Trading Performance of Foreign and Domestic Investors: Evidence from Indonesia during the Crisis and Recovery Periods

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ABSTRACT

This paper investigates relative trading performance of domestic vis-à-vis foreign investors in the Indonesia market. We take advantage of a unique dataset in the Indonesia market that codes foreign and domestic investors. We find that domestic investors outperform foreign investors in all transactions. However, in initiated trades, foreign investors tend to outperform domestic investors. Foreign advantage does not seem to deteriorate in a crisis period. Our results support Agarwal et al. (2010). However, trading performance seems to be more complex and interacts with different periods (crisis and recovery) and liquidity, resulting in different trading performance.

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INTRODUCTION

The presence of foreign investors seems to always create controversy. Foreign investors can be expected to bring in capital, and improve risk sharing and price appreciation. On the other hand, foreign investors are often associated with adverse impacts on the domestic market; mainly their destabilizing effect. Foreign investors are often blamed for increasing the volatility of domestic markets. There are at least three issues related to foreign and domestic investors in current literature: the economic impact of foreign investors (for example, see Kim and Singal, 2000; Li et al., 2011, Bae et. al, 2006; He and Shen, 2014), the trading behavior of foreign investors (Karolyi, 2002; Grinblatt and Keloharju, 2000; Richards, 2005; Yang, 2017), and the trading performance of foreign investors vis-à-vis domestic investors (Choe et al., 2005; Dvorak, 2005; Aggarwal et al., 2009; Vo, 2017).

In this paper, we focus on the issue of the trading performance of foreign investors vis-à-vis domestic investors. This issue has several academic and policy implications. While geographic barriers may explain a home bias phenomenon (Kang and Stulz, 1997; Hau, 2001, Coval and Moskowitz, 2001; Malloy, 2005; Baik et al., 2010), other types of barriers, such as information asymmetry between foreign and domestic investors, may help explaining the differences in performance (Chan et al., 2005; Kalev et al., 2007). Trading performance may reflect information advantage (Dvorak, 2005; Vo, 2017; Weng and Tsai, 2018). Policy makers would be interested in understanding information asymmetry in order to create a more efficient and perfect market, and to create a level playing field. Better understanding of foreign investors would also optimize the regulations for those investors in particular.

We extend current literature by investigating the trading performance of foreign investors in the Indonesia market. More specifically, we study their trading performance during the period of the 2007-2008 subprime financial crisis. Our study complements the studies of Choe et al. (2005) and Aggarwal et al. (2009) more directly, and other studies on performance of foreign and domestic investors (Ferreira et al., 2014; Kang et al., 2016); Lim et al., 2016; and Vo, 2017) amongst others. As suggested by recent literature, foreign investors trading strategy and behavior change in response to changing market conditions, such as following more focused strategy, as opposed to broad diversification (Choi et al, 2017; Korkeamäki et al. 2019), move away from positive feedback trading (Onishchenko and Ülkü (2019), become more aggressive (defensive) in hot (cold) market (Tsai et al., 2019). Thus, our study provides additional evidence using another and more recent financial crisis, namely the subprime financial crisis of 2008, in light of changing market condition in the ten years following the 1997 financial crisis.

The Indonesia experience in the subprime financial crisis provides an interesting setting. This period was characterized by high price fluctuation (see figure 1). The Jakarta Stock Composite Index (JSCI) reached its highest level at around 2,800 in December 2007. When the subprime financial crisis hit the Indonesia market, the JSCI started to drop and reached its lowest level of 1,100 in October 2008. Thus, the JSCI lost almost 60% of its value in less than a year. After a brief period of consolidation, the JSCI started to recover. Its level increased from 1,400 in March 2009 to 2,500 in October 2009. Thus, the JSCI experienced a return of around 78% in just six months. Throughout this paper, we refer to the period from December 2007 to October 2008 as the crisis period, and the period from March 2009 to October 2009 as the recovery period.
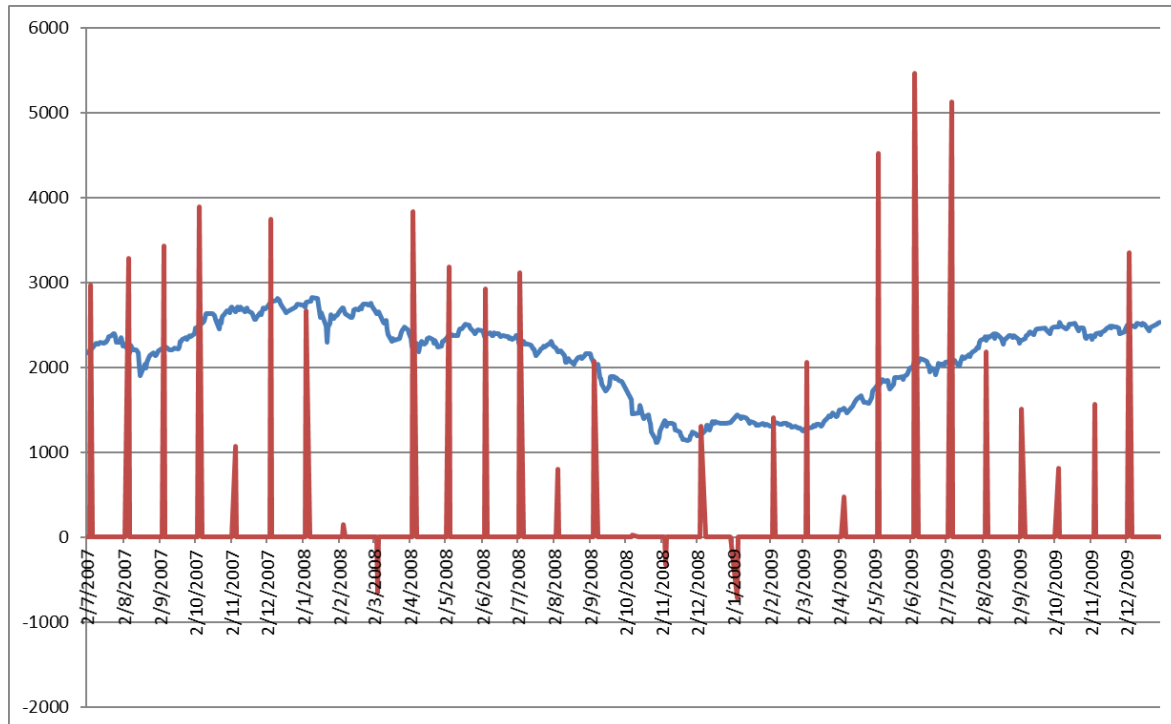
Note: This figure shows Jakarta Stock Composite Index and Net Foreign Trading Volume from June 2007 – December 2009. The graph shows that the index stars to decline from February 2008 – October 2008, and starts to climb from March 2009 – October 2009. These dates are used as cut-off month for crisis period and recovery period. Net Foreign Trading Volume is calculated as Daily foreign buy minus daily foreign sell for every stock in our sample, and then cumulated every month for each stock, and then cumulated for all stock in our sample.

