CAPITAL INFLOWS AND ASSET PRICES: THE RECENT EVIDENCE OF SELECTED EAST ASIAN ECONOMIES

Hiroyuki Taguchi[1]

ABSTRACT

This paper aims at providing empirical evidence on the relationship between capital inflows and asset prices, focusing on China, Hong Kong, Indonesia, Korea and Thailand. Main findings are: the positive responses of share prices to portfolio inflows shocks were verified in all the estimated economies, which implies the function of the direct channel into stock market; the indirect channel through domestic money supply appeared to work in the economies with peg regime like Hong Kong, whereas it did not in those with floating regime like Indonesia, Korea and Thailand, due to the sterilization of intervention in foreign exchange markets.

INTRODUCTION

Capital inflows have attracted great concerns especially in emerging market economies, since capital was starting to flow back to them with the global economy beginning to emerge from the 2008 financial crisis. In fact, the recent surges in capital inflows have complicated macroeconomic management and created financial risks for emerging market economies in the following senses.

First, large capital inflows force monetary authority to choose limited policy options in the constraint of "impossible trinity": economies can pursue two of three options –fixed exchange rates, monetary autonomy and capital mobility. Capital inflows lead to exchange rate appreciation in the first place. If the authority take the policy option, "fixed exchange rates", by intervening exchange rate market, it results in an increase in money supply and inflationary pressure, thereby "monetary autonomy" being endangered. Alternatively, if the authority tries to keep "monetary

[1] Cabinet Office, Government of Japan Nakamachidai Tsuzuki-ku Yokohama 224-0041 Japan
E-mail: tagusaya0710@s3.wh.qit.ne.jp, taguchi@nesdb.go.th

autonomy" by sterilizing the intervention, adjusted (rising) interest rate induces further capital inflows. Thus, remaining options for the authority are confined to giving up "fixed exchange rate", or to resorting to direct capital controls. The loss of stability of exchange rate seems to be a hard choice to emerging market economies, because high appreciations of their currencies caused by capital inflows will often damage competitiveness of their tradable sectors, and also because their economies are basically facing the problem of "fear of floating" (see Calvo and Reinhart; 2001 and 2002). As for direct capital controls, whether they work well in practice is the question. Ostry et al. (2010) argued that the evidence appears to be stronger for capital controls to have an effect on the composition of inflows rather than on the aggregate volume.

Another concern on massive capital inflows for emerging market economies, which appears to be more serious, is that they amplify financial fragility and crisis risk for their economies. Large capital inflows may lead to excessive foreign borrowing and foreign currency exposure, possibly fueling domestic credit booms and asset bubbles. However, capital inflows, especially when they are temporary, can be reversed due to the changes in external economic conditions like policy stances of advanced economies. When capital flows reverse suddenly, a boom stage of credit expansion and asset price hikes may be turned into a bust stage following bubble dynamics (The issue on bubble dynamics in emerging market economies will be mentioned in later section). Finally, the economies may suffer from serious financial and economic crisis. As a matter of fact, under these concerns on financial risks of massive capital inflows, some of emerging market economies, e.g. Korea, Indonesia, Thailand and Peru, have taken domestic prudential measures and even capital controls mainly on short-term capital transactions since 2009.

This paper helps to place the ongoing concerns on capital inflows in the context of observed facts, and provides empirical evidence on the relationship between capital inflows and asset prices, which is strategically important in investigating whether the existing capital inflows have been involved in bubble dynamics, i.e. boom-bust cycle. To be specific, our analytical concerns are whether the recent increase in asset prices is really coming from capital inflows; if so, through which channels capital inflows affect asset prices, direct one by their demanding assets or indirect one by an increase in money supply; whether the effects of capital inflows on asset prices differ under different currency regimes; and finally whether the recent capital inflows have committed themselves to the boom–bust cycle of the economies. In these analyses, we focus on the cases of selected East Asian emerging market economies: China, Hong Kong, Indonesia, Korea and Thailand, during the 2000s, i.e. the post- Asian currency crisis period. As the empirical method to examine these issues, we estimate impulse responses of economic variables to capital inflows shocks under a vector auto-regression (VAR) model.

The rest of the paper is structured as follows. Section 2 reviews previous studies and clarifies this paper's contribution. Section 3 presents empirical analyses introducing the methodology and data, and discussing the estimate results. Section 4 summarizes the results and concludes.

THE LITERATURE AND THIS PAPER'S CONTRIBUTION

There are a number of theoretical and empirical studies dealing with the effects of capital inflows (e.g. Heriqbaldi (2012), Umutlu and Yildiz (2011), Kefela (2011)). However, there are not many studies that have focused on the effects of capital inflows on asset prices, in the context of bubble dynamics in emerging market economies.

Caballero and Krishnamurthy (2006) provided theoretical insights on asset bubbles and capital inflows in emerging market economies. The following three points are of the essence in their arguments. First, they argued that emerging market economies present a fertile macroeconomic environment for the emergence of bubbles, since a shortage of stores of value, i.e. dynamic inefficiency, caused by the "financial repression"[2] in their financial systems tends to create a space for bubbles on unproductive assets to arise. Second, their model –a modified overlapping generation model, successfully reproduced bubbles dynamics in emerging market economies: during the growth phase of the bubble, the economy sustains high levels of investments, capital inflows and domestic credits, but when the bubble crashes, capital flows reverse, and domestic credits and investments fall. Third, they studied a set of aggregate risk management policies to alleviate the bubble-risk, such as liquidity requirements on banking system, sterilization of capital inflows and structural policies aimed at developing public debt markets.

Related to theoretical consideration as shown in Caballero and Krishnamurthy (2006), Kim and Yang (2009) provided empirical evidence on the impacts of capital inflows on asset prices. Noticing that the issue is relevant for crisis-hit economies trying to prevent a boom–bust cycle as well as in the formulation of macroeconomic policy objectives in emerging market economies, they examined whether capital flows induce domestic asset price hikes in the case of Korea, using a vector auto-regression model. They found that capital inflow shocks have contributed to the stock price increase, but not much to the increase in land prices; there has been a limited effect on nominal and real exchange rates and liquidity, which is related to the huge foreign exchange reserve accumulation. From these results, they concluded that the influence of capital inflow shocks seems to be mostly on the stock market but the influence is limited in other parts of the economy, implying that the possibility of the boom–bust cycle is relatively low in Korea.

This paper tries to extend the empirical analyses of Kim and Yang (2009), by adding the sample cases of China, Hong Kong, Indonesia and Thailand to the case of Korea. These economies can be classified into emerging market economies in East Asia. Among these, Korea, Indonesia, and Thailand are in the same economic conditions, in the sense that they all experienced the 1997-98

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[2] Caballero and Krishnamurthy (2006) referred to McKinnon (1973), which argued that the "financial repression," characterized by poor banking systems and conglomerates with corporate governance problems is a prominent aspect of the financial systems of emerging market economies.

