HITOTSUBASHI UNIVERSITY

Global COE Hi-Stat Discussion Paper Series 048

Research Unit for Statistical and Empirical Analysis in Social Sciences (Hi-Stat)

External Adjustments and Coordinated Exchange Rate Policy in Asia

Eiji Ogawa
Kentaro Iwatsubo

March 2009

Hi-Stat Discussion Paper

Hi-Stat
Institute of Economic Research
Hitotsubashi University
2-1 Naka, Kunitatchi Tokyo, 186-8601 Japan
http://gcoe.ier.hit-u.ac.jp

External Adjustments and Coordinated Exchange Rate Policy in Asia *

Eiji Ogawa[a] and Kentaro Iwatsubo[b]

January 29, 2009

Abstract

In this paper, we estimate structural VAR models with contemporaneous restrictions based on neo-classical and Keynesian theories to investigate whether the cause of current account surpluses for East Asian economies is a "saving glut" or undervalued currencies. Analytical results show that the major determinant of the current account is the real effective exchange rate for all East Asian countries with the exception of China for which the major determinant is domestic GDP. Accordingly, the recently requested revaluation of the Chinese yuan may not be an effective policy for reducing the Chinese current account surplus, and may affect other Asian current accounts. We also investigate whether a Chinese currency revaluation would contribute to the improvement of current account imbalances in East Asia and find that a revaluation would *improve* the current accounts of Japan, Korea, Indonesia, and Thailand. Since the trade structures of major East Asian countries are substitutes with that of China, a Chinese currency revaluation might not lead to a decrease, rather that an increase, in East Asian current account surpluses. Coordination of currency policy among East Asian countries is, therefore, needed to solve the global current account imbalance.

---

* This paper is a revised version of the paper prepared for ACAES-RCEA Conference in Rimini, Italy on August 29-31, 2008. The authors are grateful to participants at the Conference for their useful comments.

[a] Professor, Graduate School of Commerce and Management, Hitotsubashi University. E-mail: ogawa.eiji@srv.cc.hit-u.ac.jp.

[b] Associate professor, Graduate School of Economics, Kobe University, E-mail: iwatsubo@econ.kobe-u.ac.jp.

1. Introduction

Over the last decade we have witnessed rising global imbalances that can be characterized by large current account deficits for the U.S. and large current account surpluses for most East Asian countries and oil producing nations. Perhaps the most influential explanation for the widening U.S. current account deficits is the widening productivity gaps between the U.S. and the rest of the world (Hunt and Rebucci, 2005; Engel and Rogers, 2006; Chakraborty and Dekle, 2008). The fact that the deficit with East Asia is the most rapidly growing component of U.S. current account deficits may indicate, however, that Asian current account surpluses are an alternative cause. Indeed, the "global saving glut" explanation expounded by Bernanke (2005) seeks the cause of current account deficits outside the U.S. This argument views the excess saving of Asian countries, due to increased saving and collapsed investment in the aftermath of the financial crisis, as the cause of U.S. current account deficits.[1] Figure 1 presents evidence that the movements in the U.S. current account deficit have been symmetrical with those in the current account surpluses of Japan and East Asia (in terms of GDP).

China has been accused of exchange rate manipulation by the U.S. government and requested both to revalue the Chinese yuan and to shift from a dollar peg system to a more flexible exchange rate regime.[2] In July of 2005, the Chinese government carried out a reform of its exchange rate system that included abandoning the rigid dollar peg that had been in place since 1994. The Chinese monetary authority has, however, only been revaluing its US dollar rate by 3 to 5% per year and is still stabilizing the value of the yuan.[3] Over the last few years, the Chinese current account surplus has increased substantially and huge foreign reserves have accumulated. The widening trade deficits between the U.S. and China since 2001 have led the U.S. government to put even more political pressure on the Chinese government with the aim of reducing the U.S. current account deficit.[4]

---

[1] Chinn and Ito (2007) point out that saving *per se* is not excessive in East Asia and rather East Asia has experienced a shortfall in investment.

[2] Goldstein and Lardy (2003) write that China should make a medium-size (15% to 25%) revaluation of the yuan as the first step.

[3] See Ogawa and Sakane (2006). Goldstein (2007) stresses that even after exchange rate reform the Chinese monetary authority has maintained the undervaluation of the yuan.