Figure 1 Jakarta Stock Composite Index and Net Foreign Trading Volume

We believe that high index fluctuation provides us with an interesting setting to further study trading performance of foreign and domestic investors. Quick analysis may lead us to predictions that foreign investors may lose their advantage in sell trades in the crisis period, since we may expect that they become aggressive sellers during this period. They may also lose their advantage during the recovery period if they become aggressive buyers.[1]

Empirical studies on the relative trading performances of foreign versus domestic investors provide mixed results. One strand of literature suggests that domestic investors have better information than foreign investors (Grinblatt and Keloharju, 2000; Shukla and Van Inwegen, 1995; Hau (2001); Choe et al. (2005); Dvorak (2005); Teo (2009); Aggarwal et al. (2009), and even for local analysts vis-à-vis foreign analysts (Bae et al., 2008). The opposite strand of literature suggests that foreign investors have better performance than domestic investors (Brennan and Cao, 1997; Kang et al., 2016; Lim et al., 2016; Vo, 2017). Ferreira et al. (2017) find that foreign institutions and domestic local investors are at the same level of trading performance, while domestic institutions show information advantage.

Although Choe et al. (2005), Aggarwal et al. (2009) and Dvorak (2005) report that domestic investors outperform foreign investors, the reasons for their advantage are different. Choe et al. (2005) argue that the reason for foreign investors disadvantage is poor timings of their trades. Foreign investors buy or sell when the market moves against their position. Dvorak (2005) argues that domestic investors have better short-term information, while foreign investors have better long-term information. Aggarwal et al. (2009) argue that the aggressiveness of foreign investors is the main source for their advantage. Foreign investors perform better in initiated trades, while domestic investors perform better in non-initiated trades. Using three metrics they have developed, Aggarwal et al. (2009) show that foreign investors are more aggressive than domestic investors in initiated trades. Other variables are also shown to affect the comparative advantage of foreign vis-à-vis domestic investors, such as information asymmetry, level of investor protection, market turmoil, and liquidity

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[1] Interestingly, Aggarwal et al. (2009) find that aggressiveness of foreign investors seem to be the reason for foreign investors better trading performances compared to domestic investors.

(Ferreira et al, 2017; Kalev et al, 2008), along with trade size and intensity of foreign investors trades (Choe et al., 2005).

Following Aggarwal et. al (2009), we separate initiated trades and use them to investigate trading performance of foreign investors vis-à-vis domestic investors. We also compare trading performances of foreign and domestic investors in the crisis and recovery periods. We also investigate interactions between investor types (foreign or domestic) and the periods (crisis and recovery). Thus, we investigate whether the trading performance of one type of investor increases or decreases during the crisis or recovery periods.

We find that foreign investors underperform domestic investors in all trades (both non-initiated and initiated). This finding holds for the crisis and the recovery periods. Sell trades show stronger evidence than buy trades. When we split observations into initiated and non-initiated, we find that foreign investors outperform domestic investors in initiated trades. These findings are consistent with those of Aggarwal et al. (2009). However, findings for sell trades are not significant statistically. When we break down our observation to crisis and recovery periods, we find the source of the insignificancy. Foreign investors outperform domestic investors in the crisis period for both buy and sell trades. This finding does not seem to hold in the recovery period. In this period, we find that foreign investors outperform domestic investors in buy trades, but underperform in sell trades. This finding seems to suggest an asymmetric pattern in trading performance between foreign and domestic investors.

To investigate whether trading performance changes in different periods, we create interaction variables between investor types and crisis and recovery periods. Our results show that trading performances for buy transactions do not seem to change much. However, for sell transactions, different periods seem to affect sell trading performances. Using all observations (initiated and non-initiated), the domestic investors' advantage seems to decrease in the crisis and recovery periods as well. Using initiated trades, the foreign investors' advantage seems to increase in the crisis period, and foreign investors' advantage seems to decrease. This finding is striking. Given the massive price drop during financial crisis, foreign investors are still able to maintain their advantage. Finally, we investigate time-series behavior of trading performance differences. In general, trading performance differences do not change significantly across different periods. Further analysis shows that liquidity seems to affect trading performances.

We have organized this paper as follows. In the next section, we discuss the data and sample. This is followed by discussion of the empirical findings. The last section draws conclusions.

DATA, SAMPLE, AND RESEARCH METHODOLOGY

Data

We use transaction data obtained directly from the Indonesia Stock Exchange (IDX).[2] The transaction dataset records all transactions in IDX from mid of 1995, after IDX moved from manual to electronic transaction recording. The dataset contains date of transaction, date of settlement, stock identification, price, trading volume, trading value, time, broker identity, broker origin (foreign or domestic), board type, and investor identification (foreign and domestic investors). The dataset is unique since it codes the origin of investors— whether investors are domestic or foreign—but it does not go beyond that point. For example, it does not have the details of the investors' country of origin. The data do not have a breakdown into individual and institutional investors either. The dataset is big; we read around 10 million transaction records in the dataset, covering period of beginning of July 2007 – the end of December 2009.

The origin of foreign and domestic investors' identification comes from the era before 1997. In this period, the Indonesia government imposed restriction of 49% maximum of foreign ownership. To enforce this regulation, the Jakarta Stock Exchange developed a system that identified trading carried out by foreign and domestic investors. When the financial crisis hit Indonesia in 1997, the government abandoned this restriction. Foreign investors could buy up to 100% of outstanding shares of Indonesian listed company. However, the system that identifies the origin of investors still exists until today.

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[2] In 2007, Jakarta Stock Exchange merged with Surabaya Stock Exchange to become Indonesia Stock Exchange.

Sample Selection

Sampling construction is carried out as follows. We identify 45 stocks that are listed on the LQ45 index for every semester from June 2007 to December 2009. The LQ45 is the index for the 45 most actively traded stocks in the previous semester. The composition of the LQ45 index is revised every semester based on trading activities in the previous semester. We retain as our sample, stocks that are on the LQ45 index at least once during the five semesters in our period. We end up with 68 stocks. Thus, our sample basically consists of the most actively traded stocks in our period.

