The Effects of Financial Liberalization and Capital Flow on Emerging Countries: Case of Thailand

By

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A dissertation submitted to the faculty of Claremont Graduate University in partially fulfillment of the requirements for the degree of Doctor Philosophy in Economics

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Abstract

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At the present time, capital market development is a hot topic in Thailand since the government has recently approved a capital market master plan. The project altogether included 8 plans with an attempt to improve Thailand's capital markets. The goals of the plans are to increase the level of liberalization and the development of new products into the markets. However, these two plans have already been implemented in the past. This dissertation studies the effects of past policies aimed at liberalization in 1987 and the initiation of the futures market in 2006. Stock return volatility, one of the variables used by investors to measure risk, is the variable of interest in this dissertation. The ARCH and GARCH models, which are effective tools used to calculate volatility, are employed in this dissertation. The results from the ARCH and GARCH models show that conditional volatility increased after market liberalization in 1987 and the conditional volatility does not decrease as expected from the introduction of new products. Other than variances in volatility, this dissertation also focuses on the behavior of foreign investors from three perspectives: the effect of foreign equity flows on i) stock returns ii) stock volatility and iii) market liquidity. The dynamic relationship in these three perspectives is drawn from Vector Autoregression, the Granger causality test, the impulse response function and variance decomposition. The results contradict

many studies which indicate that foreign investors did not exacerbate the Asian crisis. However in normal periods, foreign flows were found to have positive effects on market liquidity. Thus the costs and benefits of capital market liberalization strategies need to be carefully weighted.

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I am grateful for the love and support of my friends and family members. Special thanks to Pamela Chayavichitsilp, Tim Davis and Doungdao Mahakitsiri for excellent research assistance during the last phase of writing my dissertation.

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1. Introduction

The capital markets are important to the economic and social systems in the country. It plays a vital role in capital accumulation for both the public and private sector. Moreover, capital markets promote balance and stability in the financial system, decreasing dependencies to the banking system while also providing alternatives for savings. Mature capital markets also experience decreases in major fluctuations while promoting long term growth in the country's economy.

Lessons from the previous crises in Thailand from 1997 suggested that the efficiency of financial markets is mandatory in a stable economic system. Thai authorities raised plans to the develop the stock market to be more efficient by increasing a degree of openness to the public, increasing the amount of financial products available, such as the futures and gold market and providing pertinent information to investors to enlarge the investor base and also improve the regulatory enforcement. In this dissertation, I will analyze the pre- and post-volatility of Thailand's stock market when the plans are imposed by using a dummy variable. The plan of interest increased the openness of the stock market, which allowed foreigners to hold up to 49% of publicly listed companies in 1987. Furthermore, the introduction of the Thai futures market (TFEX) is in need of attention as well since the objective of its establishment was to lower volatility in the market. Conditional volatility of Thailand's stock market estimated by Autoregressive Conditional Heteroskedasticity (ARCH) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) methods will be used to measure the effectiveness of the plans imposed by the authorities.

The increasing amount of international capital flows from the liberalization trend has raised the role of the foreign investor in the emerging markets. The impact of foreign investors on emerging stock markets is still an intense debate in both academic and policy circles. Current research provides mixed evidence on the impact of capital flows on emerging stock markets. On one hand, studies suggested a negative impact from the capital flows on the local markets and are supportive in adopting capital policies proposed by Radelet and Sachs (1998) and Kim and Wei (2002), which indicated that foreign investors are often alleged to worsen financial crises in domestic markets. Alternatively, several studies show that foreign investors have benefited the local market by decreasing systematic risk (Chari and Henry, 2004) and reducing the cost of equity capital (Bekaert, Harvey, Kim and Singal, 2000).

In addition, several studies also investigate the impact of foreign investors on emerging stock markets from different perspectives. Firstly, the behavior of local equity returns from foreign equity flows are capturing the attention of economists. The market chasing hypothesis by Bohn and Tesar (1996), which assumes that foreign investors tend to chase higher expected returns from foreign markets and the momentum or positive feedback trading behavior from foreign investors are usually found in the emerging markets. Certainly, such behavior, if occurred during a crisis period, would worsen financial crises since this behavior induces excess volatility. Several studies did not discover momentum or positive feedback trading and herding during the financial crises[1]. Focusing on Thailand's stock market, the empirical results from my dissertation contradict with those findings. My empirical results confirmed the persistence of

[1] Cho, Khoe and Stulz (1999) found strong evidence of positive feedback trading and herding by foreign investors in South Korea only in before the crisis period.

momentum or positive feedback trading strategy by foreign investors during the Asian and Subprime crises.

Other perspectives of interest in this paper are the impact of foreign investments to market volatility. The market chasing hypotheses as well as momentum or positive feedback trading and herding strategy by foreign investors indirectly imply higher market volatility in emerging countries. Only few studies direct the stock market volatility with the equity flow. Pavabutr and Yan (2007) found that the effect of foreign flows on volatility comes primarily from the unexpected shocks to foreign flows while the expected flow did not raise domestic market volatility.

Finally, market liquidity is one of the perspectives impacted by foreign investors that many studies have emphasized. Generally, emerging stock markets are small and illiquid. Several studies support the role of foreign flows due to the improvement of emerging market liquidity. Nevertheless, as suggested by Froot, O,Connell and Seahole (2001), positive feedback trading traders usually move the equity price and then influence market volatility. The increasing in volatility might impact the cost of providing market liquidity for the market maker. Therefore, the positive feedback trading strategy by foreign investors may indirectly lessen the liquidity of market.

The dissertation is organized as follows. The second chapter will studied the effectiveness of SET past policies using ARCH and GARCH models. The empirical results from the ARCH and GARCH models will also be analyzed in the second chapter. Finally, the conclusion of the study and policy recommendations will be provided in the last section of the chapter 2.

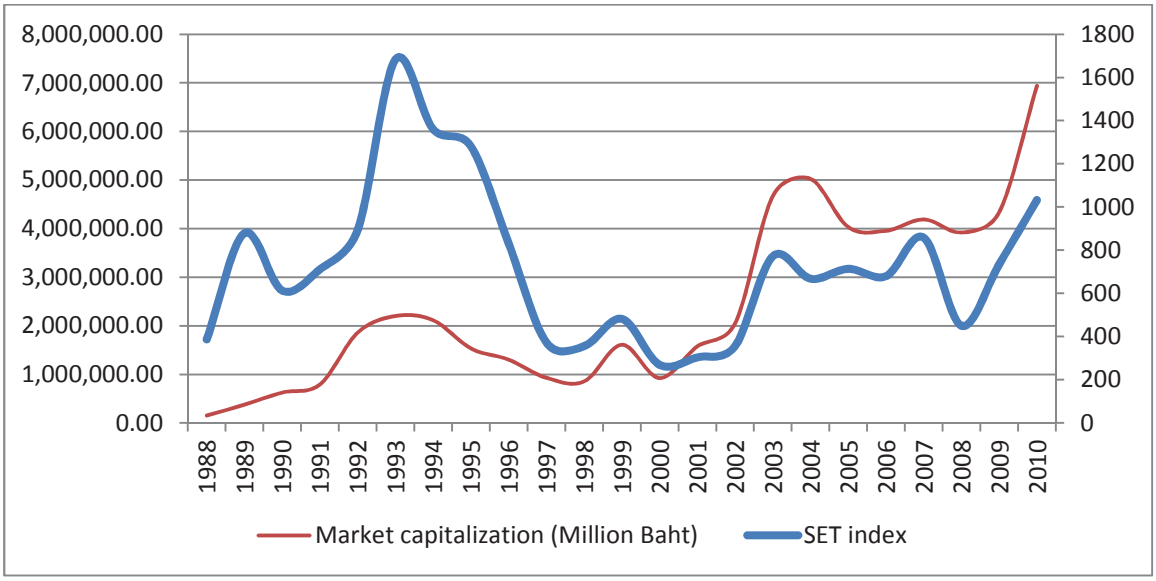
In the following chapter 3 and chapter 4, I cover all of the above perspectives from the impact of foreign investors. The study emphasizes on how cross-border equity flows affect the SET's return, volatility and liquidity, respectively. The objective is to identify whether emerging countries' stock markets (Thailand, in our case) are ready to employ a new capital market master plan which intends to completely permit foreign equity flow. The study of the dynamic relationship between variables divides into 3 systems i) SET return and capital flows ii) volatility and capital flows iii) liquidity and capital flows. Also, there are several advantages to my approach. The high frequency nature of the data set (daily) will be used to identify the relationship in all of the systems. The highly detailed data allows us to identify the short run relationship more effectively than using lower frequency data. In addition, lower frequencies of data (weekly and monthly) are also investigated to compare with the higher frequency data sets for robustness. Lastly, the conclusion and policy recommendation from this dissertation will be provided in chapter 5.

2. The effect of financial liberalization and future market to the SET's volatility

2.1 Thai Stock Market and its Policies

The stock market of Thailand is relatively small compared to other countries in the region. As of June 2009, the value of stock market capitalization compared to GDP is only 51%, whereas the size of stock market compared to GDP for Hong Kong, Singapore, Malaysia and South Korea are 845%, 202%, 104%, 66% respectively.

Figure 1: Thailand's market capitalization (million baht)



From figure 1, Thailand's capital markets in recent times have grown at a very slow pace. The SET index hit its peak in 1994 and gradually fell until the crisis in 1997. The bull market revisited again in 2002 and the SET index climbed. Compared to the rest of the region, the growth rate of Thailand's stock market is quite low. If this trend continues, Thailand's capital market will stagnate and become increasingly marginalized.

Various studies have shown that inadequate development of the capital markets will impact its ability to raise, channel and monitor resources efficiently. In the end, this will lead to loss of growth opportunities.

Established in 1975, the authorities of the SET consistently released rules for improving and developing the stock market. To increase the competiveness of SET, Thailand's government approved one of these important rules in 1988 - which in turn was one of the causes of the economic crisis in 1997 - the liberalization of capital markets that allowed foreign ownership of up to 50% in listed companies. Trading of shares registered under foreign names has been carried out on a special foreign board to facilitate trading among foreign investors of shares that have reached their foreign ownership limit. This limit, however, has become immaterial after the introduction of non-voting depository receipts (NVDRs) in 2001. Through NVDRs, foreign investors are allowed to invest over the limit with full participation in dividends and other rights, except for voting rights.

Another development of interest is the introduction of the futures market (TFEX). TFEX was established on May 17, 2004 as a derivatives exchange. TFEX is under the supervision of the Securities and Exchange Commission (SEC). TFEX had been established to act as an exchange for the trading of derivatives, offering products for effective hedging. The first product introduced was the SET 50 index futures, which launched in April 2006 and started trading in August 2006. In October 2007, SET 50 options were introduced. Recently, stock and gold futures were the latest products introduced to the capital markets of Thailand.

2.2 Literature reviews

Financial development is crucial for an emerging country like Thailand. Since the early 1990s, massive amounts of capital flowed into Southeast Asia due to the lifted restrictions for the foreign investors. Foreign capital investment accounted for 10% of Thailand's GDP at the time. Emerging countries like Thailand gained several potential benefits from opening a stock market to foreigners. According to Boyd and Smith in 1996, they stated that opening markets can create an opportunity to attract foreign capital to finance economic growth. Moreover, the study by Levine and Zervos in 1998 showed empirically that the opening of stock market was important to long run economic growth. Moreover, the studies by Rajan and Zingales in 1998 found development of financial markets facilitates economic growth by reducing the cost of external financing. Nevertheless, a previous study by Kim and Singal in 2000 stated that there are various uncertainties associated with the opening of markets. One issue of major concern is the movement of so-called hot money, that is, an international flow of funds allegedly highly sensitive to differences in interest rates, expectations of future economic growth and expected returns from holding securities. Given the sensitivity of these investments, even a shock to the economy can lead to a volatile change in fund flows, which exacerbates the shock and destabilizes the domestic economy. In addition, opening the market means exposure to foreign influence. If foreign stock prices are for some reason more volatile than domestic stock prices, domestic prices may also become more volatile. A greater volatility in stock prices would make investors more averse to holding stocks and lead them to demand a higher risk premium, which implies a higher cost of capital and less investment.

The objective of future markets is to reduce risk for the investor. The world's first stock index future was the Value Line contract, introduced by the Kansas City Board of Trade in 1982. In the present time, new stock futures and options launch almost every year. As stock market futures become pervasive, it is important to understand the effect of futures markets to the financial system. The previous studies on the effect of futures market mostly focused on developed countries and it is unclear that these results can apply to emerging countries like Thailand. Moreover, the result from previous literature was ambiguous. As pointed out by Hodges (1992), the mixed effect of introducing futures markets from various studies is came from the underlying assumptions or depending on the parameter values used in the model.

2.3 Model and Data Description

The least squares model is the powerhouse for applied econometrics. Basically, the homoscedasticity, the condition when squared of the expected value of all error terms are identical, is the important assumption in the least squares model. However, the assumption of the same squared of error terms might not be appropriate in the financial analysis of which the variances of error terms are normally larger or smaller at some given point of time. Thus, the focus of auto regressive conditional heteoskedasticity (ARCH) and generalized autoregressive conditional heteroskedasticity (GARCH), which focus on unequal error terms may be more appropriate in the application of financial analysis. In present times, when the question is about volatility, the standard tools have become the ARCH and GARCH models.

2.3.1 ARCH model

Engle (1982) introduced the ARCH model. Since we know that the volatility is persistent, however, the exact form of this volatility is unknown. The ARCH model assumes that the variance of tomorrow's returns is an equally weighted average of the squared residual in the past. The model can be written as:

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2$$

where p represents the order of the ARCH process and ω is the weighted average from the ARCH(p) estimation. The error terms then have the form

$$\varepsilon_t = \sqrt{h_t}\, z_t$$

where z_t is independent and follow standard normal variable (i.e. zero mean and unit variance)

The advantage of the ARCH model is that the weighted average of the squared residual is not estimated in an ad hoc manner. However, the equal weights seem unattractive since the more recent events in the financial analysis would be more attractive and we should weight the recent events more. Therefore, the generalized model of the ARCH model concerns this issue and was developed into the GARCH model.

2.3.2 GARCH

In 1986, the GARCH model, which was developed to overcome some restrictive aspects of the ARCH model, was introduced by Bollerslev. Bollerslev extended the ARCH (p) model to the (GARCH (p,q)) model.

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{i=1}^{q} \beta_j h_{t-1}$$

where p and q represent the order of the GARCH process and α_i and β_j are the parameters from the GARCH (p,q) estimation.

Generally, the GARCH model also relies on the weighted average of squared residual; however, it has declining weights that never go completely to zero. In other words, the model weight averages the squared residual unequally. In the present time, the GARCH model has proven to be one of the most effective models for modeling conditional volatility in the financial application.

2.3.3 Control variables

The ARCH and GARCH models use the return of the series to forecast and/or measure the volatility of the interested variable. In our study, our main objective is to capture the change in volatility after the change in policy by using the return from the stock market of Thailand. However, we cannot argue that the return of a stock market exchange in one country does not relate to other countries, especially emerging stock markets like the SET. Moreover, Black Monday, which is referred to the crashing of the stock markets around the world occurred on 19 October 1987, the same period as the date of the opening Thailand's stock market. Therefore, I include the return of United States (DOW) stock market in the mean equation to explain the co-movement in the stock markets of Thailand, Singapore and Malaysia respectively.

$$Rt = (\log \mathrm{Y_i}, - \log \mathrm{Y_i}, \mathrm{t} - 1) * 100$$

$$Rt = \mu_t + \epsilon_t$$

$$\mu_t = \alpha + \beta_1 Dow + \sum_{i=1}^{p} \phi i \; R_{t-j} \; + \sum_{j=1}^{q} \Pi j \, \epsilon_{t-j}$$

In the variance equation, the dummy variable is used to capture the change in volatility in the SET. The dummy LIB_1987 is set to 0 before the liberalization period and equal to 1 after the official liberalization period in Thailand.

$$h_t = \omega + \sum_{i=1}^{p} \Phi_i \, h_{t-1} + \sum_{j=1}^{q} \eta_j \epsilon_{t-j}^2 \; + \zeta LIB\_1987$$

Changes in stock return volatility in Thailand after September 1987 may stem from other factors other than financial liberalization. In order to confirm that the change in stock return volatility in Thailand is in fact arising from the opening of the stock market to foreigners, I'm going to repeat the earlier analysis on Singaporean and Malaysian stock markets using the date of Thai liberalization.

Similarly the dummy variable FUT indicated the date that TFEX was established. The dummy variable FUT is set to 0 before the TFEX was established and equal to 1 after the TFEX was established.

$$h_t = \omega + \sum_{i=1}^{p} \Phi_i h_{t-1} + \sum_{j=1}^{q} \eta_j \epsilon_{t-j}^2 \; + \zeta FUT$$

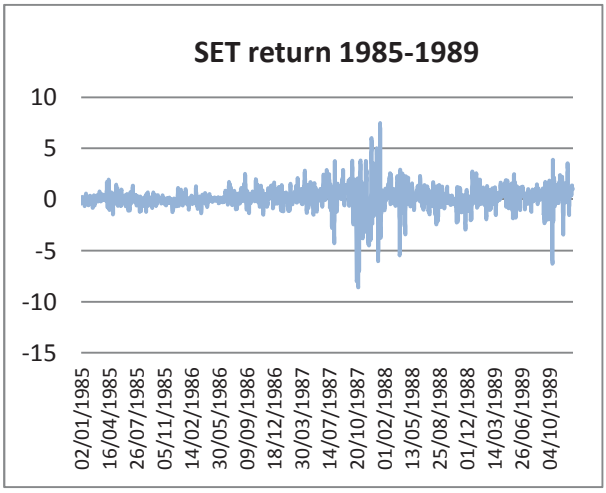
2.3.4 DATA

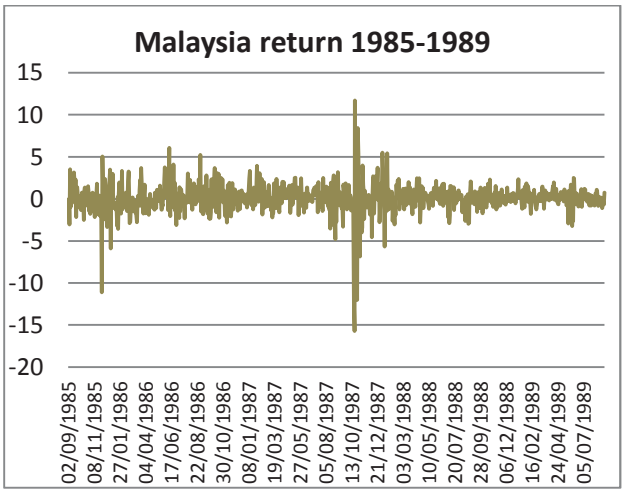
The daily closing price in the stock markets of Thailand, Singapore, Malaysia and the United States (Dow Jones) was collected to calculate the daily returns for each series

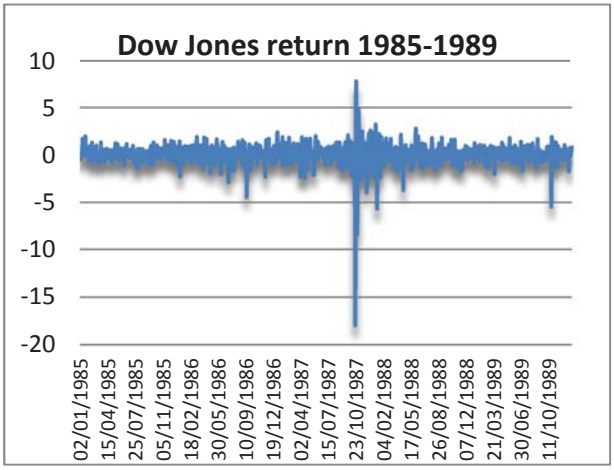
from September 1986 to August 1988 to note changes in volatility after liberalization. The daily return is calculated by the following equation:

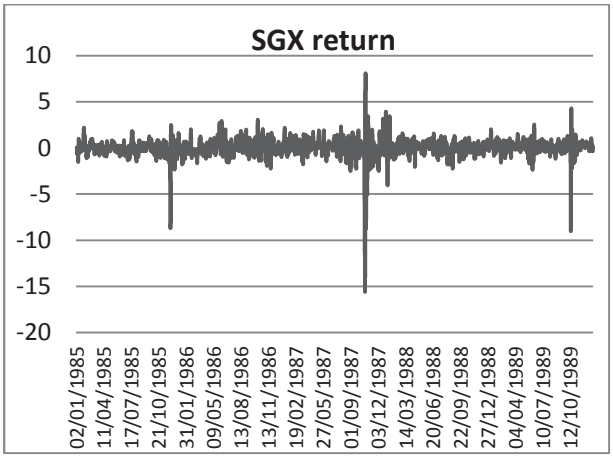
$$R_t = (\log Y_{i,t} - \log Y_{i,t-1}) * 100$$

Figure 2: Thailand's Singapore Malaysia and United States stock return from 1985-1989







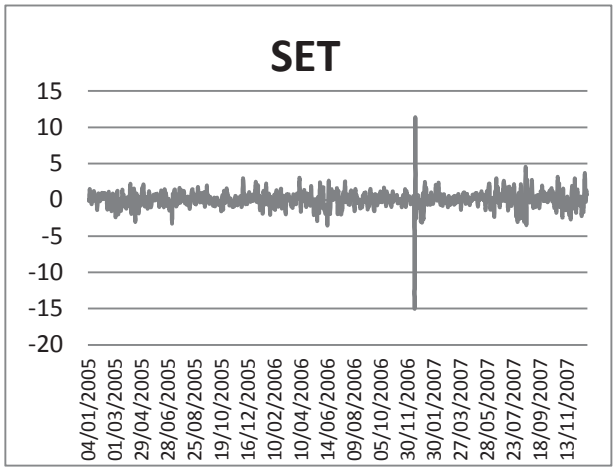


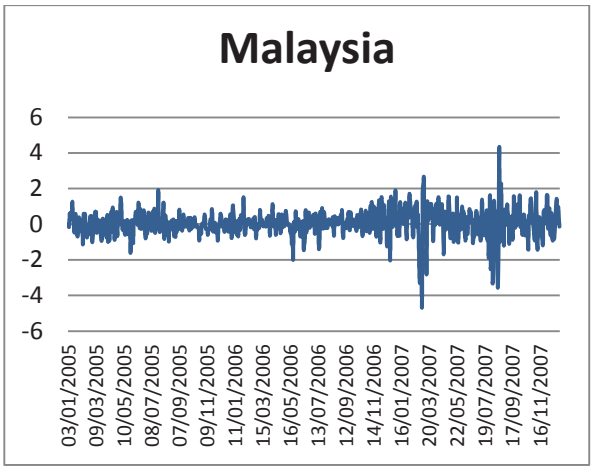
It is easy to see from figure 2 that the stock returns for all the countries of interest in this period are quite volatile. The Black Monday effect, the crash of Western stock markets in October 1987, also affects the global financial markets. From 1985-1989, the mean return of Thai stocks yielded highest among the countries of interest while Singapore's stock returns were the lowest. In the case of standard deviation, Thailand yields the highest value while Singapore is the lowest as well.

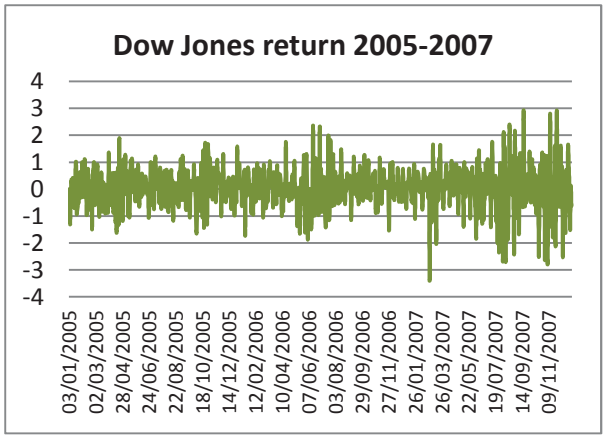
Moreover, volatility can be seen as a standard deviation of the return. Table 3 in appendix shows the standard deviation for each year from 1985 to 1989. After financial liberalization, the standard deviation of returns for Thailand seems to be higher than the rest of the countries.

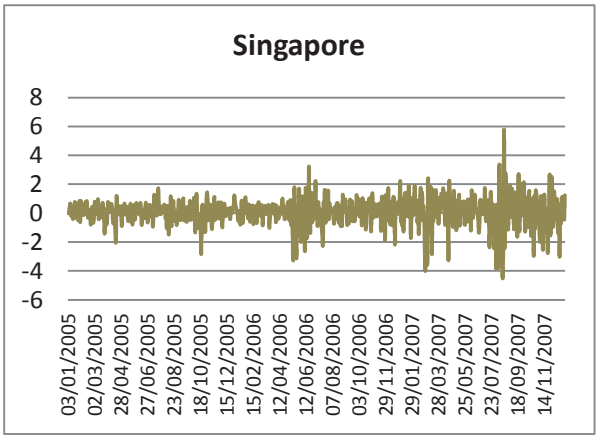
The second group of data is used to analyze the introduction of the futures market. The development of capital should induce less volatility in capital markets. Similarly, the daily closing price in the stock markets of Thailand, Singapore, Malaysia and United States (Dow Jones) were collected from April 2005 to March 2007 for the change in volatility after TFEX was established.

Figure 3: Stock return between 2004-2009









In this period, figure 3, which shows the stock returns for each country, does not show a clear view of higher volatility during the period. From 2005 to 2007, the Singaporean stock market yielded the highest return while Thailand's yielded the lowest. In the case of standard deviation, Thailand yielded the highest value while Malaysia the lowest.

2.4 Empirical result

In this paper, ARCH(1) and GARCH(1,1) were used to estimate the conditional volatility of the Thai, Singaporean and Malaysian stock markets by using daily returns. In order to control for the return by the co-movement of the foreign countries and the Black Monday effect, the daily return of Dow Jones was added in the mean equation. The BIC method was used to select the appropriate model for ARCH and GARCH[2]. The estimation from the model is appropriate in both mean specification and the conditional variance equation.

Firstly, I test the ARCH and GARCH effects of stock market return of Thailand, Singapore, Malaysia and United States from September 1986 to August 1988 by using Engle's Lagrange Multiplier[3]. From table 6, the Engle's Lagrange Multiplier clearly showed that there's an ARCH effect for the Thai, Singaporean and Malaysian rate of stock market returns since the p-value for those countries is equal to 0.00. However, the LM tests for the Dow Jones shows the p-value of 0.067 which is only statistically significant 90% level.

In the next step, the ARCH and GARCH is applied to examine the stock return volatility in all the countries of interest during Thailand's liberalization period. After using the BIC method, the most appropriate model for all the countries is ARCH(1) and GARCH(1,1). Without any dummy variables as show in table 7 and 8, the results from ARCH(1) and GARCH(1,1) are statistically significant at all levels. This can imply that the present rate of return of the stock markets from these countries can be predictable from the past. The sum of ARCH and GARCH coefficients for Thailand and Singapore

[2] See appendix A for the details of the BIC method.
[3] LM test was proposed by Engle (1982) to test the presence of ARCH process.

is close to one, indicating the effect of the shock to Thailand and Singapore's stock markets being quite persistent. The effect of shocks will remain in many periods before it is drained out. Nevertheless, as suggested from the model, the variance from GARCH (1,1) is not stationary in the Malaysian case. This is probably due to the high return of volatility in Malaysia's stock market. Therefore, only ARCH(1) is chosen for the Malaysian case.

To capture the effect of financial liberalization in Thailand, the dummy variable LIB is added in the models to explore the change in stock return volatility. From both models, it is obvious that the opening of the stock market to foreign investors increased the conditional volatility in Thailand since the dummy variables LIB is statistically significant in both 95-99% confidence intervals for both ARCH(1) and GARCH(1,1) models. This can be confirmed by the view of opponents of liberalization that foreign investments toward emerging markets are extremely volatile and highly depend on changing economic conditions. A consequence of volatile investment flows is high volatility in stock prices. Therefore, market volatility should increase after liberalization.

To confirm that the increase in stock return volatility in Thailand came primarily from the opening of the stock market, I repeated the study by using the date of Thailand's liberalization date with the Singaporean and Malaysian stock markets. The regression results from Singapore and Malaysia in table 9 and 10 show that the dummy variables for both countries are not statistically significant when applying Thailand's liberalization date. However, the GARCH result from Malaysia is not applicable in this case since the sum of GARCH and ARCH coefficients is more than one, which is the

necessary condition for the GARCH model. Therefore, we can conclude that the liberalization induced a higher rate of conditional volatility to stock market of Thailand.

The second task for this paper is to evaluate the importance of introducing new products in the capital market, which is the futures market in this case. One of the objectives of introducing new products to the market is to make the stock market less volatile, therefore, the market volatility, one of the measurements of efficiency, should decrease when the new products launch.

Similarly, I test the ARCH and GARCH effects of stock market returns of Thailand, Singapore, Malaysia and United States from April 2006 to March 2007 by using Engle's Lagrange Multiplier. From the table 11, the Engle's Lagrange Multiplier showed that there's an ARCH effect for Thailand, Singapore and Malaysia's rate of stock market return since the p-value for those countries is equal to 0.00. However, the LM tests for the Dow Jones shows the p-value of 0.067 which is only statistically significant 90% level.

Like the case of financial liberalization, the ARCH and GARCH is applied to examine the stock return volatility in the Thailand's futures market establishment period. Without any dummy variables, the result from ARCH (1) and GARCH (1,1) in table 12 is statistically significant at all levels. Nevertheless, the coefficients from all of the countries in GARCH (1, 1) show the instability of the model. Therefore, only ARCH (1) is chosen in this period.