[4] The effect of the Chinese currency adjustment on the U.S. current account deficits is inconclusive. Woo and Xiao (2007) point out that appreciation of the Chinese yuan will only re-configure the geographical distribution of global imbalances to other East Asian countries. It will not eliminate them. On the other hand, Bergsten (2007) stresses that a 40% appreciation of the Chinese yuan and other East Asian currencies against the US dollar would reduce the U.S. current account deficit by about $150 billion per year.

The request to revalue the Chinese currency may, however, be theoretically inconsistent with the "saving glut" argument. This argument relies on neo-classical economics, in which it is not the exchange rate but rather the saving-investment balance that determines current accounts. Therefore, a revaluation of the Chinese yuan and other East Asian currencies would not help to reduce the U.S. current account deficit. In contrast, the request for a revaluation of East Asian currencies relies on Keynesian economics, in which it is not the "saving glut" but currency manipulation or undervalued East Asian currencies that would cause the U.S. current account deficit.

This paper has two objectives. The first is to investigate whether the request for a currency revaluation contributes to improvements in the U.S. current account. In doing so, we estimate structural vector autoregressive (VAR) models with contemporaneous restrictions based on neo-classical and Keynesian theories to assess whether the main determinant of the current account for each of the East Asian countries is GDP or the real effective exchange rate.

The second objective is to examine whether a revaluation of the Chinese yuan would improve current account imbalances in East Asia. This link depends on whether the trade structures between China and other East Asian countries are substitutes or complements. If they are substitutes, a revaluation of the Chinese yuan will improve the current accounts of other East Asian countries. In this case other East Asian currencies should also be revalued or allowed to appreciate, in addition to the Chinese yuan, in order to reduce global current account imbalances. On the other hand, if trade structures are complementary, a revaluation of the Chinese yuan will deteriorate the current accounts of other East Asian countries. It is going to far to say that a revaluation of the Chinese yuan alone would be enough to solve global current account imbalances. We analyze the effects of the real effective exchange rate for the Chinese yuan on the current accounts of East Asian countries.

The remainder of the paper proceeds as follows. The next section explains current account models developed from the neo-classical and Keynesian frameworks. In the third section, we describe two structural VAR models with contemporaneous restrictions that correspond to the above two theories. We also present the empirical results for impulse response functions and variance decompositions. In the fourth section, both three-variable and five-variable VAR models are used to analyze the effects of a Chinese yuan revaluation on the current accounts of other East Asian countries. In the conclusion, we summarize our analytical results and discuss several policy implications that are implied by the results.

2. Current Account Models for East Asian Countries

In this section, we explain two simple models of current account determination, based on which we impose contemporaneous restrictions on the structural VAR models introduced in the following sections.

Here, we use the standard IS balance models of the neo-classical and Keynesian frameworks. The neo-classical theory assumes that prices are flexible, while the Keynesian theory assumes that they are sticky. Consider a small open economy in which both foreign real GDP and the foreign real interest rate are assumed to be exogenous, and the domestic real interest rate is pre-determined by the real interest rate parity condition.

The current account of a country is equal to the gap between domestic savings and domestic investments as shown by the following equation:

$$S(y,r) - I(r) = CA(e, y, y^*), \tag{1}$$

where S is domestic saving (the sum of private and government saving), I is domestic investment (the sum of private and government investment), CA is the current account, y is the real GDP of the home country, y^* is the real GDP of rest of the world (the United States), r is the real interest rate, and e is the (real effective) exchange rate.

In the neo-classical model, the assumption of flexible prices requires that the real GDP of the home country (y) be determined by fully employed factors of production. Both the real GDP of the United States (y^*) and the real interest rate (r) are regarded as exogenous for the small open economy of the home country. Accordingly, the real GDP of the home country (y) and the real interest rate (r) determine both domestic savings and investment, or the saving-investment gap, in advance. Then, the current account is determined at a level that equals the saving-investment gap. Finally, the real effective exchange rate (e) assumes a value that matches the current account (CA) with the saving-investment gap (S-I) as shown in equation (2):

$$S(\bar{y},\bar{r}) - I(\bar{r}) = CA(e, \bar{y}, \bar{y}^*), \tag{2}$$

where a bar ($\bar{x}$) over a variable indicates that it is regarded as predetermined in the model.