Asian currency crises seriously, and the shift of currency regime from strictly pegged one to managed floating one. Thus, we can see interestingly whether the empirical outcome in Korea as shown in Kim and Yang (2009), e.g. the low possibility of the boom–bust cycle, is applicable to the cases of Indonesia and Thailand. On the other hand, China and Hong Kong are different from the three economies above, in the sense that they have still adopted rather strictly pegged currency regime (though the two economies differ in capital mobility). So we can also examine whether the effects of capital inflows on asset prices differ under different currency regimes, by comparing the empirical outputs among them.[3]

EMPIRICS

We now proceed to the empirical analysis. Our analysis targets the cases of selected East Asian emerging market economies: China, Hong Kong, Indonesia, Korea and Thailand as we mentioned in the previous section. As the sample period, we focus on the period from the 1st quarter of 2000 to the 4th quarter of 2010 or the latest quarter with data availability, since the 1990s includes currency crises and changes in currency regime, and the 2000s have intensified capital flows in emerging market economies in line with financial integration.

In examining the effects of capital inflows on an increase in asset prices, we assume the following two channels. One channel is that capital inflows can directly affect the demand for assets, which in turn can increase asset prices. For example, capital inflows to the stock market increase the demand for stocks, thereby causing the stock price hike. The other is the indirect channel through an increase in money supply; Capital inflows tend to appreciate currency; To avoid it, the monetary authority intervenes in the foreign exchange market; This results in an accumulation of foreign reserves, and an increase in money supply unless fully sterilized; When this leads to increased liquidity flows into asset markets, then asset prices surge. Considering these channels, we first simply overview the trends of related economic variables. We then move to statistical tests on the variable relationship, by estimating impulse responses of economic variables to capital inflows shocks under a vector auto-regression (VAR) model.

DATA

We first clarify the targeting variables and data for our analysis. Basically following the analytical framework of Kim and Yang (2009) and considering data availability etc., we select the following eight economic variables: portfolio capital inflows (*PFI*), stock (share) prices (*STP*), exchange rate

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[3] The currency regimes can be identified by Reinhart and Ilzetzki (2009), and IMF classification. According to them, Indonesia, Korea and Thailand are classified into floating regime, whereas china and Hong Kong are into peg regime.

index per US dollar (*EXI*), foreign reserves (*RES*), monetary base (*MOB*), industrial production (*OUT*), consumer prices (*CPI*), and money market rate (*MMR*).[4]

The quarterly data used for the variables are retrieved from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). For *STP*, *OUT*, *CPI*, and *MMR*, we use "Share Prices (2005=100)" in line 62[5], "Industrial Production (2005=100)" in line 66[6], "Consumer Prices (2005=100)" in line 64, and "Money Market Rate" in line 60b, respectively. *PFI*, *EXI*, *RES*, and *MOB* are signified as indexes (2005=100), the original data of which are derived from "Portfolio Investment Liabilities"[7] in line 78bgd, "Exchange Rates, per US Dollar" in line rf, "Total Reserves minus Gold" in line 1l.d, "Reserve Money"[8] in line 14, respectively.

OVERVIEWS OF VARIABLE TRENDS

Figure 1.1 – 1.5 indicate the trends in economic variables related to portfolio inflows and share prices for each sample economy since the 2000s. The lowest graph in each Figure describes the changes from the same quarter of previous year in foreign reserves, d(*RES*) and monetary base, d(*MOB*), on local currency base.

The rough findings on these trends are as follows. Portfolio inflows and share prices are synchronized with some lags in some economies. The changes in foreign reserves are correlated with portfolio inflows. The changes in monetary base trace up those of foreign reserves in China and Hong Kong, but not so much in Indonesia, Korea and Thailand. Exchange rates are more sensitive to portfolio inflows in Indonesia, Korea and Thailand than in China and Hong Kong. Consumer prices, which show a steady increase, are not sensitive to portfolio inflows in all of the

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[4] We omit those variables of capital outflows, real exchange rate, apartment prices, house prices, M1 and M2 which Kim and Yang (2009) adopted, because the data for apartment prices and house prices are not available in IFS database, and also because the VAR estimation needs to preserve the degrees of freedom.

[5] As we discuss later on, capital inflows and asset prices have the problem of simultaneity: capital inflows can affect asset prices, but changes in asset prices can also induce capital inflows. Thus, we should use the end-of-period (quarter) data for asset prices, to treat capital inflows as contemporaneously exogenous to asset prices in the VAR estimation. Since the end-of-period (quarter) data for asset prices are not available in the IFS, we instead use the monthly data at the end of the quarter (for instance, in case of 1st quarter, the data of March are used).

[6] Due to data availability, "GDP Volume (2005=100)" in line 99bvp is used for Indonesia, Thailand, and China, and "Manufacturing Production (2005=100)" in line 66ey is used for Hong Kong. All of indexes are seasonally adjusted by Census X12.

[7] We exclude other types of capital inflows such as foreign direct investment, because their impacts on asset prices seem to be beyond our scope of analysis. In the case of China, quarterly data on portfolio investments are not available, so annual data are used for the following overview.

[8] "Reserve Money" is seasonally adjusted by Census X12.

sample economies. It appears that portfolio inflows affect share prices at least through the direct channel to stock market in each economy, and that the indirect channel through a change in money supply works differently among the sample economies: the channel might possibly be active in China and Hong Kong, on the other hand, the sterilization by authorities might shut down the channel in Indonesia, Korea and Thailand. These rough relationships of variables will be statistically tested through VAR model estimations in the following section.

VAR MODEL ESTIMATIONS

This section first clarifies the specific methodology, then shows the estimation results and interprets them.

METHODOLOGY

For our empirical method to examine the effects of portfolio inflows on share prices, we use a vector auto-regression (VAR) model. VAR modeling is useful for identifying the fore-mentioned two kinds of channels from portfolio inflows to share prices, and for inferring their dynamic effects. Kim and Yang (2009) adopted a VAR model to investigate the contribution of capital inflows to asset price hikes in the case of Korea. We basically follow their model, and extend it to our sample economies. We specify the VAR model in the following way:

$$\{OUT, CPI, MMR, PFI, STP, EXI, RES, MOB\} \qquad (1)$$

Where the notation of each variable is described in Section 3.1.
We include *OUT*, *CPI*, and *MMR*, as the variables to control for factors that can affect share prices through channels other than portfolio inflows, since domestic economic conditions represented by production, prices and interest rates, might also affect share prices. These control variables are assumed to be contemporaneously exogenous to portfolio inflows in order to take out all the related effects from portfolio inflows chocks. *PFI* and *STP*, the key variables of our analytical concerns, have the problem of simultaneity, as we stated in Note 5. We thus use the last-month data at the end of the quarter for share prices, and treat portfolio inflows as contemporaneously exogenous to share prices in the model.

