	0.156	0.498
5	602,239	19.2%	26,431	2,437,723	1,209,325	12,372,409	11,602,337	0.024	0.551	0.106	0.571
4	4,312	0.1%	10,581	319,152	293,023	1,640,113	1,734,203	0.121	1.066	0.089	0.536
3	889,569	28.4%	28,375	1,710,984	2,088,908	12,687,955	12,936,625	0.033	0.566	0.039	0.562
2	1,234,493	39.3%	21,495	1,771,438	1,777,957	12,521,437	11,255,035	0.025	0.566	0.043	0.459
1	378,434	12.1%	15,092	1,142,299	1,134,300	8,155,285	7,256,208	0.023	0.507	0.042	0.426
Total	3,137,774										
Panel B: Foreign Investors											
6	12,034	4.0%	97,125	457,157	56,908	2,591,368	2,174,624	0.086	0.512	0.148	0.459
5	77,082	25.3%	29,328	1,021,244	639,085	5,571,587	5,763,485	0.032	0.541	0.122	0.569
4	1,558	0.5%	14,733	138,961	150,433	783,079	858,460	0.123	1.058	0.124	0.486
3	132,563	43.5%	26,451	645,191	929,640	5,098,171	5,731,130	0.046	0.520	0.045	0.546
2	75,203	24.7%	27,594	729,963	822,216	5,214,637	5,376,089	0.043	0.529	0.068	0.520
1	6,008	2.0%	56,674	1,097,941	1,155,498	7,796,302	7,134,389	0.031	0.515	0.040	0.360
Total	304,448										
Panel C: Local Institutions											
6	4,507	4.1%	186,954	506,297	119,373	2,787,316	2,645,358	0.083	0.529	0.134	0.492
5	17,980	16.5%	46,974	785,795	415,041	4,363,727	3,955,225	0.025	0.523	0.163	0.513
4	480	0.4%	18,414	183,651	183,312	1,053,151	828,032	0.127	1.058	0.122	0.492
3	52,048	47.7%	27,144	456,270	665,862	3,720,909	3,965,004	0.041	0.515	0.043	0.508
2	32,484	29.7%	23,341	492,123	552,315	3,563,928	3,522,837	0.042	0.513	0.040	0.510
1	1,700	1.6%	49,881	700,729	904,011	5,869,388	5,568,376	0.034	0.516	0.034	0.491
Total	109,199										
Panel D: Proprietary Traders											
6	9,004	10.9%	227,768	1,194,623	117,211	6,330,138	5,285,969	0.046	0.484	0.172	0.490
5	20,145	24.3%	133,688	1,508,586	640,396	8,119,639	7,236,296	0.018	0.506	0.176	0.480
4	365	0.4%	52,417	308,445	303,683	1,826,432	1,781,740	0.096	0.953	0.143	0.436
3	41,532	50.2%	128,718	587,173	1,298,789	6,633,625	7,301,098	0.048	0.500	0.044	0.497
2	11,083	13.4%	232,681	981,420	1,134,753	6,329,504	7,045,996	0.034	0.497	0.021	0.690
1	673	0.8%	133,160	932,323	745,204	5,700,268	6,808,855	0.031	0.476	0.009	0.897
Total	82,802										



Table 4: Ordered Probit Regressions on the Determinants of Order Aggressiveness

This table presents results from the ordered probit regressions on the determinants of the aggressiveness of order submissions for 50 stocks on the SET during October to December 2009. The dependent variables is order aggressiveness ranked from the most (i.e., level 6) to the least aggressiveness (i.e., level 1) levels. Therefore, a positive estimated coefficients means that the independent variable is positively related to the level of order aggressiveness. The independent variables are as follows; *DepthBestSame* (*DepthBestOpp*) is the number of shares available at the best quote on the same side (opposite side), divided by 100,000, at the order submission time. *RelDepth* is the ratio of the number of shares available at the five best same-side quotes to the number of shares available at the five best opposite-side quotes. *Volatility* is the standard deviation of the most recent 20 quote-midpoint returns, multiplied by 100. *Spread* is the percentage relative spread, defined as the difference between the best bid and ask prices, divided by the mid-quote at the order submission time, multiplied by 100. *LastAgg* is the last aggressiveness dummy variable, equal to one if the previous order is an aggressive order (i.e., category of 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. *Buy* is a buy dummy variable, with value of one if the current order is a buy order, and zero if a sell order. Number of Sig at 1% refers to the number of coefficients significant at the 1% level.

	Coefficient Values	Number of Sig at 1%
DepthBestSame	0.192	100%
DepthBestOpp	-0.145	100%
RelDepth	-0.032	84%
Volatility	0.789	96%
Spread	-0.180	73%
LastAgg	0.509	100%
Buy	0.213	94%



Table 5: Ordered Probit Regressions on the Determinants of Order Aggressiveness, Classified by Investor Groups

This table presents results from the ordered probit regressions on the determinants of the aggressiveness of order submissions for 50 stocks on the SET during October to December 2009, classified by investor groups. There are four investor groups in the SET, namely, individual investors (Panel A), foreign investors (Panel B), local institutions (Panel C), and brokers (Panel D). The dependent variable is order aggressiveness ranked from the most (i.e., level 6) to the least aggressiveness (i.e., level 1) levels. Therefore, a positive estimated coefficient means that the independent variable is positively related to the level of order aggressiveness. The independent variables are as follows; *DepthBestSame* (*DepthBestOpp*) is the number of shares available at the best quote on the same side (opposite side), divided by 100,000, at the order submission time. *RelDepth* is the ratio of the number of shares available at the five best same-side quotes to the number of shares available at the five best opposite-side quotes. *Volatility* is the standard deviation of the most recent 20 quote-midpoint returns, multiplied by 100. *Spread* is the percentage relative spread, defined as the difference between the best bid and ask prices, divided by the mid-quote at the order submission time, multiplied by 100. *LastAgg* is the last aggressiveness dummy variable, equal to one if the previous order is an aggressive order (i.e., category of 4, 5, or 6) and it has the same direction (i.e., buy or sell) as the current order. *Buy* is a buy dummy variable, with value of one if the current order is a buy order, and zero if a sell order. Number of Sig at 1% refers to the number of coefficients significant at the 1% level.



	Coefficient Values	Number of Sig at 1%		Coefficient Values	Number of Sig at 1%
Panel A: Individual Investors			Panel B: Foreign Investors		
DepthBestSame	0.197	100%	DepthBestSame	0.282	100%
DepthBestOpp	-0.133	100%	DepthBestOpp	-0.308	100%
RelDepth	-0.025	65%	RelDepth	-0.030	55%
Volatility	0.744	96%	Volatility	0.451	57%
Spread	-0.174	65%	Spread	-0.282	53%
LastAgg	0.490	100%	LastAgg	0.391	96%
Buy	0.232	94%	Buy	0.101	71%
Panel C: Local Institutions			Panel D: Brokers		
DepthBestSame	0.206	92%	DepthBestSame	0.856	86%
DepthBestOpp	-0.245	90%	DepthBestOpp	-1.510	92%
RelDepth	-0.018	39%	RelDepth	0.072	20%
Volatility	0.698	41%	Volatility	-0.620	31%
Spread	0.075	20%	Spread	0.915	14%
LastAgg	0.543	94%	LastAgg	0.741	67%
Buy	0.077	37%	Buy	0.283	37%