In the Keynesian model, both the real GDP of the United States (y^*) and the real interest rate (r) are also regarded as given for the small open economy. At first, domestic

investment is fixed by the pre-determined real interest rate (r),

$$S(y,\bar{r}) - I(\bar{r}) = CA(e, y, \bar{y}^*) . \tag{3}$$

The assumption of sticky prices leaves room for demand factors to affect the real GDP (y) and current account (CA) of the home country. Indeed, both the real GDP of the home country (y) and the real effective exchange rate (e) are simultaneously determined so that the saving-investment gap and the current account equalize with each other.

Neo-classical model $\left.\begin{matrix} \bar{y} \\ \bar{y}^* \\ \bar{r} \end{matrix}\right\} \Rightarrow \bar{S} - \bar{I} = CA \Rightarrow e$

Keynesian model $\left.\begin{matrix} \bar{y}^* \\ \bar{r} \end{matrix}\right\} \Rightarrow e \Rightarrow y \Rightarrow CA = S - I$

The "saving glut" argument relies on the neo-classical model where saving-investment gaps are determined independently of exchange rate fluctuations. It is not the exchange rate but the saving-investment balance that determines a current account imbalance. Exchange rates adjust current account imbalances to meet the predetermined saving-investment balance. Based on this argument, the currency revaluation in China and other East Asian countries would not be effective for improving the U.S. current account deficit.

In the Keynesian model, there is room for exchange rates to affect current accounts. The saving-investment balance is not pre-determined irrespective of exchange rates adjustments. As such, East Asian countries may well be requested to revalue their currencies.

Therefore, the "saving glut" argument and the request for a revaluation of East Asian currencies are theoretically inconsistent with each other because they depend on different models.

3. Determinants of the Current accounts of East Asian Countries

(1) Structural VAR Models for the Current Account

In this section, we build up structural VAR models with contemporaneous restrictions based on the neo-classical and Keynesian models described in the previous section.[5]

The estimation structure is as follows. Let Y_t be an $n \times 1$ vector of variables and u_t be an $n \times 1$ vector of mean zero structural innovations. The p[th] order structural VAR is written as:

$$B(L)Y_t = u_t$$
$$E(u_t u_t^{'}) = D$$
$$E(u_t u_{t+s}^{'}) = 0, \quad \forall s \neq 0,$$

where $B(L)$ is a p[th] order matrix polynomial in the lag operator L, $B(L) = B_0 - B_1 L - B_2 L^2 - \cdots - B_p L^p$. B_0 is a non-singular matrix summarizes the contemporaneous relationships between the variables of the model and is most commonly where identification restrictions are imposed.

Associated with the structural model is the reduced form VAR representation:

$$A(L)Y_t = \varepsilon_t$$
$$E(\varepsilon_t \varepsilon_t^{'}) = D$$
$$E(\varepsilon_t \varepsilon_{t+s}^{'}) = 0, \quad \forall s \neq 0,$$

where $A(L) = B_0^{-1}B(L) = I - A_1 L - A_2 L^2 - \cdots - A_p L^p$ and $\varepsilon_t = B_0^{-1} u_t$.

From the above, the relationship between the reduced form and the structural model can be expressed as:

$$\Sigma = (B_0^{-1}) D (B_0^{-1})^{'}.$$

To estimate the structural VAR model requires that the model be either exactly identified or over-identified. A necessary condition for the model to be exactly identified is that there must be the same number of parameters in B_0 and D as there are in Σ, of which there are $n(n+1)/2$ parameters. It is standard in the SVAR literature to restrict D to be diagonal, imposing $n(n-1)$ restrictions. We hence require a further

[5] For more detail on structural VAR estimations, see Blanchard and Quah (1989), Christiano, Eichenbaum, and Evans (1999, 2005), Debla-Norris and Floerkemeier (2006), Mio (2002) and Jang and Ogaki (2004).

$n(n-1)/2$ restrictions on B_0. This can be accomplished by assuming that B_0 is lower triangular; that is the standard recursive constraint which we employed in this paper.

It is noted, however, that the estimation results using the recursive constraint are sensitive to an ordering of the variables in the VAR. Therefore, we estimate two VAR models with contemporaneous restrictions consistent with the neo-classical and Keynesian models to check the robustness of regression results.[6]

In the VAR specification, Y_t is a vector of five endogenous variables: the real GDP of the home country (y), the real GDP of the United States (y^*), the real interest rate (r), the real effective exchange rate for the home currency (e), and the current account in terms of the GDP of the home country (CA).