Based on the VAR model (1), we examine the impulse responses of each variable to portfolio inflows shocks. It enables us to identify the fore-mentioned two channels from portfolio inflows towards asset prices hike: When we see significantly positive responses of share prices, if there are no responses in foreign reserves and monetary base, it implies direct channel only; but if there *are* significantly positive responses in their variables, it suggests both of direct channel and indirect channel. We conduct the estimation both on individual economies and on a group of economies with their similarities (Indonesia, Korea and Thailand) by constructing panel data. The case of

China, who does not have quarterly data for portfolio inflows, is impossible to be estimated in the VAR model (1). We alternatively estimate the model excluding the variable *PFI* from (1) for China and Hong Kong, and examine the impulse responses of monetary base and share prices to foreign reserves shocks for verifying the indirect channel from portfolio inflows to share prices.

Regarding the specification of the VAR model, we include a constant term, and use one lag to capture dynamic interactions as the Schwarz criterion suggested. If we follow Sims *et al*. (1990), it can be said that our statistical inference is not affected by the presence of non-stationary factors. In the impulse response function, we trace eight quarter (two years) to examine dynamic effects in accumulated terms, and define the impulses by the inverse of the Cholesky factor of the residual covariance matrix to orthogonalize the impulses.

Results and Interpretations

Figure 2-1 reports the accumulated impulse responses of each variable to portfolio inflows shocks with a 95 percent error band over 8-quarter horizon for Indonesia, Korea, Thailand, a group of those economies with panel data, and Hong Kong. The estimation results are also summarized in Table 1. The share prices (*STP*) indicate significantly positive responses in all the sample economies including a group of economies. The exchange rate (*EXI*) significantly appreciates in Indonesia, Korea, Thailand and a group of those economies, but not in Hong Kong. The foreign reserves (*RES*) shows positive impacts in all the sample economies, whereas the monetary base (*MOB*) represents different responses among the sample economies: positive responses in Indonesia and Hong Kong, but insignificant responses in the other sample economies including a group of the economies.

Figure 2-2 reports the accumulated impulse responses of monetary base and share prices to foreign reserves shocks for China and Hong Kong, and Table 2 summarizes the results. The monetary base (*MOB*) indicates positive responses in both economies, but the share prices shows positive impacts only in Hong Kong, not in China.

We interpret the estimation outcomes in the following ways. First, the positive responses of share prices to portfolio inflows shocks may at least reflect the direct channel –the channel in which capital inflows directly go into stock market, thereby raising the share prices–, in all the sample economies except China. Korea, Thailand and a group of economies show the positive responses of share prices, without any positive responses of monetary base that is a key variable for the indirect channel. Even in Indonesia and Hong Kong, who represent the positive responses of monetary base, the responses of share prices appear to precede those of monetary base in Figure 2.1. China is out of samples in this estimation due to lack of data.

Second, the responses of exchange rates appear to be consistent with the currency regimes of the sample economies. Indonesia, Korea, Thailand and a group of those economies with floating currency regime, appreciate their currencies to portfolio inflows shocks, whereas Hong Kong does

not signify any responses of exchange rate. Even the economies with floating regime carry out the intervention in foreign exchange markets, as are shown in the positive responses of foreign reserves in Table 1. It does not, however, accompany an increase in monetary base as we see later, thereby allowing currency appreciation for absorbing the pressure of capital inflows to some degree.

Lastly, the indirect channel –the channel in which capital inflows raise share prices through an increase in domestic money supply– seems to work differently under the sample economies with different currency regimes; it works in the economies with peg regime like Hong Kong, whereas it does not in those with floating regime like Korea and Thailand. Although all the sample economies signify the positive responses of foreign reserves to portfolio inflows shocks, Korea, Thailand and a group of economies with floating regime do not show any responses of monetary base, whereas Hong Kong represents its positive responses that are fed back to the positive responses of share prices as shown in Table 2. We interpret this finding in such a way that: all the sample economies intervene in foreign exchange markets, resulting in an accumulation of foreign reserves; Korea and Thailand sterilize their intervention by absorbing the money supply through selling government securities in an open market operation; in Hong Kong the intervention straightly leads to an increase in monetary base, which causes liquidity flows into stock markets and a surge in share prices. Indonesia with positive responses of monetary base does not seem to be able to sterilize the intervention fully, but monetary responses do not appear to affect share prices, since the positive responses of monetary base come to significant level three quarters behind the significantly positive responses of share prices. In China, the correlation in the positive responses between foreign reserves and monetary base is identified just like in Hong Kong, but the feedback from monetary response to share prices is not verified in Figure 2.2 and Table 2. We speculate that liquidity flows affect real estate markets rather than stock markets in case of China.[9]

To sum up roughly our estimation outcomes, the economies with floating currency regime shut down the channel from capital inflows to domestic money supply through sterilization means, allowing currency appreciation. On the other hand, the economies with peg regime allow capital inflows to affect money supply, and then to lead to liquidity flows into asset markets. This picture is really consistent with the theorem of "impossible trinity": currency flexibility keeps monetary autonomy, while currency fixing loses it. Our estimation outcome is also in line with the previous study, i.e. Kim and Yang (2009), who argued that the influence of capital inflow shocks seems to be mostly on the stock market but the influence is limited in other parts of the economy in the case of Korea.

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[9] For instance, IMF (2010) reported in the context of the impacts of capital inflows on asset prices that concerns about excessive increases in property prices are limited to some urban areas in China and high-end luxury segments in Hong Kong SAR and Singapore, among the emerging Asian economies.

Role of Foreign Reserves

We already found that even the economies with floating regime like Indonesia, Korea and Thailand, have carried out the intensive interventions in foreign exchange markets, and have accumulated foreign reserves, while they have sterilized their interventions and have allowed their currencies to appreciate. Our remaining question is, then, why the economies who allow currency fluctuation need to intervene in foreign exchange markets and to accumulate foreign reserves. In general, the rapid growth of international reserves in recent years – a development concentrated in the emerging markets – has confronted economists with an important puzzle.

Aizenman *et al*. (2008) emphasized the change in the role of foreign reserves, by arguing that the recent literature has focused on their role as a means of self-insurance against exposure to volatile "hot money" subject to frequent sudden stops and reversals, whereas the earlier literature focused on the role of foreign reserves as a buffer stock for managing pegged exchange rate regimes. In fact, the buffer stock model may has limited capacity to account for the recent accumulation of foreign reserves, since under this model the currency regime shift to floating one for recent decades in emerging market economies should have helped reduce reserve accumulation in contrast to the reality.

Empirical works also support the changing role of foreign reserves towards financial stability. For instance, Aizenman and Lee (2007) identified the contributions of precautionary and mercantilist motives to the hoarding of international reserves by developing countries. Their empirical results support precautionary motives; since large precautionary demand for international reserves arises as a self-insurance to avoid the costs by sudden stops, a more liberal capital account regime increases international reserves. Obstfeld, *et al*. (2008), recognizing that a combination of internal drains (runs from bank deposits to currency) and external drains (flight to foreign currency or banks) has placed extraordinary demands on foreign reserves especially for emerging market economies, constructed a financial-stability model which goes far toward explaining reserve holdings in the modern era of globalized capital markets, and proved that the size of domestic financial liabilities, financial openness and exchange rate policy are all significant predictors of international reserve stocks. Aizenman *et al*. (2010) provided empirical evidence that holding massive amounts of foreign reserves allows a country to pursue a higher weighted average of monetary autonomy and financial openness, i.e., relax the "impossible trinity". It seems to imply that foreign reserves holding has taken a role not only to stabilize exchange rate, but also to ease macro-policy constraints as an anchor under deepened financial integration, especially to emerging market economies facing "fear of floating".