To capture the effect of the futures market, the dummy variables FUT is added in the models. From table 13, the ARCH (1) coefficient including the dummy variable is still statistically similar to as without the dummy variable. However, the dummy variable

FUT is statistically significant in both 95-99% confidence intervals for all of the countries of interest. This may due to the fact that the stock returns in this period are higher for the whole region. The introducing of futures, therefore, does not induce a significant effect to the financial market in Thailand.

2.5 Robustness check on the financial Liberalization effect

Some might be argue that an increase in volatility during the financial liberalization period may be due to the transition period. Figure 4 shows the unconditional variance of SET returns from 1984 to 1990. It is obvious to see the structural break during the financial liberalization period. The unconditional variance was noticeably increased during second half of 1987 and gradually decreased in early 1988.

Figure 4: Unconditional variance of SET return

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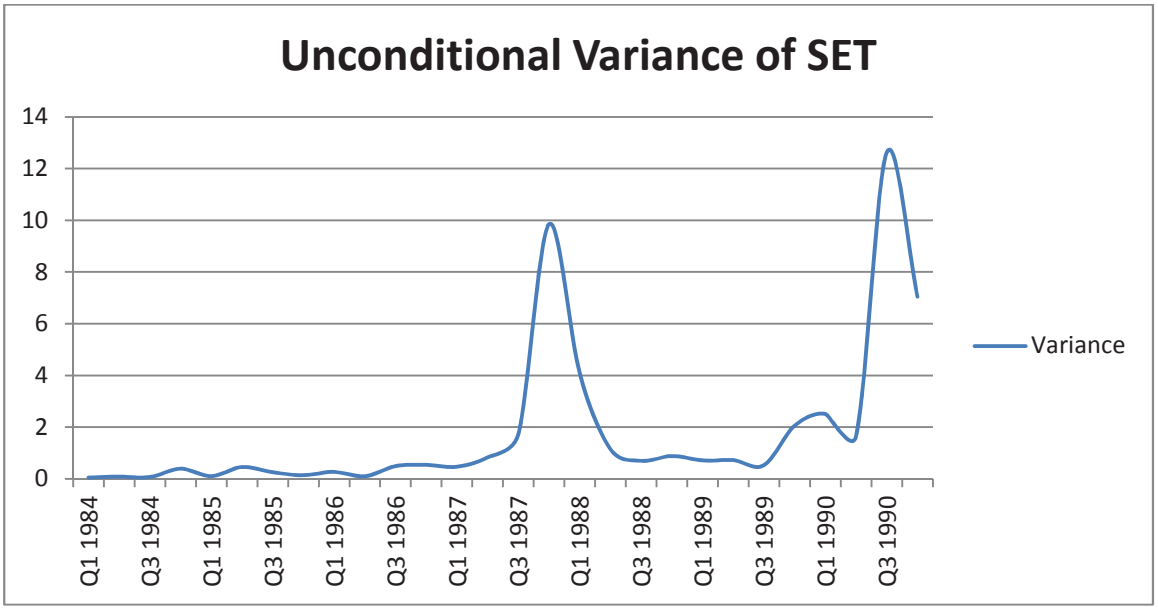


As a robustness check, I intentionally leave the gap of the period of liberalization to avoid a structural break. The dummy variable (LIB) takes value 0 from May 1986 to August 1987 and takes value 1 from January 1988 to June 1989. The result from the ARCH model is similar to the previous case which included the transition period. Dummy variable (LIB) is positive and statistically significant; however, the magnitude is lower. In the case of the GARCH model, the result is different than the inclusion of the transition period. Dummy variable (LIB) shows a statistical insignificance at all level. As a result, the result from the ARCH model confirmed the positive impact of volatility from financial liberalization after removing the transition period out. Nevertheless, due to a small change in coefficient of the dummy variable as shown in figure 5, the impact of financial liberalization on stock return volatility is not as strong as we expected.

Figure 5: ARCH and GARCH result (robustness check)

	ARCH (1) model	GARCH (1,1) model
Conditional mean equation		
Constant	0.2442***	0.2266***
	0.0806	0.0764
Malaysia return	-0.0836	-0.075
	0.0548	0.0535
Singapore return	0.4271***	0.4144***
	0.0868	0.0837
Dow Jones return	-0.0277	-0.0276
	0.0468	0.0452
Time trend	-0.0001	-0.0001
	0.0002	0.0002
Conditional variance equation		
Constant	-0.6037***	-1.8829***
	0.1076	0.7745
Arch effect	0.2859***	0.3105***
	0.0612	0.0687
Garch effect	n.a	0.4618***
	n.a	0.1545
Liberalization dummy	**0.4885*** **	0.5456
	0.1135	0.3741

2.6 Concluding Remarks

Capital market development is important to all countries, not only for Thailand. To achieve long run economic growth, healthy capital markets are mandatory. Liberalization is one of the processes of capital market development. Many studies that supported financial liberalization found that opening markets can create an opportunity to attract foreign capital to finance economic growth due to the lower cost of financing, which in turn induces an increase in investment. However, there exists some opponents to financial liberalization and the movement of hot money is one issue that policy makers should be concerned about the international flow of funds is supposedly highly sensitive to differences in interest rates, economic growth and expected returns from holding securities. Shocks to the economy can lead to a volatile change in fund flows, which exacerbates the shock and destabilizes the domestic economy. The result from this study can confirm this issue. Questions regarding the capital control policy arose due to the high increase in stock market volatility in emerging countries like Thailand after financial liberalization was adopted.

The invention of new products is another method used to improve the efficiency of capital markets. Currently, the Thai capital market has few financial products to choose from, which cannot fully cover the diverse needs of investors thus making the market relatively unattractive. This measure aims to push for the development of new products, which would help increase the variety of instruments and consequently help develop the market. Our results showed that market volatility does not decrease. Thus, we cannot conclude that the invention of financial products is not important since it is only one of the steps in the long run development plan. There are many aspects of Thailand's capital

markets that should be developed. Moreover, the introduction of the futures market in the emerging countries, where the financial market is in the nurturing phases , may create an opportunity for a hedge fund to make the financial markets more volatile. Therefore, we cannot clearly conclude that capital controls are in need for Thailand at this time, or the launch of the new products does not improve the efficiency of the capital markets. However, this study is important to indicate the effects of financial liberalization and the development of new products in the capital market that should concern policy makers.

3. The Dynamic relationship of foreign portfolio flows and SET return

After the financial liberalization period, many emerging countries experienced an increasing amount of international capital flows. Financial liberalization trends are raising the role of foreign investors in the emerging markets. One of the perspectives many scholars have taken interest in is the impact of foreign investors on local emerging stock markets. Current research provides mixed evidence on the impact of capital flows on emerging stock market return. Several studies found that foreign investors follow the market chasing hypothesis by Bohn and Tesar (1996), which assumes that foreign investors tend to chase higher expected returns from foreign markets and this behavior produces momentum or positive feedback trading. Such behaviors from foreign investors may induce excess volatility and therefore driving stock prices away from real values. In the case of expected returns, several studies also found a positive relationship between net foreign purchases and expected excess returns.

3.1 Literature review

Numerous studies of the impact of foreign flows to equity returns show no consensus about its direction. On the one hand, foreign investors are often alleged to exacerbate financial crises in domestic markets. Bohn and Tesar (1996) proposed the market chasing hypothesis which assumes that the investors tend to move into foreign market with high expected returns. Using low frequency monthly and quarterly data, the result demonstrates a positive relationship between the net foreign purchases and the expected excess returns with conditional on the assumption that investors use momentum

to form their assumption. Higher frequency data, as shown in Froot, O'Connell and Seahole (2001), also reveals the co-movement of flows and returns which is actually due to returns predicting future flows.

Another related hypothesis, in which the international investor tends to exacerbate crises in emerging markets, is that the foreign investor is a momentum investor or demonstrates positive feedback trading behavior. A number of studies found a strong pattern of positive feedback trading and herding by foreign investors. For example, Cho, Khoe and Stulz (1999) documented strong evidence of positive feedback trading and herding by foreign investors in South Korea before the crisis period. In addition, studies of Japan's stock market around the crisis period by Karolyi (2001) found evidence of consistent positive-feedback trading before, during and after the Asian crisis among foreign investors, while Japanese banks, financial institutions, investment trusts and companies themselves were aggressive contrarian investors. With this respect, the behaviors of foreign investors tend to cause excess market volatility in the emerging countries.

On the other hand, the flows of capital by foreign investors may not worsen the crisis in emerging countries since some studies show that positive feedback trading and herding from foreign investors did not contribute to heightened market volatility during crises. For example, Cho, Khoe and Stulz (1999) documented strong evidence of positive feedback trading and herding by foreign investors in South Korea before the crisis period, however, these patterns disappear during the crisis. Moreover, as suggested by Kayolri (2001), the trading patterns of foreign investors in Japan did not change during the crisis and positive feedback trading was even stronger during the crisis period. By contrast,

domestic investors, especially financial institutions and corporations, were negative-feedback.

In addition, several studies also looked at predictability of future returns from current flows. There is a conventional wisdom that foreign investors may have better information than local investors in emerging countries. A number of studies were consistent with the conventional view. Froot et. al. (1998) found that foreign equity flows predict equity returns positively in developed markets but negatively in the case of emerging countries. Using daily data for the 16 largest Finnish stocks, Grinblatt and Keloharju (2000) also found that over a two-year period, foreigner and domestic financial corporations buy more stocks that perform well over the next 120 trading days than domestic individual investors. In the case of developed markets, several studies found no evidence of better information and greater sophistication on the part of foreign investors. For example, Kang and Stulz (1997) and Hau (2000), found no evidence that foreign investors outperform domestic investors in Japan and Germany, respectively.

3.2 Data and Descriptive statistic

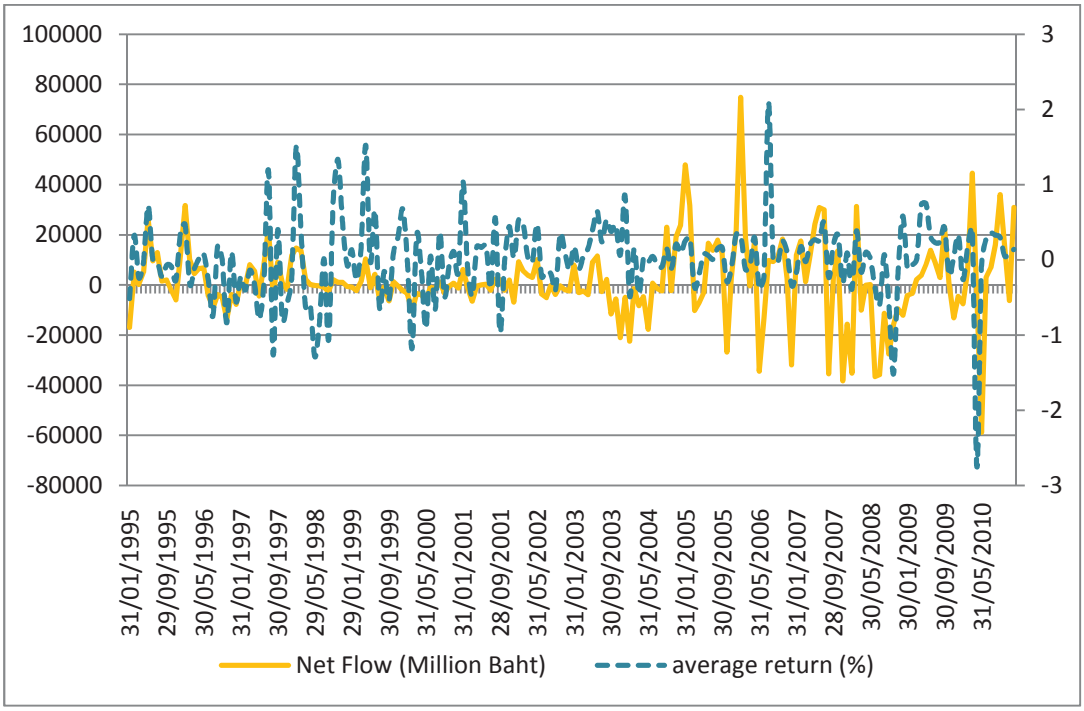
This chapter presents daily data of SET index and net foreign flows from 1995 to 2010 containing 3920 observations for each series. The data was collected from Sicco Securities Corporation in Thailand. To avoid a structural break, I will divide the data in to 5 sub-periods. The first period is the period before the Asian crisis, from January 1995 to December 1996. This period is of interest since it coincides with weak economic fundamentals and a decrease in stock prices. The second period is the period of Asian crisis ranging from February 1997 to June 1999. The different timeline of Asian crisis

from other studies which commonly start the Asian crisis in July 1997 is due to the fact that the debt default which consequently attacked the property sector began in February. Certainly, the debt default not only affected the banking sector and property developers but also spread to other sectors and thus affected the stock market. The third period is the period after the crisis from June 2000 to May 2005 which is the period of the economic fundamental uplift. The fourth period is the Subprime crisis period from January 2008 to June 2009. Unlike the other studies which started the subprime crisis in 2007, I, again, selected the starting date of the Subprime crisis when it first hit the financial market in 2008. Lastly, the recent period which represents stock market boom in Asia ranging from July 2009 to December 2010 with a huge amount of foreign inflow, the so called "hot money". Moreover, high frequency data may not enable the capture of longer interrelationships between interested variables. Therefore, the lower frequency data (weekly and monthly) which are manually transformed from daily data basis are also investigated in this dissertation.

Daily returns from the SET is calculated by $R_t = (\log Y_{i,t} - \log Y_{i,t-1}) *100$ where $Y_{i,t}$ and $Y_{i,t-1}$ are the current and previous SET indices. The weekly and monthly returns are calculated by the same method.

Overall, the full sample period indicated a very small amount of market returns (less than 0.01%) from 1995 to 2010. During the crisis period, SET returns were quite volatile where the maximum and minimum of SET return was at 12 percent and -10 percent, respectively. Moreover, the Asian crisis period indicated the highest standard deviation in comparison to other periods. With the Augmented Dickey fuller test, the SET return is stationary in all of the periods.

Figure 6: Monthly SET return and net foreign flow



After financial liberalization**,** foreign equity flows gradually increased in the SET. Nowadays, the role of foreign investors also increased from approximately 15 percent to 30 percent of overall market volume. The average capital flow indicates a net inflow from foreign investors in most of the period. Surprisingly, the average of net inflow is higher in Asian crisis period than other periods except the stock boom period in 2009. Throughout the full sample period, there exists positively cumulative net foreign flow in the SET. Net foreign flows in this paper were calculated by net foreign buy and sell in the period divided by the average market capitalization in that period. Moreover, the Augmented Dickey fuller test for scale net foreign flow also showed stationary property.

3.3. Model specification and Methodology

To thoroughly study the interrelationship between variables, the empirical procedure started with the study of dynamic relationship between interested variables. The vector autoregression (VARS) is employed to investigate the dynamic relationship in every system of interested variables. However, this relationship does not imply a causal relationship. The Granger causality is further applied to explore the causal relationship in each of the variables system. To illustrate the effect of shock from other variables, the plotted impulse response function of our variables system was also employed. Lastly, the variance decomposition which is the percentage of the variance of error made in forecasting a variable due to a specific shock at a given horizon to see how much one variable can help explain the variance of other variables in the system. See the following section for details.

3.3.1 Vector Autoregression (VAR)

In the present time, the standard tool in determining the interrelationship among variables is the the vector autoregression (VAR) which is commonly used for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of *all* of the endogenous variables in the system. For a set of n time series variables $y_t = (y_{1t}, y_{2t,}..., y_{nt})'$, a VAR model of order p (VAR(p)) can be written as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + ... + A_p y_{t-p} + u_t \quad (1)$$

where the A_i's are (nxn) coefficient matrices and $u_t = (u_{1t}, u_{2t}, ..., u_{nt})'$ is an unobservable i.i.d. zero mean error term.

The objective of this dissertation is to identify the interrelationship between interested variables. Firstly, I estimate a restricted VAR model between the interested variables[4]. See, the following systems:

$$ret_t = \gamma_1 + \sum_{i=1}^{l} \beta_{11}^i ret_{t-1} + \sum_{i=1}^{l} \beta_{12}^i flow_{t-1} + \varepsilon_{1t} \quad (1)$$

$$flow_t = \gamma_2 + \sum_{i=1}^{l} \beta_{21}^i ret_{t-1} + \sum_{i=1}^{l} \beta_{22}^i flow_{t-1} + \varepsilon_{2t} \quad (2)$$

where $ret\ flow$ are stock returns and net foreign flows.

3.3.2 The Granger causality

Granger causality test is useful to see whether one variable causes another variable in a temporal sense. A variable is said to be Granger caused by another if one variable can help predict another. Consider a bivariate autoregression in our system:

$$ret_t = \gamma_1 + \sum_{i=1}^{l} \beta_{11}^i ret_{t-1} + \sum_{i=1}^{l} \beta_{12}^i flow_{t-1} + \varepsilon_{1t}$$

$$flow_t = \gamma_2 + \sum_{i=1}^{l} \beta_{21}^i ret_{t-1} + \sum_{i=1}^{l} \beta_{22}^i flow_{t-1} + \varepsilon_{2t}$$

In our case, the appropriate model is pair wise Granger Causality/Block Exogeneity test which is the extended model from the conventional Granger causality test. Instead of using the F-test as conventional Granger causality test, I used the χ^2

[4] Shin and Cohen (2002) indicated that excluding the contemporaneous effect on the VAR system produces the qualitatively similar results.

(Wald) statistics for joint significance of the other lagged variables in the equation. For example, if β_{12}^{i} is statistically significant from the χ^2 (Wald) statistics for joint significance with the inclusion of past SET returns and capital flows, this implies that capital flows granger causes the SET return which means that capital flows yield a higher prediction for a future of SET returns. In contrary, if the χ^2 (Wald) statistics for joint significance does not reject the hypothesis that β_{12}^{i}=0, then the capital flows does not granger cause the SET returns. In choosing the optimal lagged length, the number of lagged terms to be included in the model is decided using the Akaike Information Criterion (AIC) like the VARs model.

3.3.3 Impulse Response Function and variance decomposition

Impulse responses trace out the response of current and future values of each of the variables to a one-unit increase in the current value of one of the VAR errors, assuming that this error returns to zero in subsequent periods and that all other errors are equal to zero. This implied thought experiment of changing one error while holding the others constant. To illustrate the Impulse Response Function, consider two dimensional unrestricted VAR model:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \qquad (7)$$

In order to derive the impulse responses function and variance decomposition, we have to turn VAR into vector moving average (VMA):

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=1}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}^{i} \begin{bmatrix} e_{1,t-i} \\ e_{2,t-i} \end{bmatrix} \qquad (8)$$

However, $e_{1,t-i}$ $e_{2,t-i}$ are composites errors with the structural innovation. Therefore, we have to substitute $e_{1,t-i}$ $e_{2,t-i}$ with $\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = \frac{1}{(1-b_{21}b_{12})} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}$ and denote $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ equal to A. Then, the equation is:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=1}^{\infty} \frac{A^i}{1-b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{y,t-i} \\ \varepsilon_{z,t-i} \end{bmatrix} \quad (9)$$

Replace $\frac{A^i}{1-b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix}$ with Φ

Then , we get

$$= \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \Phi_{11}^{(i)} & \Phi_{12}^{(i)} \\ \Phi_{21}^{(i)} & \Phi_{22}^{(i)} \end{bmatrix}^i \begin{bmatrix} \varepsilon_{y,t-i} \\ \varepsilon_{z,t-i} \end{bmatrix} \quad (10)$$

$$= \overline{X} + \sum_{i=0}^{\infty} \Phi_i \varepsilon_{t-i} \quad (11)$$

Φ and ε are the impulse response function and innovation (shock) matrices, respectively.

The variance decomposition can be derived from equation 11. The forecast error of each period for y is $\Phi_{11,0}\varepsilon_{y,t}$. Thus, the variance of n-step forecast error of y is then:

$$\sigma_{y,n}^2 = \sigma_y^2(\Phi^2_{11,0} + \Phi^2_{11,1} + \ldots + \Phi^2_{11,n-1}) + \sigma_z^2(\Phi^2_{21,0} + \Phi^2_{21,1} + \ldots + \Phi^2_{21,n-1}) \quad (12)$$

where $\sigma_y^2(\Phi^2_{11,0} + \Phi^2_{11,1} + \ldots + \Phi^2_{11,n-1})$ is the proportion of forecast error due to its own innovation and $\sigma_z^2(\Phi^2_{21,0} + \Phi^2_{21,1} + \ldots + \Phi^2_{21,n-1})$ is the proportion of variance due to another variables shock.

In summary, the variance decomposition is the percentage of the variance of the error made in forecasting a variable due to a specific shock at a given horizon. Together with the impulse response function, these methodologies, also called "innovation accounting," are a useful tool to examine the relationship among different estimated economic variables.

3.4 Empirical result

In this section, I identified the relationship between stock returns and capital flows using unrestricted bivariate VAR models. Table 14 provides the daily results of VARs between flow and SET returns for all sub sample periods. In the full sample period, the regression results of variables with its own lags show a positive relationship. Hence, the results from full sample periods indicated that contemporaneous foreign flows are positively related to the prior daily foreign flows. Similarly, stock returns are significantly positively related to prior daily returns, but the momentum reverses rather quickly. When looking at the dynamic relationship between stock returns and capital flows, it is obvious that foreign investors follow positive feedback or momentums trading since foreign flows are positively related to prior returns. In addition, the returns of SET are also positively correlated with the lags of foreign inflows which indicated that there is some ability of foreign flows to forecast local equity returns. This may be due to the view that foreign investors have better marginal information over local investors in the emerging markets[5].

With lower frequency data, positive feedback trading effect is much weaker than daily data. From table 15, the weekly data shows that contemporaneous foreign flows are

[5] Seasholes (2000) using Taiwanese data and Grinblatt and Keloharju (2000) using Finnish data make a convincing case that foreign investors have advantage information.

positively related to the prior week foreign flow while stock returns are statistically insignificant. For monthly data, only foreign flows correlate with their lags while the regression results for SET returns were not statistically significant. In the case of dynamic relationship between stock returns and foreign flows, both weekly and monthly data moved into the same direction. SET returns are positively correlated with prior period equity foreign flows. In contrast, foreign flows have a negative relationship the returns in the lags prior, but the effect is very small.

Table 15 provides daily VAR estimates before the crisis period. From the table, current period foreign flows and stock returns are positively related to their own lags in the full sample period. The VAR results are different in the higher frequency data. Again, both weekly and monthly data move into the same direction. The higher frequency data shows that foreign flows still have a positive influence by the prior week foreign flows; however, SET returns have a negative correlation with the two lags prior. Turning to the dynamic relationship, regression results show that foreign investors follow positive feedback or momentum trading strategies since foreign flows are positively influenced by prior period of SET returns and this behavior is confirmed by all data frequencies. This implies that the increased SET returns in all frequencies of data induce the higher volume of the foreign flows. In the SET returns equation, VAR results show that foreign investors' flows have some ability to predict SET returns like the full sample period. The flow of capital induces a higher return in SET, however, the effect quickly reverses in the lagged after and the result is confirmed by all the data frequencies. Thus, there is some anticipation effect of investor on the SET.

Table 15 provides daily VAR results for the Asian crisis period. Again, foreign flows in the current period are positively influenced by past foreign flows for all the data frequencies; however, monthly data shows statistically insignificant results. Nevertheless, the uncertain economic condition in the view of investors can be viewed from the return equation. The current daily returns are positively correlated to the past returns, but the correlation quickly reverses in the prior two lags before. For the weekly data, current returns are positively associated with two weeks prior SET returns. In dynamic relationship, SET returns still depend on foreign flows as the full sample and before crisis period. The main difference between crisis period and others is the foreign flow equation since results show an unclear view of momentum strategies from foreign investors. On the daily basis, foreign inflows positively depend on SET returns only one day prior and quickly reverse the day after. In higher frequency data, there is a small impact of past returns to the foreign flows; however, it is interesting to see that foreign inflows are negatively related to past SET returns.

In the after Asian period, data ranges from June 2000 to May 2005. In tables 15 and 16, prior period of flows influenced contemporaneous flows for daily and weekly data while monthly data is not statistically significant. Nevertheless, there is ambiguous effect of past returns on current period returns. High frequency daily data shows a positive effect on the two lags prior while lower frequency data like weekly and monthly data are not statistically significant. In the case of dynamic relationship, behavior of foreign investors is similar to before crisis and full sample period. Again, foreign investors tend to follow positive feedback trading strategies. The volume of foreign flows depends positively on prior SET returns for daily and monthly data while weekly

data is not statistically significant. On the other hand, there is little impact of prior foreign flows to contemporaneous returns. SET returns have a positive effect to prior foreign inflows and quickly reverse the next day. Moreover, lower frequency data, both weekly and monthly, indicate that there is no effect between prior foreign flows and contemporaneous returns.

Turning to subprime crisis, with the SET returns equation, it is surprising that past returns do not influence contemporaneous returns for all the data frequencies. On the other hand, foreign flows are positively related to their own lag for all data frequencies as well. Under dynamic relationship, higher daily foreign flows attribute to higher returns for a short period of time and quickly reverse the day after. However, weekly data shows statistically insignificant outcome. An interesting outcome is on dynamic relationship between foreign flows and prior SET returns. The outcome is comparable to the Asian crisis period which indicated that positive feedback or momentum trading is weak during that period. Daily data shows that foreign inflows positively depend on SET returns only one day prior and quickly reverse the day after but this is not the case for lower frequency data since the outcome is not statistically significant.

In the Asian stock market boom period it is interesting to see that daily results show that SET returns have a negative impact on its own lag in this period while foreign flows have a positive correlation with its own lag in the earlier period. In dynamic relationship, prior foreign inflows induce higher returns for a short time, but quickly inverse the day after. On the other hand, higher SET returns stimulate foreign inflows in earlier period, but the effect is for a short time. For higher frequency data, all dynamic

relationships show statistical significance suggesting that the flow effect on returns has only a temporary component.

Our results in the tranquil periods which consist of the full sample, before Asian crisis, after Asian crisis and stock boom periods, are similar to the finding by Froot et al.(2005). They found that find that flows are strongly positively related to the expected-return component at short horizons, but negatively related at longer horizons. This may be due to a conventional view that foreign investors have better information and outperform domestic investors. However, foreign inflows have no lasting positive impact on expected returns, and may even have a negative impact. Results from both Asian and Subprime crisis, however, do not follow this finding since a negatively correlation occurred even in short horizon.

The identified correlation from the Vector Autoregression in the previous section does not imply a causal relationship between SET returns and foreign portfolio flows. To investigate the detail of causal relationship, the test of pairwise Granger causality test is employed. Table 32 provides daily Granger causality test between SET returns and foreign portfolio flows. There is a bilateral Granger causal relationship between SET returns and foreign portfolio flows for all periods except Subprime crisis period. Bilateral Granger causal relationship implies that the lag of the foreign flows can help explain stock returns and vice versa. Unilateral Granger causal relationship in Subprime crisis period indicated that the lag of SET returns can help predict foreign flows while the lag of foreign flows cannot help predict SET returns.

With lower frequency data, the results from pairwise Granger causality test behave differently. Both joint statistics of coefficients from weekly and monthly data

indicate that foreign flows do not granger-cause flows for all periods. The lags of foreign flows do not have a causal relationship with SET returns when using the lower frequency data. On the other hand, SET returns do granger-cause foreign flows only in the full sample and pre Asian crisis period in weekly data.

Table 23, we report daily variance decomposition of foreign flows and SET returns. In full sample period, foreign flows explain less than 1 percent of the forecast error variance of SET returns when the forecast horizon is up to 10 periods. The period that variations in foreign flow can explain squares error of SET returns the most is the Asian stock market boom and before crisis period suggesting that return chasing strategy by the foreign investors is prevalent. While the rest periods, the shock on foreign flows only explain forecast error variance in SET returns less than 3 percent. In contrast, when turning to foreign flows forecast error, Asian stock market boom period is the period that variance in SET returns can explain the square error in foreign flows the least. The reaction to shock of returns can explain more than 50 percent of forecast error variance of foreign flows in before crisis period. For the rest of the periods, an average of 30 percent of squared prediction error in foreign flows can be explained by SET returns.

Looking at the forecast of forecast error variance decomposition up to ten days may not depict a clear view of foreign investors' behavior. Using lower frequency data, the variance decomposition of SET returns shows that the period that the innovation of foreign flows can explain the forecast error variance of SET returns the most is the Asian crisis period. In all of the periods, the shock of foreign flows has almost no impact on the variance of SET returns. In contrast, the forecast power of error variance decomposition in foreign flows by the shock of SET returns is very high especially in the pre crisis,

Asian crisis and subprime crisis periods. In the pre crisis period, approximately 65 percent of squared prediction error in foreign flows can be explained by SET returns. On average, the forecast error variance decomposition in foreign flows can be explained by variation SET returns around 30 percent. This contradicts the view that the impact of external shock to emerging countries market is less than the internal shock.