In the neo-classical model, the order of the endogenous variables is written as

$$Y_t = [y^*, r, y, CA, e]'.$$

The real GDP of the home country (y), the real GDP of the United States (y^*), and the real interest rate (r) are ordered before the current account (CA) and the real effective exchange rate (e) because the first three variables contemporaneously affect the current account (CA) and the real effective exchange rate (e), rather than the other way around.

In contrast, in the Keynesian model, the order of variables is written as

$$Y_t = [y^*, r, e, y, CA]'.$$

The real GDP of the United States (y^*) and the real interest rate (r) are pre-determined as before. Although the real GDP of home country (y) and the real effective exchange rate (e) are simultaneously determined, we arrange the order so that the real effective exchange rate (e) simultaneously affects the real GDP (y) and the current account (CA), but not the reverse. Such ordering allows us to assess whether the order of the endogenous variables leads to different results for the neo-classical and Keynesian models.

We estimate parameters of the VAR models for both the neo-classical and Keynesian models and analyze the impulse responses of the current account of each East Asian country to an exchange rate shock, a domestic GDP shock, and a U.S. GDP shock. Furthermore, we examine the degree to which fluctuations of current accounts are explained by each shock using the forecast error variance decomposition.

---

[6] We do not aim to assess which model can better explain the data between the neo-classical and Keynesian models.

The sample countries include China, Japan, Korea, Singapore, Malaysia, the Philippines, Indonesia, and Thailand. The sample period covers from 1994:Q1 to 2006:Q4.

We use quarterly data for the relevant economic variables. Data on real effective exchange rates are available from the effective exchange rate indices of the Bank for International Settlements (BIS) (http://www.bis.org/statistics/eer/index.htm). Data on current accounts, GDP, interest rates and Consumer Price Index (CPI) are obtained from the IMF, *International Financial Statistics*. Long-term government bond yields are collected to create real interest rates for the sample countries except for China (bank lending rates) and Indonesia (three-month deposit rates). Chinese CPI is calculated (December 2000=100) based on rates of change in the CPI that are obtained from the China Statistical Yearbook of the National Bureau of Statistics. Only annual data are available for Chinese and Malaysian current accounts and Singapore's GDP. We use cubic spline interpolation to convert them from annual to quarterly data. For real GDP (seasonally adjusted), the Hodrick-Prescott filter is used to extract cyclical movements around the trend.

Due to the HP filtering, both the logarithm of the real GDP of home countries (y) and the logarithm of the real GDP of the United States (y^*) are stationary. The real interest rates (r) are also found stationary. The current account (CA) in terms of GDP and the logarithm of the real effective exchange rate (e) are non-stationary for most sample countries.

It is controversial whether to difference or not to difference the nonstationary series in characterizing the dynamics in terms of a vector autoregression. In this paper, we estimate VAR in levels to compare the regression results among the sample countries. Hamilton (1994, pp. 651-652) describes several reasons that not to difference is to be recommended. First, the parameters that describe the system's dynamics are estimated consistently. Second, even if the true model is a VAR in differences, certain functions of the parameters and hypothesis based on a VAR in levels have the same asymptotic distribution as would estimates based on differenced data.[7]

(2) Impulse Responses of Current Accounts to Shocks

[7] Another approach is to test each series individually for unit roots and then test for possible cointegration among the series. Once the cointegration relationship is found, a stationary representation such as a vector error-correction representation can be estimated. The disadvantage of this approach is that, despite the care one exercises, the restrictions imposed may still be invalid. Moreover, alternative tests for unit roots and cointegration can produce conflicting results, and the investigator may be unsure as to which should be followed.

The panels in Figure 2 show the current accounts and real effective exchange rates of China, Japan, Korea, Singapore, Malaysia, the Philippines, Indonesia, and Thailand. Comparisons between current accounts and real effective exchange rates for all of the countries show, in general, a negative correlation between them. This means that an appreciation of the home currency is related with a decrease in its current account.

The panels in Figure 3 show the accumulated impulse responses of current accounts to shocks (one standard deviation innovations) in the five economic variables (real GDP of home country (y), real GDP of the United States (y^*), real interest rate (r), real effective exchange rate (e), and current account (CA)) for both the neo-classical and Keynesian models. In addition, Figure 3 shows a variance decomposition of the current accounts into the five economic variables (real GDP of home country (y), real GDP of the United States (y^*), real interest rate (r), real effective exchange rate (e), and current account (CA)) for both the neo-classical and Keynesian models.