Concluding Remarks

This paper aimed at providing empirical evidence on the relationship between capital inflows and asset prices, which is strategically important in investigating whether the recent massive capital inflows to emerging market economies have been involved in bubble dynamics, i.e. boom-bust

cycle. In the analysis, we focus on the cases of selected East Asian emerging market economies: China, Hong Kong, Indonesia, Korea and Thailand, during the 2000s, i.e. the post- Asian currency crisis period. As the empirical method to examine these issues, we estimate impulse responses of economic variables to capital inflows shocks under a vector auto-regression (VAR) model.

Our main findings are as follows. The positive responses of share prices to portfolio inflows shocks were verified in all the estimated economies, which imply the function of the direct channel –the channel in which capital inflows directly go into stock market, thereby raising the share prices. The indirect channel –the channel in which capital inflows raise share prices through an increase in domestic money supply– appeared to work differently under the sample economies with different currency regimes; it works in the economies with peg regime like Hong Kong, whereas it does not in those with floating regime like Indonesia, Korea and Thailand, due to the sterilization of the intervention in foreign exchange markets.

With respect to the policy implications of these findings, we would like to emphasize the difference in responses to capital inflows shocks under different currency regimes: the economies with floating currency regime shut down the channel from capital inflows to domestic money supply through sterilization means, whereas the economies with peg regime allow capital inflows to affect money supply, and then to lead to liquidity flows into asset markets. In this sense, the economies with peg regime are easer to be involved in bubble dynamics, i.e. boom-bust cycle by capital inflows than those with floating regime. The difference in responses to capital inflows shocks under different currency regimes also affects the policy options among macroeconomic policy, prudential policy and capital controls. Under floating regime, the sterilization of capital inflows as a macroeconomic policy can be one of the key options, as Caballero and Krishnamurthy (2006) suggested in the context of risk management policies. Under peg regime without the sterilization instrument, the heavier burdens are imposed on domestic prudential measures and even direct capital controls to avoid boom-bust cycle under massive capital inflows.

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Table-1. Summary on Impulse Responses to Portfolio Inflows Shocks

	Share Prices	Exchange Rate	Foreign Res.	Monetary Base
Indonesia	Positive	Appreciate	Positive	Positive
Korea	Positive	Appreciate	Positive	-
Thailand	Positive	Appreciate	Positive	-
Panel (3 economies)	Positive	Appreciate	Positive	-
Hong Kong	Positive	-	Positive	Positive

Table-2. Summary on Impulse Responses to Foreign Reserves Shocks

	Monetary Base	Share Prices
China	Positive	-
Hong Kong	Positive	Positive

Figure-1.1. The Trends in Economic Variables: China

Portfolio Inflows

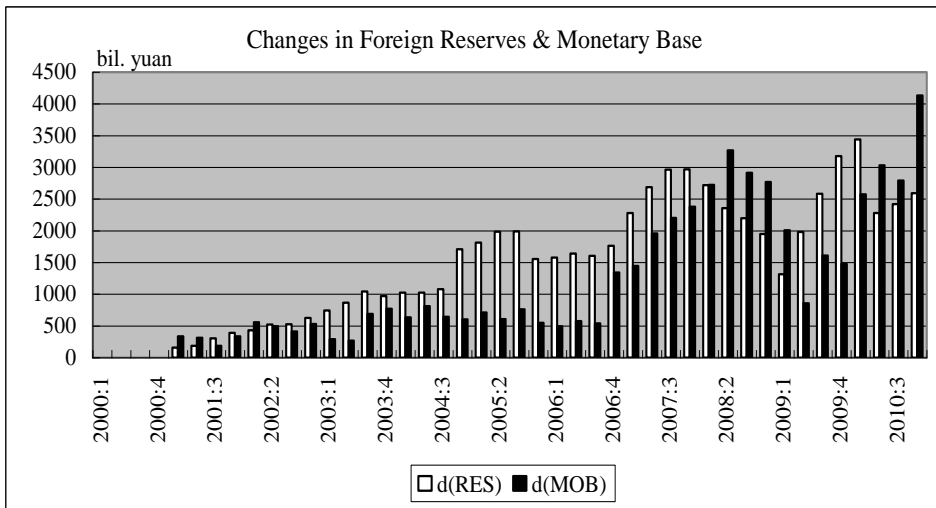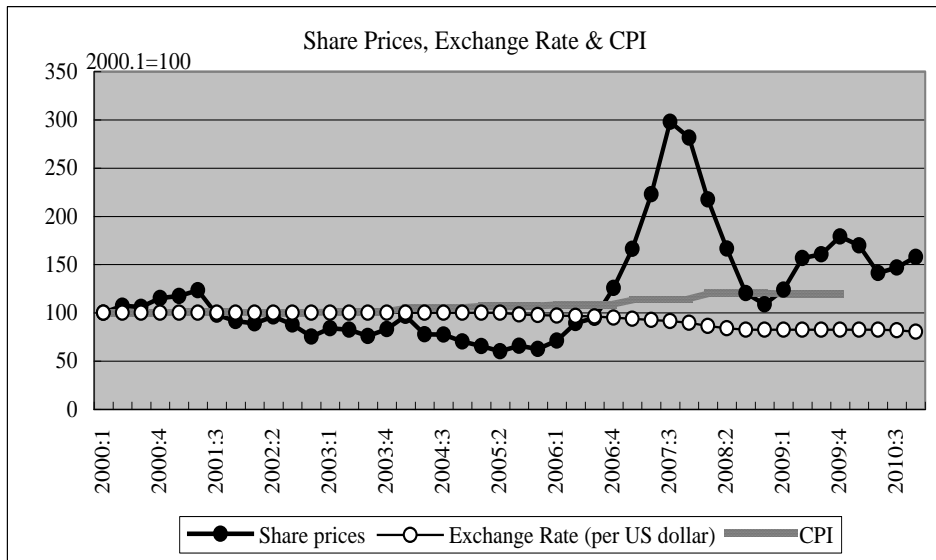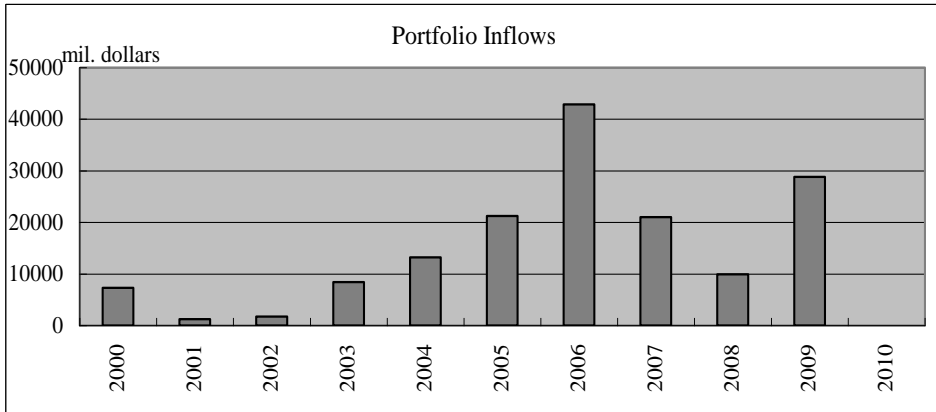**Share Prices, Exchange Rate & CPI**