Furthermore, the impulse response function, as suggested by Sims (1980), is applied to trace the length of responses of the innovation to an impulse shock between capital flow and SET returns. Impulse responses can be used to review mainly the shocks and effects of external factors in long run behavior of interested variables. In all the system, the impulse response function for all periods is consistent since all of the interested variables are depicted to go to long run equilibrium. Appendix B.1.1 simultaneously illustrates daily impulse response between capital flows and SET returns for each period. The daily impulse responses for each period indicated a positive dynamic relationship between two variables. Similar to the variance decomposition, the impact of SET returns to response of foreign flows to shock of SET returns is much more than the response of SET returns to shock of foreign flows. From appendix B.1.1, the impact of foreign flows from the variant of SET returns hit its highest at the Asian crisis period.

Turning to lower frequency data, the impact between these two variables is less than daily basis. Appendix B.1.2 and B.1.3 demonstrate weekly and monthly impulse response between capital flows and SET returns for each period, respectively. Most of the impulse response functions show a positive relationship between two variables. Only weekly and monthly crisis describe negative dynamic relation between capital flows and

SET returns. However, as shown in the VAR analysis, the negative coefficient between the response of prior foreign flows and Set returns, vice versa, is statistically significant only for weekly data. Even though, the magnitude of response to the shock between these two variables is less than higher frequency data, it is important to see that behavior of foreign investors is heading in the same direction.

Chapter 4: The dynamic relationship of capital flow with volatility and market liquidity

As stated in the previous chapter, foreign investors do follow the market chasing strategy and positive feedback trading regularly found in the SET. The market chasing hypothesis as well as momentum or positive feedback trading and herding strategies by foreign investors indirectly imply higher market volatility in the emerging countries by the fact that this strategy lead to excess volatility. However, only few studies direct stock market volatility with the equity flows. In this chapter, I thoroughly investigated the dynamic relationship of foreign equity flow with stock return volatility.

In addition to the dynamic relationship of foreign equity flows with stock return volatility, I also studied the impact of foreign equity flows with market liquidity. Usually, the nature of an emerging country's stock market is small and illiquid. Again, earlier studies of the role of foreign equity flows and market liquidity also provided a mixed result. On one hand, the studies found the role of foreign investors as a liquidity provider for emerging countries stock markets. On the other hand, the positive feedback trading traders may move the equity price and thus increase market volatility. The increasing in volatility might impact the cost of providing market liquidity for the market maker. Therefore, the positive feedback trading strategy by foreign investors may indirectly lessen the liquidity of the market. Therefore, this chapter will also provide the impact of foreign equity flows to market liquidity in the SET.

4.1 Literature reviews

Although many studies found positive feedback trading and herding from foreign investors and some also follow the market chasing hypothesis, which indirectly

implies that the market volatility in emerging countries should rise, there are only a few pieces of literatures that directly accompanied foreign equity flows with stock market volatility. The most relevant literature is Pavabutr and Yan (2007), which divides the foreign flows into predictable and unpredictable shocks. They found that the effect of foreign flows on volatility comes primarily from the unexpected shock to foreign flows while the expected flow, which contributes to positive feedback trading, did not raise domestic market volatility.

The positive feedback trading and herding from foreign investors not only affect the market return and stock volatility, but also influence the local market liquidity. As suggested by Vagias and Van Dijk in 2010, this pattern of trading by foreign investors can lessen local liquidity to the extent that it is associated with the rise in order imbalance and/or market volatility. From a study on NYSE stocks from 1993 through 2002, Chordia, Roll and Subrahmanyam (2002) found that an exogenous shock caused extreme order imbalances and at the same time reduced liquidity in NYSE. As stated earlier, positive feedback trading and herding from foreign investors tend to pressure the price and in turn market volatility. The higher volatility leads to a higher margin and thus, increasing the cost of providing liquidity. As reported by Brunnermier and Pederson in 2009, it is more capital intensive for dealers to trade in volatile securities and; therefore dealers tend to provide less market liquidity in such securities. From this view, the trading behaviors of foreign investors are likely to worsen local market liquidity in emerging countries.

In other prospects, the rise in volatility from positive feedback trading and herding by foreign investors might improve the market liquidity as many studies found a

positive association between market liquidity and capital flows. Firstly, the study by Tauchen and Pitt (1983) point out that both futures and equity markets always find a positive association between price variability and trading volume. Further, Gallant et al. (1992) investigated the co-movement between price and volume using NYSE daily data from 1928 to 1987 and found positive correlation between conditional volatility and market volume. Lastly, Lee and Rui (2002) also documented a positive relationship between trading volume and return volatility in the market of New York, Tokyo and London.

Most of the previous studies elaborated above were intended to investigate the effect of stock returns and/or stock volatility to market liquidity, which implied the indirect relationship between capital flows and market liquidity. However, there are little numbers of studies that incorporate the direct effect of foreign flows to emerging market liquidity. Again, the closest literature to this dissertation in the study of market liquidity is Pavabutr and Yan (2007), which studied the impact of foreign equity flows on market liquidity in the SET. They found a positive relationship between foreign inflows and market liquidity which implied the improvement of market liquidity from the foreign investors.

4.2. Data and Descriptive statistic

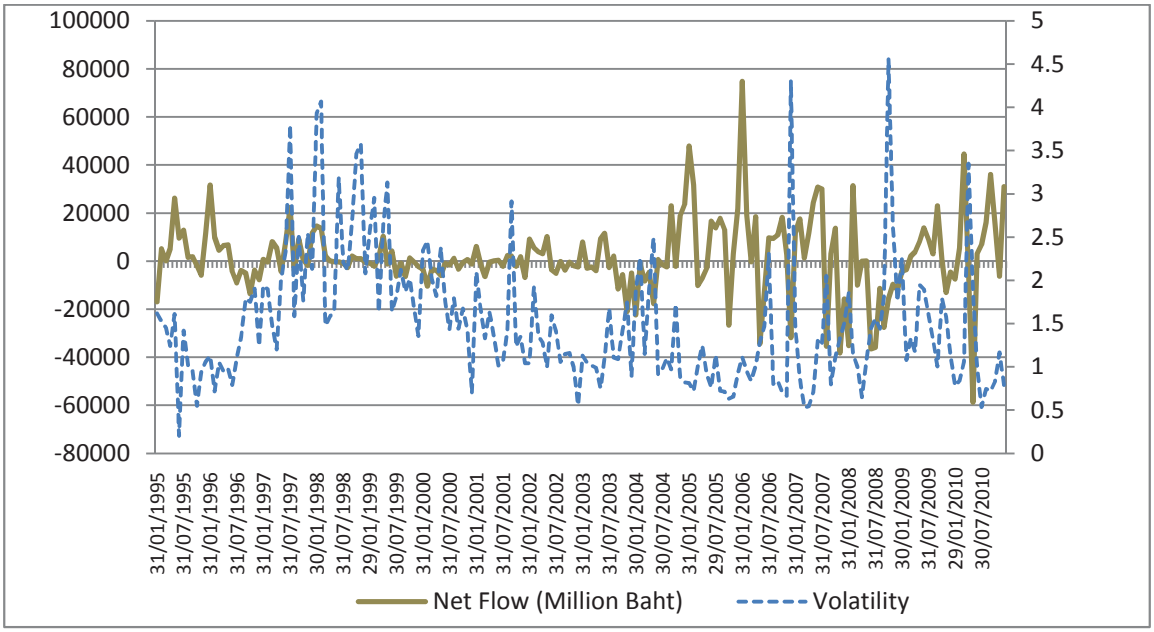
The data in this chapter are also collected from the same source as previous chapter. The data are collected from Sicco Securities Corporation in Thailand. This unique daily dataset comprises of daily data of turnover ratio (as a proxy of market liquidity), daily trading of foreign investors and the daily market returns of SET from

January 1995 to December 2010. I also divided the data into 5 sub periods as the case of the dynamic relationship between foreign flows and market return. The first period is the period before the Asian crisis. The data is from January 1995 to December 1996. The second period is the period of the Asian crisis ranging from February 1997 to June 1999. The third period is the period after the crisis from June 2000 to May 2005, which is the period that economic fundamentals uplifted. The fourth one is the Subprime crisis period from January 2008 to June 2009. Finally, the recent period that stock market in Asia boomed ranged from July 2009 to December 2010 where huge amounts of foreign inflows surged into the SET.

4.2.1 Stock Volatility

In determining the value of volatility, I follow the Schwert method (1989), where the daily volatility comes from the absolute value of SET return, whereas the weekly and monthly data are $\sigma_t = \sum_{i=1}^{N_t}(r_t - \bar{r})^2$, where σ_t is volatility at time t, N_t is a number of trading in week (month) t, r_t is the SET return at time t and $\bar{r}$ is the average SET return of that period.

Figure 7: Monthly volatility and net foreign flow

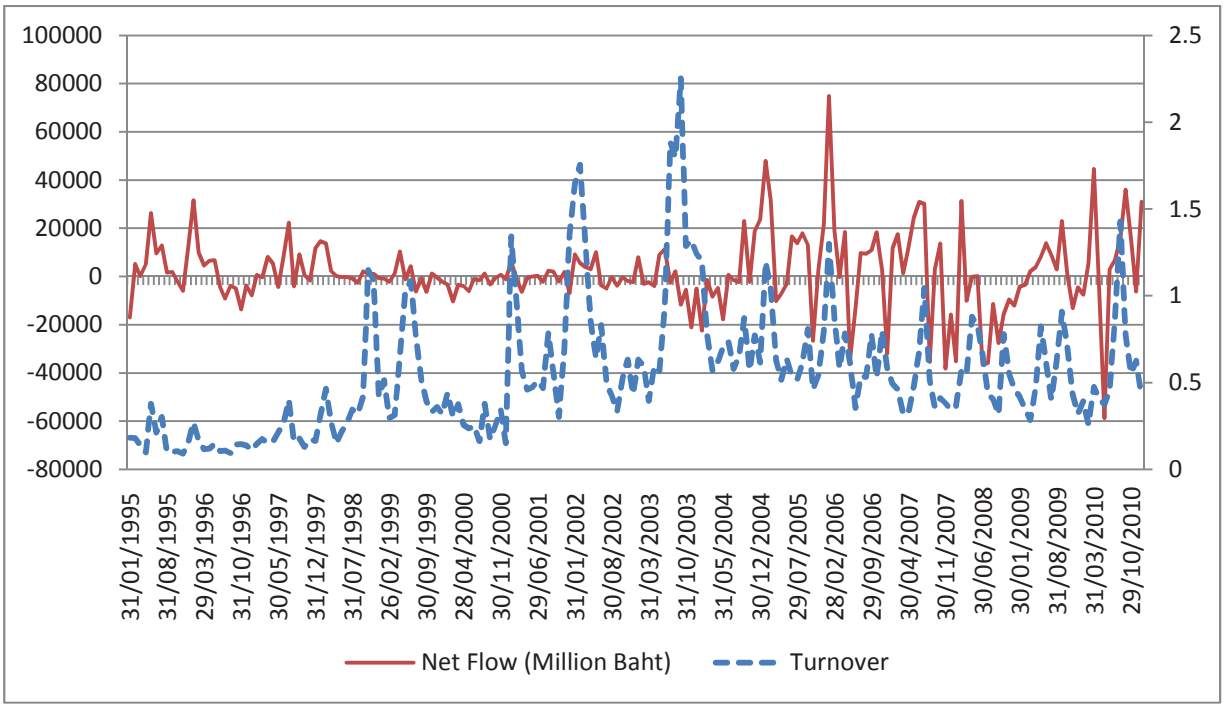


4.2.2 Turnover ratio

As suggested by the earlier studies[6], there is a positive relationship between liquidity and volatility. Instead of finding a relationship between liquidity and volatility, the dynamic relationship between foreign flows has been employed in this paper. As a common market liquidity measurement, I use the turnover ratio which is calculated by the ratio of total trade values to the market capitalization as a proxy of liquidity. The average turnover ratio is very low before Asian crisis period and growing during the Asian crisis suggesting an improvement of liquidity during the crisis.

[6] Tauchen and Pitt(1983), Gallant et al.(1992) and Lee and Rui found a positive relationship between trading volume and return volatility.

Figure 8: Monthly liquidity and net foreign flow



4.3 Model specification

In this chapter, the method to study the interrelationship between variables is similar to the previous chapter. Vector autoregression (VAR) is employed to investigate the dynamic relationship between interested variables. Further, Granger causality is further applied to explore the causal relationship in each of the variable's system. To illustrate the effect of the shock from other variables, the plotted impulse response function of our variable's system is also drawn from VAR. Finally, variance decomposition is also used to see how much an innovation in one variable can help

explain the variance of the other variable in the system. Thus, unrestricted VARs in this chapter are in the following forms:

$$v_t = \gamma_1 + \sum_{i=1}^{l} \beta_{11}^{i} v_{t-1} + \sum_{i=1}^{l} \beta_{12}^{i} flow_{t-1} + \varepsilon_{1t} \quad (3)$$

$$flow_t = \gamma_2 + \sum_{i=1}^{l} \beta_{21}^{i} v_{t-1} + \sum_{i=1}^{l} \beta_{22}^{i} flow_{t-1} + \varepsilon_{2t} \quad (4)$$

$$turn_t = \gamma_1 + \sum_{i=1}^{l} \beta_{11}^{i} turn_{t-1} + \sum_{i=1}^{l} \beta_{12}^{i} flow_{t-1} + \varepsilon_{1t} \quad (5)$$

$$flow_t = \gamma_2 + \sum_{i=1}^{l} \beta_{21}^{i} turn_{t-1} + \sum_{i=1}^{l} \beta_{22}^{i} flow_{t-1} + \varepsilon_{2t} \quad (6)$$

where $flow\ v\ turn$ are net foreign flow, stock volatility and turnover ratio, respectively. Equation 3 and 4 indicate the VAR specification to identify the dynamic relationship between volatility and foreign flow. Similarly, the interrelationship between market liquidity and foreign flows are determined by equations 5 and 6. For the rest of the model specification, the methodologies are the same as stated in chapter 3.

4.4 The dynamic relationship between market volatility and foreign flow

Like the previous section, I identified the relationship between market volatility and capital flows using the unrestricted bivariate VAR models in equations 3 and 4. Table 17 provides the VAR regression result for the daily data of every period of interest. Likewise, each variable of the variables in VAR system is correlated by its own lagged as the case of SET return and foreign flows. Hence, the results from every period indicated that contemporaneous foreign flows are positively related to the prior daily foreign flows. Similarly, market volatility is also significantly positively related to its own lagged. When looking at the dynamic relationship between stock returns and capital flows, the

VAR results contradict many earlier studies, which indicated that the volatility of the stock market during the Asian crisis came from the domestic investors[7]. For all periods excluding the Asian crisis, the prior foreign flows negatively influenced the market volatility. Since our data consist of the net foreign flows, the negative relationship implies that capital outflows induce higher market volatility. In contrary, the positive correlation between the lagged of foreign flows and market volatility implied that the inflow of capital is associated with higher market volatility. The highlight of the result is the VAR regression result from Asian crisis period. Many studies argued that foreign investors are the group of investors that alleviated emerging stock market volatility during the crisis since the foreign investors were a net buyer at that time, however, the net buyer of foreign investors did not ease the volatility in the market. Moreover, the regression result from the Asian crisis period shows that the foreign investors induce even higher volatility to the market.

Turning to lower frequency data, the impact of foreign investor behavior in each period is identical. Table 18 and 19 provide the VAR regression results for weekly and monthly data, respectively. The weekly data shows that the contemporaneous foreign flows are positively related to the prior week foreign flows while market volatility positively related with its own lagged two weeks before. For the monthly data, only market volatility correlates with its lagged while the regression result for foreign flows shows statistically insignificance. In the case of the dynamic relationship between volatility and foreign flows, both weekly and monthly data are moving into the same direction as the daily data. Excluding the Asian crisis period, prior foreign inflows are

[7] Kayolri (2001) found that domestic investors, espeacially financial institutions and corporations, in Japan were negative feedback during Asian crisis.

negatively correlated with the market volatility while there is a positive relationship between lagged of foreign flows and volatility. Nevertheless, this positive effect quickly reverses in the period t-2. In contrast, the foreign flows have a negative relationship with the volatility in the lagged prior, but the effect is very small. On the other hand, the impact of the prior volatility to the contemporaneous of the foreign flow is very small as suggested in the Table18 and 19.

In table 33, the Granger causality test is reported. As earlier stated, the identified correlation from the Vector Autoregression does not imply the causal relationship between market volatility and foreign portfolio flows. To investigate the detail of the causal relationship, the Granger causality test is employed. In the full sample period, there is a bilateral Granger causal relationship between market volatility and foreign portfolio flows. This implies that the lagged of volatility and predicts the amount of capital flow and the other way around. The bilateral Granger causal relationship implies that the lagged of the foreign flows and market volatility can help predict each other's current value. In the capital flow equation, only during the Asian crisis and after the Asian crisis period that market volatility grangers cause the foreign flow. Turning to the market volatility equation, only the Asian crisis period that the foreign flows do not grangers cause market volatility.

In contrast with the higher frequency data, the granger causality test result is different from the lower frequency data. The weekly joint statistic indicates that volatility do granger cause flow in all the periods except during the Asian crisis and after the crisis period. This may be due to the fact that there are many factors that affect the investment decision during the Asian crisis period. Thus, volatility in the longer time

span may not be the important factor that foreign investors take into account. Alternatively, the market volatility in the longer time span when the economy is in a normal condition might be of more importance. In the market volatility equation, the weekly granger causality result shows that there is no causal relationship between the lagged of capital flows and volatility at all of periods*. Similarly, the test statistic for monthly data also points out that there is no causal relationship between interested variables at all periods as well.

Table 20, we report the daily variance decomposition of foreign flows and market volatility. In the full sample period, foreign flows explain less than 1 percent of the forecast error variance of market volatility when the forecast horizon is up to 10 periods. However, before Asian crisis and subprime crisis period, variation in foreign flows can explain the square error of market volatility at 5 and 9 percent, respectively. While for the rest of the periods, the shock on foreign flows only explains the forecast error variance in market volatility less than 3 percent. In case of the foreign flow forecast error, the market volatility merely forecasts error variance of capital flows approximately 1 percent in all of the periods with the exception of Asian crisis. The power of the forecast goes up during the Asian crisis in which the innovation in market volatility can forecast error variance of capital flow by more than 10 percent.

To see a clearer view of foreign investor's behavior, the lower frequency data has been examined. The predicting power from the variance decomposition between foreign flows and volatility is increasing as frequency of data falls. With weekly data, the variance decomposition of volatility shows that the period that the shock of foreign flow can explain the forecast error variance of SET returns the most is during the

Subprime crisis period. While the rest of period, the shock on foreign flows enables us to forecast around 3 percent error variance of the volatility. The forecast error variance of volatility rises with the monthly data. On average, 12 percent of the forecast error variance in volatility can be explained by the shock of foreign flows. At the same time, the forecast power of error variance decomposition in daily the foreign flows by the shock of the daily volatility is averaging only 2 percent. However, more than 10 percent of the forecast error variance in foreign flows can be forecast by the volatility in the Asian crisis period. Similar to the variance decomposition of volatility, the lower frequency data indicates the higher forecasting power in the foreign flow equation. Generally, the market volatility can forecast the error variance of foreign flows around 10 percent in the weekly and monthly data for all periods.

Moreover, the impulse response function is applied to trace the length of responses of the innovation to an impulse shock between capital flows and volatility. As previously stated, impulse responses can be used to review the shocks and effects of external factors on the long run behavior of interested variables. Like the impulse response function between stock return and capital flows, the impulse response function for all of the period is consistent since all of the interested variables also go to long run equilibrium. In appendix B.2.1, the daily impulse response between capital flows and volatility for each period is demonstrated. Up until the subprime crisis, the daily response of foreign flows to the shock of volatility is positive in the early stage and goes to the long run equilibrium. Conversely, the subprime and Asian boom periods show that the foreign flow negatively responds to the shock of volatility before going to the long run equilibrium. In the meantime, appendix B.2.1 shows the impulse response that

investigates the daily response of volatility to the shock of flows. From the graph, the result is going in the same direction as VAR regression result. Before going to the long run equilibrium, volatility is decreasing from the shock of foreign flows in all periods except during the Asian crisis where volatility is increasing from the shock of foreign flows.

Turning to the lower frequency data, the graphic represented from the impulse response function is a bit different from the daily one. In the response of capital flows to volatility, there is a positive relationship from the capital flow to the volatility up until the stock boom period where increases in prior volatility reduce the amount of inflows. In the case of reaction of volatility to the structural innovation of foreign flows, the increasing in capital inflows induces to a lesser volatility in the market for all the periods except the Asian crisis. This result is comparable to the case of higher frequency data. Although, the graphical impulse response function is different towards the period and the different of data frequencies, all the results are consistent since the graphical analysis shows that the entire interested variable goes to the long run equilibrium.

4.5 The dynamic relationship between liquidity and foreign flow

As per the earlier section, I identified the relationship between market liquidity which proxy by turnover ratio and capital flows using the unrestricted bivariate VAR models. Table 20 shows the VARs estimated from the daily data in all periods. The regression results describe that both turnover ratio and capital flows are correlated by its own lagged in the daily data. Similar to the previous section, the contemporaneous foreign flows are also positively related to the prior daily foreign flow. In the case of the

turnover ratio, for every period with the exception of the subprime crisis period, contemporaneous flow is positively influence by the prior flow. During the subprime crisis, the positive relationship of turnover ratio with its own lagged quickly reverses in the 3 days prior. When looking at the dynamic relationship between liquidity and lagged of capital flow, the foreign investors act as a liquidity provider in the full sample period since the dynamic relationship between the turnover ratio and the lagged of flow is positive. This implies that the net equity flow from foreign investors help improve the market liquidity in the full sample period. The daily result is consistent in all of the periods with the exception of after the Asian crisis period where a negative relationship is present. On the other hand, the prior value of the turnover ratio only has a small effect on the foreign flows. Before the crisis period, the lagged of the turnover ratio has positive influence on the capital flows but quickly reversed as well during the subprime crisis period. In other periods, the coefficients show a statistical insignificance between variables.

Turning to lower frequency data, the VARs result is contradictory to several studies which indicated that foreign equity inflows promote market liquidity during a crisis. Likewise, both turnover ratio and capital flows are correlated by its own lagged as well as the daily data. In table 21, the weekly shows that the contemporaneous foreign flows are positively related to the prior week foreign flows as well as the turnover ratio positively related with its own lagged and this result is consistent with the monthly data provided in table 22. The appealing result is on the dynamic relationship between turnover ratios and lagged of foreign equity flows. The weekly full sample period indicated the positive relationship between turnover ratios and lagged of foreign equity

flows but quickly reverse in the further period. The negative coefficients suggest that the foreign outflow does help to promote market liquidity or the foreign equity flows lessen the liquidity of the market. The outcome of the full sample period is comparable to the Asian crisis and Subprime crisis period when using weekly data. For the rest of the period, the coefficient between turnover ratios and lagged of foreign equity flow is positive indicating the foreign equity flow does help raise the market liquidity. The weekly result is also consistent with the monthly data. Thus, foreign equity inflow, which many studies argue help promote market liquidity during the crisis, could not apply to the SET.

Looking at the foreign flow equation in the lower frequency data, it is interesting that the foreign flow is negatively influenced by the market liquidity during the crisis. During the crisis, the foreign inflows will be lessening if the market liquidity is high. This may due to the fact that the vulnerable economic condition encourages the foreign investor to hold the equity in a shorter period.

Likewise, the result from Vector Autoregression in the previous sections does not imply the causal relationship between market liquidity and foreign portfolio flows. To investigate the details of the causal relationship, the test of pairwise Granger causality test between market liquidity and foreign portfolio flows is also employed. In Table 34 provided the daily Granger causality test between turnover ratio and foreign portfolio flows, there is a bilateral Granger causal relationship between turnover ratio and foreign portfolio flows only the full sample and before Asian crisis periods. The bilateral Granger causal relationship implies that the lagged of the foreign flows can help explain the market liquidity and vice versa. The unilateral Granger causal relationship is only

present in the Subprime crisis period which indicated the lagged of the turnover ratio can help predicted the foreign flows while the lagged of foreign flows cannot help predict the turnover ratio. For the rest of the period, the daily data shows that there is no causal relationship between market liquidity and foreign portfolio flows through the Granger Causality test.

With the weekly data, the result from pair wise Granger causality test behaves differently. In the full sample period, the Granger Causality describes a bilateral causal relationship between turnover ratio and foreign portfolio flows. Nevertheless, there is no bilateral causal relationship for all the periods. The turnover ratio or market liquidity in this case does not granger cause the foreign equity flows in all the periods implying that the lagged of turnover ratio could not help explain the foreign equity flows which is different to the daily data where the turnover ratio granger causes foreign equity flow in the subprime crisis. Moreover, the result when the turnover ratio is a dependent variable is also different from the daily data. The unilateral Granger causal relationship appears in the Asian and Subprime crises. The weekly data in those crisis periods show that the foreign flow granger causes market liquidity which implies that the foreign flows can help explain the future value of market liquidity. In the case of monthly data, the results from Granger Causality are not statistically significant in all the periods. This may be due to the limited observation in the study.

In Table 29, I report the daily variance decomposition of foreign flows and turnover ratio, or market liquidity in this case. Starting with the turnover ratio equation, foreign flows explain less than 1 percent of the forecast error variance of the market liquidity when the forecast horizon is up to 10 periods in the full sample period. In the

sub-sample period, only before the Asian crisis and Subprime crisis periods that foreign equity flows enable to forecast error variance of the market liquidity by more than 2 percent. While for the rest of the periods, the shock on foreign flows only explains the forecast error variance in market liquidity by less than 1 percent. Turning to the foreign flow equation, the ability of innovation in liquidity can help explain the variance of foreign flows more than the other way around. In the full sample period, market liquidity explains almost 7 percent of the forecast error variance of foreign flows the when the forecast horizon is up to 10 periods. In the sub-sample period, the ability of market liquidity to forecast error variance of foreign equity flow is more than 10 percent in the period before the Asian crisis, during the Asian crisis and following subprime crisis periods.

Interestingly, the ability to forecast error variances between foreign flows and the turnover ratio or market liquidity is increasing throughout the lower frequencies of data. In the turnover equation, the weekly data shows that foreign equity flows enable to forecast error variance of the market liquidity to approximately 2 percent in the full sample period. In addition, foreign equity flows enable us to forecast error variance of the market liquidity by more than 5 percent in the before crisis period and subprime crisis. On average in the rest of the sub-periods, the shocks on foreign flows only explain the forecast error variance in market liquidity by less than 1 percent. Similar to the daily data, the ability of forecasts from shocks in liquidity to the variance of foreign flow is much more than the other way around. Market liquidity explains almost 7 percent of the forecast error variance of foreign flows the when the forecast horizon is up to 10 periods in the full sample period. The astonishing periods are before the Asian crisis, during the

Asian crisis and subprime crisis in which the ability of market liquidity to forecast error variance of foreign equity flow is more than 10 percent, especially the before crisis period that accounts for 35 percent. The rising ability of the forecast error variance of foreign flows by the market liquidity implies that the foreign investor also takes market liquidity as one of the important indicators in making an investment decision.

In the case of monthly data, the result is comparable when using weekly data. In the turnover equation, the monthly data shows that foreign equity flows enable forecast error variance of the market liquidity by less than 1 percent in the full sample period. However, foreign equity flow enable to forecast error variance of the market liquidity 17 and 9 percent in the before Asian crisis and Asian crisis, respectively. In the foreign flows equation, market liquidity also explains approximately 1 percent of the forecast error variance of foreign flows when the forecast horizon is up to 10 periods in the full sample period. Nevertheless, the ability of market liquidity to forecast error variance of foreign equity flow is higher in the sub-sample. The shocks in market liquidity explain 28 and 12 percent of the forecast error variance of foreign flows in the before Asian crisis and Asian crisis, respectively.

In the next procedure, the impulse response function is applied to trace the length of responses of innovation to impulse shocks between capital flows and market liquidity similar to previous sections. In all periods, the impulse response function is consistent since all of the interested variables are depicted to die out to zero. Appendix B.3.1 simultaneously illustrates the daily impulse response between capital flows and market liquidity for each period. The daily impulse responses of foreign equity flows to market liquidity for every period are positive. Daily impulse responses of market liquidity to

foreign equity flows also show a positive relationship with the exception of before Asian crisis and Subprime crisis periods.

Turning to lower frequency data, the impact between two variables is much more than daily basis. Appendix B.3.1 and B.3.2, demonstrate weekly and monthly impulse responses between capital flows and market liquidity for each period, respectively. The weekly and monthly impulse responses of foreign equity flows to market liquidity for every period are also positive and go to long run equilibrium with the exception of Asian crisis period, whereby foreign flows react negatively to the shock of liquidity before it dies out to zero. On the other hand, weekly and monthly impulse responses of market liquidity to foreign equity flows also show a positive response to foreign flows with the exception of subprime crisis that shows a negative response. The results from all the models suggested that foreign equity flows act as a liquidity provider to SET in the tranquil period.

Chapter 5: Conclusion and policy implication

Capital market development is important to all countries. To achieve long run economic growth, a healthy capital market is mandatory. Financial liberalization is one of the processes of capital market development. Previous related literature provided mixed results on the impact of financial liberalization. Many studies that supported financial liberalization found that opening markets can create an opportunity to attract foreign capital to finance economic growth from lower cost of financing which in turn induces an increase in investment. In the view of opponents, financial liberalization encourages a surge of capital flows and movement of hot money. International flows of funds are apparently highly sensitive to differences in interest rates, economic growth, and expected returns from holding securities. Shocks to the economy can lead to a volatile change in capital flows, which exacerbates the shock and destabilizes the domestic economy. The results from this dissertation confirmed an increase in stock return volatility after the financial liberalization process.