The impulse responses of the current accounts, shown in Figure 3, show how the current account of each of the countries reacts to shocks according to both the neo-classical and Keynesian models. Here we focus especially on the impulse responses of current accounts to shocks in the real GDP of the home country, the real GDP of the United States, and the real effective exchange rate of the home currency. The real GDP of the home country is expected to have a positive effect on its current account because an increase in real GDP increases savings and, in turn, the saving-investment gap, that is the current account. The real GDP of the United States is expected to have a positive effect on the current account of the home country because an increase in U.S. GDP increases the exports of the home country and, in turn, its GDP. The real effective exchange rate of the home currency is expected to have a negative effect on the current account of the home country given that an increase in the real effective exchange rate means an appreciation of the relevant currency.

In the case of China, in both models domestic GDP has a positive effect on the Chinese current account while U.S. GDP has a negative effect after having no effect for the first three quarters. The real effective exchange rate of the Chinese yuan has a negative effect on the Chinese current account in both models. Both the positive effect of Chinese GDP and the negative effect of the exchange rate on the current account coincide with the results predicted by the theoretical models, although the negative effect of U.S. GDP on the Chinese current account is not expected.

In the case of Japan, domestic GDP has a positive effect on the Japanese current account after two years while U.S. GDP has a small positive effect on the current account during the first two years in both the models. The real effective exchange rate of

the Japanese yen has a negative effect on the Japanese current account. Both the positive effect of Japanese GDP after two years and the negative effect of the exchange rate on the current account are the same as those predicted by the theoretical models. The small positive effect of U.S. GDP on the current account during the first two years is also an expected result.

In the case of Korea, in both models, while domestic GDP and U.S. GDP have positive effects on the Korean current account, the real effective exchange rate of the Korean won has a negative effect. These impulse responses are the same as those predicted by the theoretical models.

In the case of Singapore, domestic GDP has a small positive effect on the Singaporean current account while U.S. GDP has a negative effect after having no effect for the first three quarters in both of the neo-classical and Keynesian models. The real effective exchange rate of the Singapore dollar has a negative effect on the current account in both models. Both the positive effect of Singaporean GDP and the negative effect of the exchange rate on the current account are the same as the results expected in the theoretical models, although the negative effect of U.S. GDP on the current account is not the same as the expected result.

In the case of Malaysia, domestic GDP has a positive effect on the Malaysian current account in the neo-classical model but little effect on the current account in the Keynesian model. U.S. GDP and the real effective exchange rate have a negative effect on the Malaysian current account in both models. The positive effect of domestic GDP for the neo-classical model and the negative effect of the real effective exchange rate are expected. The effect of U.S. GDP on the current account, however, differs from the predictions of the theoretical models.

In the case of the Philippines, although domestic GDP has a negative effect on the current account, U.S. GDP has a positive effect for the first four years. The real effective exchange rate has a negative effect on the current account. Both the positive effect of U.S. GDP and the negative effect of the exchange rate match the expected effects of the theoretical models. The negative effect of domestic GDP on the current account is, however, not an expected result.

In the case of Indonesia, domestic GDP and U.S. GDP have positive effects, and the real effective exchange rate of the Indonesian rupiah has a negative effect on the current account in both models. These impulse responses are the same as those predicted by the theoretical models.

In the case of Thailand, both Thai and U.S. GDP have a positive effect on the Thai current account in the two models. The real effective exchange rate of the Thai baht has

a negative effect on the current account. These impulse responses are the same as those anticipated by the theoretical models.

All of the impulse responses are the same as those predicted by the theoretical models for Korea, Indonesia, and Thailand. On the other hand, both the positive effect of domestic GDP and the negative effect of the exchange rate on the current account are the same as expected in the theoretical models, although the negative effect of U.S. GDP on the current account is not the same as the result expected for Japan, China, Singapore, and Malaysia. Moreover, both the positive effect of U.S. GDP and the negative effect of the exchange rate on the current account are the same as expected in the theoretical models although the negative effect of domestic GDP on the current account is not the same as the result as expected for the Philippines.[8]

(3) Variance Decomposition of Current Accounts

Next, variance decomposition is conducted based on the above impulse response analysis to investigate the major determinants of current account variation for each country using both the neo-classical and Keynesian models. The panels in Figure 3 show the variance decomposition and the impulse response of the current account for each country.