Changes in Foreign Reserves & Monetary Base
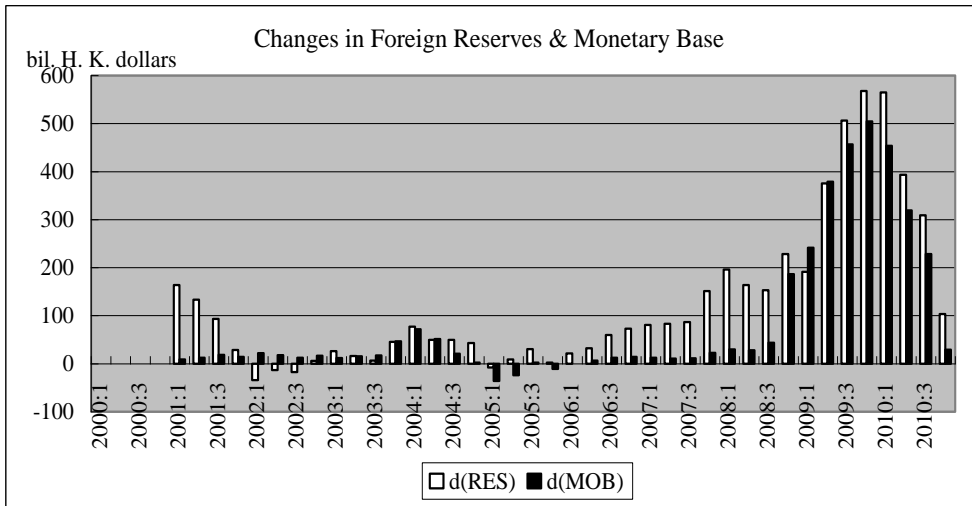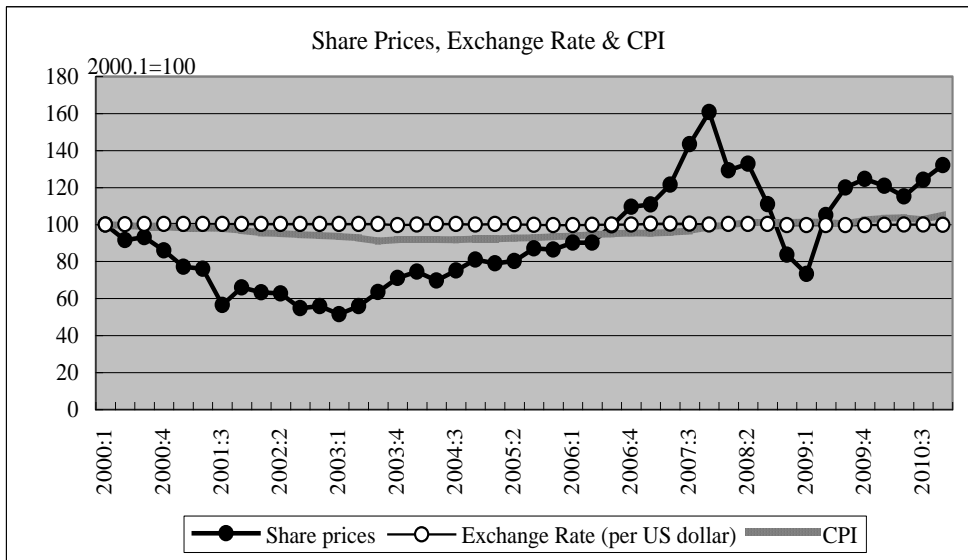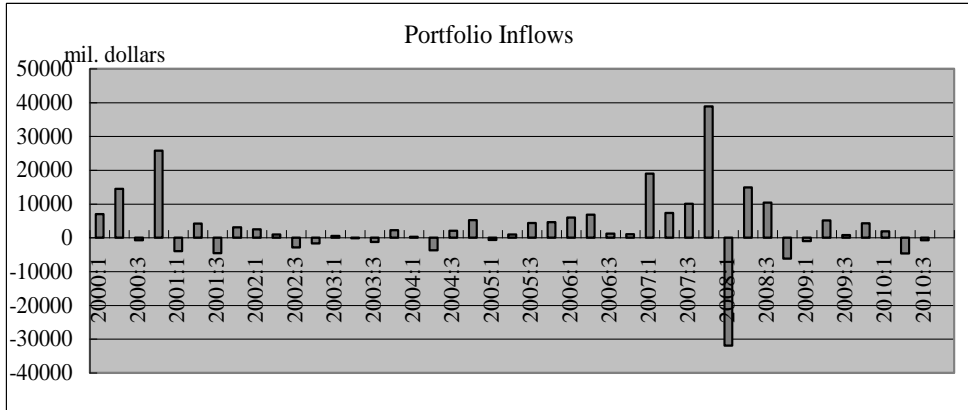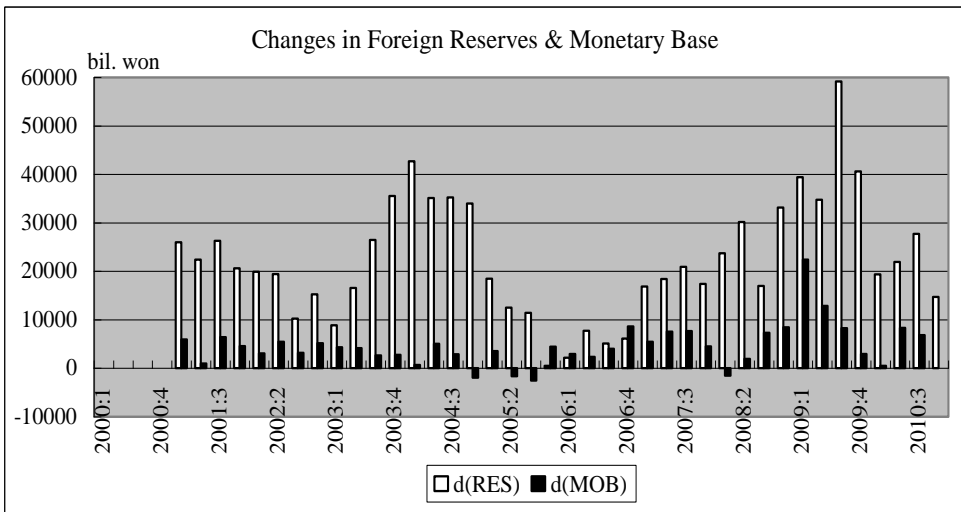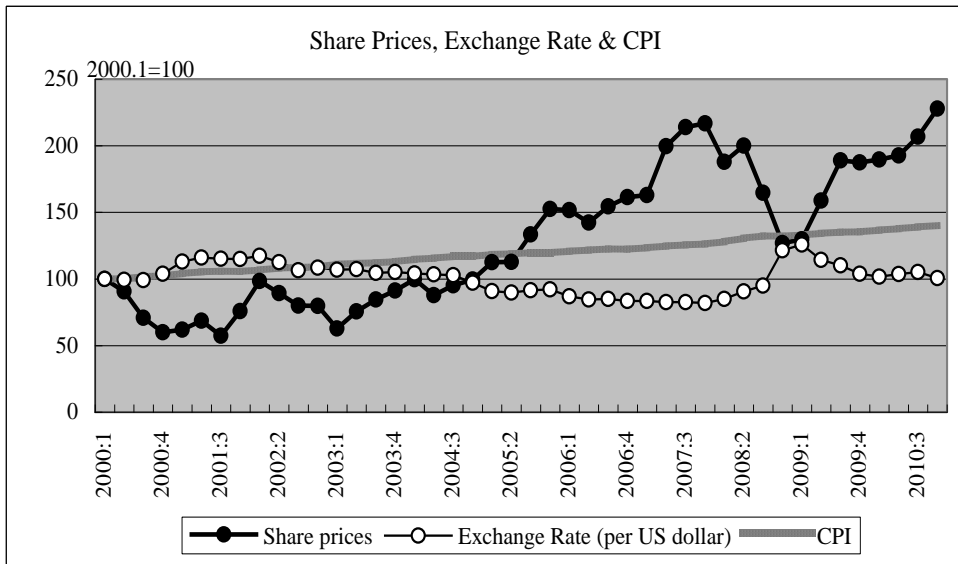
Figure-1.2. The Trends in Economic Variables: Hong Kong

