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# **The Impact of Foreign Ownership on Stock Volatility in Indonesia**

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## **ABSTRACT**

This study documents a negative relationship between foreign ownership and future volatility of Indonesian stocks. This calming effect of foreign ownership is present before, during, and after the Asian financial crisis. It is independent of gross and net foreign trading and the stock's historical volatility. The effect increases with the level of foreign holdings. The findings are contrary to the volatility impact of institutional ownership in developed markets, and indicate the presence of different economic mechanisms leading to opposite volatility impact from foreign ownership and foreign trading.

Keywords: emerging markets, foreign ownership, foreign trading, volatility, Granger causality, Asian financial crisis

JEL Codes: F32, F36, G12, G15

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## **I. Introduction**

Emerging equity markets have much higher volatility than developed markets. High volatility increases the cost of capital, deters investments, and impedes long-run market development. Understanding the determinants of emerging market volatility is important for investors and policymakers. The financial crises in the 1990s have led to many studies on the volatility impact of foreign investors. Early studies compare volatility surrounding the events of market openings in late 1980s and early 1990s. Most of them, e.g. De Santis and Imrohoroglu (1997), Bekaert and Harvey (1995, 1997, 1998, 2000), Henry (2000), and Kim and Singal (2000), find market opening to be associated with stable or lower volatility. However, Roll (1995) was the first to document a surge in volatility following market opening in Indonesia in late 1988. Levine and Zervos (1998) presents evidence of greater volatility associated with market opening in 16 countries. More recently Bae, et al. (2004) investigates whether restrictions on foreign ownership affect stock volatility in emerging markets. They report a robust positive relationship between a stock's accessibility to foreign investors and its volatility. Based on daily trading activities of foreign investors in six Asian emerging markets, Richards (2005) finds much greater price impact from foreign trading than previously reported. Wang (2007a) shows that even though foreign selling accounted for only 15% of daily trading volume in Indonesia, it had a dominant impact on the volatility of the Jakarta Composite Index.

This study explores Granger causality from foreign ownership to stock volatility in Indonesia: whether and how foreign ownership affects future volatility. This causal relationship affects future volatility dynamics, therefore asset allocation decisions. More importantly, it has been regarded as a critical test for the benefits of market opening and foreign portfolio investments. If, *ceteris paribus*, foreign participation leads to greater risk sharing, enhanced liquidity, and improved corporate governance and disclosure, these

benefits should result in lower future volatility for stocks with greater foreign ownership. Conversely, if greater foreign ownership were associated with greater volatility, as suggested by Bae, et al. (2004), it would cast doubt on the benefits of foreign participation to emerging markets. This causal relationship has not been examined in the existent literature.

A key feature of this study is that we separate the volatility impact of foreign ownership from that of foreign trading. Theory<sup>1</sup> and empirical studies have shown that trading in general, and foreign trading in particular, leads to higher volatility. However, as discussed in section II, foreign ownership of an emerging market stock may lead to lower volatility. For example, foreign ownership increases a stock's investor base, leading to greater risk sharing and lower volatility. It also attracts greater analyst following, which helps reduce information asymmetry. Using detailed data on foreign ownership and foreign trading in Indonesia, this paper tests the hypothesis that after controlling the impact of foreign trading, foreign ownership has a negative, i.e. stabilizing, effect on future volatility. We examine the cross-sectional relationship between a stock's volatility in a month (or quarter) and foreign ownership in the previous month (or quarter), while controlling for a range of contemporaneous and lagged variables. While there is a positive contemporaneous relationship between foreign trading and stock volatility, we show that the level of foreign ownership is negatively related to subsequent volatility. This result is independent of the net trading by foreign investors: if two stocks have the same amount of foreign trading in the same direction, the one with the higher foreign ownership has lower future volatility. Therefore it is different from the findings of Wang (2007) where daily foreign selling has a strong contemporaneous impact on daily market volatility. The finding is also independent of past volatility: if two stocks have the same past volatility, the one with the higher foreign ownership has lower future volatility. Thus the finding is not driven by foreign preference for

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<sup>1</sup> The mixture of distribution hypothesis in market microstructure literature provides a theoretical link between trading activity and price volatility. See Andersen (1996) and references therein.

stocks with low historical volatility. Our findings are consistent with Agudelo (2010) which documents a positive liquidity impact from foreign ownership and a negative impact from foreign trading. Furthermore, we find that the relationship between volatility and foreign ownership is nonlinear: the stabilizing effect increases with the level of foreign ownership. These findings hold for all sub-periods before, during, and after the Asian financial crisis. They show the complex effects of foreign participation, and point to different economic mechanisms leading to opposite effects from foreign ownership and foreign trading.