In addition to financial liberalization, introduction of new products is another method to improve the efficiency of the market. Currently, the Thai capital market has few financial products to choose from, which cannot take care of the diverse needs of investors thus making the market relatively unattractive. This measure aims to push for developments of new products which would help increase the variety of instruments and consequently help develop the market. Although, my results showed that market volatility does not decrease from the introduction of the futures market, we cannot conclude that the invention in financial products is not important since it is only a nurturing step in the long run development plan. There are many aspects of Thailand's

capital market that should be developed. Furthermore, the introduction of the futures markets in the emerging countries, where the financial market is in an early stage, may create an opportunity for hedge funds to make the financial market more volatile. From the results, we cannot clearly conclude that capital controls are in needed for Thailand at this time or that the launch of new products will not ultimately improve the efficiency of the capital market. However, this study is important because it indicates the effects of financial liberalization and the development of new products in the capital market should be carefully monitored.

Furthermore, the dynamic relationship of i) foreign equity flows and SET returns ii) foreign equity flows and volatility iii) foreign equity flow and liquidity are investigated to identify the impact of foreign investors on the emerging stock market. A positive feedback or momentum trading is usually found on the emerging market and our results were consistent with such behavior. Several studies argue that this behavior was disappearing during the Asian crisis time; and foreign investors did not worsen the crises; however, my results contradicted those studies. The results from every methodology showed that foreign investors still employed the momentum strategy and even behaved as a contrarian. One might argue that foreign investors may not participate significantly in the Asian crisis period; however, the results from variance decomposition showed that the period that the shocks from foreign flows explain the variance in SET returns the most is the Asian crisis. This implies that SET returns were highly influenced foreign flows during the Asian crisis period.

In the case of volatility, my results also contradicted several studies which argued that foreign investors alleviated emerging stock market volatility during the crisis

since foreign investors were net buyers at that time, however, net buying power of foreign investors did not ease the volatility of the market.

Overall, international flows do improve market liquidity in Thailand. The dynamic relationship between foreign flows and market liquidity provided by all of our models indicated that foreign investors are liquidity providers in emerging countries in the tranquil periods. However, the results were not consistent with the crisis periods. The results in the crisis period showed a negative relationship between the lagged foreign flows and market liquidity. These results contradicted earlier studies which stated that foreign equity inflows promote the market liquidity during crisis. Although, the international flows from foreign investors do not help promote market liquidity during crisis, foreign flows are still important to emerging countries like Thailand since they help promote the overall liquidity in normal periods.

In a policy-making context, the effect from the foreign equity flows should be a subject of carefully monitoring. Although, foreign equity flows during the crisis may exacerbate the capital market in emerging countries, the benefit of foreign equity such as reduction in cost of capital and providing liquidity to the market may overweigh the disadvantages of the foreign flows to the capital market. In my view, international flows are necessary to the development of emerging countries' capital markets. However, this may not require that capital flows must be free of all limitations. Our findings of some negative effects from foreign equity flows suggest that the costs and benefits need to be carefully weighted. Policy makers should be very careful in implementing any capital control policy since foreign investors are extremely sensitive to such policies which in turn can worsen the overall capital market.

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Table 1: Timeline for the new products in the capital market

	Key Events of Thailand Futures Exchange
28-Apr-06	Launch SET50 Index Futures as the first product
28-Aug-06	Started internet trading in SET50 Index Futures
18-Sep-06	Appointed 3 market makers to provide liquidity for SET50 Index Futures
9-Apr-07	Sign the Memorandum of Understanding with The Taiwan Futures Exchange (TAIFEX)
3-Sep-07	Allowed Direct Market Access (DMA) for convenience and easy execution
29-Oct-07	Launch SET50 Index Options as the second product
16-May-08	Sign the Memorandum of Understanding with Chicago Board Options Exchange (CBOE)
5-Sep-08	Sign the Memorandum of Understanding with The Options Industry Council (OIC)
24-Nov-08	Launch Stock Futures
2-Feb-09	Launch Gold Futures

Table 2: Descriptive statistic of the stock return from 1985-1989

	Thailand	Singapore	Malaysia	United States
Mean	0.2189	0.0288	0.1071	0.0139
Std. Dev.	0.0256	0.0133	0.0198	0.0142
Skewness	-1.2833	-3.458	-1.8209	-4.2101
Kurtosis	10.9639	41.7421	20.1782	55.1672
Observation	517	517	517	517

Table 3: Standard deviation of stock market return

	1985	1986	1987	1988	1989
Thailand	0.0049	0.0061	0.0187	0.0131	0.0103
Singapore	0.0087	0.0084	0.0169	0.0080	0.0092
Malaysia	0.0140	0.0154	0.0148	0.0072	0.0090

Table 4: Descriptive statistic of the stock return from 2005 to 2007

	Thailand	Singapore	Malaysia	United States
Mean	0.0122	0.0929	0.0734	0.0524
Std. Dev.	0.0124	0.0081	0.0064	0.0066
Skewness	-2.0332	-0.8241	-1.1552	-0.2317
Kurtosis	55.3621	6.693	12.1671	5.0046
Observation	498	498	498	498

Table 5: Standard deviation of stock market return

	2005	2006	2007
Thailand	0.0088	0.0156	0.0123
Singapore	0.0057	0.0082	0.0132
Malaysia	0.0048	0.0052	0.0104

Table 6: LM test for Autoregressive Conditional Heteroskedasticity (ARCH) from September 1996-August 1998

	Thailand	Singapore	Malaysia	United States
Chi2	94.4380	52.6940	93.7110	3.2890
P-value	0.0000	0.0000	0.0000	0.0697

H0: no ARCH effect

H1:ARCH(p) disturbance

Table 7: Regression result from ARCH(1) process without dummy variable

	Thailand	**Singapore**	**Malaysia**
Conditional Mean Equation			
constant	**0.0029**	**0.0005**	**0.0006**
	0.0004	**0.0004**	**0.0006**
DOW	**0.2597*** **	**0.4897*** **	**0.7957*** **
	0.0231	**0.0243**	**0.0351**
Conditional Variance Equation			
ARCH	**0.6839*** **	**0.4298*** **	**0.4646*** **
	0.0596	**0.069**	**0.0753**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Table 8:Regression result from GARCH(1,1) process without dummy variable

	Thailand	**Singapore**	**Malaysia**
Conditional Mean Equation			
constant	**0.0030**	**0.0006**	**0.0015**
	0.0005	**0.0004**	**0.0006**
DOW	**0.2519*** **	**0.4146*** **	**0.5986*** **
	0.0221	**0.0295**	**0.0388**
Conditional Variance Equation			
ARCH	**0.4880*** **	**0.1920*** **	**0.1237*** **
	0.0682	**0.0459**	**0.0282**
GARCH	**0.3935*** **	**0.6697*** **	**0.9358*** **
	0.0795	**0.1136**	**0.128**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Table 9:Regression result of ARCH(1) process with dummy variable

	Thailand	Singapore	Malaysia
Conditional Mean Equation			
constant	**0.0030**	**0.0005**	**0.0004**
	0.0004	**0.0004**	**0.0006**
DOW	**0.2207*** **	**0.4907*** **	**0.7985*** **
	0.0286	**0.0243**	**0.0355**
Conditional Variance Equation			
LIB_1987	**1.0470*** **	**-0.0556**	**-0.0031**
	0.1267	**0.1566**	**0.1331**
ARCH	**0.4256*** **	**0.4397*** **	**0.4457*** **
	0.0655	**0.0787**	**0.0769**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Table 10:Regression result of GARCH(1,1) process with dummy variable

	Thailand	Singapore	Malaysia
Conditional Mean Equation			
constant	**0.0030**	**0.0006**	**n.a.**
	0.0005	**0.0004**	**n.a.**
DOW	**0.2241*** **	**0.4157*** **	**n.a.**
	0.0275	**0.0306**	**n.a.**
Conditonal Variance Equation			
LIB_1987	**0.8770*** **	**-0.4796**	**n.a.**
	0.2106	**1.0495**	**n.a.**
ARCH	**0.4461*** **	**0.1916*** **	**n.a.**
	0.0710	**0.0459**	**n.a.**
GARCH	**0.279*** **	**0.6627*** **	**n.a.**
	0.0831	**0.1283**	**n.a.**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Table 11:LM test for Autoregressive Conditional Heteroskedasticity (ARCH) from April 2005-March 2007

	Thailand	Singapore	Malaysia	United States
Chi2	71.8710	11.6180	53.5030	0.1780
P-value	0.0000	0.0007	0.0000	0.0673

Table 12:Regression result from ARCH(1,1) process without dummy variable (2005-2007)

	Thailand	Singapore	Malaysia
Conditional Mean Equation			
constant	**0.0001**	**0.0006**	**0.0008**
	0.0006	**0.0002**	**0.0002**
DOW	**0.4481*** **	**0.5595*** **	**0.2810*** **
	0.0837	**0.0415**	**0.031**
Conditonal Variance Equation			
ARCH	**0.1209*** **	**0.2988*** **	**0.3939*** **
	0.0582	**0.0805**	**0.056**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Table 13: Regression result from ARCH(1,1) process with dummy variable

	Thailand	Singapore	Malaysia
Conditional Mean Equation			
constant	**0.0001**	**0.0007**	**0.0005**
	0.0005	**0.0002**	**0.0002**
DOW	**0.3769*** **	**0.4535*** **	**0.2341*** **
	0.0721	**0.0400**	**0.0355**
Conditonal Variance Equation			
FUT	**0.9270*** **	**0.9752*** **	**0.8222*** **
	0.0769	**0.1075**	**0.0902**
ARCH	**0.0870*** **	**0.1351*** **	**0.1529*** **
	0.0332	**0.0636**	**0.0537**

Notes: italic font represents standard deviation and *** means statistically significance at both 95-99%.

Vector Autoregression estimated of capital flow and SET return

Table 14: Daily Data estimated of capital flow and SET return

Stock return regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Subprime Crisis Jun 2008-May 2009	Period 5 Stock market boom Jun 2009 -Dec2010
Stock return						
Lag 1	0.0699***	0.0928***	0.1685***	0.0287	0.0227	-0.0598
T-Stat	4.0040	1.7560	3.7792	0.8578	0.3939	-1.1281
Lag 2	0.0236**	0.0810**	-0.1941***	0.0494**	0.0710	-0.1289***
T-Stat	1.2973	1.4138	-2.0181	1.3990	1.1784	-2.3584
Lag 3	-0.0099	0.0092	-0.0060		0.0041	0.0091
T-Stat	-0.5462	0.1613	-0.1288		0.0703	0.1716
Net Flow						
Lag 1	3.2957***	5.1782**	7.2211***	5.7173***	8.9747***	12.6984***
T-Stat	2.9446	1.5174	1.8294	2.9323	1.7654	5.1077
Lag 2	-0.2648	-3.0604	3.081	-3.3175***	2.9734	-3.9142**
T-Stat	-0.2257	-0.8550	0.7302	-1.8627	0.5565	-1.5220
Lag 3	-0.1477	-5.0284**	-1.1101		-9.0056**	-0.9903***
T-Stat	-0.1253	-1.4108	-0.2605		-1.9569	2.5694

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression	All Data	Period 1	Period 2	Period 3	Period 4	Period 5
		Before Asian Crisis	Asian Crisis	After Asian Crisis	Subprime Crisis	Stock market boom
	Jan 1995-Dec 2010	Jan 1995-Dec1996	Feb 1997-Jun1999	Jun 2000-May 2005	Jun 2008-May 2009	Jun 2009 -Dec2010
Stock return						
Lag 1	0.0050***	0.0068***	0.0037***	0.0061***	0.0039***	0.00578***
T-Stat	18.5647	9.0856	7.4681	10.6122	6.0606	5.1699
Lag 2	-0.0004**	0.0011***	-0.0009***	0.0015***	-0.0021***	-0.0004
T-Stat	-1.4257	1.4393	-1.8231	2.5492	-3.0620	-0.4108
Lag 3	-0.0004***	0.0009*	-0.0004		0.0001	-0.0005
T-Stat	-1.6839	1.0971	-0.9155		0.1490	-0.5084
Net Flow						
Lag 1	0.3343***	0.3683***	0.3972***	0.3636***	0.3734***	0.2481***
T-Stat	19.1457	7.5338	9.0038	10.8642	6.5360	4.7430
Lag 2	0.1017***	-0.1105***	0.0792***	0.1054***	0.1670***	0.0985***
T-Stat	5.5579	-2.1549	1.6815	3.4504	2.7820	1.8207
Lag 3	0.0648***	0.1076***	0.0534***		0.0725***	0.1467***
T-Stat	3.5282	2.1090	1.1498		1.4025	2.7142

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 15: Weekly data estimated of capital flow and SET return

Stock return regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Subprime crisis Jun 2008-May 2009	Period 5 Stock boom Jun 2009 -Dec2010
Stock return						
Lag 1	-0.0023	0.0083	-0.0674	0.0181	-0.0130	-0.0862
T-Stat	-0.0542	0.0548	-0.5900	0.2469	-0.0671	-0.6277
Lag 2	0.1395***	-0.1992**	0.2070***	0.0530	0.2000	-0.1082
T-Stat	3.2968	-1.4043	1.8261	0.7387	1.0547	-0.8497
Lag 3	0.0787***		0.1715**			
T-Stat	1.8594		1.5120			
Net Flow						
Lag 1	43.4595	1.4516	274.997**	6.2983	53.0605	8.4328
T-Stat	1.1813	0.0123	1.8294	0.1206	0.1506	0.0829
Lag 2	-4.219	212.3573***	-111.4241	2.4396	-36.4319	3.4494
T-Stat	-0.1075	2.0383	-0.6578	0.0473	-0.1091	0.0347
Lag 3	-9.3526		-70.9538			
T-Stat	-0.2413		-0.4809			

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 200	Period 4 Subprime crisis Jun 2008-May 2009	Period 5 Stock boom Jun 2009 -Dec2010
Stock return						
Lag 1	0.0000	0.0004***	-0.0001*	0.0000	-0.0001	-0.0001
T-Stat	0.1070	2.2009	1.1594	-0.1118	-0.9232	-0.8094
Lag 2	0.0001**	-0.0003***	-0.0001	-0.0001	-0.0001	0.0001
T-Stat	-1.0578	-1.7054	0.1706	-0.3012	0.8653	0.3524
Lag 3	0.0001*		-0.0001*			
T-Stat	-1.6509		-1.1829			
Net Flow						
Lag 1	0.4133***	0.1280*	0.6151***	0.3663***	0.5897***	0.5279***
T-Stat	9.6910	1.0315	5.3955	5.0609	2.8613	3.7962
Lag 2	0.1169***	0.4475***	0.0050	0.1783***	0.0211	0.0385
T-Stat	2.5702	4.0790	0.0395	2.4970	0.1080	0.2843
Lag 3	0.0637**		0.0836			
T-Stat	1.4180		0.7476			

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 16: Monthly data estimated of capital flow and SET return

Stock return regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005
Stock return				
Lag 1	0.0051	-0.1869	0.0617	-0.1455
T-Stat	0.0688	-0.6244	0.2567	-1.1745
Lag 2	-0.0008	-0.3630	0.1220	-0.0020
T-Stat	-0.1067	-1.0955	0.5033	-1.1014
Net Flow				
Lag 1	6.8027*	10.1975	6.9579	2.7464
T-Stat	1.0746	0.5579	0.3202	0.348
Lag 2	0.2532	16.8824	-14.8871	-0.3428
T-Stat	0.0399	0.9542	-0.6858	-0.0447

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005
Stock return				
Lag 1	0.0006	0.0080***	-0.0016	0.0031**
T-Stat	0.7137	1.6014	-0.6285	1.5614
Lag 2	-0.0014**	-0.0003	-0.0010	0.0020*
T-Stat	-1.6473	-0.0605	-0.3988	1.0146
Net Flow				
Lag 1	0.1106**	-0.1469	0.2181	0.0549
T-Stat	1.4834	-0.4817	0.9174	0.4312
Lag 2	0.0117	-0.0727	-0.0456	0.0731
T-Stat	0.1578	-0.2443	-0.1919	0.2552

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Vector Autoregression estimated of capital flow and volatility

Table 17: daily estimated of capital flow and volatility

Volatility regression	Jan 1995-Dec 2010	Before Asian Crisis Jan 1995-Dec1996	Asian Crisis Feb 1997-Jun1999	After Asian Crisis Jun 2000-May 2005	Sub prime Crisis Jun 2008-May 2009	Stock market boom Jun 2009 -Dec2010
Volatility						
Lag 1	0.1815***	0.0998***	0.1777***	0.0648***	0.2077***	0.119438***
T-Stat	11.3480	2.1902	4.1424	2.2552	3.1844	2.35666
Lag 2	0.1245***	0.0687***	0.0480*	0.1551***	0.1778***	0.142915***
T-Stat	7.6452	1.5008	1.1021	5.4033	2.7424	2.84045
Lag 3	0.0938***	0.0932***	0.0926***	0.0328*	0.0741*	0.181293***
T-Stat	5.7183	2.0377	2.1267	1.1311	1.1435	3.65558
Net Flow						
Lag 1	-1.9419***	-2.3766	2.6341*	0.097	-3.2583	-2.362212**
T-Stat	-2.4967	-1.2776	1.0428	0.1027	-0.7221	-1.59927
Lag 2	-0.3709	-3.7322	-2.7644	0.2076	-10.6696	-2.860411
T-Stat	-0.5115	-1.7095	-0.9957	0.2002	-2.1676	-1.85531***
Lag 3	0.1997	1.3437	4.3822**	-1.9238***	3.5258	1.063996
T-Stat	0.2753	0.6140	1.5761	-1.8557	0.781	0.71419

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Sub prime Crisis Jun 2008-May 2009	Period 5 Stock market boom Jun 2009 -Dec2010
Volatility						
Lag 1	0.0025***	0.0012*	0.0029***	0.0028***	-0.0005	0.0012
T-Stat	6.5413	1.1429	4.0351	3.2690	-0.5415	0.68289
Lag 2	-0.0001	0.0001	-0.0009*	0.0007	0.0019***	-0.0013
T-Stat	-0.0465	0.0139	-1.1916	0.8864	2.1007	-0.73006
Lag 3	-0.0006***	-0.0005	-0.0001**	-0.0006	0.0001	0.0006
T-Stat	-1.6671	-0.4711	-1.4732	-0.7173	0.0477	0.37416
Net Flow						
Lag 1	0.4458***	0.6142***	0.4683***	0.4520***	0.4705***	0.3235***
T-Stat	28.6025	13.5094	10.9538	15.7642	7.1774	6.38463
Lag 2	0.0621***	-0.1020	0.0536*	0.06428***	0.0918***	0.1434***
T-Stat	3.5436	-1.9087	1.1413	2.0589	1.2841	2.71221
Lag 3	0.0467***	0.1352***	0.0344	0.0079	0.0296	0.1298***
T-Stat	2.6657	2.5337	0.7329	0.2514	0.4522	2.54087

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 18: **weekly estimated of capital flow and volatility**

Volatility regression	Jan 1995-Dec 2010	Before Asian Crisis Jan 1995-Dec1996	Asian Crisis Feb 1997-Jun1999	After Asian Crisis Jun 2000-May 2005	Sub prime Crisis Jun 2008-May 2009	Stock market boom Jun 2009 -Dec2010
Volatility						
Lag 1	0.2208***	0.2207***	0.0552	0.299799***	0.325411***	0.118854*
T-Stat	6.3761	2.1786	0.5821	4.66656	2.24734	1.05874
Lag 2	0.2023***	-0.0066	0.2370***	0.011686	0.115980	0.294062***
T-Stat	5.7989	-0.0676	2.4973	0.17622	0.81074	2.62801
Lag 3	0.1374***			0.115836***		
T-Stat	3.9695			1.71061		
Net Flow						
Lag 1	-76.6633**	-216.3292**	420.5546***	-103.1452**	-869.3381***	-181.8613*
T-Stat	-1.3125	-1.6820	1.8605	-1.38350	-1.94501	-1.18403
Lag 2	-56.3690	-90.3785	-315.3321**	-73.76825	387.9477	182.2837*
T-Stat	-0.9019	-0.6838	-1.4129	-0.92392	0.86600	1.22289
Lag 3	50.8625			84.23222		
T-Stat	0.8826			1.06106		

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression		Before Asian Crisis	Asian Crisis	After Asian Crisis	Subprime Crisis	Stock boom
	Jan 1995-Dec 2010	Jan 1995-Dec1996	Feb 1997-Jun1999	Jun 2000-May 2005	Jun 2008-May 2009	Jun 2009 -Dec2010
Volatility						
Lag 1	0.0001***	-0.0000	0.0000	0.000108	9.15E-05***	-6.20E-05
T-Stat	3.0833	-0.5275	0.1154	1.93596	2.02728	-0.74921
Lag 2	-0.00002**	0.0000	0.0396	-0.000142	-9.44E-05***	-0.000176***
T-Stat	-1.1512	-0.0513	0.4130	-2.46591	-2.11744	-2.13807
Lag 3	-0.00001***			-3.43E-05		
T-Stat	-2.4530			-0.58374		
Net Flow						
Lag 1	0.4259***	0.3337***	0.5206***	0.379342***	0.454476***	0.413351***
T-Stat	12.2912	4.0647	5.3607	5.86291	3.26192	3.64897
Lag 2	0.1054***	0.2408***	0.0039	0.115291**	0.209603**	0.054608
T-Stat	2.8436	2.8537	0.4130	1.66385	1.50096	0.49674
Lag 3	0.0256			-0.064271		
T-Stat	0.7493			-0.93289		

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 19: **monthly estimated of capital flow and volatility**

Volatility regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 200
Volatility				
Lag 1	0.338503***	0.419572***	0.066976	0.020569
T-Stat	4.64856	1.90927	0.30373	0.14998
Lag 2	0.106982**	0.637442***	-0.116733	-0.062361
T-Stat	1.47231	2.60550	-0.52571	-0.47428
Net Flow				
Lag 1	987.8051**	-549.5101	2986.8**	-1364.246***
T-Stat	1.36728	-0.94388	1.38925	-1.99380
Lag 2	-1860.555***	-677.0891*	-1593.418	-1129.206**
T-Stat	-2.58383	-1.10053	-0.60283	-1.59711

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Net Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 200
Volatility				
Lag 1	0.0000	-4.43E-05	0.0000	0.0000
T-Stat	-0.42926	-0.44615	-0.59981	-0.43597
Lag 2	-7.95E-06	4.58E-06	-2.91E-06	-4.09E-05*
T-Stat	-1.06670	0.04142	-0.11982	-1.55697
Net Flow				
Lag 1	0.1143**	0.0473	0.2068	-0.0043
T-Stat	1.54329	0.17969	0.87827	-0.03167
Lag 2	0.0032	-0.209731	-0.0537	-0.0274
T-Stat	0.04363	-0.75407	-0.18547	-0.19367

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Vector Autoregression estimated of capital flow and liquidity

Table 20: daily estimated of capital flow and liquidity

Turnover regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Sub prime Crisis Jun 2008-May 2009	Period 5 Stock market boom Jun 2009 -Dec2010
Turnover ratio						
Lag 1	0.7255***	0.6324***	0.7445***	0.7369***	0.641041***	0.639631***
T-Stat	44.1477	13.1169	16.9142	19.8474	9.65909	12.4996
Lag 2	0.0977***	0.0761**	0.0233	0.0099	0.184678***	0.117461***
T-Stat	4.8317	1.3509	0.424	0.2150	2.34963	1.94375
Lag 3	0.0040	-0.0287	0.0042	0.1381***	-0.176313***	0.125406***
T-Stat	0.1993	-0.5108	0.0767	3.0101	-2.21837	2.45447
Net Flow						
Lag 1	21.9274***	7.5023	21.6787	-29.1655	-25.55015	-0.255926
T-Stat	1.8758	0.5483	0.8414	-0.7648	-0.50570	-0.00779
Lag 2	35.5737***	-12.0638	-6.4378	10.7694	70.61146**	-5.684569
T-Stat	2.7915	-0.7644	-0.2239	0.2626	1.26947	-0.16659
Lag 3	-9.1523	23.4715**	23.5423	-75.3101***	-50.65512	21.49943
T-Stat	-0.7181	1.4878	0.8199	-1.835	-0.90859	0.65543

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Sub prime Crisis Jun 2008-May 2009	Period 5 Stock market boom Jun 2009 - Dec2010
Turnover ratio						
Lag 1	0.0001***	0.0003***	0.0001	0.0001***	0.000251***	3.27E-05
T-Stat	4.8748	2.1706	0.0776	1.2597	2.95028	0.41291
Lag 2	-0.0001	0.0001	-0.0001	0.0000	-0.000294***	4.50E-06
T-Stat	-4.217	0.4184	-0.5673	-0.8717	-2.91588	0.04811
Lag 3	0.0001	-0.0004***	0.0000	0.0000	0.000156***	3.61E-05
T-Stat	1.0044	-2.1735	-0.5058	0.9526	1.52876	0.45696
Net Flow						
Lag 1	0.4429***	0.5893***	0.5006***	0.3927***	0.469966***	0.311561***
T-Stat	27.0353	12.31	11.3388	10.5089	7.24537	6.12672
Lag 2	0.0641***	-0.1281***	0.0355	0.0465**	0.100843**	0.137836***
T-Stat	3.5935	-2.3211	0.7213	1.1590	1.41215	2.60974
Lag 3	0.045***	0.1710***	0.0239	0.0479*	-0.055594	0.119529***
T-Stat	2.5213	3.099	0.4872	1.1590	-0.77671	2.35425

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 21: weekly estimated of capital flow and liquidity

Turnover regression	Jan 1995-Dec 2010	Before Asian Crisis Jan 1995-Dec1996	Asian Crisis Feb 1997-Jun1999	After Asian Crisis Jun 2000-May 2005	Subprime Crisis Jun 2008-May 2009	Stock market boom Jun 2009 -Dec2010
Turnover ratio						
Lag 1	0.729855**	0.667292***	0.660456***	0.794424***	0.653495***	0.709992***
T-Stat	[19.9631]	[5.95796]	[6.98795]	[12.1434]	[4.14978]	[6.20286]
Lag 2	0.039869	-0.07571	0.235995***	0.02724	-0.0694	0.075055
T-Stat	[0.87587]	[-0.69617]	[2.44779]	[0.41771]	[-0.45479]	[0.66152]
Lag 3	0.033435					
T-Stat	[0.73484]					
Net Flow						
Lag 1	17.60362***	3.957699	34.17286***	10.95466	-91.54099***	27.97426*
T-Stat	[2.23408]	[0.51640]	[2.04349]	[0.55539]	[-2.12526]	[1.16580]
Lag 2	-9.805674*	12.52092***	-30.93526***	-10.55247	81.45698***	-4.708375
T-Stat	[-1.14764]	[1.62050]	[-1.93418]	[-0.54646]	[1.89162]	[-0.19729]
Lag 3	8.316177					
T-Stat	[0.96923]					

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005	Period 4 Subprime Crisis Jun 2008-May 2009	Period 5 Stock market boom Jun 2009 -Dec2010
Turnover ratio						
Lag 1	-0.000174	0.000825	-0.000723**	-9.70E-05	2.94E-05	3.73E-04
T-Stat	[-1.02976]	[0.61160]	[-1.33453]	[-0.44979]	[0.04915]	[0.68122]
Lag 2	8.35E-05	-0.000702	0.000192	0.0000	-0.0004	-2.81E-05
T-Stat	[0.39706]	[-0.53607]	[0.34773]	[-0.16264]	[-0.70124]	[-0.05178]
Lag 3	-0.000248					
T-Stat	[-1.17950]					
Net Flow						
Lag 1	0.435219***	0.309893***	0.5399***	0.368449***	0.417702***	0.444425***
T-Stat	[11.9539]	[3.35785]	[5.62986]	[5.66525]	[2.55639]	[3.87609]
Lag 2	0.085532***	0.262826***	0.055243	0.113034**	0.199377*	0.073016
T-Stat	[2.16651]	[2.82479]	[0.60230]	[1.77525]	[1.22051]	[0.64029]
Lag 3	0.040049					
T-Stat	[1.01019]					

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 22: monthly estimated of capital flow and liquidity

Turnover regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005
Turnover ratio				
Lag 1	0.801898***	-0.110356	0.830595***	0.753535***
T-Stat	[10.8781]	[-0.38731]	[3.87660]	[5.43367]
Lag 2	-0.054797	0.11535	-0.303494	-0.073339
T-Stat	[-0.74482]	[0.46219]	[-1.36053]	[-0.53600]
Net Flow				
Lag 1	2.224482	5.846564**	5.557479*	-0.389245
T-Stat	[0.77463]	[1.78627]	[1.09958]	[-0.04791]
Lag 2	-1.634944	1.390485	-8.925549*	0.568718
T-Stat	[-0.57157]	[0.39349]	[-1.52005]	[0.07014]

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Flow regression	All Data Jan 1995-Dec 2010	Period 1 Before Asian Crisis Jan 1995-Dec1996	Period 2 Asian Crisis Feb 1997-Jun1999	Period 3 After Asian Crisis Jun 2000-May 2005
Turnover ratio				
Lag 1	0.000191	0.001763	-0.000287	0.002523
T-Stat	[0.10106]	[0.06656]	[-0.03192]	[1.05941]
Lag 2	-0.001421	-0.008372	-0.011307*	-0.0017
T-Stat	[-0.75347]	[-0.36076]	[-1.20990]	[-0.70668]
Net Flow				
Lag 1	0.110924**	0.010682	0.130328	-0.006687
T-Stat	[1.50658]	[0.03510]	[0.61550]	[-0.04793]
Lag 2	-0.009791	-0.178576	-0.171056	0.026595
T-Stat	[-0.13351]	[-0.54351]	[-0.69535]	[0.19102]

Notes: italic font represents standard deviation and ***,** and * means statistically significance at 99%,95% and 90%, respectively.