We believe that these are the stocks that foreign investors are most likely to trade. Foreign investors are more likely to trade in liquid and large capitalization stocks, and those listed in main board (Aaron et al., 2019). Thus, our sample is ideal for investigating the behavior of foreign investors in the Indonesia market. This study focuses on a regular or non-negotiated market (board). This market is the most likely place for marginal investors to trade. Trading in a regular market is based on an order driven system, in which orders are matched using JATS (Jakarta Automated Trading System), through continuous auction. Prices are determined by matching buy and sell orders. Prices in the regular board are used to calculate the daily Composite Index.

Trading Performance

Following Choe et al. (2005), we examine trading performance of foreign vis-à-vis domestic investors by calculating buy-weighted average prices, as follows:

$$WP^{i}_{dj}/WP_{dj} \tag{1}$$

where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^{i}_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. This price ratio is computed for purchase and sale, as well as investor class (foreign and doemstoc), separately. Appendix 1 illustrates calculation of the price ratio. Following Aggarwal et al. (2009) we also calculate this ratio for both initiated and non-initiated trades. We use the algorithm of Lee and Ready (1991) to define initiated trades. Transaction in the uptick is classified as buy-initiated, while transaction in the downtick is classified as sell-initiated. Transactions in zero tick are neither classified as buy or sell initiated. We delete these transactions. Aggarwal et al. (2009) show that foreign investors have better performances when they are more aggressive (i.e. in initiated trades). Since we calculate trading performance daily, for each stock, we end up with around 70,000 stock-day observations.

Appendix 1 Illustration of Trading Performance Calculation

Suppose in day T, for stock X, there are four transaction as follows:

Transaction #	Investor Type	Buy or Sell	Number of Shares	Price
1	Foreign	Buy	100	10,000
	Domestic	Sell	100	10,000
2	Foreign	Buy	200	11,000
	Domestic	Sell	200	11,000
3	Domestic	Buy	300	10,500
	Foreign	Sell	300	10,500
4	Domestic	Buy	200	12,000
	Foreign	Sell	200	12,000

First, we calculate weighted average price for stock X in day T. Since, buy and sell are mirror to each other, we can use either buy or sell data. Volume weighted average price for this stock on day T is { (100/800) x 10,000 } + { (200/800) x 11,000 } + { (300/800) x 10,500 } + { (200/800) x 12,000 } = 10,937.5. Then, we collect buy and sell transactions for foreign and domestic investors. Volume buy and sell weighted average prices can be calculated accordingly.

Volume weighted average price for domestic investors buy = (300/500) x 10,500 + { (200/500) x 12,000 } = 11,100. Volume weighted average price for foreign investor buy = { (100/300) x 10,000 } + { (200/300) x 11,000 } = 10,667. Buy weighted average (trading performance or bwap) for domestic investors = 11,100 / 10,937.5 = 1.0148, while buy weighted average for foreign investors = 10,667 / 10,937.5 = 0.9572. In this case, domestic investors pay more than average investors when they buy, while foreign investors pay less than average investors. Domestic investors are at disadvantage compared to foreign investors when then buy.

Volume weighted average price for domestic investors sell = { (100/200) x 10,000 } + { (200/300) x 11,000 } = 10,667. Volume weighted average price for foreign investor sell = { (300/500) x 10,500 } + { (200/500) x 12,000 } = 12,000. Sell weighted average (trading performance) for domestic investors = 10,667 / 10,937.5 = 0.9752, while sell weighted average for foreign investors = 11,071 / 10,937.5 = 1.0971. In this case, domestic investors receive less than average investors when they sell, while foreign investors receive more. Domestic investors are at disadvantage compared to foreign investors when they sell.

EMPIRICAL FINDINGS

Trading Statistics

Tables 1 and 2 report daily trading statistics of our sample. Trading size in shares (Rupiah) is the number of shares (the amount in Rupiah) for each transaction. We average trading size to get mean of trading size in one day, take average for each stock, then we average across stocks. Total trading volume (value) is total shares (total amount in Rupiah) of transactions in one day. Again, we calculate trading size, trading volume, and trading value for each stock daily, then take average for each stock, and finally we average across stocks. During our period, around 40 million shares are traded every day on the Indonesia Stock Exchange. The value of this trading is around IDR 47 billion. Using the exchange rate of IDR 9,000 per USD 1, this amount translates into around a USD 5.2 million daily trading value. The most active stock registers daily trading volume of around 645 million shares, around ten times larger than the average daily trading volume in the sample. Average trade size in the Indonesia Stock Exchange is around 40,000 shares, or around IDR 52 million in value. Using an exchange rate of IDR 9,000 per USD 1, level of exchange rate in 2008s, this amount translates into around USD 6,000. The average of total number of transactions (trading frequency) in one day is around 700 times., with a minimum of around 80 times, and the most active one is around 6,000 time.

Table 2 provides a comparison between trading statistics for foreign and domestic investors. In general, the pattern shows that domestic investors have a smaller trade size both in volume (shares) as well as in value (Rupiah/IDR). Domestic investors trade more frequently than foreign investors do. Daily trading volume and trading value for domestic investors are larger than those for foreign investors. This pattern holds for both buy and sell transactions.

Table 1 Daily Trading Statistics

	Mean	Median	Standard Deviation	Minimum	Maximum
Trading Size (shares)	44,493	32,537	52,752	3,537	312,011
Trading Size (Rupiah)	51,923,905	39,395,127	37,116,147	11,454,766	186,240,165
Daily Trading Volume (shares)	40,346,648	13,887,811	90,241,135	766,220	649,445,901
Daily Trading Value (Rupiah)	47,102,458,477	19,317,909,268	98,332,056,929	1,217,377,449	766,501,060,669
Daily Number of Trades	708	519	863	83	6,301
Number of Stocks	68	68	68	68	68

Note: This table shows daily trading statistics in Indonesia Stock Exchange from June 2007 – December 2009. We calculate the statistics daily, average them for each stock, and then average them across stocks. Sample consists of stocks that are included in LQ45 index, which is the index for 45 most liquid stocks.

Table 2 Daily Trading Statistics Average By Investor Type

	Buy Side		Sell Side	
	Domestic	Foreign	Domestic	Foreign
Mean of Trading Size (shares)	41,069	81,733	41,853	75,333
Mean of Trading Size (Rp)	46,511,754	102,537,475	47,181,494	97,411,417
Mean of Daily Trading Volume (shares)	35,849,265	6,630,009	36,152,630	6,394,112
Mean of Daily Trading Value (Rupiah)	37,360,422,723	14,736,973,901	37,974,162,539	14,224,315,661
Mean of Daily Number of Trades	638	109	633	120
Number of Stocks	68	68	68	68

Note: This table shows daily trading statistics in Indonesia Stock Exchange from June 2007 – December 2009 for domestic and foreign investors. We calculate these numbers daily, average them for each stock, and then average them across stocks. Sample consists of stocks that are included in LQ45 index, which is the index for 45 most liquid stocks.