The stabilizing effect documented in this paper is consistent with the findings from Korea by Choe, Kho, and Stulz (1999) and Kim and Wei (2002). These studies show that foreign investors, particularly offshore investment funds, do not destabilize the Korean stock market, therefore “are not especially worrisome monsters.” As discussed in section II, there are several economic mechanisms through which foreign ownership may lead to lower stock volatility. These mechanisms are present in most emerging markets. For example, there is evidence that foreign institutions are better monitors of company management in India (Khanna and Palepu, 1999). Foreign analysts are better than local analysts in several Latin American emerging markets (Bacmann and Bolliger, 2001). The positive effect from foreign ownership to corporate governance and profitability is documented in 28 emerging markets (Mitton, 2006). Indeed a recent study by Li, et al. (2011) confirms that the stabilizing effect of large foreign ownership (>5%) is present in 31 emerging markets.

The stabilizing effect of foreign ownership suggests that any adverse effect on the local markets from foreign participation is likely to come from foreign trading, in particular foreign selling, and not from foreign ownership per se. Herding and positive feedback trading by foreign investors have been documented by many studies in many markets, e.g. Dornbusch and Park (1995) and recently Hsieh, et al. (2011). Foreign trading tends to create large market reaction due to their reputation as sophisticated investors, their perceived

information advantage, and their large trading size. The positive effects of foreign ownership on corporate governance and profitability (Mitton, 2006) lead to strong market reaction to foreign selling. This may explain the love-hate relationship between foreign investors and emerging market policymakers and regulators. An implication of the finding is that emerging market policymakers should pay more attention to retaining foreign investments, as oppose to attracting more foreign investments. If not, domestic capital markets become a short stop for foreign investments, resulting in adverse market impact without the expected benefits.

The finding of this paper also has implication for future research in developed markets. Foreign investors in emerging markets are overwhelmingly financial institutions from developed markets<sup>2</sup>. The volatility impact of institutional investors in their home markets has been investigated by many studies<sup>3</sup>. However the literature has not made the distinction between the volatility impact of institutional ownership and trading. Most studies use institutional ownership as a proxy for institutional trading, and find a positive relationship between institutional ownership and volatility. Studies of corporate governance<sup>4</sup>, on the other hand, suggest a positive impact of institutional ownership on shareholder monitoring and corporate governance, which should lead to lower future volatility. Our empirical finding makes a strong case for the joint analysis of the volatility impact of institutional ownership and institutional trading in developed markets. Since institutional ownership and trading are positively correlated, omitting one variable will lead to biased coefficients for the other.

The paper is organized as follows. Section II provides a brief literature review and develops the main hypothesis to be tested. Section III explains the data and features of foreign ownership in Indonesia. The causality from foreign ownership to future stock volatility is tested in section IV. The paper concludes in section V.

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<sup>2</sup> For example, Kim and Wei (1999) shows that foreign institutions accounted for 99.6% of foreign holdings in Korea in mid-1998, and U.S. institutions accounted for 61.5% of the total foreign institutional holdings.

<sup>3</sup> A partial list includes Potter (1992), Sias (1996), Xu and Malkiel (2003), Bushee (2004), Brandt, et al. (2005), Dennis and Strickland (2005), Chang and Dong (2005), and Gabaix, et al. (2006).

<sup>4</sup> See the review and discussion by Gillan and Stark (2003).

## **II. Foreign Ownership and Stock Volatility: Hypothesis Development**

Most studies of the impact of foreign investors can be divided into three groups. Early studies, e.g. De Santis and Imrohoroglu (1997), Bekaert and Harvey (1995, 1997, 1998, 2000), Errunza (1999), Henry (2000), and Kim and Singal (2000), compare volatility before and after market liberalization without detailed data on the level of foreign participation. The second group is based on foreign trading, e.g. Richards (2005), Wang (2007a), Agarwal, et al. (2009), among others. Using daily trading data by foreign and domestic investors, Richards (2005) and Wang (2007a) demonstrate a strong positive link between foreign trading, particularly foreign selling, and local market volatility. The last group is based on foreign ownership, e.g. Huang and Shiu (2005), Wang (2007b), Li, et al. (2011).

This study is among the few that provide a joint estimate of the effects of foreign ownership versus foreign trading. In particular, we develop and test the hypothesis that after controlling the effect of foreign trading, foreign ownership has a stabilizing effect on stock volatility. There are several economic mechanisms that support this hypothesis. First, foreign ownership increases the investor base, leading to greater risk sharing and higher return (Merton, 1987). A simple extension of Merton's model shows that greater investor base also reduces volatility (Wang, 2007a). Second, foreign institutional ownership attracts greater analyst following, thus reducing information asymmetry surrounding a stock (O'Brien and Bhushan, 1990; Kini and Mian, 1995). Foreign institutions are better monitors of company management than local institutions (Khanna and Palepu, 1999) and foreign analysts produce more timely and accurate forecasts than local analysts (Bacmann and Bolliger, 2001). Indeed Wang (2007b) shows that in Indonesia, stocks with high foreign ownership tend to lead stocks with low foreign ownership in price movements. Dvorak (2005) and Bae, et al. (2011) show that foreign investors have better investment performance than local

investors in Indonesia and Korea<sup>5</sup>. Finally, there is a large body of literature showing the positive impact of foreign institutional investors on corporate governance, disclosure, and operational profits, which again leads to better returns and lower volatility. Foreign institutional ownership tends to improve corporate governance and profitability (D'Souza, et al., 2005, Mitton, 2006), and help firms to recover from financial stress (Blalock, et al., 2005). When faced with agency conflicts, foreign institutions are more likely to raise objection (Gillan and Stark, 2003), therefore have a deterrence effect on managerial expropriation (Johnson, et al., 2000)<sup>6</sup>. Taken together, the evidence suggests that foreign ownership should have a calming effect on volatility, opposite to that of foreign trading activity.<sup>7</sup> By separating the volatility impact of foreign ownership and trading, we provide new insight into the impact of market opening and foreign participation.