Portfolio Inflows

mil. dollars

Share Prices, Exchange Rate & CPI

2000.1=100

Share prices ——○—— Exchange Rate (per US dollar) ▨ CPI

Changes in Foreign Reserves & Monetary Base

bil. H. K. dollars

□ d(RES) ■ d(MOB)

Figure-1.3. The Trends in Economic Variables: Indonesia

Portfolio Inflows

Share Prices, Exchange Rate & CPI

Changes in Foreign Reserves & Monetary Base
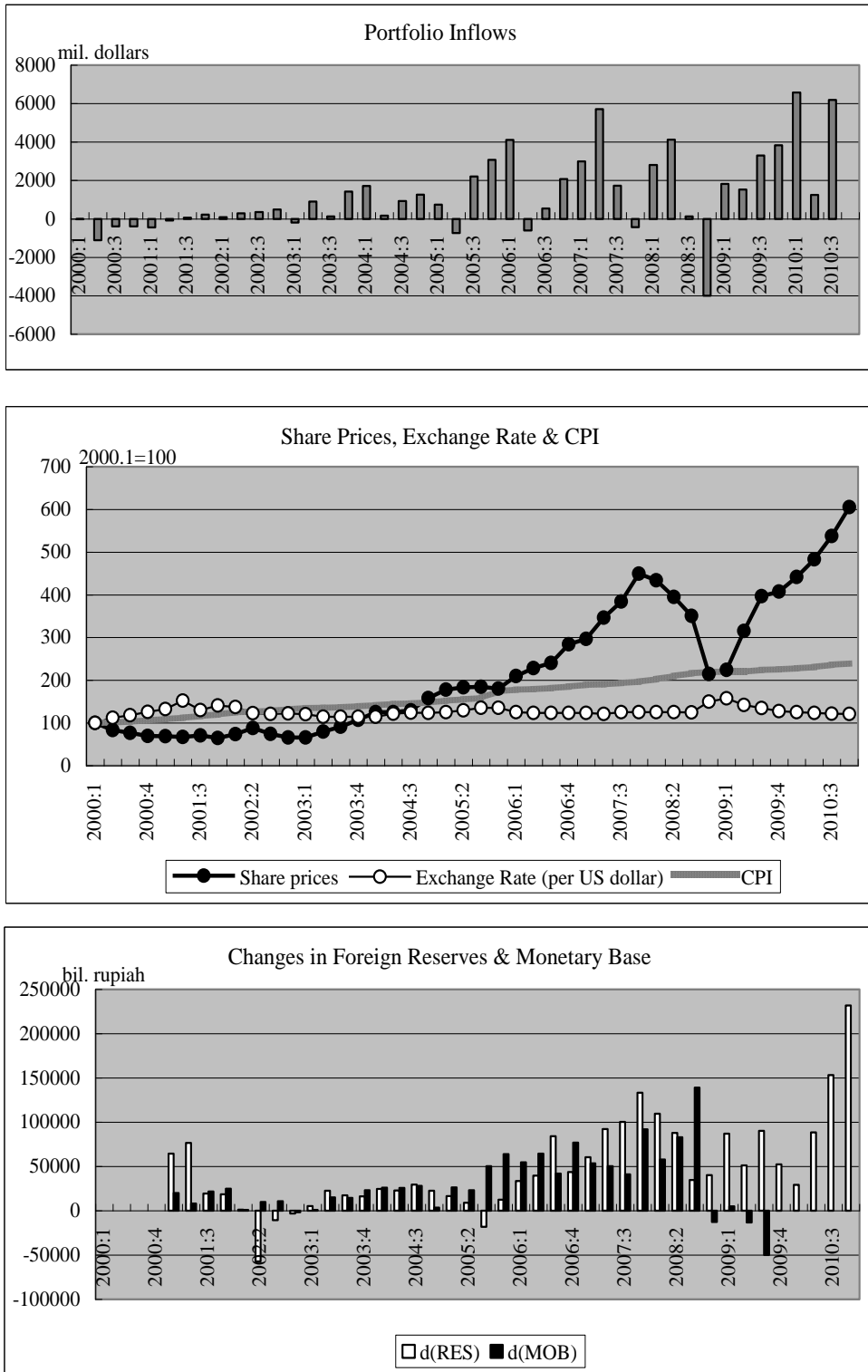
Figure-1.4. The Trends in Economic Variables: Korea