Table 23: Daily variance decomposition between foreign equity flow and SET return

SET decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.77938	0.220616	99.6519	0.348104	99.45621	0.543787	99.20077	0.799228	98.49141	1.508593	94.03725	5.962749
3	99.76027	0.239725	99.656	0.344001	98.92648	1.073521	99.10876	0.891242	98.01104	1.988959	93.98982	6.010181
4	99.75289	0.247108	99.43443	0.565565	98.8594	1.140602	99.09689	0.903109	97.69406	2.305938	93.97873	6.021274
5	99.72332	0.276684	99.43125	0.568747	98.51928	1.48072	99.08403	0.915967	97.69463	2.305375	93.82043	6.179571
6	99.68039	0.319613	99.43261	0.567392	98.32441	1.675593	98.87555	1.124448	97.65772	2.342282	93.75316	6.24684
7	99.66619	0.333809	97.63066	2.369335	98.23043	1.769568	98.83293	1.167067	97.63319	2.366814	93.74956	6.250437
8	99.65559	0.344415	96.28855	3.711447	98.18071	1.819293	98.83165	1.168349	97.63189	2.368108	93.74766	6.252338
9	99.64871	0.351288	96.198	3.801999	98.13814	1.861858	98.82835	1.171651	97.62983	2.370167	93.74503	6.254971
10	99.6441	0.355896	96.20049	3.799509	98.10865	1.891349	98.82779	1.172208	97.6287	2.371302	93.74471	6.255291

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	15.15434	84.84566	27.26709	72.73291	12.78679	87.21321	12.28569	87.71431	15.40245	84.59755	7.151246	92.84875
2	27.18237	72.81763	48.07498	51.92502	25.93725	74.06275	26.42145	73.57855	28.64672	71.35328	16.20838	83.79162
3	28.21818	71.78182	51.76522	48.23478	26.84037	73.15963	26.6658	73.3342	29.81463	70.18537	16.04561	83.95439
4	28.30311	71.69689	53.1649	46.8351	26.40865	73.59135	27.0274	72.9726	28.75379	71.24621	15.76496	84.23504
5	27.96798	72.03202	53.53856	46.46144	25.42934	74.57066	26.67204	73.32796	28.77631	71.22369	15.68373	84.31627
6	27.69995	72.30005	53.48761	46.51239	25.03693	74.96307	26.45433	73.54567	28.65328	71.34672	16.00493	83.99507
7	27.37173	72.62827	52.64367	47.35633	24.9065	75.0935	26.13105	73.86895	28.57422	71.42578	15.97633	84.02367
8	27.26329	72.73671	51.07807	48.92193	24.80003	75.19997	26.09142	73.90858	28.55866	71.44134	15.97417	84.02583
9	27.20067	72.79933	50.74899	49.25101	24.69935	75.30065	26.02342	73.97658	28.54317	71.45683	15.98946	84.01054
10	27.15641	72.84359	50.75907	49.24093	24.63532	75.36468	25.99449	74.00551	28.53561	71.46439	16.00637	83.99363

Table 24: Week decomposition between foreign equity flow and SET return

SET decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.832	0.1683	99.99991	8.78E-05	97.36662	2.6334	99.98616	0.01384	99.9503	0.0497	99.99127	0.00873
3	99.819	0.1809	98.15232	1.84768	97.41692	2.5831	99.9771	0.0229	99.9515	0.0486	99.9851	0.0149
4	99.815	0.1845	98.13458	1.86542	97.4657	2.5343	99.9731	0.0269	99.9502	0.0498	99.98404	0.01596
5	99.807	0.1935	98.01015	1.98985	97.36886	2.6311	99.97126	0.02874	99.9502	0.0498	99.98372	0.01628
6	99.805	0.1949	97.96154	2.03846	97.37545	2.6245	99.97053	0.02947	99.9502	0.0498	99.98357	0.01643
7	99.803	0.1969	97.92889	2.07111	97.37355	2.6265	99.97022	0.02978	99.9502	0.0498	99.98352	0.01648
8	99.801	0.1986	97.91479	2.08522	97.37007	2.6299	99.9701	0.0299	99.9502	0.0498	99.9835	0.0165
9	99.801	0.1992	97.90586	2.09414	97.37034	2.6297	99.97005	0.02995	99.9502	0.0498	99.98349	0.01651
10	99.8	0.1996	97.90131	2.09869	97.36997	2.63	99.97003	0.02997	99.9502	0.0498	99.98349	0.01651

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	33.519	66.481	62.41312	37.5869	37.6103	62.39	28.24464	71.7554	48.4128	51.587	33.98298	66.017
2	33.644	66.356	68.09745	31.9026	33.6434	66.357	28.07914	71.9209	43.3954	56.605	30.95531	69.0447
3	32.971	67.029	64.58733	35.4127	33.03654	66.963	26.44412	73.5559	45.1275	54.873	31.10402	68.896
4	32.186	67.814	65.05609	34.9439	31.71841	68.282	26.00425	73.9958	45.1252	54.875	31.18872	68.8113
5	31.736	68.264	64.92811	35.0719	31.11893	68.881	25.7923	74.2077	45.3974	54.603	31.1755	68.8245
6	31.484	68.516	64.92963	35.0704	30.82936	69.171	25.71225	74.2878	45.4565	54.543	31.17149	68.8285
7	31.364	68.636	64.90237	35.0976	30.71255	69.287	25.67913	74.3209	45.5011	54.499	31.17161	68.8284
8	31.296	68.704	64.90017	35.0998	30.65477	69.345	25.66593	74.3341	45.5152	54.485	31.17155	68.8285
9	31.247	68.753	64.89522	35.1048	30.63378	69.366	25.66058	74.3394	45.5223	54.478	31.17148	68.8285
10	31.22	68.78	64.89343	35.1066	30.62958	69.37	25.65843	74.3416	45.5248	54.475	31.17146	68.8285

Table 25: Monthly decomposition between foreign equity flow and SET return

SET decomposition

	All		Period 1		Period 2		Period 3	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	100	0	100	0	100	0	100	0
2	99.38974	0.610258	99.97069	2.93E-02	98.87004	1.129957	99.99858	0.001422
3	99.37553	0.624465	95.73869	4.261314	93.74557	6.254433	99.96667	0.033327
4	99.3752	0.624803	95.23637	4.76363	93.31068	6.689316	99.96654	0.033462
5	99.37518	0.624816	94.46964	5.530362	93.31238	6.687622	99.96515	0.03485
6	99.37518	0.624818	93.9508	6.0492	93.31345	6.686545	99.96512	0.03488
7	99.37518	0.624818	93.94719	6.052808	93.30476	6.695236	99.96508	0.034915
8	99.37518	0.624818	93.77036	6.229636	93.30209	6.697908	99.96508	0.034917
9	99.37518	0.624818	93.7507	6.249295	93.30189	6.698112	99.96508	0.034918
10	99.37518	0.624818	93.73088	6.269118	93.30187	6.698129	99.96508	0.034918

Flow decomposition

	All		Period 1		Period 2		Period 3	
Period	RET	FLOW	RET	FLOW	RET	FLOW	RET	FLOW
1	4.426209	95.57379	35.6527	64.3473	20.98428	79.01572	9.111469	90.88853
2	4.930992	95.06901	42.22833	57.77167	20.31396	79.68604	13.78124	86.21876
3	6.069388	93.93061	46.25375	53.74625	22.27697	77.72303	15.83494	84.16506
4	6.087597	93.9124	46.12295	53.87705	22.36777	77.63223	16.1925	83.8075
5	6.088529	93.91147	46.96096	53.03904	22.34687	77.65313	16.32357	83.67643
6	6.088549	93.91145	46.96511	53.03489	22.34064	77.65936	16.33883	83.66117
7	6.088552	93.91145	46.98741	53.01259	22.34424	77.65576	16.34299	83.65701
8	6.088553	93.91145	47.0755	52.9245	22.34491	77.65509	16.34346	83.65654
9	6.088553	93.91145	47.0534	52.9466	22.34483	77.65517	16.34357	83.65643
10	6.088553	93.91145	47.07479	52.92521	22.34481	77.65519	16.34358	83.65642

Table 26: Daily variance decomposition between foreign equity flow and volatility

Volatility decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.78692	0.21308	99.66702	0.332983	99.82001	0.179994	99.99914	0.000864	99.78698	0.213016	99.36079	0.639206
3	99.64906	0.350943	99.66159	0.338415	99.79215	0.207846	99.99322	0.006784	96.74083	3.259167	97.71245	2.287554
4	99.59949	0.40051	98.85833	1.141667	99.43778	0.562215	99.71411	0.285886	96.23643	3.763571	97.65109	2.34891
5	99.51273	0.487273	98.45069	1.549314	99.24566	0.754338	99.65016	0.349837	95.60617	4.393826	97.21908	2.780916
6	99.44233	0.557672	97.81315	2.18685	99.16536	0.834635	99.33962	0.66038	95.21	4.790002	96.83696	3.163039
7	99.37204	0.62796	96.99821	3.001793	99.10468	0.895316	99.09947	0.900528	95.02529	4.974705	96.69667	3.303333
8	99.27256	0.727445	96.53669	3.463309	99.06515	0.934854	98.9404	1.0596	94.9148	5.085204	96.5586	3.441401
9	99.24977	0.75023	96.46507	3.534934	99.04035	0.959654	98.8305	1.1695	94.86225	5.137749	96.46558	3.534417
10	99.2079	0.792098	96.08965	3.910353	99.02386	0.976142	98.71699	1.283008	94.83775	5.162248	96.41539	3.584611

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	0.014394	99.98561	0.012933	99.98707	6.08551	93.91449	0.112498	99.8875	0.526638	99.47336	0.484568	99.51543
2	1.005753	98.99425	0.262458	99.73754	11.1819	88.8181	1.071952	98.92805	0.823885	99.17611	0.452049	99.54795
3	1.316469	98.68353	0.356965	99.64304	11.65609	88.34391	1.538834	98.46117	1.358372	98.64163	0.555265	99.44473
4	1.335438	98.66456	0.343772	99.65623	11.4276	88.5724	1.632845	98.36716	1.542755	98.45725	0.526295	99.4737
5	1.387317	98.61268	1.011147	98.98885	11.08524	88.91476	1.608294	98.39171	1.779159	98.22084	0.515449	99.48455
6	1.429087	98.57091	1.724918	98.27508	10.91219	89.08781	1.620174	98.37983	1.994566	98.00543	0.514192	99.48581
7	1.429925	98.57007	1.678498	98.3215	10.82113	89.17887	1.717025	98.28297	2.11498	97.88502	0.510806	99.48919
8	1.41793	98.58207	1.63044	98.36956	10.76828	89.23172	1.711033	98.28897	2.191706	97.80829	0.508997	99.491
9	1.403456	98.59654	1.602013	98.39799	10.72969	89.27031	1.707905	98.2921	2.233657	97.76634	0.508058	99.49194
10	1.39978	98.60022	1.58752	98.41248	10.70576	89.29424	1.709103	98.2909	2.254935	97.74507	0.50756	99.49244

Table 27: Weekly variance decomposition between foreign equity flow and volatility

Volatility decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.803	0.1969	98.21179	1.78821	97.22961	2.7704	99.27153	0.72847	93.7389	6.2611	98.30784	1.69216
3	99.46	0.5396	96.5858	3.4142	97.28745	2.7125	97.90171	2.09829	93.1982	6.8018	98.11511	1.88489
4	99.451	0.5488	95.74678	4.25322	97.23418	2.7658	97.92869	2.07131	92.5814	7.4186	98.12635	1.87365
5	99.392	0.6078	95.319	4.681	97.22541	2.7746	97.74791	2.25209	92.0758	7.9242	98.06569	1.93431
6	99.358	0.6424	95.1098	4.8902	97.22573	2.7743	97.20457	2.79543	91.8354	8.1646	98.05416	1.94584
7	99.341	0.6588	95.00602	4.99398	97.2228	2.7772	97.21522	2.78478	91.6725	8.3275	98.03885	1.96116
8	99.329	0.6713	94.95487	5.04513	97.22239	2.7776	97.22563	2.77437	91.5755	8.4245	98.03278	1.96722
9	99.322	0.6785	94.92955	5.07045	97.2218	2.7782	97.17666	2.82334	91.519	8.481	98.0297	1.97031
10	99.317	0.6827	94.91704	5.08296	97.22165	2.7784	97.13753	2.86247	91.4849	8.5151	98.02848	1.97152

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	0.0011	99.999	0.061631	99.9384	11.5467	88.453	0.064819	99.9352	0.38029	99.62	2.447093	97.5529
2	0.9318	99.068	0.238578	99.7614	11.82419	88.176	1.193462	98.8065	8.18933	91.811	3.9201	96.0799
3	0.9343	99.066	0.267904	99.7321	12.34927	87.651	1.721191	98.2788	7.72311	92.277	11.11481	88.8852
4	1.0599	98.94	0.300405	99.6996	12.53952	87.46	2.4263	97.5737	7.26132	92.739	13.4814	86.5186
5	1.0698	98.93	0.311528	99.6885	12.64885	87.351	6.539653	93.4604	7.08088	92.919	15.45255	84.5475
6	1.1188	98.881	0.317991	99.682	12.69084	87.309	7.24885	92.7512	7.03247	92.968	16.2484	83.7516
7	1.1722	98.828	0.320879	99.6791	12.70958	87.29	9.194013	90.806	7.00054	92.999	16.63802	83.362
8	1.2069	98.793	0.322365	99.6776	12.71662	87.283	9.614354	90.3857	6.99069	93.009	16.78792	83.2121
9	1.2342	98.766	0.323081	99.6769	12.71942	87.281	9.721468	90.2785	6.98795	93.012	16.84424	83.1558
10	1.2526	98.747	0.323439	99.6766	12.72045	87.28	9.766867	90.2331	6.98683	93.013	16.86285	83.1372

Table 28: Monthly variance decomposition between foreign equity flow and volatility

Volatility decomposition

	All		Period 1		Period 2		Period 3	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	100	0	100	0	100	0	100	0
2	99.12039	0.879615	94.99256	5.007444	91.44825	8.55175	93.38573	6.614268
3	97.45122	2.54878	88.52932	11.47068	91.18331	8.816693	89.18422	10.81578
4	97.20042	2.799575	87.23172	12.76828	90.53404	9.465962	89.20344	10.79656
5	97.09782	2.902181	86.72224	13.27776	90.5407	9.459296	89.22767	10.77233
6	97.07743	2.922568	85.9891	14.0109	90.51459	9.485409	89.16275	10.83725
7	97.06802	2.931979	85.47012	14.52988	90.5149	9.485102	89.15604	10.84396
8	97.06489	2.935111	85.07117	14.92883	90.51381	9.486189	89.15592	10.84408
9	97.0637	2.936295	84.78726	15.21274	90.51381	9.486186	89.15583	10.84417
10	97.06331	2.936695	84.53846	15.46154	90.51377	9.486229	89.15547	10.84453

Flow decomposition

	All		Period 1		Period 2		Period 3	
Period	Vola	FLOW	Vola	FLOW	Vola	FLOW	Vola	FLOW
1	2.569818	97.43018	0.099814	99.90019	10.08045	89.91955	4.135712	95.86429
2	2.553619	97.44638	1.020211	98.97979	10.09106	89.90894	4.467167	95.53283
3	3.318682	96.68132	1.149827	98.85017	10.6131	89.3869	8.250437	91.74956
4	3.500601	96.4994	1.470002	98.53	10.61327	89.38673	8.228888	91.77111
5	3.551995	96.448	1.690408	98.30959	10.63517	89.36483	8.213144	91.78686
6	3.566429	96.43357	2.072588	97.92741	10.63488	89.36512	8.234681	91.76532
7	3.572196	96.4278	2.42191	97.57809	10.63584	89.36416	8.24399	91.75601
8	3.574251	96.42575	2.846699	97.1533	10.63582	89.36418	8.243674	91.75633
9	3.574989	96.42501	3.292698	96.7073	10.63586	89.36414	8.243658	91.75634
10	3.575244	96.42476	3.807008	96.19299	10.63586	89.36414	8.243842	91.75616

Table 29: Daily variance decomposition between foreign equity flow and liquidity

Turnover decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	Turn
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.94173	0.058274	99.95551	0.044486	99.92352	0.076479	99.94708	0.052916	99.92477	0.075234	99.99999	1.11E-05
3	99.92332	0.07668	99.95595	0.044047	99.88112	0.118881	99.93024	0.069762	99.77627	0.223725	99.99503	0.004971
4	99.71529	0.284706	99.7804	0.219596	99.6809	0.319101	99.5511	0.448903	99.78896	0.211039	99.96553	0.034474
5	99.60559	0.394413	99.73027	0.26973	99.70589	0.294106	99.46396	0.53604	99.80088	0.199122	99.94599	0.054009
6	99.61566	0.384344	99.71965	0.280352	99.69773	0.302271	99.363	0.637001	98.71355	1.286452	99.93047	0.069528
7	99.63547	0.364534	98.97185	1.028146	99.68433	0.315673	99.35295	0.64705	97.74494	2.255064	99.90828	0.091717
8	99.64919	0.350811	98.23944	1.760565	99.69036	0.309637	99.35473	0.645272	96.65302	3.346976	99.88822	0.111781
9	99.66653	0.333475	97.64901	2.350988	99.68144	0.318564	99.36525	0.634746	96.01023	3.989767	99.87054	0.129456
10	99.68091	0.319093	97.17329	2.82671	99.65989	0.340105	99.36367	0.636325	95.34926	4.650739	99.85434	0.145663

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW
1	5.121657	94.87834	8.933126	91.06687	12.71124	87.28876	0.085472	99.91453	1.648954	98.35105	0.644535	99.35546
2	6.859332	93.14067	12.05476	87.94524	12.79719	87.20281	0.367074	99.63293	6.400028	93.59997	0.780509	99.21949
3	6.839486	93.16051	14.49547	85.50453	12.47809	87.52191	0.383243	99.61676	6.003428	93.99657	0.894003	99.106
4	6.857948	93.14205	14.47156	85.52844	12.20712	87.79288	0.591148	99.40885	6.924903	93.0751	1.201595	98.7984
5	6.781945	93.21806	14.7558	85.2442	11.85717	88.14283	0.88827	99.11173	9.097426	90.90257	1.464071	98.53593
6	6.716846	93.28315	14.72623	85.27377	11.63705	88.36295	1.174762	98.82524	9.181094	90.81891	1.703962	98.29604
7	6.766702	93.2333	14.46037	85.53963	11.51777	88.48223	1.209864	98.79014	9.124574	90.87543	1.948068	98.05193
8	6.699757	93.30024	14.60991	85.39009	11.48261	88.51739	1.247891	98.75211	9.213841	90.78616	2.168341	97.83166
9	6.638781	93.36122	14.84865	85.15135	11.4869	88.5131	1.27482	98.72518	9.219596	90.7804	2.364486	97.63551
10	6.602509	93.39749	15.01158	84.98842	11.52157	88.47843	1.294107	98.70589	9.245951	90.75405	2.539362	97.46064

Table 30: weekly variance decomposition between foreign equity flow and liquidity

Turnover decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW
1	100	0	100	0	100	0	100	0	100	0	100	0
2	99.614	0.3864	99.89894	0.10106	97.77951	2.2205	99.92743	0.07257	92.6772	7.3228	98.83733	1.16267
3	99.565	0.4346	98.44263	1.55737	98.12401	1.876	99.94029	0.05971	93.0091	6.9909	98.15608	1.84392
4	99.345	0.655	97.24921	2.75079	98.30876	1.6912	99.9474	0.0526	93.2103	6.7897	97.58053	2.41947
5	99.306	0.6939	96.27319	3.72681	98.46517	1.5348	99.95144	0.04856	93.2809	6.7191	97.15821	2.84179
6	98.972	1.028	95.65976	4.34024	98.58143	1.4186	99.95362	0.04638	93.2746	6.7254	96.85453	3.14547
7	98.398	1.6021	95.29144	4.70856	98.66878	1.3312	99.95479	0.04521	93.2433	6.7567	96.64074	3.35927
8	98.378	1.6223	95.08786	4.91214	98.73523	1.2648	99.95543	0.04457	93.2115	6.7885	96.49189	3.50811
9	98.433	1.5666	94.97935	5.02065	98.78652	1.2135	99.9558	0.0442	93.1876	6.8124	96.389	3.611
10	98.444	1.5562	94.92373	5.07627	98.82667	1.1733	99.95601	0.04399	93.1721	6.8279	96.31819	3.68181

Flow decomposition

	All		Period 1		Period 2		Period 3		Period 4		Period 5	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW
1	8.1242	91.876	33.94145	66.0586	10.00533	89.995	8.287442	91.7126	17.5722	82.428	0.293598	99.7064
2	7.508	92.492	35.66861	64.3314	8.071254	91.929	7.851229	92.1488	17.7662	82.234	1.105829	98.8942
3	7.2983	92.702	35.67876	64.3212	7.533942	92.466	7.533533	92.4665	16.4123	83.588	1.7921	98.2079
4	7.1307	92.869	35.7117	64.2883	7.621648	92.378	7.439964	92.56	15.6623	84.338	2.404992	97.595
5	7.0923	92.908	35.65192	64.3481	8.072395	91.928	7.449174	92.5508	15.3281	84.672	2.890662	97.1093
6	7.1147	92.885	35.61861	64.3814	8.689674	91.31	7.501635	92.4984	15.204	84.796	3.256202	96.7438
7	7.1062	92.894	35.59514	64.4049	9.350932	90.649	7.561915	92.4381	15.1739	84.826	3.521659	96.4783
8	7.4715	92.529	35.58279	64.4172	9.987393	90.013	7.615688	92.3843	15.1775	84.822	3.710296	96.2897
9	7.4787	92.521	35.57615	64.4239	10.56657	89.433	7.658676	92.3413	15.1889	84.811	3.842499	96.1575
10	7.6036	92.396	35.57286	64.4271	11.07693	88.923	7.691111	92.3089	15.1991	84.801	3.934337	96.0657

Table 31: monthly variance decomposition between foreign equity flow and liquidity

Turnover decomposition

	All		Period 1		Period 2		Period 3	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW
1	100	0	100	0	100	0	100	0
2	99.80465	0.195349	82.73105	17.26895	96.85275	3.147255	99.99724	0.002758
3	99.83347	0.166525	82.88859	17.11141	95.9758	4.024199	99.9964	0.003603
4	99.84725	0.15275	82.94661	17.05339	92.18209	7.817911	99.99584	0.004162
5	99.8536	0.146397	82.88274	17.11726	91.11596	8.884036	99.99554	0.00446
6	99.85675	0.143254	82.88178	17.11822	91.11293	8.887066	99.99541	0.004585
7	99.85835	0.141648	82.88183	17.11817	90.98602	9.013976	99.99536	0.004637
8	99.85919	0.140815	82.88175	17.11825	90.98557	9.014431	99.99534	0.004658
9	99.85962	0.140379	82.8817	17.1183	90.96151	9.038492	99.99533	0.004667
10	99.85985	0.14015	82.8817	17.1183	90.93399	9.066011	99.99533	0.004671

Flow decomposition

	All		Period 1		Period 2		Period 3	
Period	Turn	FLOW	Turn	FLOW	Turn	FLOW	Turn	FLOW
1	0.678038	99.32196	27.24154	72.75846	1.166382	98.83362	3.301553	96.69845
2	0.696831	99.30317	27.28306	72.71694	1.189632	98.81037	5.311478	94.68852
3	0.925963	99.07404	28.97892	71.02108	7.173182	92.82682	5.337171	94.66283
4	1.130757	98.86924	28.94968	71.05032	12.0313	87.9687	5.338395	94.66161
5	1.243832	98.75617	28.95349	71.04651	12.6893	87.3107	5.338419	94.66158
6	1.302518	98.69748	28.96017	71.03983	12.61299	87.38701	5.338469	94.66153
7	1.333208	98.66679	28.96051	71.03949	12.67295	87.32705	5.3385	94.6615
8	1.349369	98.65063	28.96054	71.03946	12.67195	87.32805	5.338514	94.66149
9	1.357897	98.6421	28.96055	71.03945	12.71285	87.28715	5.33852	94.66148
10	1.362398	98.6376	28.96056	71.03944	12.7339	87.2661	5.338522	94.66148

Table 32 : Pairwise Granger Causality test between capital flow and return

Daily

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*	*0.0000*
Chi-sq	352.4749	114.1178	66.8989	150.6638	28.6867	29.13445
DF	6	8	4	6	3	4
Return as a Dependent Variable						
P-value	0.0371	*0.0004*	*0.0529*	0.0176	*0.0683*	*0.0000*
Chi-sq	13.404	28.2889	9.3505	15.3657	7.116	25.5454
DF	6	8	4	6	3	4

Weekly

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0206*	*0.0127*	*0.3319*	*0.0585*	*0.4869*	*0.6836*
Chi-sq	11.6034	8.7284	3.4156	5.6789	1.4396	0.7607
DF	4	2	3	2	2	2
Return as a Dependent Variable						
P-value	0.7814	*0.0886*	*0.3239*	0.9658	*0.9885*	*0.9914*
Chi-sq	1.7511	4.8463	3.4763	0.0697	0.0232	0.0173
DF	4	2	3	2	2	2

Monthly

	Full sample	Phase1	Phase 2	Phase 3
Flow as a Dependent Variable				
P-value	*0.1975*	*0.1227*	*0.7239*	*0.0789*
Chi-sq	3.2445	4.1960	0.6463	5.0804
DF	2	2	2	2
Return as a Dependent Variable				
P-value	0.5564	*0.6227*	*0.5162*	0.9893
Chi-sq	1.1725	0.9475	1.3227	0.0215
DF	2	2	2	2

Table 33 : Pairwise Granger Causality test between capital flow and volatility

Daily

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0000*	0.2033	*0.0008*	0.0144	0.1927	0.7972
Chi-sq	46.1337	8.5064	18.9525	15.8824	4.729188	1.0169
DF	8	6	4	6	3	3
Volatility as a Dependent Variable						
P-value	*0.0196*	*0.0055*	*0.3012*	0.0719	*0.0316*	*0.0243*
Chi-sq	8	18.3152	4.8671	11.5831	8.833597	9.408385
DF	18.2338	6	4	6	3	3

Weekly

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0033*	0.8551	*0.9478*	*0.0016*	0.0410	0.0589
Chi-sq	13.7522	0.3130	0.1071	21.3137	6.3860	5.6624
DF	3	2	2	6	2	2
Volatility as a Dependent Variable						
P-value	*0.2479*	*0.0675*	*0.1543*	0.3057	*0.1484*	*0.3748*
Chi-sq	4.1290	5.3926	3.7376	7.1671	3.8157	1.9626
DF	3	2	2	6	2	2

Monthly

	Full sample	Phase1	Phase 2	Phase 3
Flow as a Dependent Variable				
P-value	*0.3816*	0.8915	*0.8236*	*0.2591*
Chi-sq	1.9270	0.2296	0.3883	2.7009
DF	2	2	2	2
Volatility as a Dependent Variable				
P-value	*0.0197*	0.3764	*0.3606*	0.0427
Chi-sq	7.8515	1.9540	2.0398	6.3088
DF	2	2	2	2

Table 34 : Pairwise Granger Causality test between capital flow and market liquidity

Daily

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0000*	0.0387	*0.2968*	*0.5581*	0.0019	0.4832
Chi-sq	18.412	13.2903	4.9089	4.888	19.0145	2.45653
DF	8	6	4	6	5	3
Turn as a Dependent Variable						
P-value	*0.0183*	*0.0356*	*0.2772*	0.5261	*0.1511*	*0.9290*
Chi-sq	41.8356	13.5149	5.1002	5.1390	8.0941	0.4536
DF	8	6	4	6	5	3

Weekly

	Full sample	Phase1	Phase 2	Phase 3	Phase 4	Phase 5
Flow as a Dependent Variable						
P-value	*0.0215*	0.8145	*0.1367*	*0.5727*	0.4911	0.6083
Chi-sq	17.9656	0.4105	3.9805	1.1148	1.4224	0.9941
DF	8	2	3	2	2	2
Turn as a Dependent Variable						
P-value	*0.0141*	*0.1365*	*0.0818*	0.8076	*0.0605*	*0.4670*
Chi-sq	19.1540	3.9834	5.0058	0.4273	5.6098	1.5227
DF	8	2	3	2	2	2

Monthly

	Full sample	Phase1	Phase 2	Phase 3
Flow as a Dependent Variable				
P-value	*0.5734*	0.9353	*0.3175*	*0.5695*
Chi-sq	1.1124	0.1338	2.2946	1.1260
DF	2	2	2	2
Turn as a Dependent Variable				
P-value	*0.6573*	*0.2025*	*0.2255*	0.9964
Chi-sq	0.8392	3.1942	2.9790	0.0072
DF	2	2	2	2

Appendix A:

AIC and BIC criteria

The Akaike information criterion (AIC) and Bayesian information criterion (BIC) is a measure of the relative goodness of fit of a statistical models developed by Akaike (1974) and Schwarz (1978), respectively. They are grounded in the concept of information entropy, in effect offering a relative measure of the information lost when a given model is used to describe reality. Both models can be said to describe the tradeoff between bias and variance in model construction, or loosely speaking between accuracy and complexity of the model.