### **III. Data and Preliminary Analysis**

The Jakarta Stock Exchange (JSX) publishes daily foreign holdings of individual stocks. Our data include stock code, daily high, low, and closing prices, daily trading volume, rupiah value, and the number of transactions, shares outstanding, and end-of-day foreign share holding in each stock. The sample period is from 1 January 1996 to 22 December 2000 and has 1212 trading days. After removing records with obvious errors, e.g. missing price (price=0), duplicate records (same stock with two trading records on the same day), daily high being less than daily low, etc, our initial sample has 329,393 stock-day records.

Our sample covers the Asian financial crisis period. Given the severity of the crisis, it is sensible to divide the full sample into three sub-periods: before, during, and after the Asian

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<sup>5</sup> The high reputation of foreign investors in small open markets may also explain their superior investment performance, e.g. Yoo (2011), and consequently the stabilizing effect of foreign ownership.

<sup>6</sup> Gillan and Starks (2003) provides a detailed discussion on direct and indirect influences of foreign institutional investment on corporate governance. They report that some large US pension funds have directly sought to improve corporate governance in their overseas holdings.

<sup>7</sup> The findings of a positive relationship between a stock's investibility and its volatility (Bae, et al., 2004) may reflect the impact of foreign trading, as oppose to foreign ownership restrictions.



crisis. Figure 1 depicts the Jakarta Composite Index (JCI) and the IDR/USD exchange rate. The stock market in Indonesia had a bull run in 1996 and the first half of 1997. The crisis hit Indonesia in early August 1997. The stock market crashed after August 5, and the Rupiah was floated on August 14. The crisis deepened through the rest of 1997 and early 1998. In May 1998, Suharto resigned as the Indonesian President and a new rescue package was signed with the International Monetary Fund. The JCI began a strong and sustained recovery after October 6, 1998. The rupiah also experienced a substantial surge against US dollar in the second week of October. We take August 5, 1997, as the start of the crisis for Indonesia, and October 7, 1998, as the start of the recovery. Using alternative dates for the Asian crisis, e.g. July 1997 to August 1998 as in Johnson and Mitton (2003) and Lemmon and Lins (2003), does not alter the main results.

Table 1 provides a brief summary of the JSX. Over the sample period, the number of listings increased from 271 to 289. The market was highly concentrated: the top 10 stocks accounted for over 50% of the total market capitalization, and the concentration increased over the sample period. Although trading activity increased substantially, the average transaction size decreased after the start of the Asian crisis. Over 35% of listed stocks were not traded on an average trading day. Our analyses are based on active stocks, defined as those traded more than 5 days in a month. Overall only 136 of the 289 stocks are considered being active. The JCI was up almost 40% from early 1996 to mid-1997. The crisis period saw the JCI losing over 63% of its value and is accompanied by a surge in volatility.

Figure 2 and Panel A of Table 1 depict the aggregate foreign ownership over the sample period. The percentage foreign holdings, by shares and rupiah value, were relatively stable except in the second half of 2000 when they had several large drops. Overall there was no evidence of massive capital outflows from Indonesia's equity market during the Asian crisis. Foreign holding in rupiah value decreased by only 3.2% compared to the decline in

the JCI by 63.4% over the period, indicating capital inflows from foreign investors. Indeed foreign shareholding increased by 5.5 billion over the crisis period, even though the percentage shareholding dropped by 4.9% because of the increase in the total shares outstanding from the 18 newly listed stocks. It appears that foreign investors took advantage of the low share prices and rupiah value and increased their share holding in Indonesia during the crisis period. Other studies<sup>8</sup> report capital inflows in Korea and Thailand. There was a surge in the total shares outstanding and foreign shareholding in early April 1999.<sup>9</sup> Foreign percentage holdings increased only slightly, and began to decrease in the second half of 2000.