Comparing the Trading Performances of Foreign and Domestic Investors

Table 3 reports trading performances for all trades (non-initiated and initiated). The table shows that foreign investors underperform domestic investors in buy and sell transactions. For buy transactions, domestic investors pay 0.008% more than average investors. The difference between the trading performances of foreign and domestic investors is weakly significant statistically. For sell transactions, domestic investors sell at higher prices than foreign investors. Domestic investors sell at around 0.098% higher than average investors. The difference is significant statistically. We observe an asymmetry between buy and sell transactions: the difference for sell transactions is stronger than that for buy transactions.

Table 3 Trading Performances of Foreign and Domestic Investors for All Trades

	Mean	Median	Standard Deviation	Minimum	Maximum	Number of Observation
Buy transactions						
Domestic bwap	0.9998995	1.00000	0.001977	0.921996	1.04882	41267
Foreign bwap	0.9999886	1.00005	0.009453	0.88058	1.123286	31206
T-value (p-value)			-1.64 (0.1013)			
Sell transactions						
Domestic bwap	1.0002635	1.00000	0.002076	0.94333	1.055931	41239
Foreign bwap	0.9992834	0.99963	0.009707	0.870514	1.207526	30500
T-value (p-value)			17.34 (<.0001)			

Note: This table presents trading performances of foreign and domestic investors in Indonesia Stock Exchange. We cover period of June 2007-December 2009. Trading performance is calculated as follows:

$$WP^i_{dj}/WP_{dj}$$

where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^i_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Higher numbers for buy (sell) transactions show that particular investors are at disadvantage (advantage) compared to other investors.

We further separate our observations into non-initiated and initiated trades. Initiated trades are identified using Lee and Ready (1991). Table 4 shows results for initiated trades.

Table 4 Trading Performances of Foreign and Domestic Investors for Initiated Trades

	Mean	Median	Standard Deviation	Minimum	Maximum	Number of Observation
Buy						
Domestic bwap	1.0048168	1.0037	0.00876	0.89536	1.1636	39892
Foreign bwap	1.0032609	1.0026	0.01333	0.88058	1.15881	20092
T-value (p-value)	15 (<0.0001)					
Sell						
Domestic bwap	0.9958107	0.99661	0.008072	0.793605	1.080704	40239
Foreign bwap	0.9958552	0.99688	0.013825	0.8135	1.117365	17928
T-value (p-value)	0.49 (0.6877)					

Note: This table presents trading performances of foreign and domestic investors in Indonesia Stock Exchange. We cover period of June 2007-December 2009. Trading performance is calculated as follows:

$$WP^i_{dj}/WP_{dj}$$

where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^i_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Higher numbers for buy (sell) transactions show that particular investors are at disadvantage (advantage) compared to other investors. Initiated trades are calculated using Lee and Ready (1991). Transactions that occur at prices higher (lower) than previous price are classified as buy (sell) initiated trades. All other transactions are classified as non-initiated trades and deleted from the observations.

Table 4 shows opposite results from those of all trades. Foreign investors outperform domestic investors for both buy and sell trades. However, the difference in buy transactions is significant statistically, while that for sell transactions is not significant statistically. Again, there is an asymmetry between sell and buy transactions, in an opposite pattern than that in all transactions. For initiated trades, the pattern for buy transactions is stronger than that for sell transactions. We can also check the median of price ratio to ensure that possible deviation from normality will not affect our results. The median numbers show consistent results with the mean. Domestic investors pay less (more) when they buy (sell) than foreign investors do in all observations. In initiated trades, we find the opposite result. Domestic investors pay higher (lower) prices when they buy (sell) than foreign investors do.

In tables 5 and 6, we present regression results to address the question of which investors (domestic or foreign) have better performances, for all trades and initiated trades. The basic regression model is as follows:

$$\text{Performance}_{(i,t,c)} = \text{Investor Type}_{(i,t,c)} + e_{(i,t,c)} \tag{2}$$

where i refers to stock i, t refers to day t, and c refers to types of investor (foreign versus domestic). The data resemble panel, however they are not, since we have two performance data for each date (foreign and domestic investors). The data show heteroskedasticity. To address this issue, we use Ordinary Least Square estimation with White (1980) robust standard errors throughout this paper.

Table 5 Regression Results of Investor Types on Trading Performance (All Trades)

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	0.99998	0.99932	1.00000	0.99965	0.99995	0.99929
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	-0.0000805	0.000937	-0.00009877	0.00065166	-0.00005957	0.0009102
	(0.1301)	(<0.0001)	(0.3786)	(<0.0001)	(<0.5962)	(<0.0001)
N	75881	75145	20716	20683	18370	18165
F-value	2.93	374.96	1.02	47.08	0.35	76.05
(prob F)	(0.0872)	(<0.0001)	(0.3130)	(<0.0001)	(0.5562)	(<0.0001)
Adj R-sqr	0.000	0.005	0.000	0.0022	-0.0000	0.0041

Note: This table presents regression results of investor types on trading performance. Trading performance is calculated as WP_{dj}^i / WP_{dj} , where WP_{dj} is the volume-weighted average price for stock j on day d, and WP_{dj}^i is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Investor Types has a value of 1 for domestic and 0 for foreign investors. White (1980) robust standard error p-values are in parentheses.

Table 6 Regression Results of Investors Types on Trading Performance (Initiated trades)

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	1.00329	0.99586	1.00350	0.99660	1.00341	0.99512
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	0.00156	-0.0000776	0.00168	-0.00084732	0.00102	0.00066534
	(<0.001)	(0.4836)	(<0.0001)	(0.0001)	(<0.0001)	(0.0047)
N	62236	59823	16917	16738	15647	14627
F-value	300.23	0.73	76.70	20.63	35.76	12.99
(prob F)	(<0.0001)	(0.3944)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0003)
Adj R-sqr	0.0048	-0.0000	0.0045	0.0012	0.0022	0.0008

Note: This table presents regression results of investor types on trading performance. Trading performance is calculated as WP_{dj}^i / WP_{dj} , where WP_{dj} is the volume-weighted average price for stock j on day d, and WP_{dj}^i is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Initiated trades are calculated using Lee and Ready (1991). Transactions that occur at prices higher (lower) than previous price are classified as buy (sell) initiated trades. All other transactions are classified as non-initiated trades and deleted from the observations. Investor Types has a value of 1 for domestic and 0 for foreign investors. White (1980) robust standard error p-values are in parentheses.