Portfolio Inflows

mil. dollars

Share Prices, Exchange Rate & CPI

2000.1=100

Share prices — Exchange Rate (per US dollar) — CPI

Changes in Foreign Reserves & Monetary Base

bil. won

☐ d(RES)   ■ d(MOB)
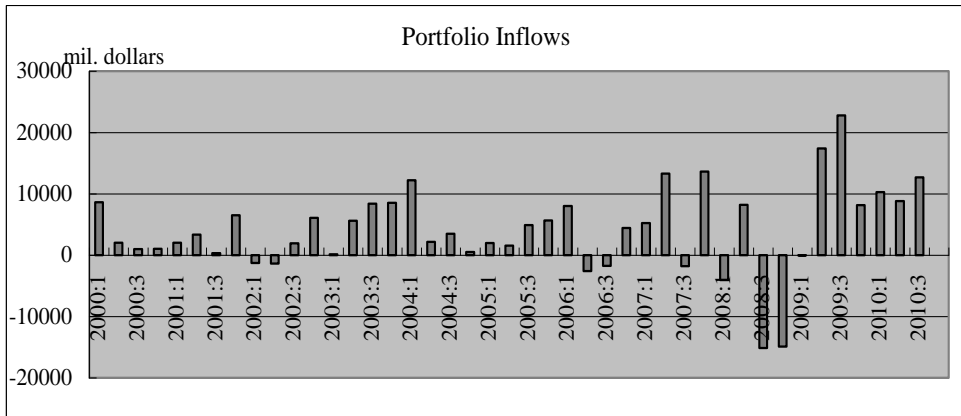
Figure-1.5. The Trends in Economic Variables: Thailand

Portfolio Inflows
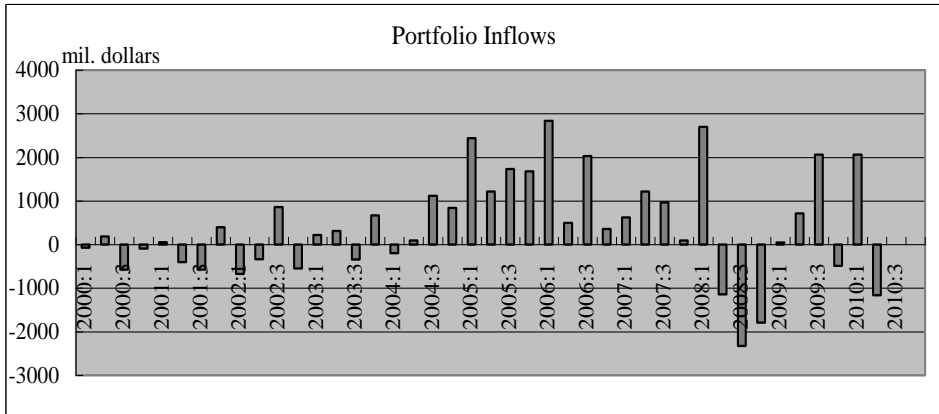

Share Prices, Exchange Rate & CPI

Changes in Foreign Reserves & Monetary Base
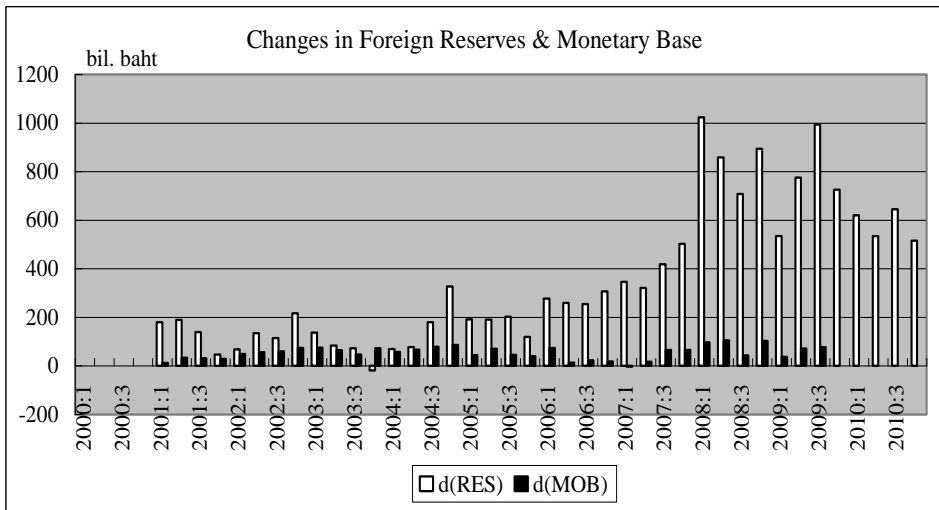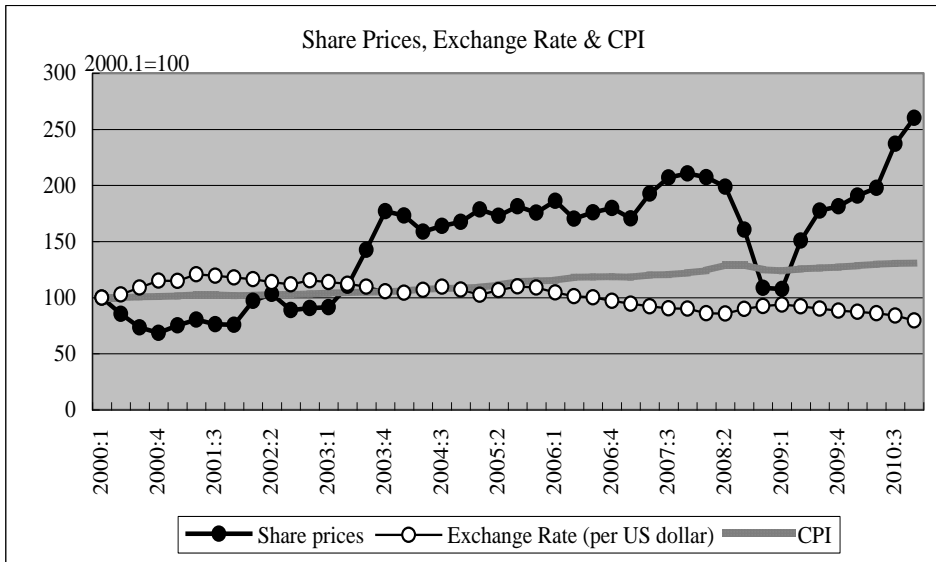
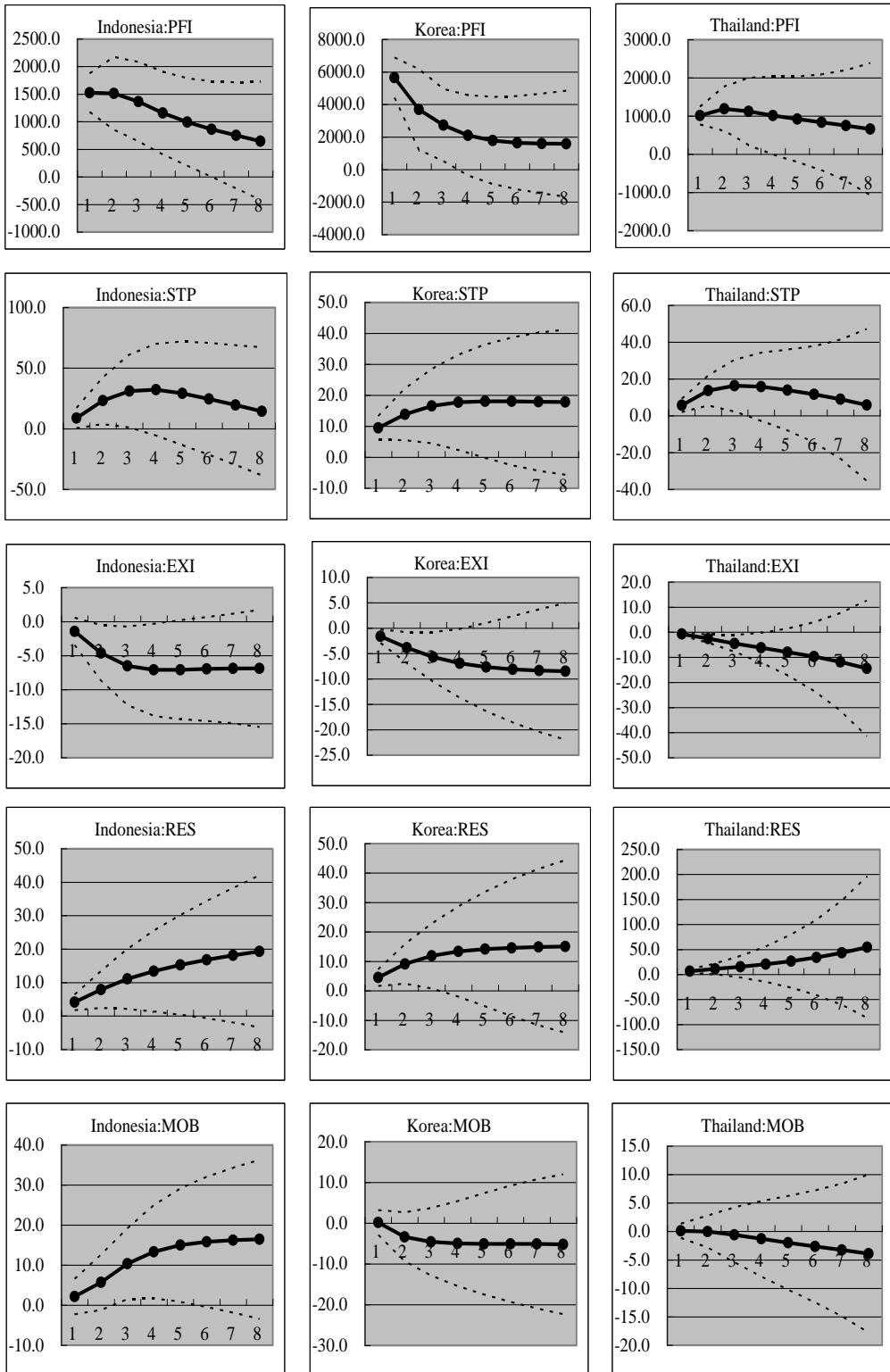**Figure-2.1.** Impulse Responses to Portfolio Inflows Shocks