Panels B and C of Table 2 report foreign ownership by market capitalization and by daily turnover. Foreign investors in Indonesia do not favor large stocks and high turnover stocks as suggested in previous studies. For the full sample, the largest 50 stocks accounted for 78.3% of the total market capitalization in Indonesia and 79.3% of the total foreign holding in Indonesia. On average foreign investors hold 27.6% of the top 50 stocks. The market weight for the next 100 stocks is 16%, while their weight in the aggregate foreign portfolio is 15.9%. The market weights and foreign portfolio weights are very similar across different market capitalization groups in all three sub-periods. Foreign investors do not favor stocks with the highest turnover, except during the Asian crisis. Despite the higher volatility and greater trading activities during the crisis, the turnover ratio is actually lower. This is consistent with smaller transaction size and more stocks not being traded during the crisis (Table 1). Panel D of Table 2 shows foreign ownership distribution across active stocks, those traded more than 5 days in a month. The distribution shifted towards the lower end of percentage holdings during the Asian crisis.

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<sup>8</sup> Kim and Wei (1999) report that foreign holdings in Korea increased from 7.06 to 8.58 trillion won between November 1997 and June 1998. Wang (2007a) reports that foreign investors were net buyers of 64 billion baht of Thai stocks during the crisis.

<sup>9</sup> Between March 30 and April 6, 1999, the total shares outstanding on the JSX increased from 154 billion to 472 billion. Three banks, Bank Danamon (BDMN), Bank International Indonesia (BNI), and Bank Tiara Asia (BNTA), increased shares outstanding by about 320 billion, while prices of these banks remained steady. Foreign shareholding increased from 36.2 billion to 118 billion.

#### IV. Foreign Ownership and Future Volatility

The causality from institutional ownership to stock volatility in the United States has been examined by Sias (1996) and Xu and Malkiel (2003). Sias (1996) performs cross-sectional regressions of firm-level volatility on changes in institutional ownership, while Xu and Malkiel (2003) estimate cross-sectional regressions of firm-level idiosyncratic volatility on the level of institutional ownership. Both report a positive impact from institutional ownership to future volatility. Brandt, et al. (2005) disputes the findings of Xu and Malkiel (2003) and reports a negative relationship between institutional ownership and idiosyncratic volatility among low-priced stocks.

Our empirical model is in the same spirit as Sias (1996) and Xu and Malkiel (2003), but has several important differences. Instead of annual analysis, we conduct monthly and quarterly analyses which are more relevant for investment decisions. More importantly, we control for the volatility impact of gross and net foreign trading. Although net foreign trading determines the level of foreign ownership, we expect ownership to have an independent effect on volatility as discussed in section I. We also control for other firm characteristics that may affect foreign holding preference: e.g. foreign investors may prefer stocks with low historical volatility which may have low future volatility. We control for historical volatility and compare stocks with the same historical volatility but different foreign holdings. Specifically foreign impact on future volatility is examined using the following model:

$$\ln(\sigma_{i,t}) = \beta_0 + \beta_1 \ln(\sigma_{i,t-1}) + \beta_2 \ln(\sigma_{i,t-2}) + \beta_3 \ln(\text{MCAP}_{i,t-1}) + \beta_4 \text{TOVER}_{i,t} + \beta_5 r_{i,t} \\ + \beta_6 r_{i,t-1} + \beta_7 \text{FT}_{i,t} + \beta_8 \Delta \text{FH}_{i,t} + \beta_9 \text{FH}_{i,t-1} + \varepsilon_{i,t}$$

where  $\sigma_{i,t}$  is stock  $i$ 's volatility in month  $t$ ,  $\text{MCAP}_{i,t}$  is the average market capitalization in month  $t$ ,  $\text{TOVER}_{i,t}$  is turnover,  $r_{i,t}$  is return in month  $t$ ,  $\text{FT}_{i,t}$  is foreign trading, and  $\text{FH}_{i,t}$  is the percentage foreign holding at the end of month  $t$ . Monthly volatility is calculated as  $\sigma_{i,t} =$

$\sqrt{\sum_{d=1}^M [\ln(H_{i,d}/L_{i,d})]^2}$  where  $H_{i,d}$  and  $L_{i,d}$  are the daily high and low prices of stock  $i$ , and  $M$

is the number of trading days in the month. The use of daily range as a volatility measure has been support by several studies, e.g. Alizadeh, et al. (2002). Using daily returns to calculate monthly volatility does not alter the main results. Foreign trading  $FT_{i,t}$  is approximated by the sum of the absolute changes of daily foreign shareholdings for stock  $i$  during month  $t$ . In order to obtain reliable volatility estimates for each month, we use only the active stocks, those traded more than 5 days in a month, for the analysis.