In general, the results from regression analysis are consistent with those in the previous section. For all trades, domestic investors outperform foreign investors significantly in sell transactions, while for initiated trades, foreign investors outperform domestic investors significantly in buy transactions. We observe asymmetric patterns between trading performance of buy and sell transactions. In all trades, sell transactions have stronger results than those for buy transactions, while in initiated trades, buy transactions have stronger patterns than sell transactions.

Next, we split our observations into crisis and recovery periods. For all trades, results from crisis and recovery periods show consistency with those from all periods. However, for initiated trades, we observe an interesting pattern. In sell transactions, we observe that foreign investors have better performance in the crisis period, and worse performance in the recovery period. This result is striking, since it is contrary to our prediction. Instead of losing advantage, foreign investors gain advantage in the crisis period, while they lose advantage in the recovery period.

Trading Performance in the Crisis and Recovery Periods

One of central questions in this paper is whether trading performances change when the period changes. To investigate this issue further, first, we create dummy variables Period1 and Period2. Period1 has a value of one for the period 21 February 2008 to 28 October 2008, and zero outside of that period. Period2 has a value of one for the period 21 March 2009 to 15 October 2009 and zero outside of that period. Thus regression coefficients for Period1 and Period2 provide an increase or a decrease in trading performance relative to the

base period. The base period in this case is the dates outside crisis and recovery periods that we have already defined. Next, we interact variables Period1 and Period2 with Investor Types. The coefficients for the interaction variables will be able to shed light on the question whether the advantage of foreign investors vis-à-vis domestic investors increases or decreases during the crisis and the recovery periods. The interaction variables are our main focus. Table 7 reports our regression results.

Table 7 Trading Performance, Investor Type, and Periods of Crisis and Recovery (All and Initiated Trades)

	Buy All		Sell All		Buy Initiated		Sell Initiated	
Intercept	0.99999	0.99999	0.99924	0.99914	1.00325	1.00310	0.99585	0.99581
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	-0.0000808	-0.0000814	0.00093635	0.00111	0.00155	0.00177	-0.00008048	-0.00001995
	(0.1287)	(0.2447)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.4664)	(0.8941)
Period1	0.00000259	0.00001254	0.00024077	0.00050529	0.00033740	0.00039874	0.00021991	0.00079874
	(0.9640)	(0.9231)	(<0.0001)	(<0.0001)	(0.0016)	(0.0991)	(0.0322)	(0.0011)
Period2	-0.0000227	-0.00003480	0.00003092	0.00014644	-0.00018140	0.00031040	-0.00021819	-0.00068796
	(0.7002)	(0.7903)	(0.6133)	(0.2889)	(0.0711)	(0.1601)	(0.0332)	(0.0091)
InvType* Period1		0.00001733		-0.00046012		-0.00009318		-0.00082736
		(0.8957)		(0.0005)		(0.7253)		(0.0018)
InvType* Period2		0.00002187		-0.00020161		-0.00075751		0.00068529
		(0.8688)		(0.1488)		(0.0018)		(0.0140)
N	75881	75881	75147	75147	62236	62236	59823	59823
F-value	1.04	0.64	131.26	81.96	106.95	66.71	5.05	10.41
(prob F)	(0.3742)	(0.6685)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0017)	(<0.0001)
Adj R-sqr	0.0000	-0.0000	0.0052	0.0054	0.0051	0.0053	0.0002	0.0008

Note: This table shows regression results of investor types, and crisis and recovery periods on trading performances. Trading performance is calculated as WP_{dj}^i / WP_{dj}, where WP_{dj} is the volume-weighted average price for stock j on day d, and WP_{dj}^i is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor types has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Period1 has a value of 1 in crisis period, and 0 otherwise. Period2 has a value of 1 for recovery period and 0 otherwise. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Initiated trades are calculated using Lee and Ready (1991). Transactions that occur at prices higher (lower) than previous price are classified as buy (sell) initiated trades. White (1980) robust standard error p-values are in parentheses.

First, let us turn our attention to all trades. For all transactions, in general, relative trading performance does not seem to change in the crisis and recovery periods, although we observe some exceptions. For example, in sell transactions, domestic advantage seems to decrease. Next, we turn our attention to initiated trades. In buy-initiated trades, foreign advantage does not seem to change in the crisis period. However, foreign advantage seems to decrease in the recovery period. In sell-initiated trades, foreign advantage seems to increase during the crisis period, but decreases during the recovery period.

The results from the crisis period seem to contradict our expectation. Despite a massive downturn in the crisis period, and reportedly a massive pull-out by foreign investors, foreign investors are able to maintain their advantage during the crisis period. Analysis of foreign flow during our period shows that foreign investors, in general, are still net buyers (see figure 1). Further analysis reveals that, in the crisis period, the average of daily foreign net volume of stocks in our sample still shows a positive number of around 89 million shares. This number is much smaller than the average of daily foreign net volume in the recovery period, which reaches around 158 million shares. However, net foreign investors flows still show positive numbers. During the crisis period, foreign investors accumulate around 14.7 billion shares. Out of 166 days in the crisis period, the number of days showing negative daily net foreign volume is 50, around 30 percent of total days in the crisis period. In the recovery period, out of 139 days, the number of days showing negative daily net foreign volume reaches 34, around 24% of total days in the recovery period. Meanwhile, the daily net foreign volume in the crisis period is lower than that the in recovery period, and also the percentage of negative net foreign flow in the crisis period is higher than in the recovery period. These statistics seem to suggest that foreign investors are not feeling panic. Thus, despite the crisis, foreign investors still seem to be able to trade in an orderly fashion. This result is different from Karolyi (2002) who reports that foreign investors in Japan are scared by the crisis, as shown by net selling by foreign investors during this period. However, Karolyi

(2002) shows that the trading pattern and behavior of foreign investors in Japan do not seem to change during the crisis period.