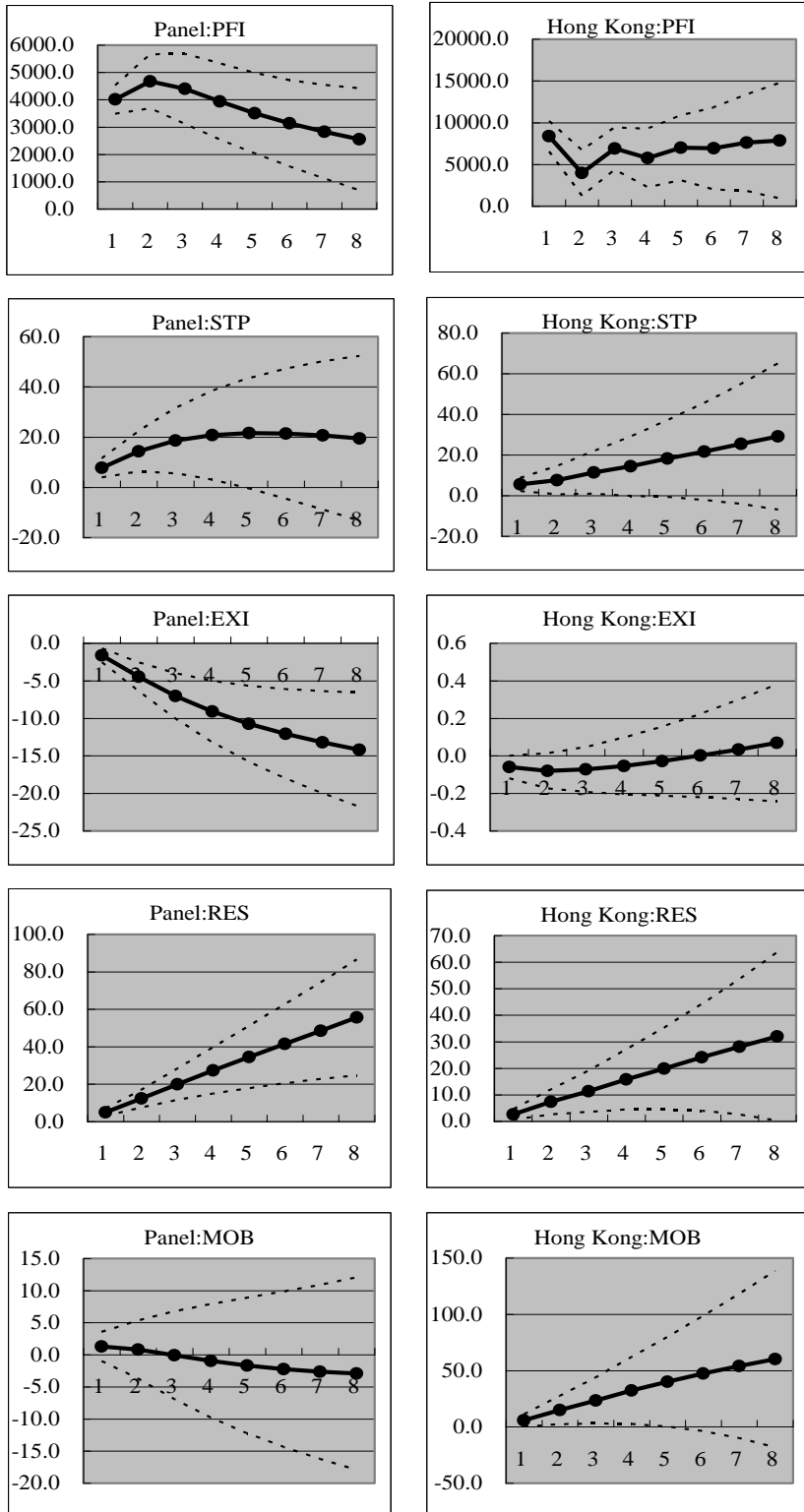**Figure-2.1.** Impulse Responses to Portfolio Inflows Shocks (continued)

Figure-2.2. Impulse Responses to Foreign Reserves Shocks