The full-sample results at monthly intervals are reported in Panel A of Table 3. Model (1) includes only lagged variables. Model (2) includes contemporaneous return and turnover. Model (3) includes contemporaneous foreign gross and net trading. The modified Fama-MacBeth t-statistics is calculated with the standard error given by  $\frac{\text{St. Dev.}(\beta)}{\sqrt{T}} \left( \frac{1+\rho(1)}{1-\rho(1)} \right)$ , where “St. Dev.” is the standard deviation across all months,  $\rho(1)$  is the first-order autocorrelation of the estimated coefficients, and  $T$  is the number of month (Cochrane, 2001). Overall volatility increases with turnover, is inversely related to lagged returns, but is unaffected by market capitalization or current returns. In all three specifications, volatility is negatively related to past foreign holdings. Since foreign trading is positively correlated with foreign holding and has a positive impact on volatility, omitting  $FT_{i,t}$  leads to an overestimation of  $\beta_9$ .<sup>10</sup> Indeed  $\beta_9$  in models (1) and (2) are larger than in model (3). Adding  $FT_{i,t}$  in model (3) strengthens the negative relationship between foreign holdings and future volatility. Since foreign investors do not trade in the same direction,  $FT_{i,t}$  still underestimates the actual monthly foreign volume. Therefore  $\beta_7$  is likely to be underestimated, which again may lead to an overestimation of  $\beta_9$ . When  $FT_{i,t}$  is properly measured, the inverse relationship between  $\sigma_{i,t}$  and  $FH_{i,t-1}$  should be stronger than reported.

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<sup>10</sup> The bias is given by  $E(\hat{\beta}_9) - \beta_9 = \left[ \frac{\text{Cov}(FT_{i,t}, FH_{i,t-1})}{\text{Var}(FH_{i,t-1})} \right] \beta_7 > 0$  (Greene, 2003, p148).

Panel B reports the results for quarterly estimations of model (3). Foreign net purchase,  $\Delta FH_{i,t}$ , is no longer significant. But foreign holdings in the previous quarter still have a negative impact on current volatility. Panel C of Table 3 reports monthly sub-period estimations for model (3). Foreign holdings had a calming effect on future volatility in all three sub-periods. Before the crisis, large stocks had lower volatility. The Indonesian market had a bull run, and volatility becomes higher as the prices moved higher ( $\beta_5 > 0$ ). During the crisis period, volatility appeared to be unrelated to trading activities: Turnover (TOVER), gross foreign trading (FT), and net foreign trading ( $\Delta FH$ ) were all unrelated to volatility. It is likely that volatility was driven by severe currency depreciations and the overall macro uncertainty related to leadership changes and IMF programs. Interestingly the calming effect of foreign holdings was strongest during the crisis period. After the crisis the calming effect of foreign ownership became weaker but remained significant.

Panel D of Table 3 explores possible nonlinear relationships between volatility and foreign holdings: the impact of foreign holdings may be a function of the level of foreign holdings. We separate stocks into groups with foreign holdings below 15%, between 15-30%, between 30-45%, and above 45%. The average numbers of stocks in these groups are reported in Panel D of Table 2. The full-sample results show that as foreign holding increases, the coefficients become more negative with greater statistical significance. Across sub-periods, the statistical significance of different foreign holding groups varies. During the crisis, only foreign holdings above 45% had a significant calming effect on future volatility. After the crisis, foreign holdings above 15% contributed to lower future volatility.

## **V. Conclusion**

Recent studies, e.g. Bae, et al. (2003) and Wang (2007), link foreign participation to greater volatility in emerging markets. This study shows that after controlling for gross and net foreign trading, foreign ownership has a calming effect on future stock volatility. The

effect is robust to foreign preference for historical volatility, alternative specifications, and sub-period analyses. There are several economic mechanisms that may potentially explain the calming effect of foreign ownership on future volatility: increased risk sharing and higher return, positive signaling and greater investor confidence, and positive impact on corporate governance, disclosure, and operational profits. An important future research topic is to investigate the economic mechanisms that lead to our findings.

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**Table 1: JSX Summary**

This table provides a summary of listing and trading on the JSX. “Number of stocks listed” is at the end of the period. “JCI return” is the JCI index return over the period. All other numbers are daily averages for the period. “Top 10” is the market capitalization of the top 10 largest stocks relative to the total. “No trading” is the percentage of stocks not traded on a trading day. “Active stocks” is the average number of stocks traded more than 5 days in a month.

	Full Sample 1996/1/1 – 2000/12/22	Before Crisis 1996/1/1 – 1997/8/5	During Crisis 1997/8/7 – 1998/10/6	After Crisis 1998/10/7 – 2000/12/22
Stocks listed	289	271	289	289
Market Cap. (tri. rupiah)	245	201	182	312
Top 10 (%)	56	53	55	60
Volume (million shares)	333	117	298	510
Value (billion rupiah)	348	238	329	438
Number of transactions	13642	8382	13339	17655
Transaction Size (mil. rupiah)	25.5	28.4	24.7	24.8
No trading (%)	36.7	37.2	38.0	35.5
Active stocks	136	132	145	137
JCI return (%)	-18.8	39.3	-63.4	59.4
JCI volatility (%)	2.19	1.04	3.33	2.41

**Table 2: Foreign Ownership in Indonesia****Panel A: Foreign Ownership over Time**

	Before Crisis 1996/1/1 – 1997/8/5		During Crisis 1997/8/7 – 1998/10/6		After Crisis 1998/10/7 – 2000/12/22	
Shares	(billion)	(%) <sup>*</sup>	(billion)	(%) <sup>*</sup>	(billion)	(%) <sup>*</sup>
Average	18.4	26.8	34.4	25.3	133.6	20.3
High	30.4	28.7	36.4	28.5	179.1	28.8
Low	11.5	25.0	29.8	23.4	35.4	11.7
Change	18.9	3.4	5.5	-4.9	127.1	-9.7
Rupiah Value	(trillion)	(%) <sup>**</sup>	(trillion)	(%) <sup>**</sup>	(trillion)	(%) <sup>**</sup>
Average	54.8	27.2	47.3	25.9	80.8	25.8
High	74.7	28.7	71.5	28.4	135.4	30.3
Low	40.4	26.0	27.5	22.9	27.0	20.9
Change	33.3	1.9	-43.6	-3.2	26.5	-4.2

\* Percentage of the total shares outstanding.