In the case of China, Chinese GDP explains about 20% of the Chinese current account after five quarters in both the neo-classical and Keynesian models. U.S. GDP explains about 10% of the current account after two years in both the models. The real effective exchange rate explains about 5% to 10% of the current account over time in both models.

In the case of Japan, the real effective exchange rate explains about 35% of the Japanese current account after one and half years in the Keynesian model. Japanese GDP explains about 20% of the current account after three years later in both the models. U.S. GDP explains about 10% of the current account in both the models.

In the case of Korea, the real effective exchange rate explains about 35% of the Korean current account in the Keynesian model. The real interest rate explains about 35% of the current account in the first half year. After that, it explains about 25% of the current account. U.S. GDP explains about 5% of the current account in both of the

[8] In the small open economy, the foreign GDP positively influences the home country's current account in the Keynesian framework, but does not in the neo-classical model. On the contrary, in two-country model, it is possible that the foreign GDP negatively affects the home country's current account in the neo-classical model. Our regression results of the negative foreign GDP effects is consistent with the two-country mode, suggesting that the countries such as Japan, China and Singapore may not be small open economies but large countries like the US.

models.

In the case of Singapore, U.S. GDP explains about 15% of the Singaporean current account after one and half years in both the models. Domestic GDP explains about 10% of the current account in both the models. The real effective exchange rate explains a small part of current account in earlier stages, and about 30% of the current account in the 30th quarter.

In the case of Malaysia, the real effective exchange rate explains 40% to 50% of the Malaysian current account in the Keynesian model. Each of Malaysian and U.S. GDP each explain no more than 10% of the current account in both models.

In the case of the Philippines, U.S. GDP explains about 15% of Philippine current account in both the models. Domestic GDP explains about 5% of the current account. The real effective exchange rate explains about 20% of the current account after three years in both models.

In the case of Indonesia, the real effective exchange rate explains about 20% of the Indonesian current account after a half of year in the Keynesian model. In addition, the real interest rate explains about 20% of the current account in both models. U.S. GDP and Indonesian GDP each explain about 10% of the current account.

In the case of Thailand, the real effective exchange rate explains about 40% of the Thai current account after a half a year in the Keynesian model. The real interest rate explains about 15% of the current account in both models. U.S. GDP explains about 15% of the current account in the first quarter but only about 5% of the current account after one year. Thai GDP explains about 5% of the current account in both models.

In sum, the East Asian countries can be classified into three groups. The first group, which includes Japan, Korea, Malaysia, Indonesia, and Thailand, consists of countries for which the real effective exchange rate is a major determinant of the current account. U.S. GDP has a relatively small effect on the current accounts of these countries. The second group, which includes Singapore and the Philippines, consists of countries where U.S. GDP is a major determinant of the current account in earlier stages and the real effective exchange rate is a major determinant in later stages. For the last group, which only includes China, domestic GDP is a major determinant of the current account.

China is the only country for which domestic GDP or aggregate domestic demand is a major determinant of the current account. For the other East Asian countries, it is the exchange rate, rather than domestic or U.S. GDP, that contributes to the current account. The Chinese determination of the current account corresponds to the neo-classical model in which domestic GDP, U.S. GDP, and the real interest rate are pre-determined before the exchange rate changes to adjust the current account. On the

other hand, the determination of the current accounts of the other East Asian countries corresponds to the Keynesian model in which U.S. GDP and the real interest rate are pre-determined before the exchange rate changes to adjust the current account. This is followed by an adjustment in the GDP of the home country.

As explained in section 2, the "saving glut" argument relies on the neo-classical model while the request to revalue currencies relies on the Keynesian model. Accordingly, the Chinese current account surplus can be associated with the "saving glut" argument because it is mainly determined by Chinese GDP, or aggregate domestic demand. Therefore, a "saving glut" in China is responsible for the current account surplus of China. On the other hand, a revaluation of the Chinese yuan would contribute little to the reduction of this surplus.

The current accounts of the other East Asian countries are well explained by the Keynesian model, which the request to revalue or appreciate currencies, not the "saving glut argument", relies on. The current account surpluses of these countries are not caused by excess savings but rather undervalued currencies. Revaluation or appreciation of currencies should contribute to a reduction of current account surpluses. Our finding that the real efficient exchange rate is a major determinant of the current account in all of the sample countries, with the exception of China, provides clear evidence that a revaluation or appreciation of currencies should reduce the current account surpluses of these countries. Thus, policy-makers should adopt different measurements to reduce the current account surplus between China and other East Asian countries.