Time Series Behavior of Trading Performance

We further attempt to broaden our analysis by investigating time-series behavior of trading performance. Specifically, first, we calculate differences in trading performance between foreign and domestic investors as follows:

$$\text{Price Ratio Difference} = \text{Price Ratio for Domestic} - \text{Price Ratio for Foreign} \tag{3}$$

We calculate these differences for buy and sell transactions. For buy trades, a positive number for these differences indicates that domestic investors are at a disadvantage. For sell trades, a positive number of these differences indicates that domestic investors are at an advantage. Figures 2 and 3 show time-series movements of price ratio differences during our period. We calculate price ratio differences for buy and sell, and for all observations and initiated trades as well.
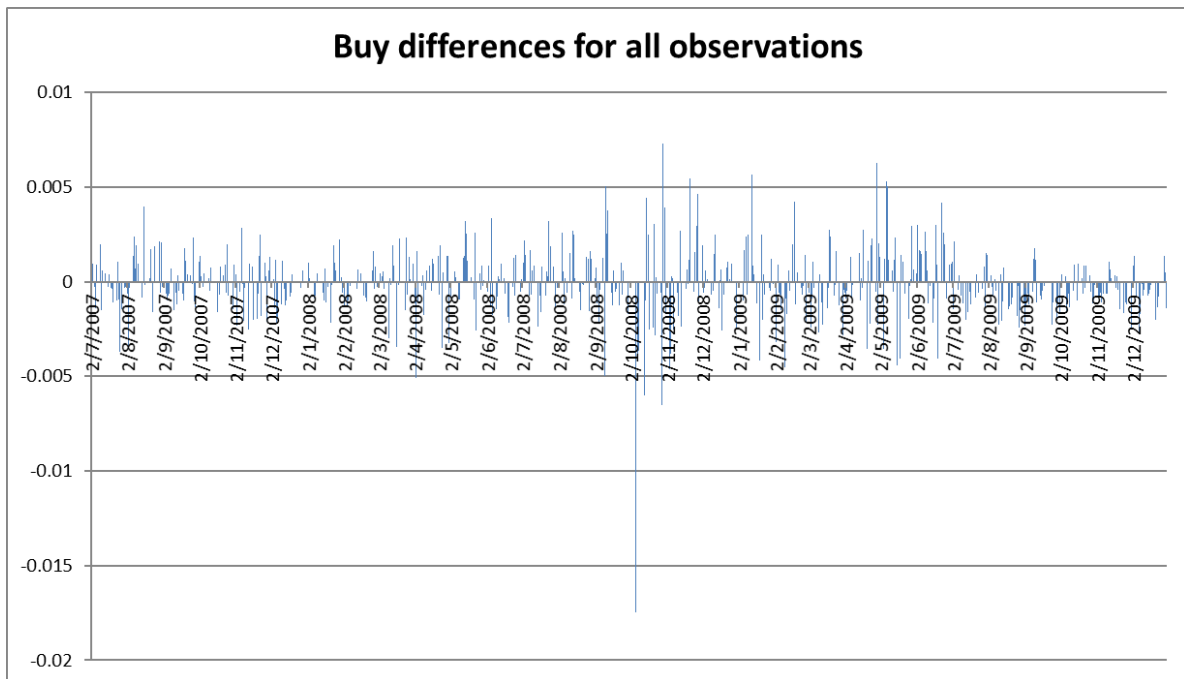
Note: This figure shows bwap differences for domestic and foreign buy, from June 2007- December 2009. Bwap differences are calculated as domestic bwap – foreign bwap. Positive numbers show that domestic investors are at disadvantage.

Figure 2 Bwap Differences for All Buy Trades
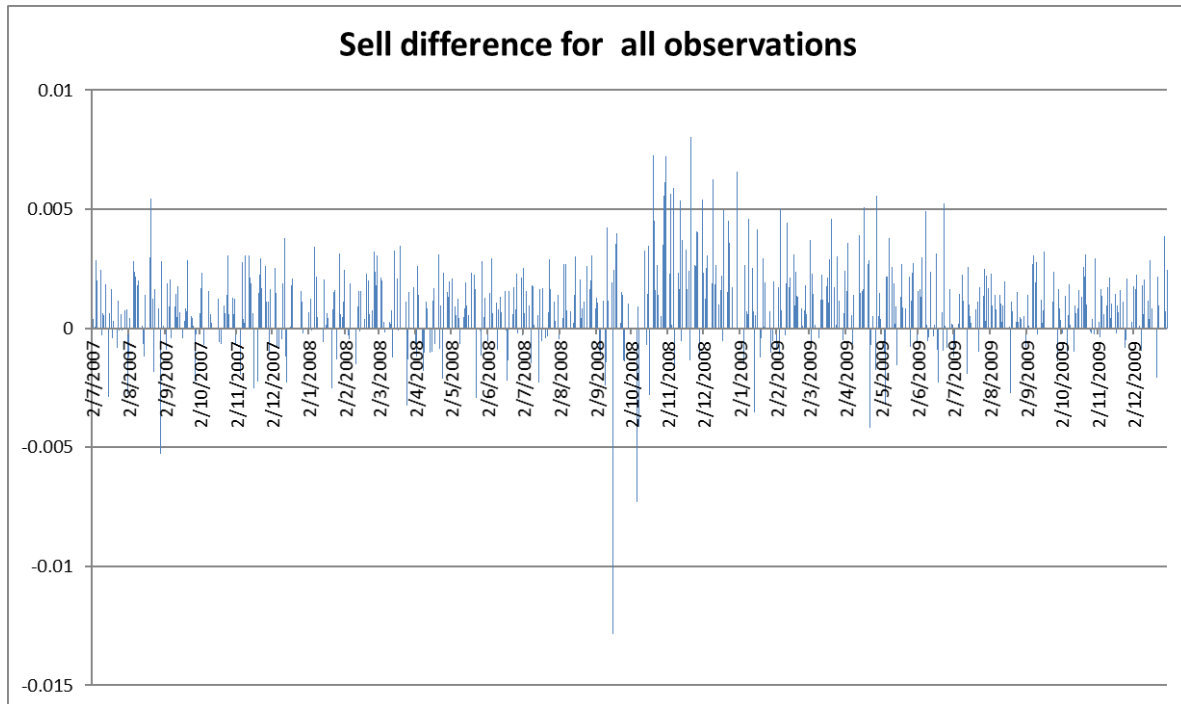
Note: This figure shows bwap differences for domestic and foreign sell, from June 2007- December 2009. Bwap differences are calculated as domestic bwap – foreign bwap. Positive numbers show that foreign investors are at disadvantage.

Figure 3 Bwap Differences for All Sell Trades

The figures show that price ratio differences seem to be stable over time. In the crisis period, for example in October and November 2008, fluctuation of price ratio differences seems to increase.

We analyze time-series behavior of price ratio differences more formally using regression. First, we want to investigate whether price ratio differences change during the crisis and recovery periods. In general, crisis and recovery periods do not seem to have an impact on price ratio differences. However, the signs for Period1 for sell transactions for all and initiated trades are significantly negative. These results suggest that foreign investors' performance during the crisis period improves. This result contradicts our prediction, and strengthens our point in the previous section that foreign investors seem to be able to maintain their performance during the crisis period.