\*\* Percentage of the total market capitalization.

**Table 2 – Continued**

**Panel B: Foreign Ownership by Market Capitalization**

	Top 50	Medium 100	Remaining Stocks
Full Sample			
% of Market Capitalization	78.3	16.0	5.7
% of Foreign Holding	79.3	15.9	4.8
Average Foreign Holding (%)	27.6	24.8	21.6
Before Crisis			
% of Market Capitalization	78.2	17.7	4.0
% of Foreign Holding	78.2	18.3	3.5
Average Foreign Holding (%)	31.3	27.1	24.1
During Crisis			
% of Market Capitalization	80.9	14.8	4.3
% of Foreign Holding	80.2	16.1	3.7
Average Foreign Holding (%)	27.0	25.9	21.5
After Crisis			
% of Market Capitalization	84.0	12.1	3.9
% of Foreign Holding	84.8	11.7	3.5
Average Foreign Holding (%)	24.8	25.1	22.8

**Panel C: Foreign Ownership by Daily Turnover**

	Top 50	Medium 100	Remaining Stocks
Full Sample			
Average Turnover (%)	0.98	0.28	0.07
Average Foreign Holding (%)	21.7	27.2	22.0
Before Crisis			
Average Turnover (%)	1.46	0.26	0.04
Average Foreign Holding (%)	22.5	28.0	27.1
During Crisis			
Average Turnover (%)	0.77	0.18	0.02
Average Foreign Holding (%)	25.9	24.6	22.7
After Crisis			
Average Turnover (%)	1.04	0.26	0.04
Average Foreign Holding (%)	25.6	26.0	21.9

**Panel D: Foreign Ownership of Active Stocks\***

	Number of Active Stocks	Foreign Ownership Distribution			
		<15%	(15%,30%]	(30%,45%]	>45%
Full Sample	136	37	42	37	20
Before Crisis	132	27	40	44	21
During Crisis	145	43	49	39	14
After Crisis	137	42	41	32	22

\*Stocks traded more than 5 days in a month.

**Table 3: Impact of Foreign Holdings on Volatility**

This table reports the following cross-sectional regression:

$$\ln(\sigma_{i,t}) = \beta_0 + \beta_1 \ln(\sigma_{i,t-1}) + \beta_2 \ln(\sigma_{i,t-2}) + \beta_3 \ln(\text{MCAP}_{i,t-1}) + \beta_4 \text{TOVER}_{i,t} + \beta_5 r_{i,t} + \beta_6 r_{i,t-1} + \beta_7 \text{FT}_{i,t} + \beta_8 \Delta \text{FH}_{i,t} + \beta_9 \text{FH}_{i,t-1} + \varepsilon_{i,t}$$

where  $\sigma_{i,t}$  is the return volatility of stock  $i$  in month  $t$ ;  $\text{MCAP}_{i,t}$  is the median market capitalization;  $r_{i,t}$  is the monthly return;  $\text{FH}_{i,t}$  is the percentage foreign holding at the end of the month;  $\text{TOVER}_{i,t}$  is turnover in month  $t$ ;  $\text{FT}_{i,t}$  is the sum of the absolute changes in daily foreign holding of stock  $i$  in month  $t$  and is a proxy for foreign trading volume; and  $\Delta \text{FH}_{i,t} = \text{FH}_{i,t} - \text{FH}_{i,t-1}$ . The coefficients are averaged across monthly estimations. “St. Dev.” is the standard deviation across all months,  $\rho(1)$  is the first-order autocorrelation of the estimated coefficients, “F-M t-stat” is the modified Fama-MacBeth t-statistics with the standard error given by  $\frac{\text{St. Dev.}(\beta)}{\sqrt{T}} \left( \frac{1 + \rho(1)}{1 - \rho(1)} \right)$  with  $T$  being the number of months. The asterisks \*, \*\*, and \*\*\* denote one-sided significance at 10%, 5%, and 1% respectively.