In derivation for both AIC and BIC, the lag length for the VAR(p) model may be determined using model selection criteria. The general approach is to fit VAR(p) models with orders p = 0, ..., pmax and choose the value of p which minimizes some model selection criteria. Model selection criteria for VAR(p) models have the form

$$IC(p) = \ln |\sum(p)| + c_t * \theta(n,p)$$

where $|\sum(p)| = T^{-1} \sum_{t=1}^{T} \hat{\varepsilon_t} \hat{\varepsilon_t}^{/}$ is the residual covariance matrix without a degrees of freedom correction from a VAR (p) model, c_t is a sequence indexed by the sample size T, and $\theta(n,p)$ is a penalty function which penalizes large VAR(p) models. From the folloing derivation, the AIC and BIC are:

$$AIC(p) = \ln |\sum(p)| + \frac{2}{T} pn^2$$

$$BIC(p) = \ln |\sum(p)| + \frac{lnT}{T} pn^2$$

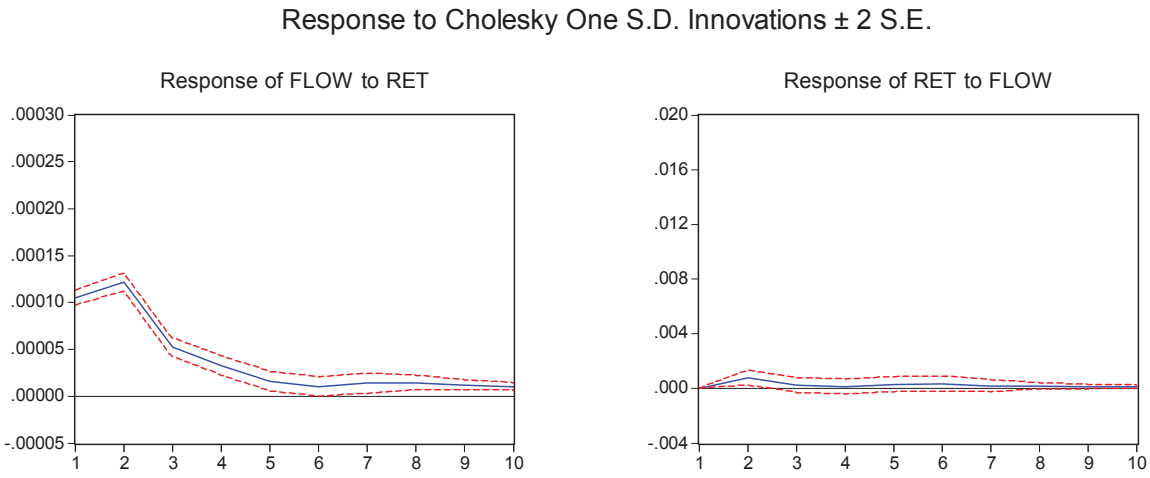
From the derivation above, it is obvious to see that the penalty term in the BIC criteria will be higher than the AIC criteria.

Appendix B: The impulse response function in all periods and data frequencies

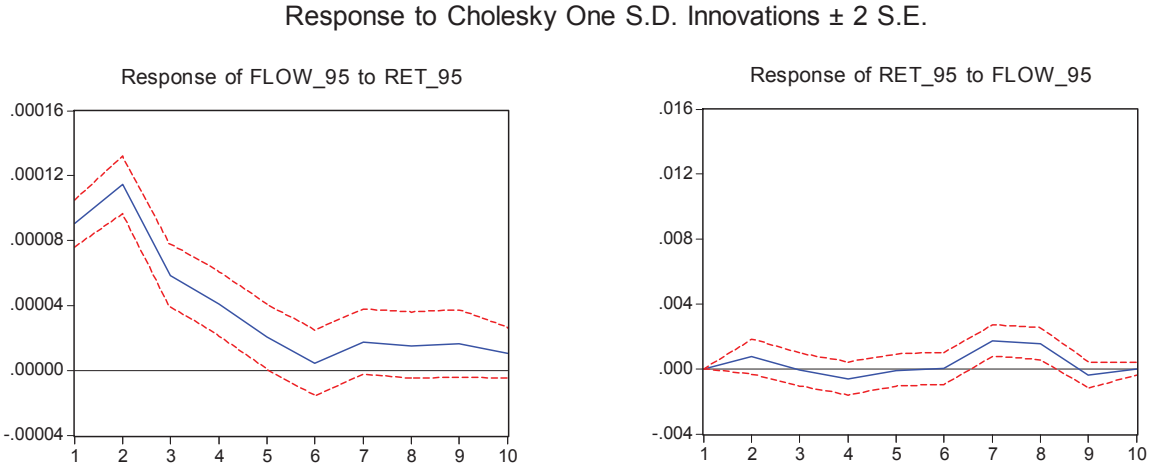
B.1 impulse response function between foreign equity flow and SET return