Table 8 Time-Series Regression of Periods of Crisis and Recovery, Market Return, and Net Foreign Buy on Trading Performance Differences (All and Initiated Trades)

	All observations				Initiated			
	Buy		Sell		Buy		Sell	
Intercept	-0.00011036	-0.00025235	0.00120	0.00131	0.00033650	0.00023442	0.00130	0.00121
	(0.1515)	(0.0054)	(<0.0001)	(<0.0001)	(0.0213)	(0.1606)	(<0.0001)	(<0.0001)
Period1	-0.00002212	0.00030873	-0.00044526	-0.00027952	-0.00015921	-0.0001001	-0.00061091	-0.00040402
	(0.8790)	(0.0583)	(0.0025)	(0.0729)	(0.5671)	(0.7364)	(0.0294)	(0.1616)
Period2	0.00002506	0.00006201	-0.00023735	-0.0003687	-0.0004067	-0.0001134	0.00053798	0.00021054
	(0.8601)	(0.7049)	(0.1143)	(0.0252)	(0.1131)	(0.6825)	(0.0569)	(0.4682)
Market Return		0.01139		0.02027		-0.00679		-0.00643
		(0.0185)		(<0.0001)		(0.4363)		(0.4587)
Net Foreign Buy		-7.519E-12		-7.422E-12		1.5887E-12		9.254E-12
		(0.0636)		(0.0400)		(0.8127)		(0.1158)
N	32900	23828	32166	27054	20408	15933	17749	15408
F-value	0.04	5.83	4.87	13.96	1.20	0.43	6.78	2.84
(prob F)	0.9582	(0.0001)	(0.0077)	(<0.0001)	(0.3026)	(0.7877)	(0.0011)	(0.0228)
Adj R-sqr	-0.0001	0.0008	0.0002	0.0019	0.000	-0.0001	0.0007	0.0005

Note: This table presents the results of regressions on the effect of crisis and recovery periods, market return, and net foreign buy, on trading performance differences between Foreign and Domestic Investors. Differences in Trading performance is calculated as bwap

domestic – bwap foreign for both buy and sell transactions. Period1 has a value of 1 in crisis period, and 0 otherwise. Period2 has a value of 1 for recovery period and 0 otherwise. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index (JSCI) drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. The rest of period is used as a base for the regression. Initiated trades are calculated using Lee and Ready (1991). Transactions that occur at prices higher (lower) than previous price are classified as buy (sell) initiated trades. Market return is calculated as ln $(JSCI_{(t)}/JSCI_{(t-1)})$. JSCI is Jakarta Stock Exchange Composite Index. Net foreign buy is calculated as sum of trading buy by foreign investors at day t – sum of trading sell by foreign investors at day t. White (1980) robust standard error p-values are in parentheses.

Next, we include the market return and net foreign buy variables in our regressions. Choe et al. (2005) show that foreign investors' performance becomes worse when they trade more, either through larger trades, or through more intensive trading. However, market return does not seem to affect the trading performance of foreign investors. We calculate the market return using return of Jakarta Stock Composite Index. Net foreign buy on day (t) is calculated by subtracting foreign sell from foreign buy on day (t).

We can develop testable hypotheses regarding the effect of net foreign buy on price ratio differences. If foreign aggressiveness is the source of foreign advantage, then we can develop the following hypotheses. Bear in mind that positive price ratio difference for a buy transaction suggests that foreign investors have an advantage. If foreign investors become more aggressive, they will buy more, resulting in large net foreign buys. If aggressiveness is the source of the advantage, then we can expect that foreign advantage increases, i.e. larger price ratio difference for buy transactions when they buy more. Thus we can predict a positive relationship between net foreign buys and price ratio differences for buy transactions. Similar reasoning can be used to develop the hypothesis for sell transaction. If foreign investors are more aggressive in selling shares, we can expect to have less or negative net foreign buys. Smaller or negative net foreign buy can be expected to result in smaller price ratio differences for sell transactions. Thus, we can expect a positive relationship between net foreign buys and price ratio difference for sell transactions.

In table 8, for all observations, the coefficients for net foreign buys, for both buy and sell transactions, show negative signs. For buy transactions, a negative sign suggests that when foreign investors buy more, then their performance decreases. For sell transactions, the negative sign suggests that when foreign investors buy more (or sell less), then their performance increases. For initiated trades, we find a significant positive sign for sell transactions. The positive sign suggests that when foreign investors buy more (or sell less), then their performance decreases. These results seem to provide mixed support for Choe et al. (2005) and Agarwal et al. (2009). The coefficients for market return show significant positive signs. These results seem to suggest that foreign investors have good timing ability. When the market price goes up and down, then both their buy and sell performances increase. This result is different from that of Choe et al. (2005).

FURTHER TESTS

We observe that although our sample consists of the most liquid shares in Indonesia Stock Exchange, liquidity of our sample still shows large variation. In our sample, daily average of trading volume for the most active stock is around 655 million shares, while the average for least liquid is around 1.6 million shares. We investigate whether our results are robust to liquidity variable. Liquidity may reflect characteristics that affect trading performance such information asymmetry (Kalev et al, 2008), illiquidity premium (Bekaert et al., 2007), timing of information arrival (Chakraborty & Kakani, 2016).

We split our sample into two groups based on liquidity. First, we sort our sample based on liquidity from the most liquid to the least liquid stocks. Then we create two groups: the first half is the most liquid, and the rest is for the second group. Then we rerun regressions of trading performance on investor identity (foreign or domestic), for all trades, for initiated trades, in full, crisis, and recovery periods, for each group. Tables 9 to 12 report our results.

Table 9 <u>Regression Results for Types of Investors and Trading Performance for Less Liquid Stocks (all trades)</u>

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	1.0015	0.99936	0.99992	0.99956	1.00036	0.99953
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	-0.0002849	0.000953	-0.00002376	0.000834	-0.000535	0.0006954
	(0.0002)	(<0.0001)	(0.8663)	(<0.0001)	(0.0002)	(<0.0001)
N	31889	31514	8554	8748	7764	7603
F-value	17.85	193.79	0.03	44.59	17.47	23.28
(prob F)	(<0.0001)	(<0.0001)	(0.8683)	(<0.0001)	(<0.0001)	(<0.0001)
Adj R-sqr	0.0005	0.0061	-0.0001	0.0053	0.0021	0.0029

Note: This table presents regression results of investor types on trading performance. Trading performance is calculated as WP^{i}_{dj}/WP_{dj}, where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^{i}_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Investor Types has a value of 1 for domestic and 0 for foreign investors. More liquid stocks are those in the top half of the most liquid stocks, while the rest is included in less liquid stocks. White (1980) robust standard error p-values are in parentheses.