Panel A: Full Sample – Monthly Estimation

	$\beta_0$	$\ln(\sigma_{i,t-1})$	$\ln(\sigma_{i,t-2})$	$\ln(\text{MCAP}_{i,t-1})$	$r_{i,t-1}$	$\text{TOVER}_{i,t}$	$r_{i,t}$	$\text{FT}_{i,t}$	$\Delta \text{FH}_{i,t}$	$\text{FH}_{i,t-1}$	$R^2$
Model (1)											
Coefficients	-0.437	0.433	0.213	-9.874	-0.19					-0.136	0.341
St. Dev.	0.574	0.115	0.099	49.41	0.285					0.261	
$\rho(1)$	0.155	0.212	0.142	0.091	0.231					-0.181	
F-M t-stat	-4.35***	19.1***	12.6***	-1.30	-3.25***					-5.89***	
Model (2)											
Coefficients	-0.832	0.39	0.19	4.794	-0.193	1.226	0.172			-0.161	0.418
St. Dev.	0.571	0.116	0.104	38.9	0.289	0.715	0.502			0.256	
$\rho(1)$	0.367	0.279	0.145	0.052	0.149	0.412	0.365			-0.088	
F-M t-stat	-5.27***	14.8***	10.7***	0.87	-3.87***	5.58***	1.25			-5.85***	
Model (3)											
Coefficients	-0.769	0.385	0.185	-2.195	-0.181	1.201	0.206	2.056	-0.67	-0.169	0.428
St. Dev.	0.585	0.116	0.104	40.9	0.293	0.702	0.504	2.95	1.593	0.267	
$\rho(1)$	0.378	0.27	0.14	0.103	0.096	0.371	0.412	0.376	-0.001	-0.074	
F-M t-stat	-4.64***	14.9***	10.5***	-0.34	-3.98***	6.13***	1.33	2.47***	-3.29***	-5.75***	



Table 3 – *Continued*

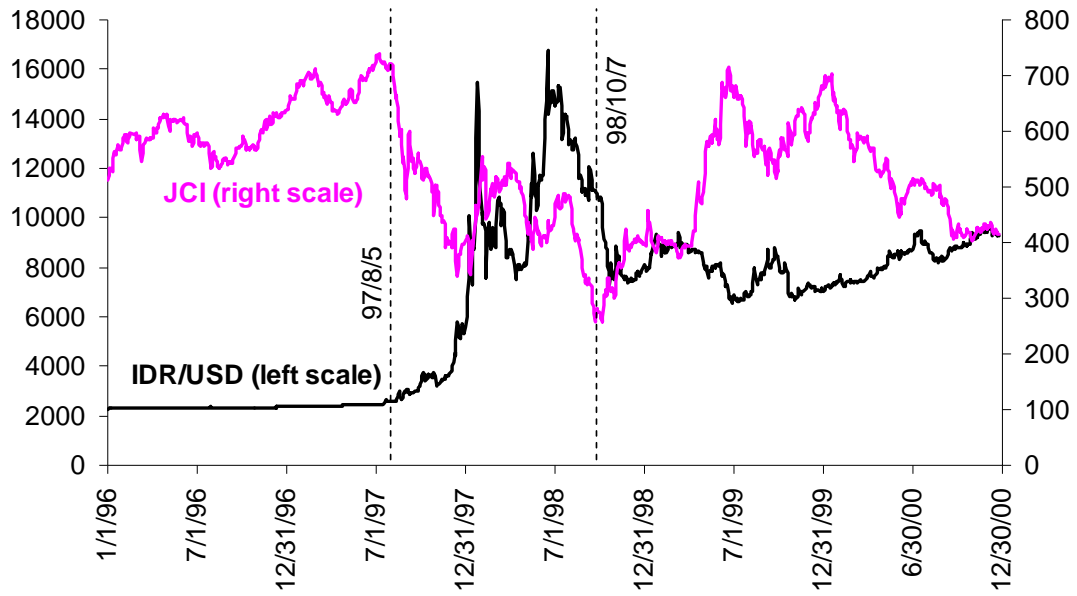
Panel B: Full Sample – Quarterly Estimation											
	$\beta_0$	$\ln(\sigma_{i,t-1})$	$\ln(\sigma_{i,t-2})$	$\ln(\text{MCAP}_{i,t-1})$	$r_{i,t-1}$	$\text{TOVER}_{i,t}$	$r_{i,t}$	$\text{FT}_{i,t}$	$\Delta\text{FH}_{i,t}$	$\text{FH}_{i,t-1}$	$R^2$
Coefficients	-0.595	0.42	0.179	0.013	-0.205	0.316	-0.037	0.157	-0.165	-0.112	0.522
St. Dev.	0.323	0.18	0.114	0.054	0.137	0.186	0.216	0.423	0.634	0.249	
$\rho(1)$	0.296	-0.245	0.11	-0.021	0.38	-0.122	-0.201	-0.605	-0.077	-0.281	
F-M t-stat	-4.58***	17.66***	5.78***	1.16	-3.08***	9.94***	-1.17	6.89***	-1.39	-3.68***	
Panel C: Sub-periods – Monthly Estimation											
	$\beta_0$	$\ln(\sigma_{i,t-1})$	$\ln(\sigma_{i,t-2})$	$\ln(\text{MCAP}_{i,t-1})$	$r_{i,t-1}$	$\text{TOVER}_{i,t}$	$r_{i,t}$	$\text{FT}_{i,t}$	$\Delta\text{FH}_{i,t}$	$\text{FH}_{i,t-1}$	$R^2$
Before Crisis											
Coefficients	-1.075	0.334	0.133	-8.097	-0.321	1.279	0.552	3.02	-1.222	-0.193	0.380
St. Dev.	0.503	0.107	0.09	37.9	0.424	0.464	0.485	3.14	1.43	0.249	
$\rho(1)$	-0.352	0.073	0.112	-0.56	-0.121	-0.019	0.117	-0.105	-0.41	0.211	
F-M t-stat	-19.9***	12.1***	5.25***	-3.38***	-4.32***	12.8***	4.02***	5.31***	-9.15***	-2.26**	
During Crisis											
Coefficients	-0.401	0.412	0.182	-9.254	-0.186	1.247	-0.1	3.354	-0.511	-0.249	0.400
St. Dev.	0.564	0.121	0.106	52.6	0.134	1.01	0.382	3.93	1.19	0.313	
$\rho(1)$	0.585	0.715	-0.113	0.405	0.51	0.692	0.254	0.598	0.162	-0.305	
F-M t-stat	-0.72	2.19**	8.38***	-0.29	-1.74**	0.87	-0.60	0.83	-1.20	-5.80***	
After Crisis											
Coefficients	-0.75	0.41	0.219	4.781	-0.09	1.015	0.161	0.999	-0.153	-0.106	0.464
St. Dev.	0.522	0.111	0.097	37.6	0.215	0.672	0.428	2.00	1.65	0.205	
$\rho(1)$	0.234	0.305	0.282	0.073	0.227	0.055	0.339	0.04	-0.191	0.013	
F-M t-stat	-4.64***	10.2***	6.55***	0.57	-1.37	7.03***	0.97	2.40***	-0.71	-2.63***	