B.1.1 Daily data

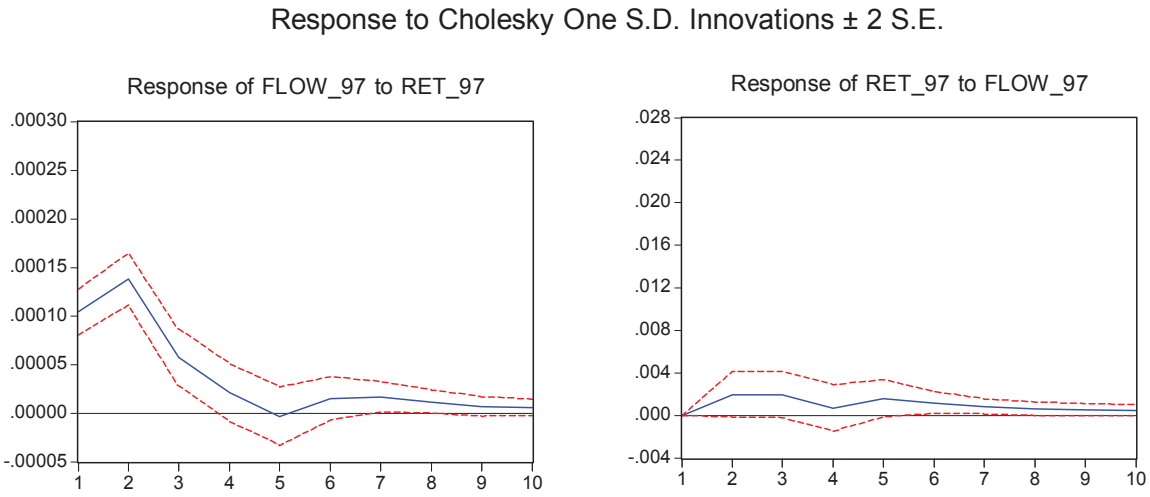
Full sample



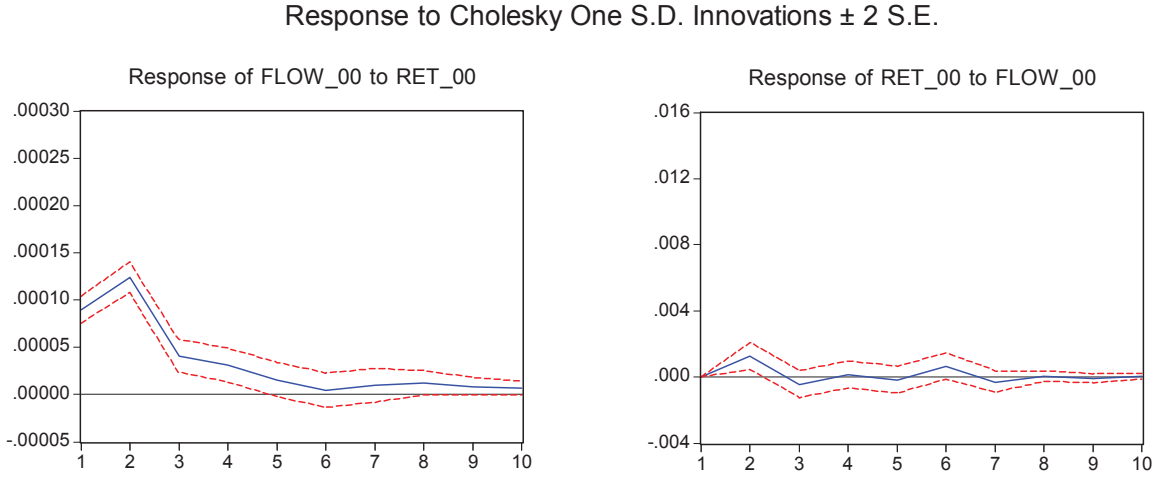
Before Asian crisis



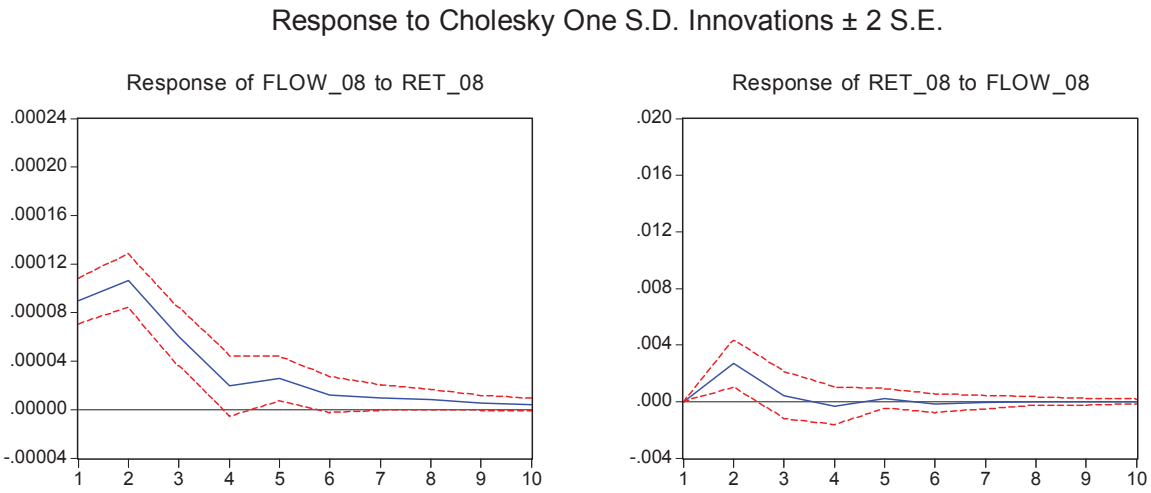
Asian Crisis Period



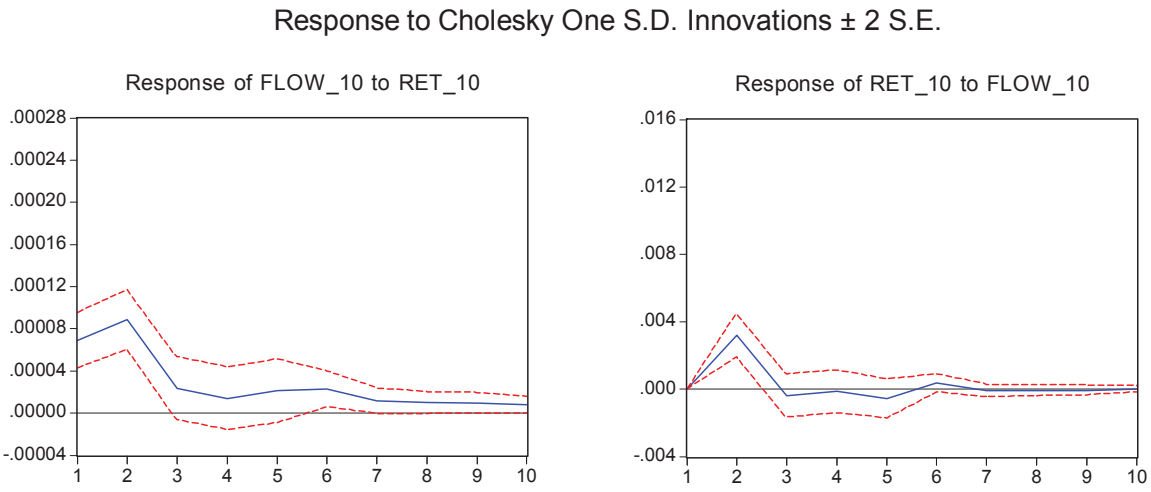
After Asian Crisis



Subprime Crisis

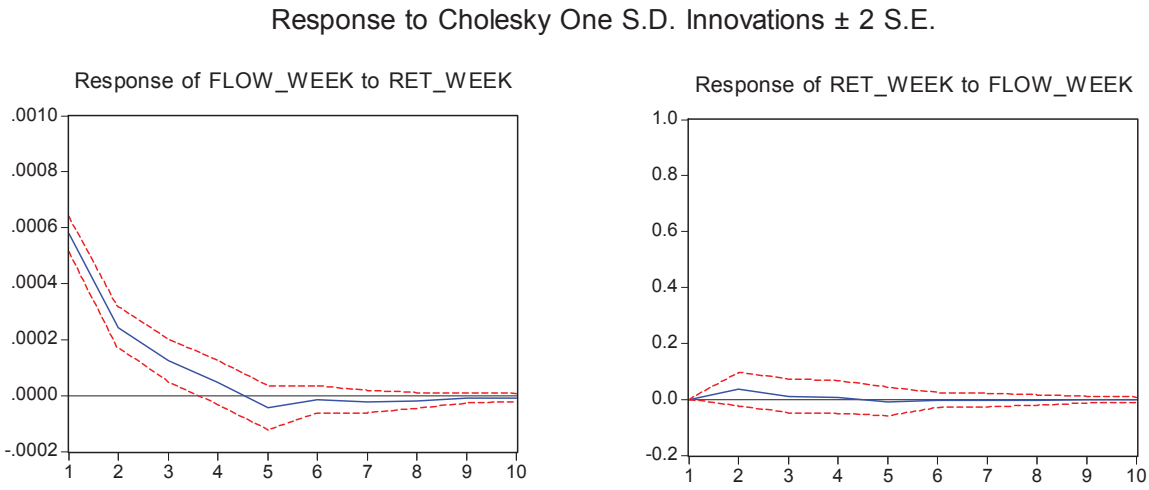


Stock boom period

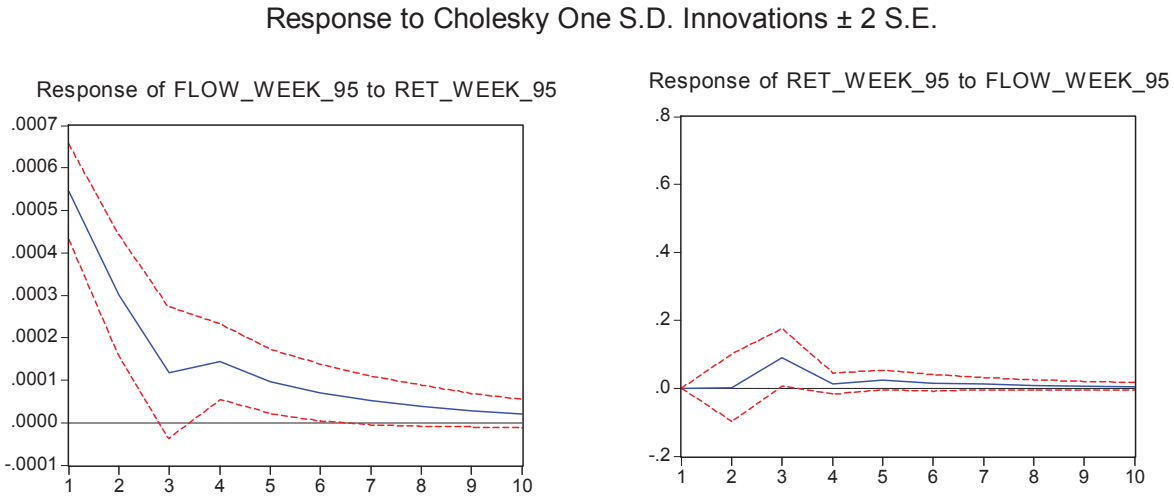


B.1.2 Weekly data

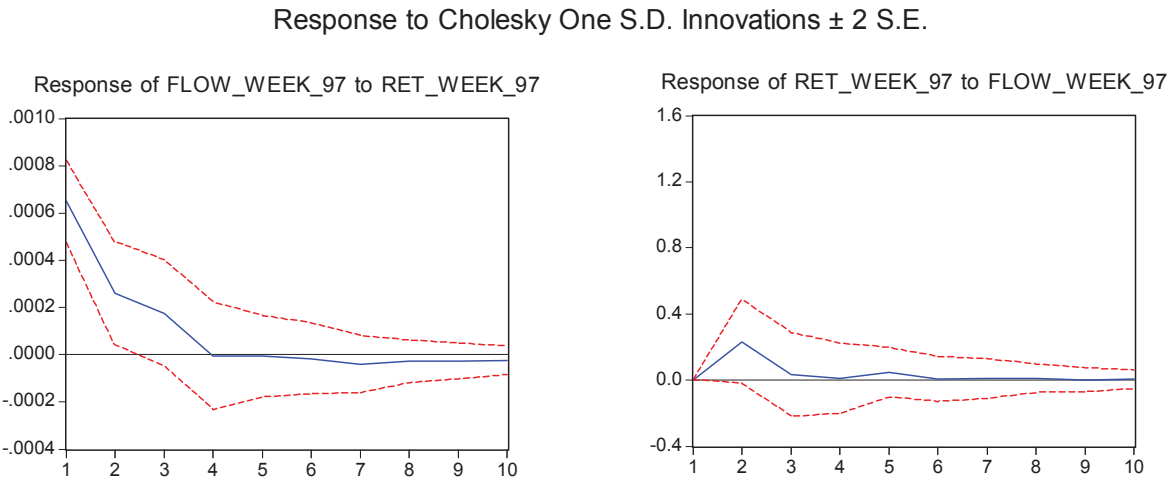
Full sample period



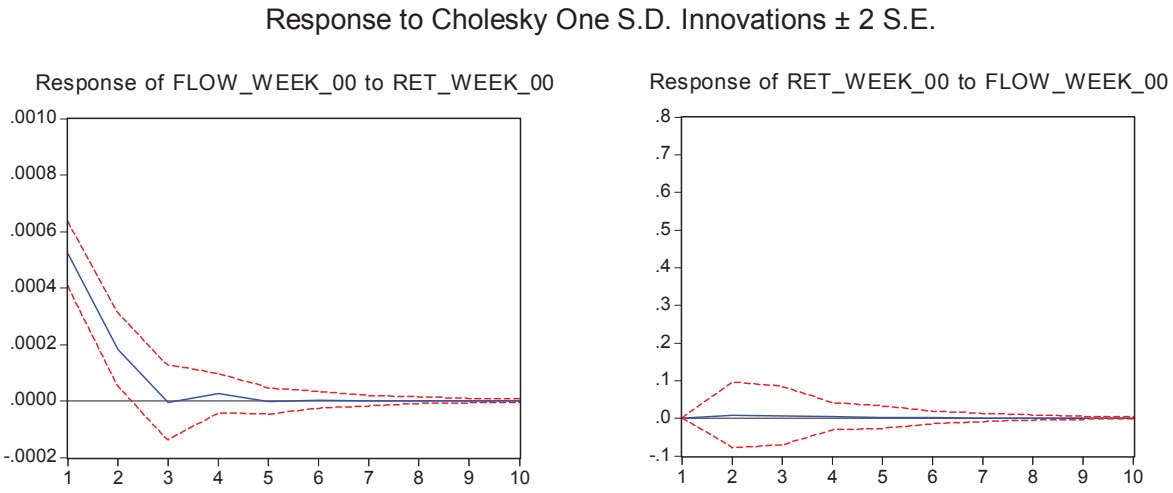
Pre Asian crisis



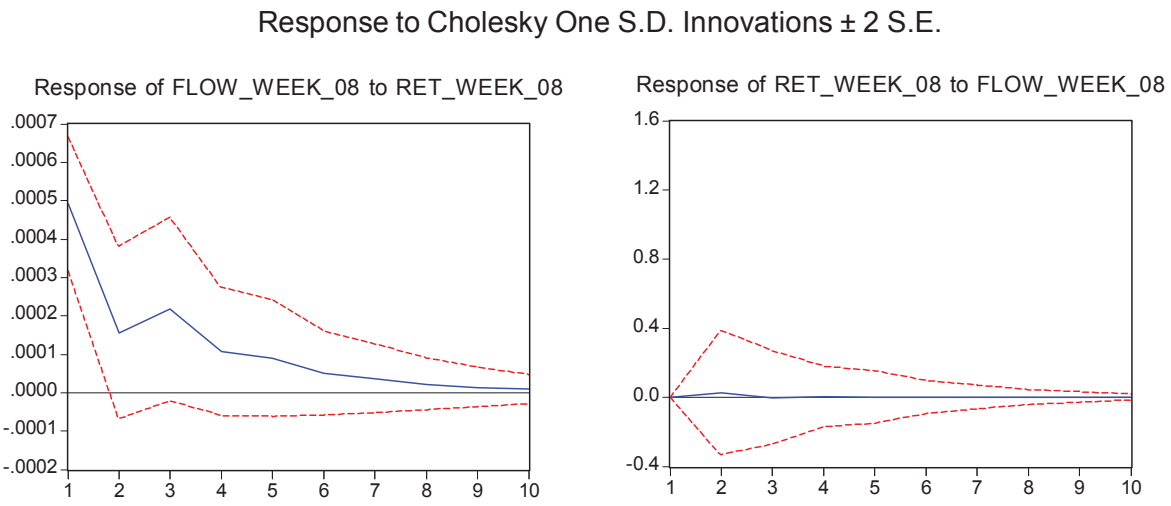
Asian crisis



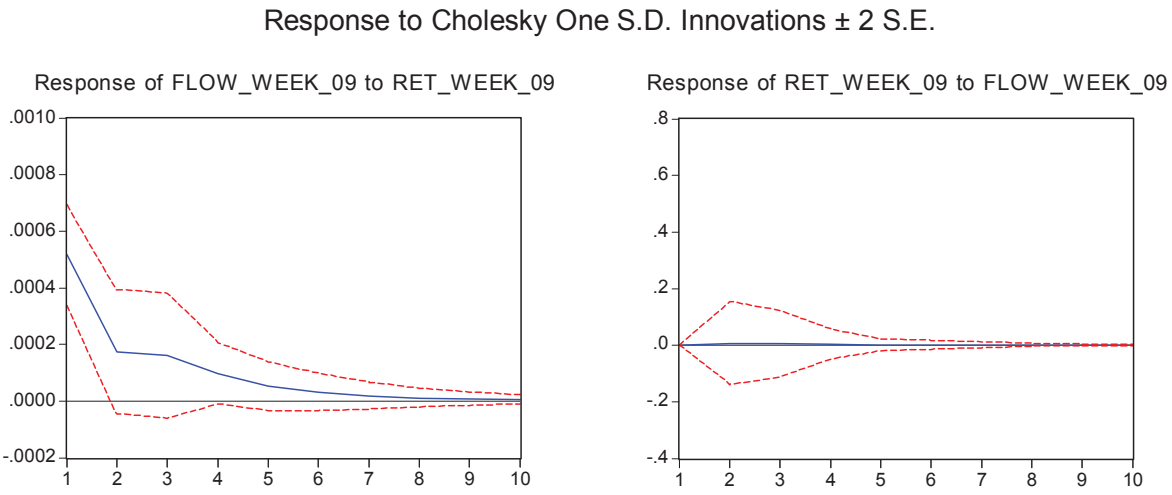
After Asian crisis



Subprime crisis

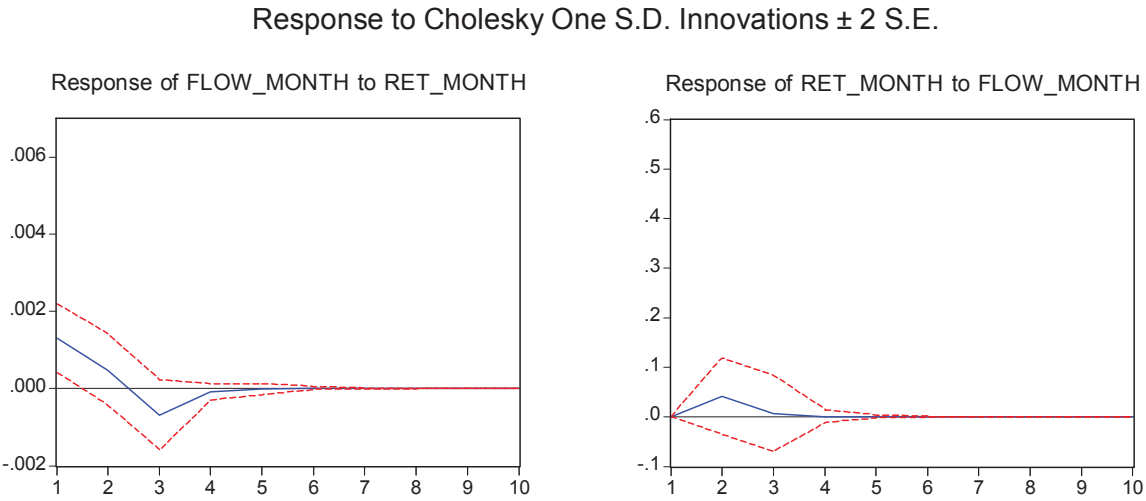


Stock boom period

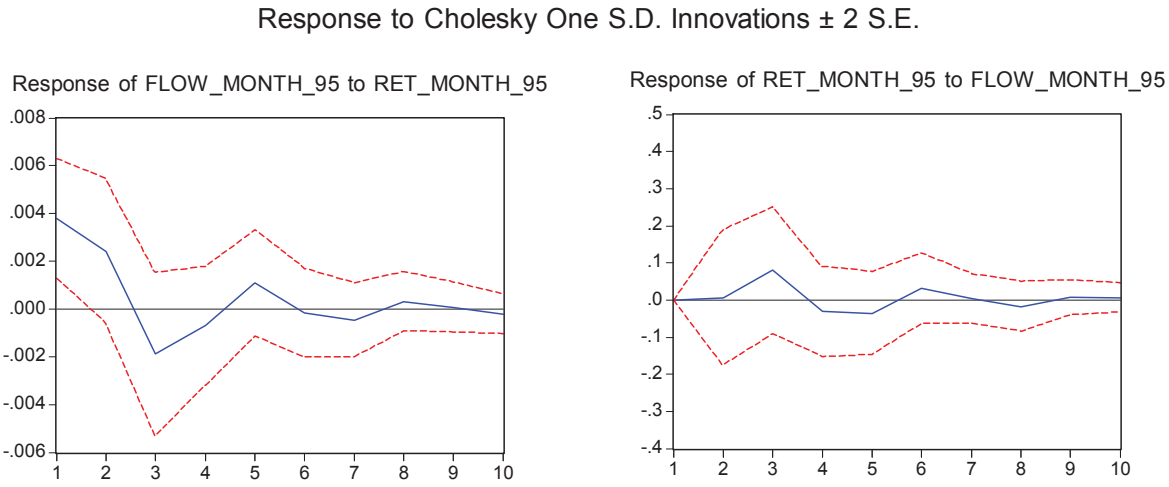


B.1.3Monthly return

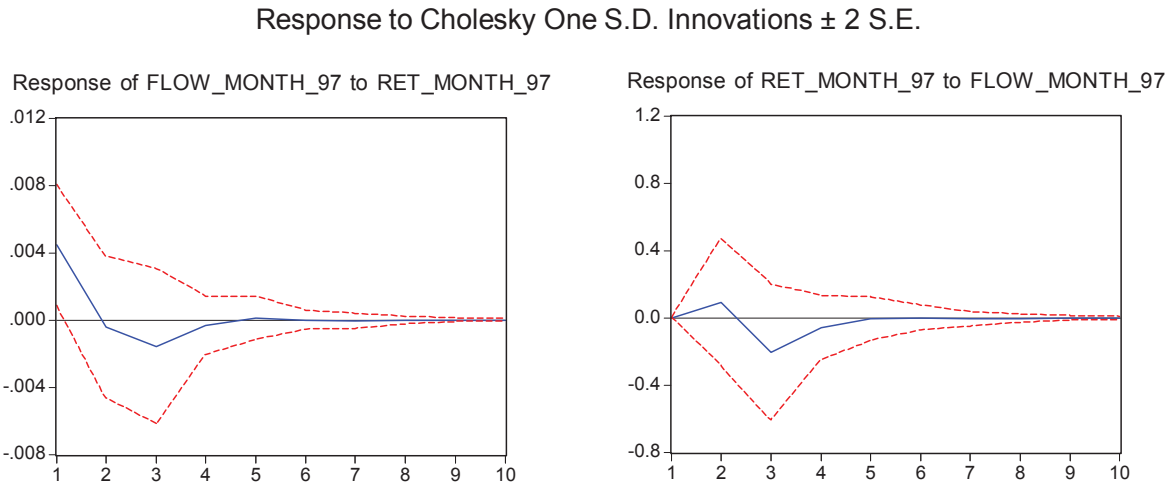
Full sample period



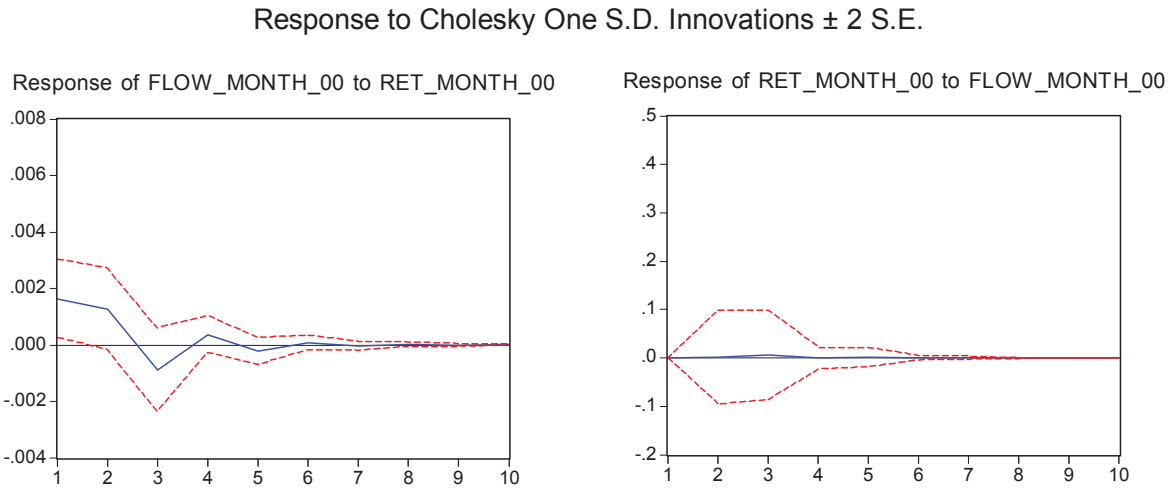
Monthly before crisis



Monthly Asian crisis



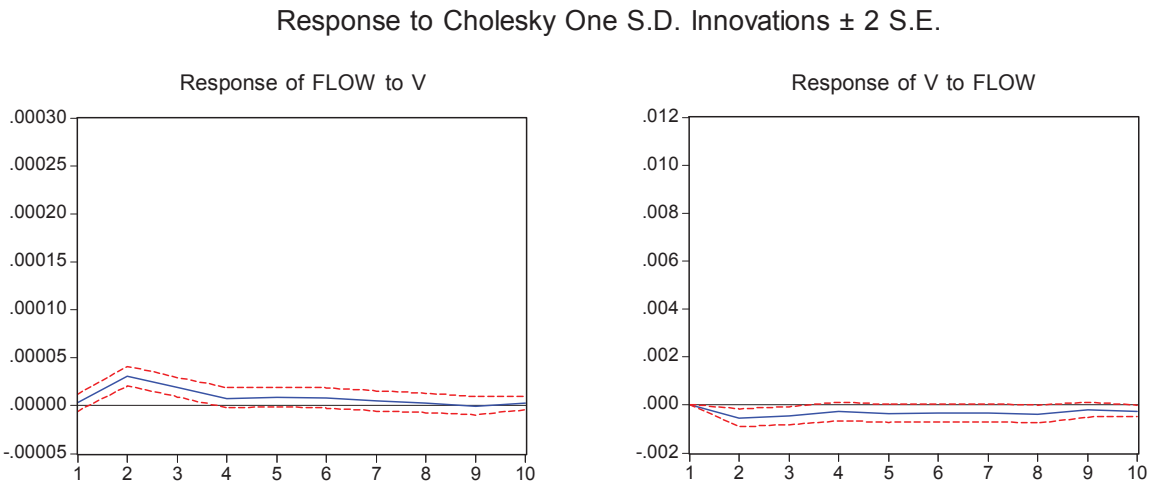
Monthly after Asian crisis



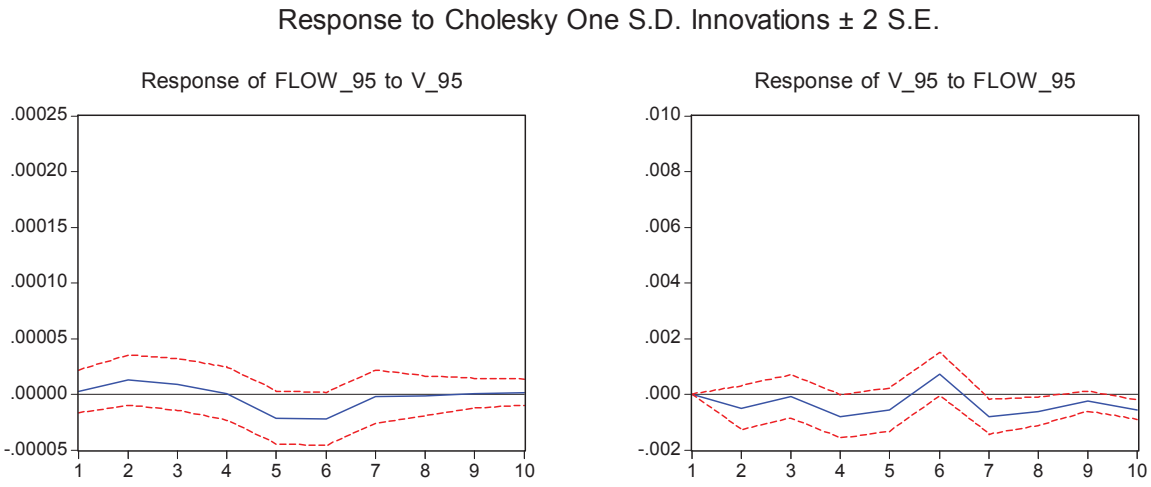
B.2 impulse response function between foreign equity flow and volatility