Table 10 <u>Regression Results for Types of Investors and Trading Performance for More Liquid Stocks (all trades)</u>

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	1.0000	0.99924	1.0001	0.99959	0.99990	0.99919
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	-0.0001028	0.00102	-0.000136	0.000706	0.00001044	0.00101
	(0.2176)	(<0.0001)	(0.4258)	(<0.0001)	(0.9556)	(<0.0001)
N	33848	33490	9116	9054	8212	8168
F-value	1.89	169.99	0.81	20.28	0.00	36.01
(prob F)	(0.1689)	(<0.0001)	(0.3684)	(<0.0001)	(0.9513)	(<0.0001)
Adj R-sqr	0.0000	0.0050	-0.0000	0.0021	-0.0001	0.0043

Note: This table presents regression results of investor types on trading performance. Trading performance is calculated as WP^{i}_{dj}/WP_{dj}, where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^{i}_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Investor Types has a value of 1 for domestic and 0 for foreign investors. More liquid stocks are those in the top half of the most liquid stocks, while the rest is included in less liquid stocks. White (1980) robust standard error p-values are in parentheses.

Table 11 Regression Results for Types of Investors and Trading Performance for Less Liquid Stocks (Initiated trades)

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	1.00310	0.99678	1.00328	0.99731	1.00344	0.99676
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	0.00149	-0.000654	0.00167	-0.00112	0.00112	-0.0006306
	(<0.0001)	(<0.0001)	(<0.0001)	(0.0003)	(<0.0001)	(0.0232)
N	26657	25493	7279	7254	6730	6149
F-value	133.24	193.79	34.82	17.01	23.49	6.85
(prob F)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(0.0089)
Adj R-sqr	0.0049	0.0009	0.0046	0.0022	0.0033	0.0009

Note: This table presents regression results of investor types of trading performance. Trading performance is calculated as WP^{i}_{dj}/WP_{dj}, where WP_{dj} is the volume-weighted average price for stock j on day d, and WP^{i}_{dj} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Investor Types has a value of 1 for domestic and 0 for foreign investors. More liquid stocks are those in the top half of the most liquid stocks, while the rest is included in less liquid stocks. White (1980) robust standard error p-values are in parentheses.

Table 12 Regression Results for Types of Investors and Trading Performance for More Liquid Stocks (Initiated trades)

	All periods		Crisis		Recovery	
	Buy	Sell	Buy	Sell	Buy	Sell
Intercept	1.00337	0.99539	1.00358	0.99580	1.00342	0.99485
	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Investor Type	0.00146	0.000107	0.00153	-0.000458	0.0008451	0.0008347
	(<0.0001)	(0.5218)	(<0.0001)	(0.1779)	(0.0073)	(0.0175)
N	27820	26599	7493	7339	6960	6569
F-value	112.17	0.62	28.60	2.54	10.24	9.26
(prob F)	(<0.0001)	(0.4314)	(<0.0001)	(0.1113)	(0.0014)	(0.0023)
Adj R-sqr	0.0040	-0.0000	0.0031	0.0002	0.0013	0.0014

This table presents regression results of investor types of trading performance. Trading performance is calculated as WP_{dj}^{i}/WP_{dj}, where WP_{dj} is the volume-weighted average price for stock j on day d, and WP_{dj}^{i} is the volume-weighted average buying or selling prices by investor class i for stock j on day d. Investor type has a value of 1 for domestic and 0 for foreign investors. The whole period covers June 2007 – December 2009. Crisis period is defined as a period from February 21, 2008 to October 28, 2008, when Jakarta Stock Composite Index drops from 2,700 to 1,100. Recovery period is defined from a period of March 21, 2009 to October 15, 2009, when Jakarta Composite Index increases from 1,400 to 2,500. Investor Types has a value of 1 for domestic and 0 for foreign investors. More liquid stocks are those in the top half of the most liquid stocks, while the rest is included in less liquid stocks. White (1980) robust standard error p-values are in parentheses.

In general, we find consistent findings: we find that domestic investors outperform foreign investors for all trades, and opposite findings for initiated trades. In all trades, domestic investors pay less when they buy and receive more when they sell, and vice versa in initiated trades. However, there are some interesting patterns from the tables. Results from less liquid stocks seem to show stronger patterns. In all trades, domestic advantages in less liquid stocks are stronger than those in more liquid stocks. This pattern also holds for foreign investors advantage. In initiated trades, foreign advantages are also stronger in less liquid stocks than those in more liquid stocks. This result seems to be consistent with an interpretation that more liquid stocks have better information disclosure, resulting in more equal access to information, and more equal probability to make profit between foreign and domestic investors.

Our results in initiated trades in crisis period seem to strengthen our point that foreign investors do not get panic in crisis period. Foreign investors buy at lower prices than domestic investors, and sell at higher prices than domestic investors. This pattern is stronger in less liquid stocks. The results in this section highlight the importance of liquidity in trading performance, which we believe is not explored extensively in current literature.

CONCLUSION

We study trading performance of foreign investors vis-à-vis domestic investors using the period of subprime mortgage crisis from 2007 to 2008 in the Indonesia Stock Exchange. This period offers an interesting setting since the Jakarta Stock Composite Index dropped significantly in the second part of 2008 (crisis period) and increased significantly in the first part of 2009 (recovery period). Thus, we are able to contrast trading performances in the crisis and recovery periods.

Our results show that domestic investors outperform foreign investors in all trades. In initiated trades, foreign investors outperform domestic investors. There seems to be an asymmetric pattern between trading performance of buy and sell transactions. In all trades, results from sell transactions are stronger than those for buy transactions, while in initiated trades, buy transactions have stronger pattern than sell transactions. In initiated trades, foreign advantage for sell transactions in the crisis period does not seem to decrease. Instead, foreign investors seem to be able to maintain their advantage; they seem to be able to maintain an orderly fashion in their trading even in the crisis period. Trading performance seems to change in different periods. Further analysis shows that liquidity plays an important role in trading performance. Patterns in less liquid stock is stronger than those in more liquid stocks.

While we agree with Aggarwal et al. (2009), that aggressiveness may play an important role, we believe that aggressiveness may be more complex. For example, aggressiveness may interact with different

periods and result in different trading performance. We also show that liquidity seems to affect trading performance. We believe such interactions and liquidity effect warrant further research.

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