Table 3 – *Continued*

## Panel D: Foreign Holding Thresholds – Monthly Estimation

	$\ln(\text{MCAP}_{i,t-1})$	$r_{i,t-1}$	$\text{TOVER}_{i,t}$	$r_{i,t}$	$\text{FT}_{i,t}$	$\Delta\text{FH}_{i,t}$	$\text{FH}_{i,t-1}$ <15%	$\text{FH}_{i,t-1}$ (15%,30%]	$\text{FH}_{i,t-1}$ (30%,45%]	$\text{FH}_{i,t-1}$ >45%	$R^2$
Full Sample											
Coefficients	-0.017	-0.216	0.864	0.151	1.548	-0.677	-0.137	-0.073	-0.09	-0.113	0.573
St. Dev.	0.043	0.229	0.658	0.407	2.421	2.234	1.322	0.507	0.372	0.307	
$\rho(1)$	0.05	0.117	0.204	0.319	0.273	-0.062	-0.129	-0.276	-0.281	-0.159	
F-M t-stat	-2.59***	-6.41***	6.70***	1.41	2.92***	-2.56***	-1.50	-2.14**	-3.85***	-4.50***	
Before Crisis											
Coefficients	-0.023	-0.378	1.055	0.311	2.194	-1.134	-0.173	-0.047	-0.088	-0.055	0.475
St. Dev.	0.045	0.265	0.44	0.435	2.821	1.227	1.475	0.553	0.456	0.427	
$\rho(1)$	-0.061	-0.286	0.015	0.167	-0.109	-0.119	-0.255	-0.084	-0.252	-0.188	
F-M t-stat	-2.26**	-15.22***	10.03***	2.08**	4.68***	-4.90***	-2.08**	-0.64	-2.14**	-1.44	
During Crisis											
Coefficients	-0.029	-0.15	0.708	-0.043	2.713	-0.721	0.051	-0.04	-0.091	-0.242	0.558
St. Dev.	0.037	0.151	0.643	0.436	2.826	1.508	1.319	0.353	0.269	0.243	
$\rho(1)$	0.119	-0.35	0.459	0.274	0.465	0.401	-0.166	-0.263	-0.122	-0.146	
F-M t-stat	-2.73***	-7.29***	1.47	-0.01	1.42	-0.97	0.57	-0.19	-1.32	-5.62***	
After Crisis											
Coefficients	-0.005	-0.141	0.731	0.157	0.783	-0.087	-0.098	-0.127	-0.078	-0.096	0.629
St. Dev.	0.045	0.196	0.765	0.333	1.758	3.027	1.365	0.574	0.361	0.207	
$\rho(1)$	0.069	0.069	0.052	0.371	-0.014	-0.296	-0.092	-0.404	-0.39	-0.44	
F-M t-stat	-0.80	-3.14***	5.17***	1.05	2.46***	0.30	-0.34	-2.17**	-1.95*	-6.15***	

**Figure 1: The Jakarta Composite Index and IDR/USD Exchange Rate**



**Figure 2: Foreign Ownership in Indonesia**