B.2.1 Daily data

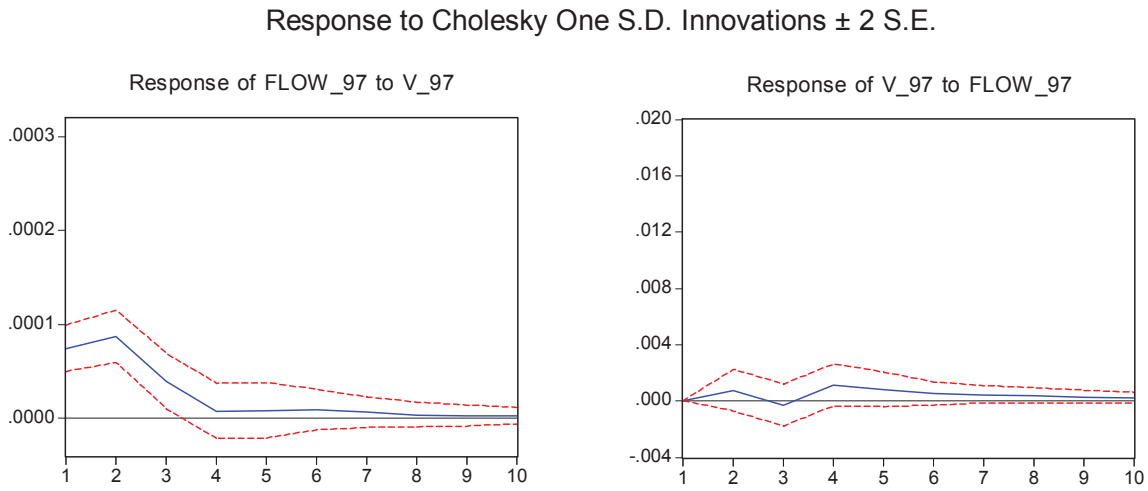
Full sample period



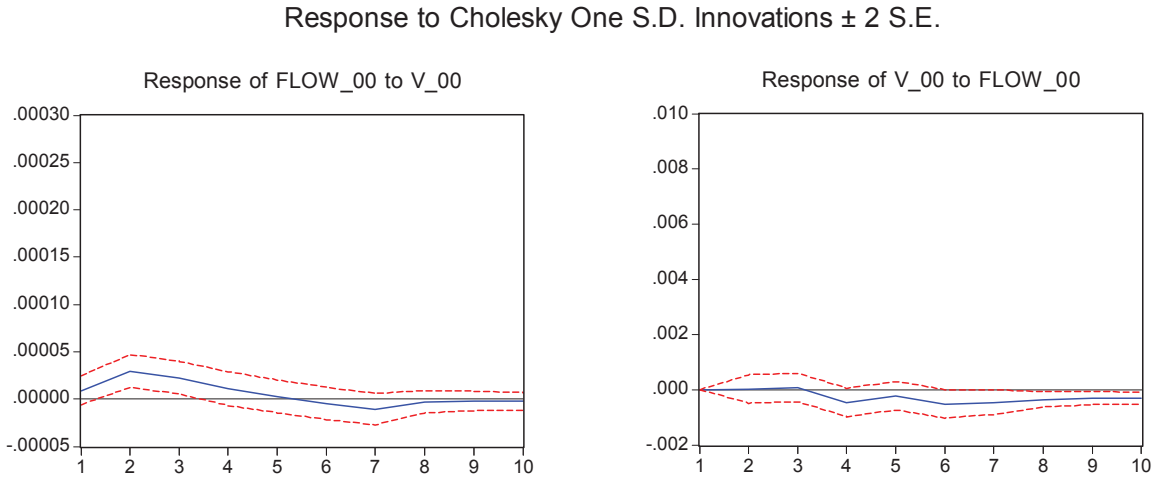
Pre Asian crisis



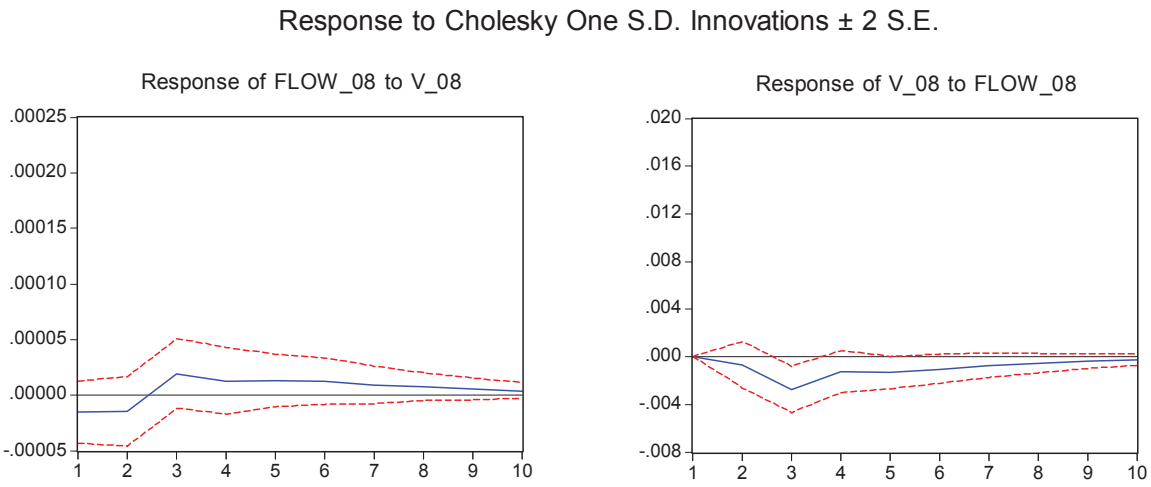
Asian Crisis



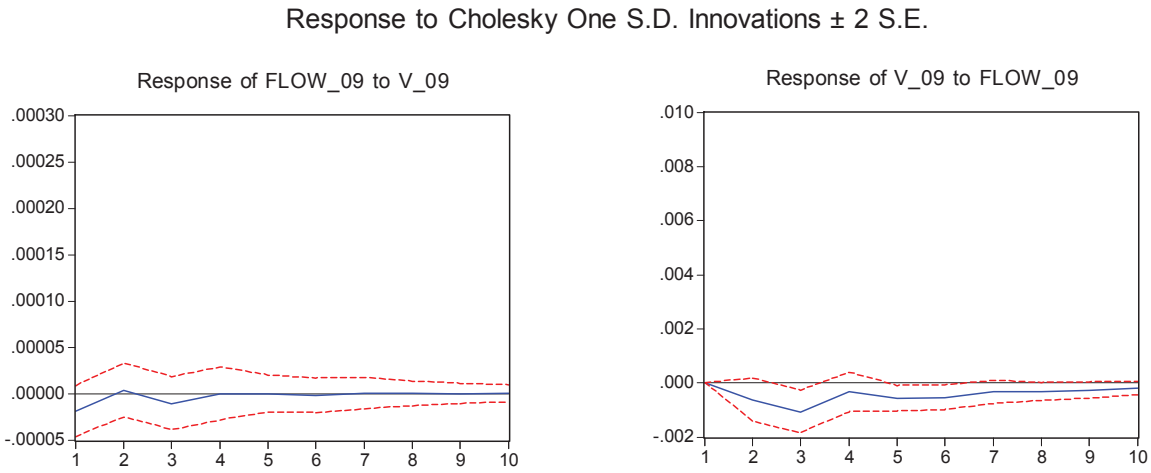
After Asian crisis



Subprime

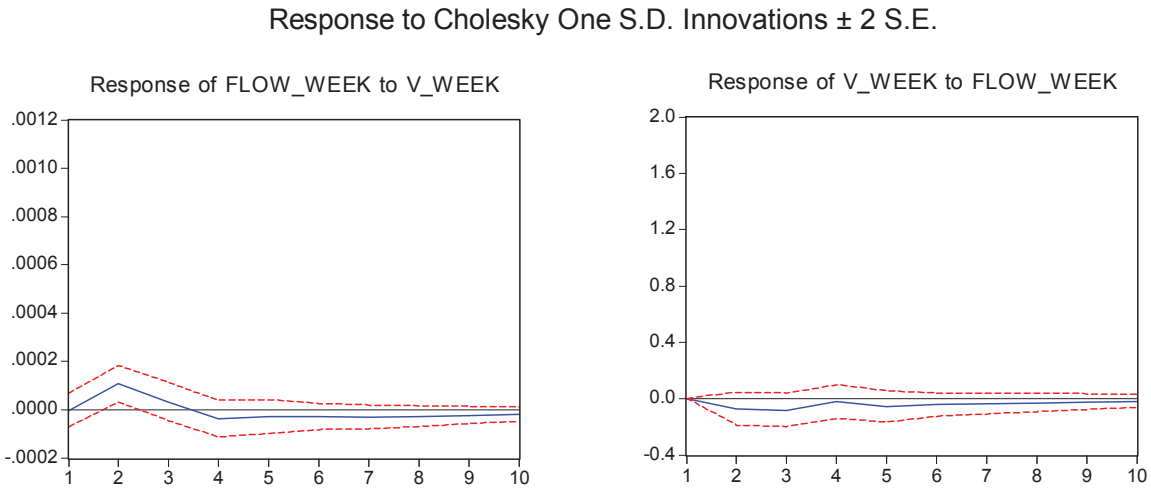


Stock market Boom

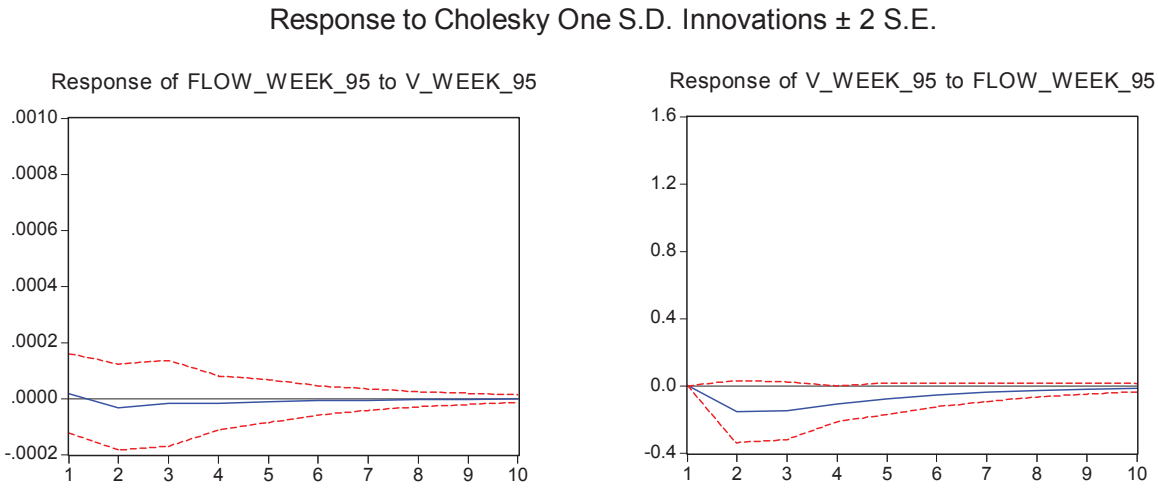


B.2.2 Weekly data

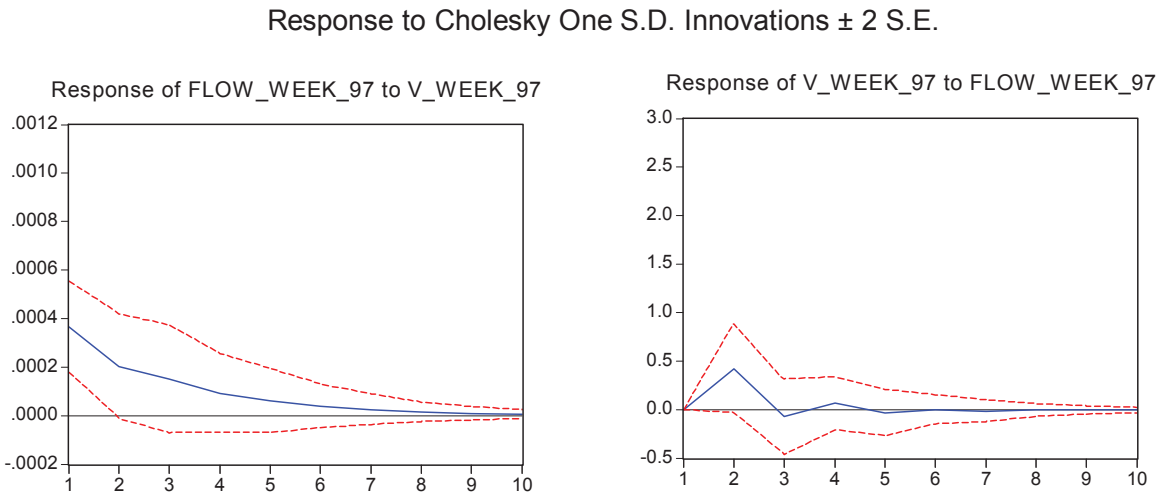
Full sample period



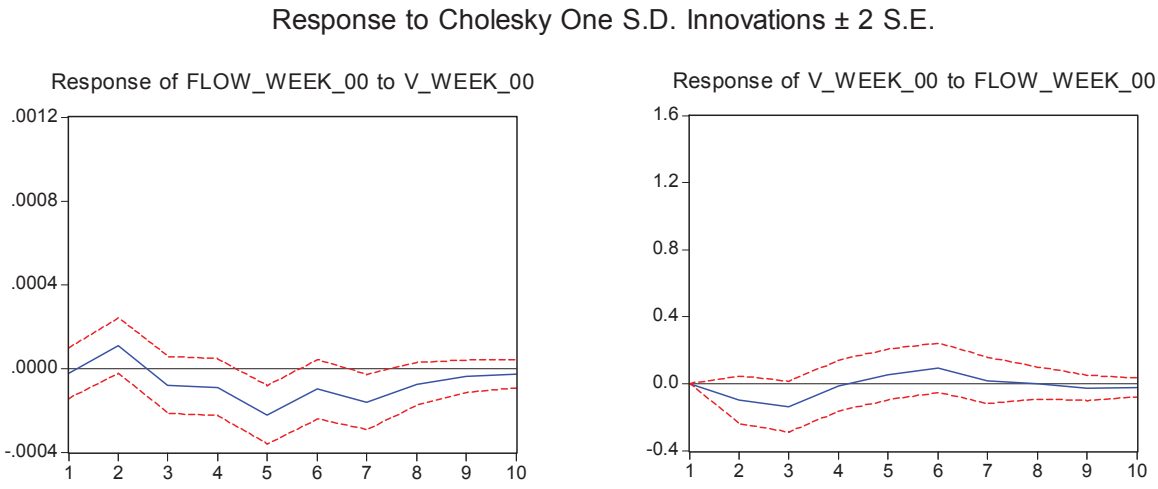
Pre Asian crisis



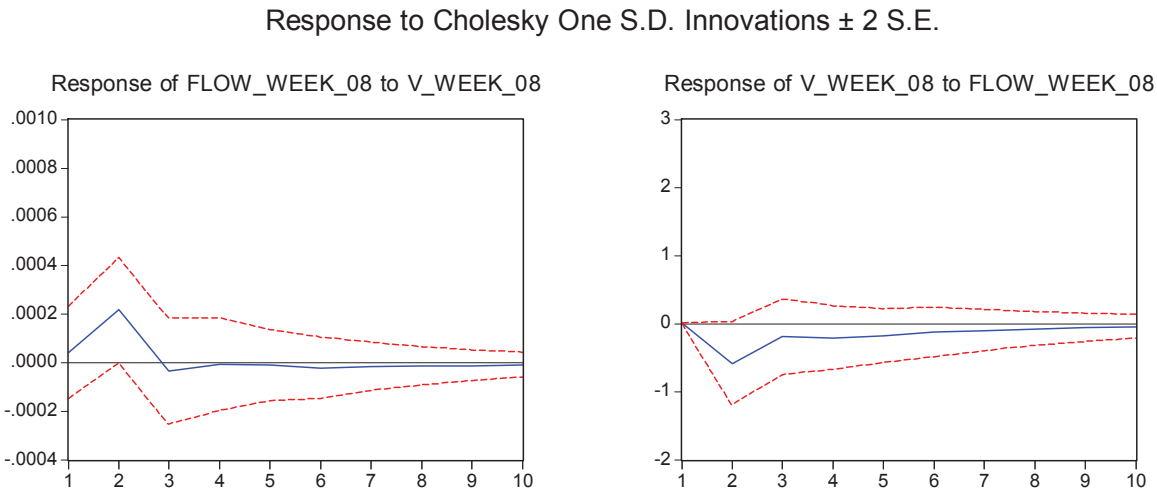
Asian crisis



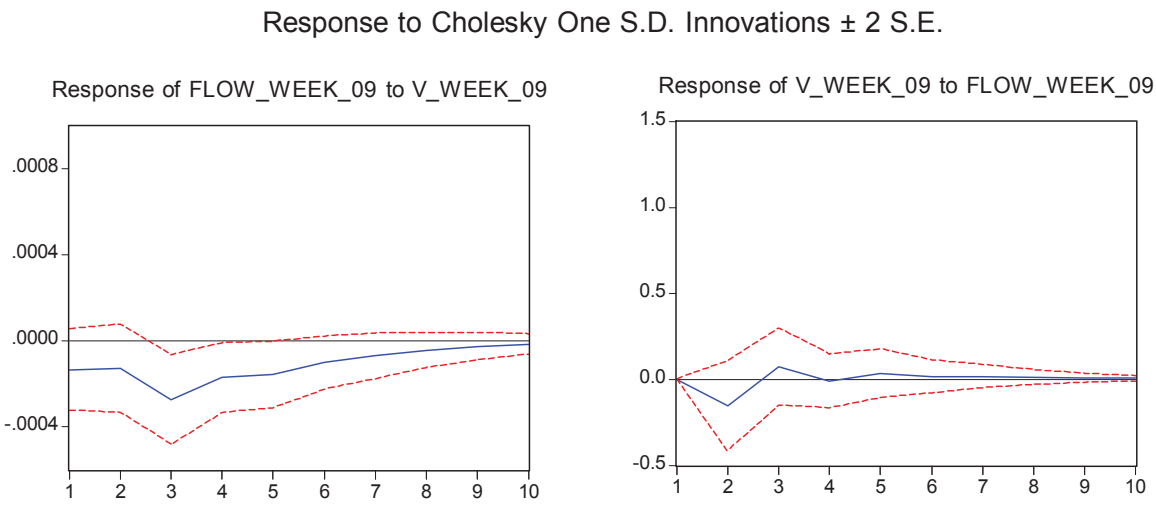
After Asian crisis



Subprime

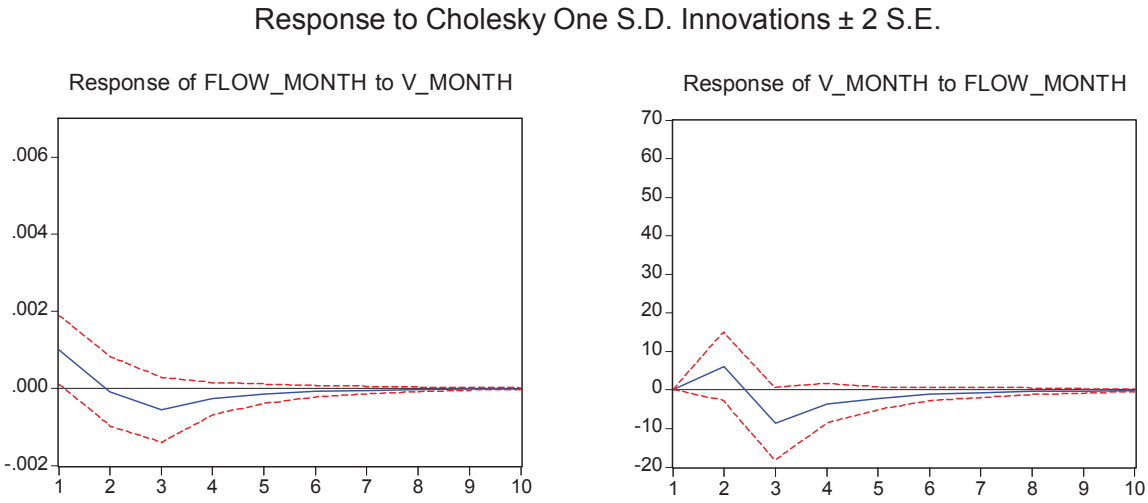


Stock market boom

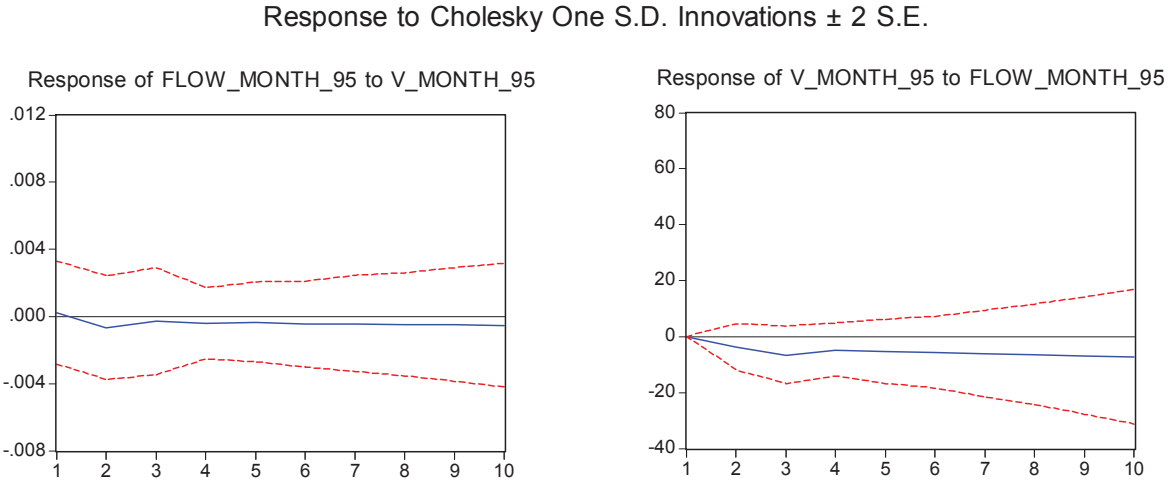


B.2.3 Monthly data

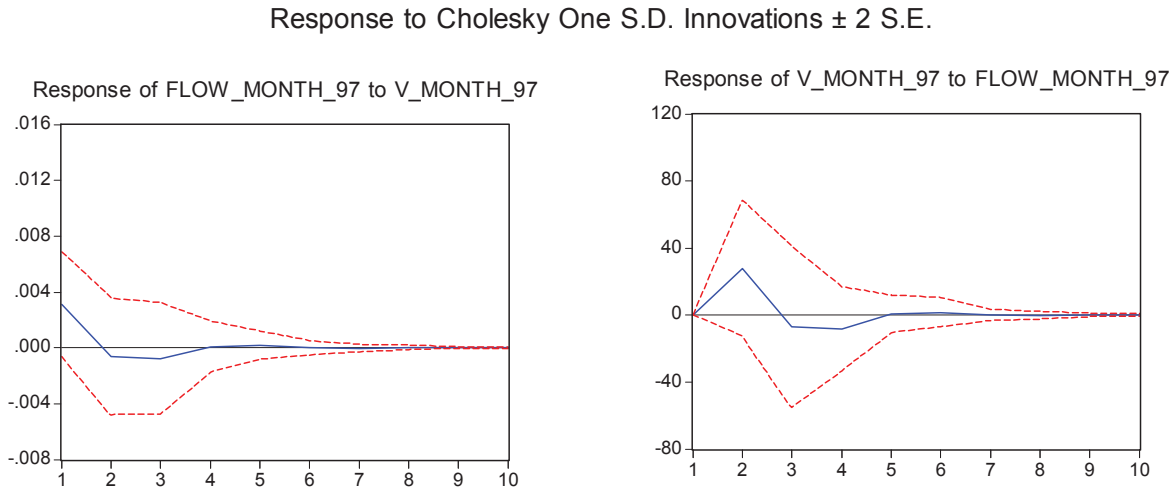
Full sample period



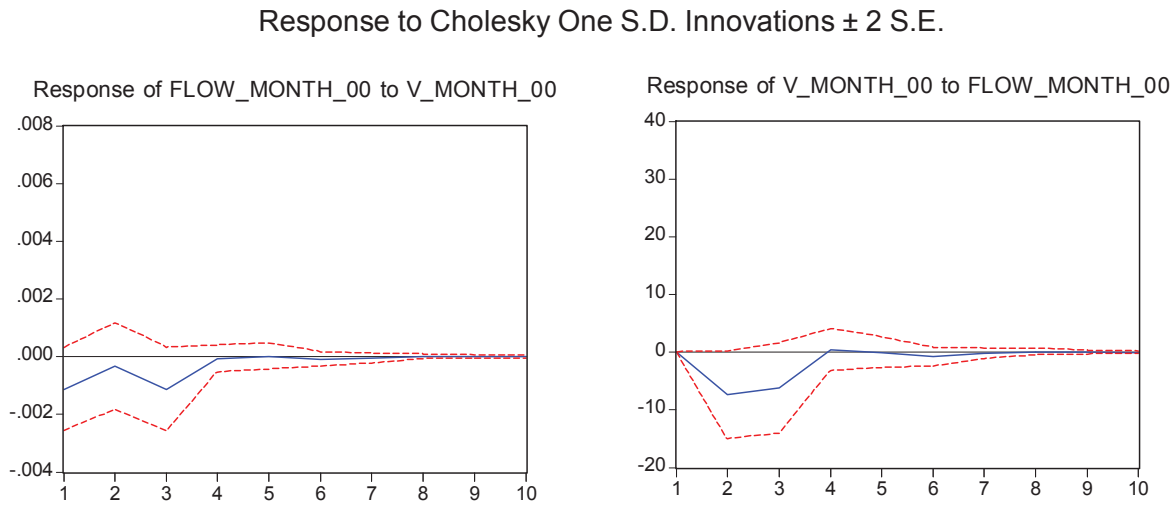
Pre Asian crisis



Asian Crisis



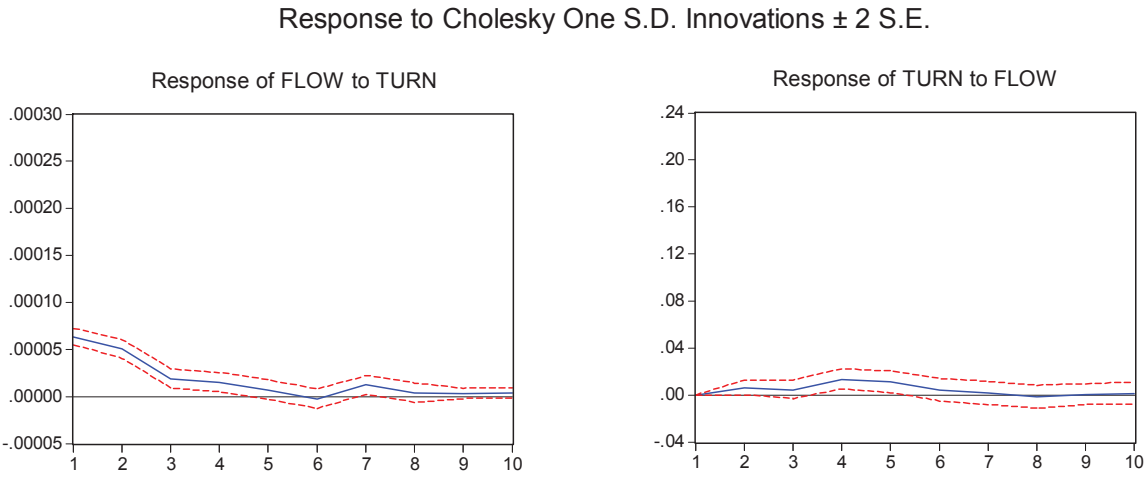
Post Asian crisis



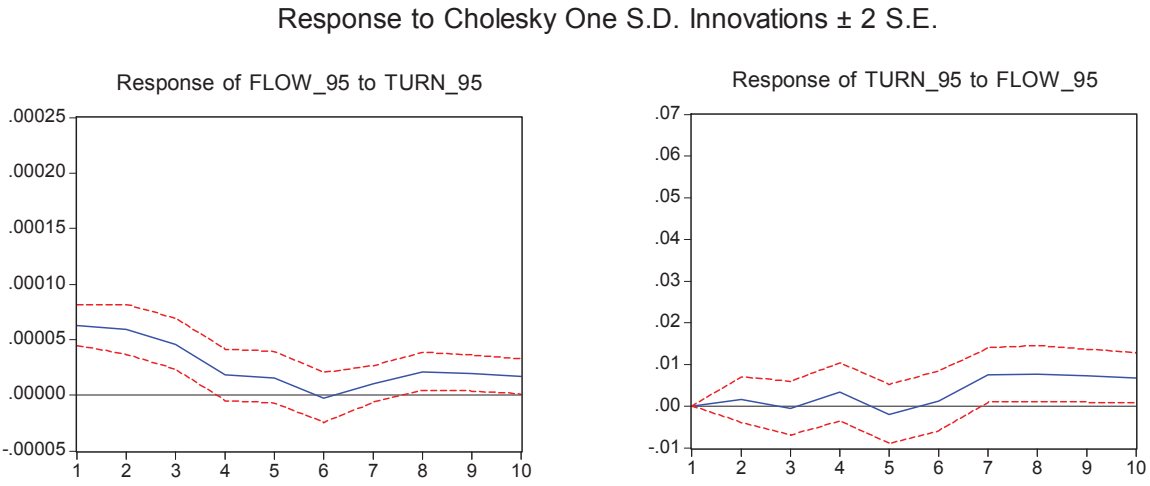
B.3 impulse response function between foreign equity flow and market liquidity

B.3.1 Daily data

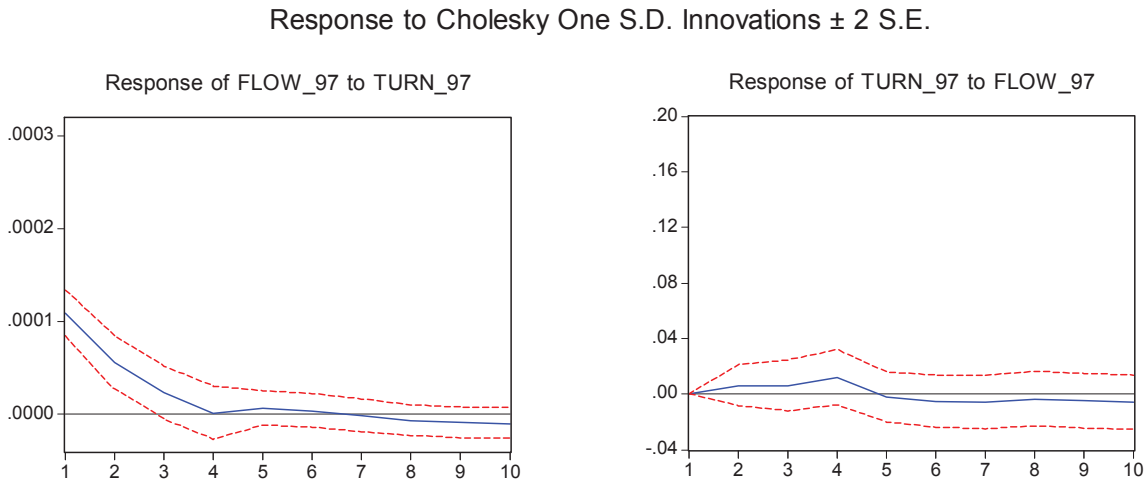
Full sample period



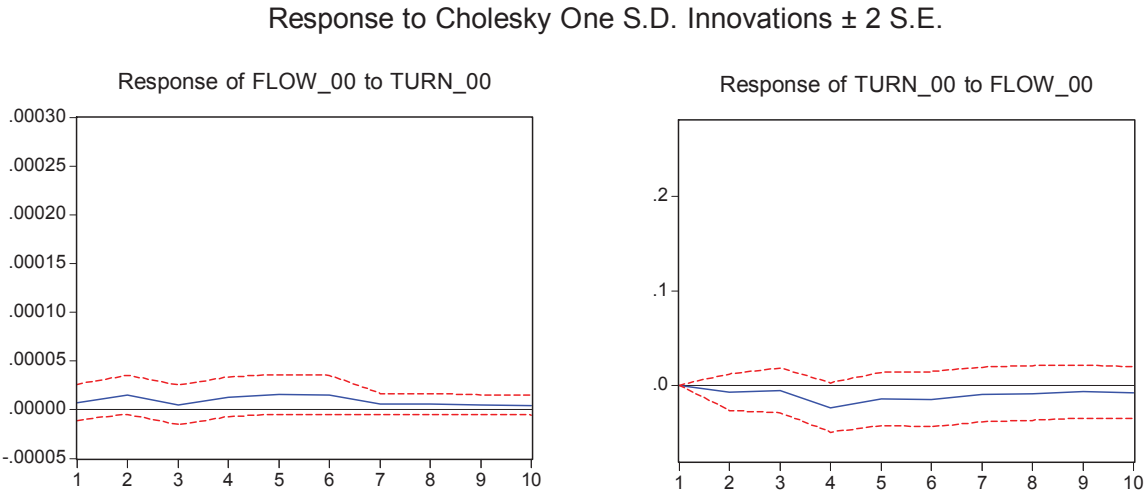
Before Asian Crisis



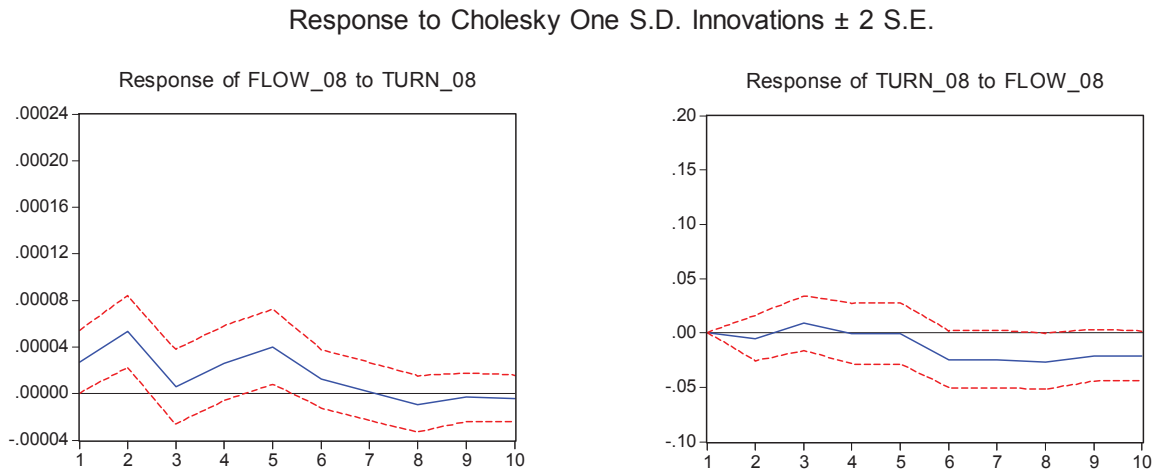
Asian Crisis



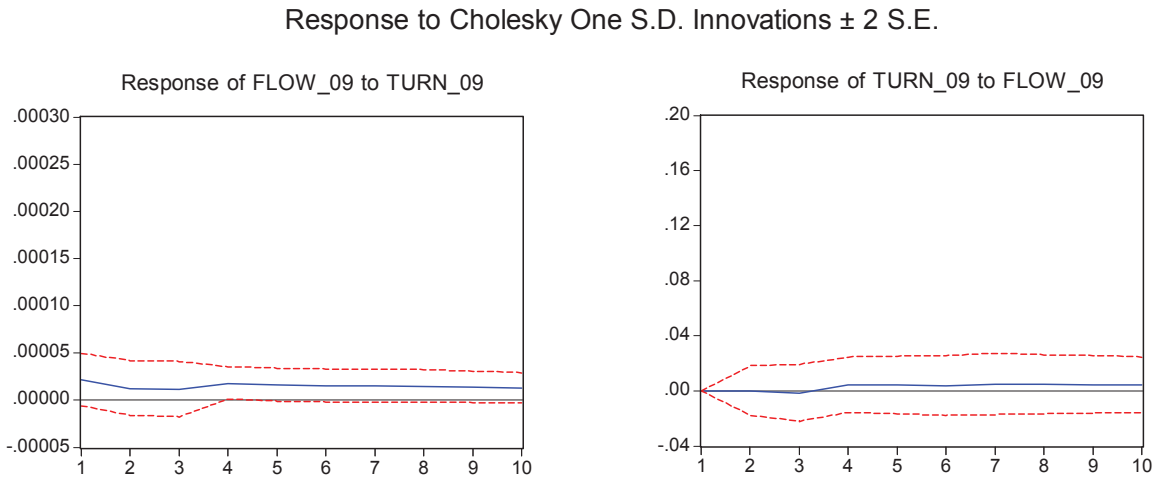
After Asian Crisis



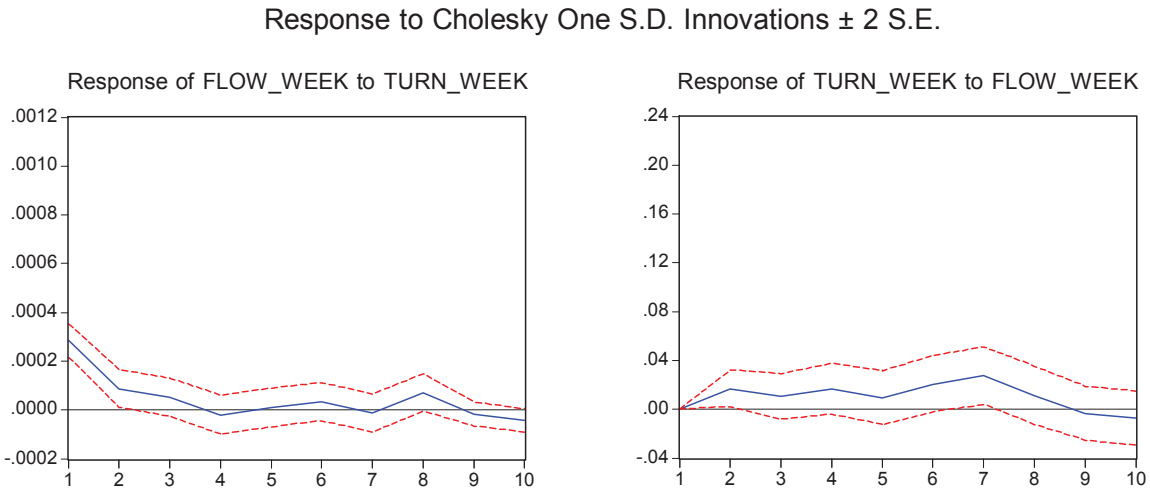
Subprime



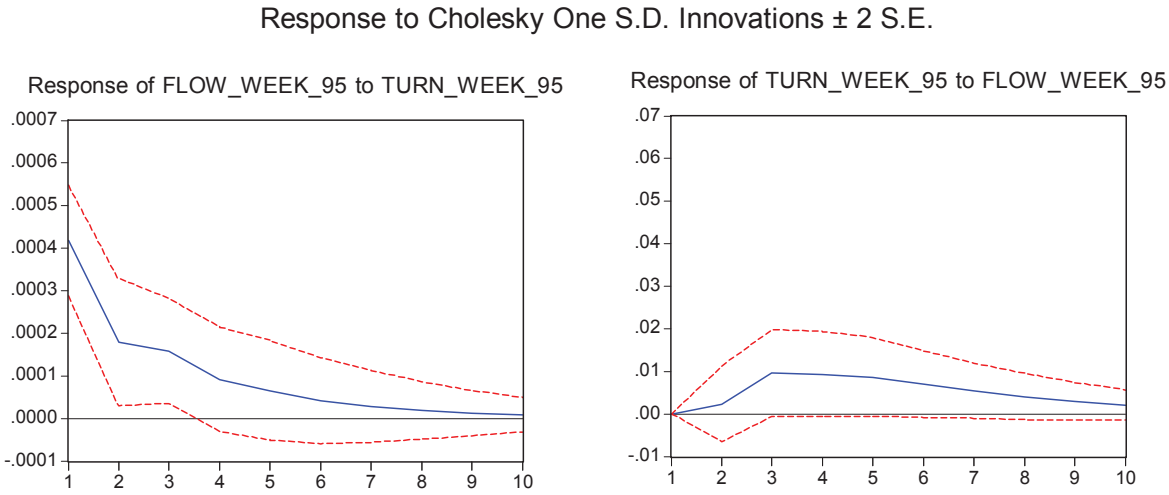
Stock market Boom



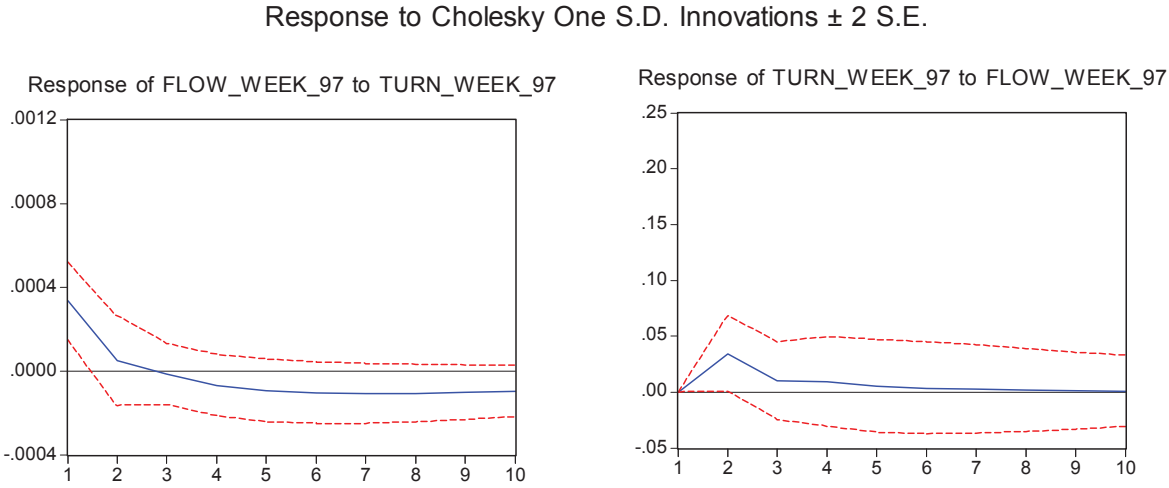
B.3.2 Weekly data



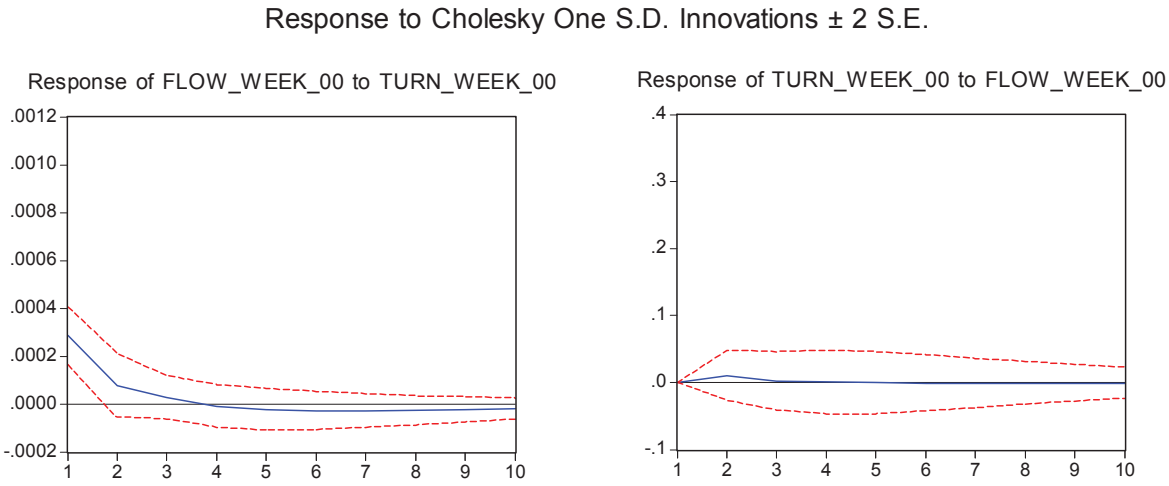
Pre Asian crisis



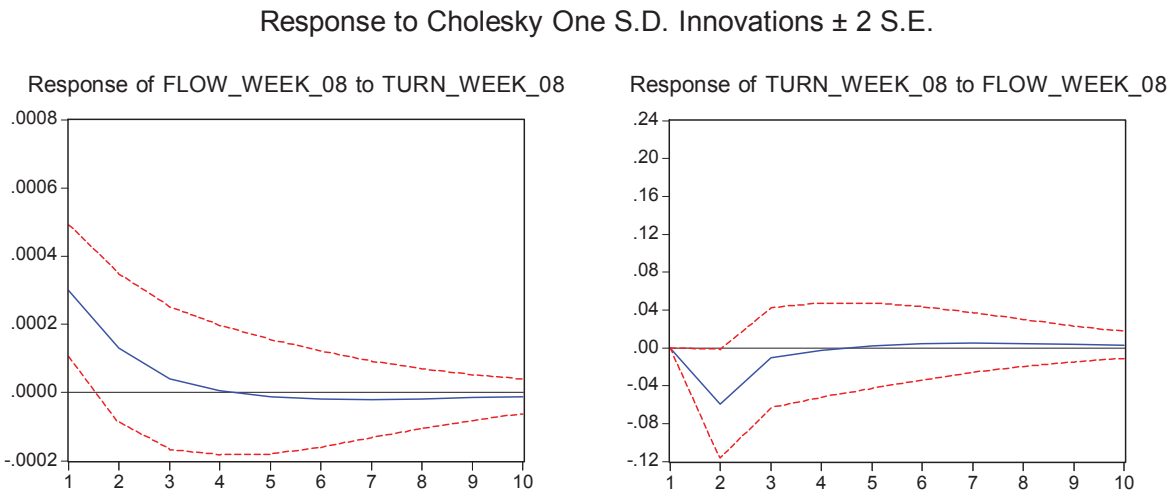
Asian Crisis



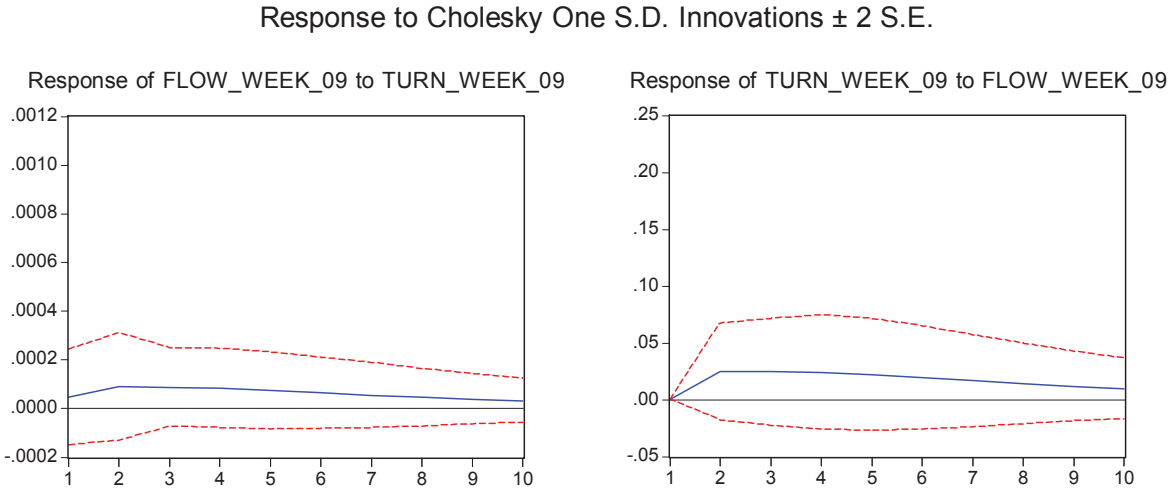
After Asian crisis



Subprime

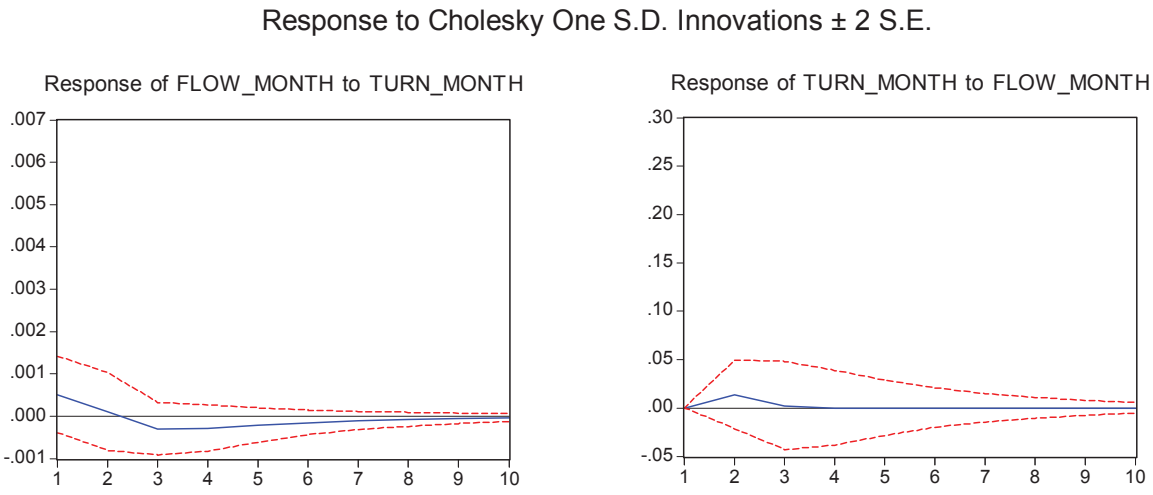


Stock market Boom

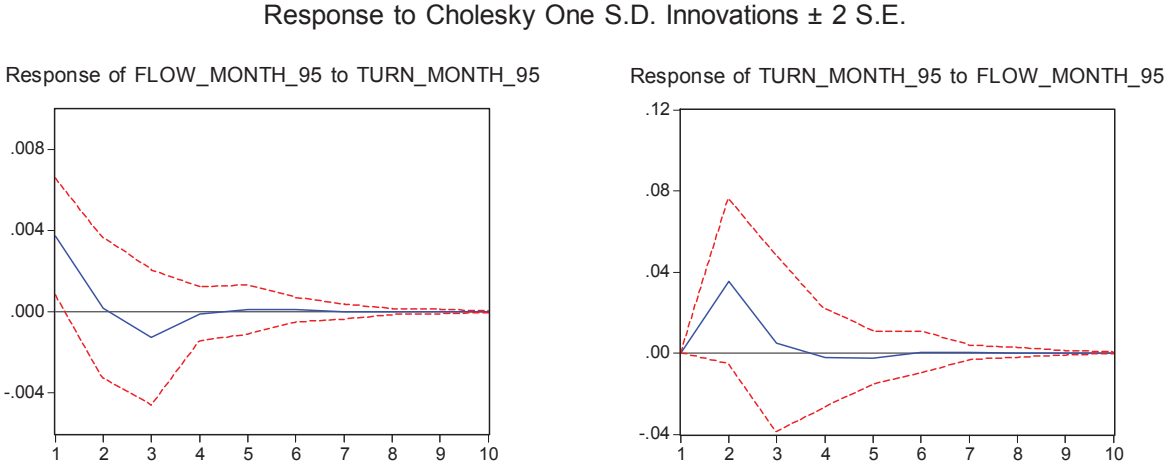


B.3.3 Monthly data

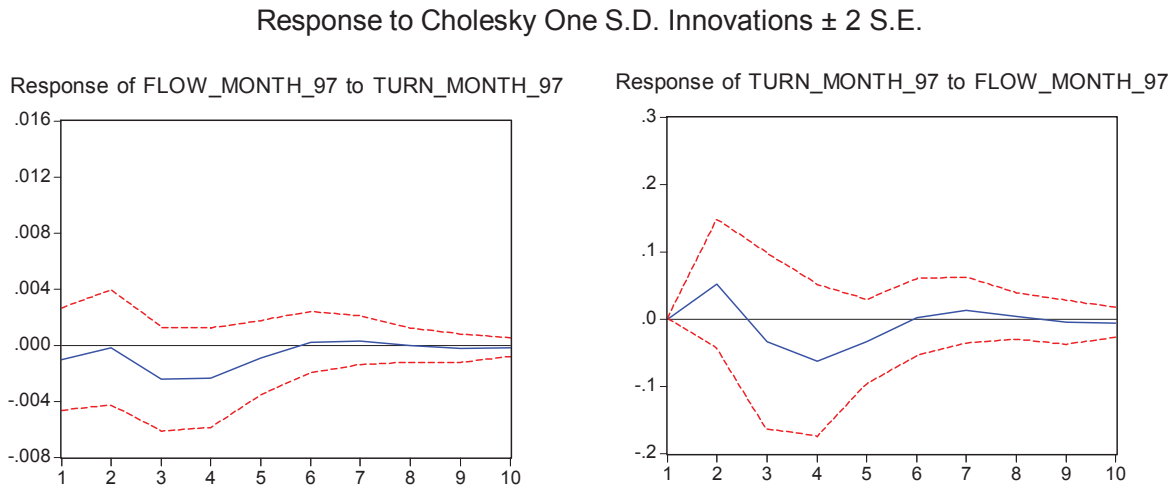
Full sample period



Before Asian Crisis



Asian crisis



Post Asian crisis