4. Effects of the Chinese Yuan Revaluation on the Current Accounts of Other East Asian Countries

In spite of the small reduction in the Chinese current account surplus that a revaluation might achieve, a revaluation of the Chinese yuan has been requested by the governments of many countries, including the United State and the European Union (EU). Supposing that the Chinese government accomplished a significant revaluation of the Chinese yuan we investigate what effects a revaluation would have on the current accounts of other East Asian countries.

For this purpose, the Keynesian model is used to analyze how the current account of each of the East Asian countries reacts to a revaluation of the Chinese yuan, given that the current accounts of these countries should be well explained by the Keynesian model. Both three-variable and five-variable VAR models are used for the analysis. The

three-variable VAR model includes the real effective exchange rate of the home currency (e), the current account in terms of domestic GDP (CA), and the real effective exchange rate of the Chinese yuan (e^*) as endogenous variables. On the other hand, the five-variable VAR model includes as endogenous variables both real domestic GDP (y) and Chinese GDP (y^*), the real effective exchange rates of the home currency (e) and the Chinese yuan (e^*), and the current account in terms of domestic GDP (CA).

The real effective exchange rates of the home currency and the Chinese yuan and the GDPs of the home country and China as well as the current account are regarded as endogenous variables in the five-variable VAR model. In contrast, only the real effective exchange rates of the home currency and the Chinese yuan and the current account are regarded as endogenous variables while the GDPs of home country and China are regarded as exogenous variables in the three-variable VAR model. Accordingly, while the three-variable VAR model supposes that a Chinese yuan shock will have a direct effect on the current account of the home country, the five-variable VAR model supposes that in addition to the direct effect there will be an indirect effect through the GDPs of the home country and China. The direct effect is closely related to whether the trade structure of the home country is a substitute or complement of that of the Chinese economy.

The estimated three-variable and five-variable VAR models are used to analyze the impulse responses of the current accounts of East Asian countries to a real effective exchange rate shock in the Chinese yuan. The sample period covers from 1994:Q1 to 2006:Q4.

The real effective exchange rate for the home currency is expected to have a negative effect on the current account of the home country in the three-variable VAR model. The real effective exchange rate for the Chinese yuan is expected to have a positive direct effect on the current account of the home country if the trade structures of China and other East Asian countries are substitutes. On the other hand, the real effective exchange rate of the Chinese yuan is expected to have a negative direct effect on the current account of the home country if trade structures are complements.

The indirect effect of the Chinese yuan on the current account of the home country in the five-variable VAR can be explained as follows. Supposed that trade structures of the home country and China are substitutes. A revaluation of the Chinese yuan (an increase in the real effective exchange rate of the Chinese yuan) induces a demand shift from Chinese products to home products. This shift increases the GDP of the home country and, at the same time, decreases Chinese GDP In turn, home imports increase (caused by the increase in GDP of home country) and home exports decrease (caused by

the decrease in Chinese GDP. Thus, the real effective exchange rate of the Chinese yuan has a negative indirect effect on the current account of the home country in the case where trade structures are substitutes. Accordingly, the total effect of the real effective exchange rate of the Chinese yuan on the current account is the sum of the positive direct effect and the negative indirect effect in the five-variable VAR model. The sign of the total effect will depend on which is larger, the direct or the indirect effect.

The panels in Figure 4 show the accumulated impulse responses of the three economic variables (both the real effective exchange rates of home currency (e) and the Chinese yuan (e^*) and the current account in terms of GDP of the home country (CA)) to a shock (one standard deviation innovations) of the real effective exchange rates of the Chinese yuan (e^*) for each of the sample countries. The panels in Figure 5 show the accumulated impulse responses of the five economic variables (both the real effective exchange rates of home currency (e) and the Chinese yuan (e^*), both GDPs of home country (y) and China (y^*), and the current account in terms of the GDP of home country (CA)) to a shock (one standard deviation innovations) in the real effective exchange rate of the Chinese yuan (e^*).

The three-variable VAR analyses have the following analytical results. The real effective exchange rate of the home currency has a negative effect on current account of the home country for all of the sample countries. The real effective exchange rate of the Chinese yuan has a positive direct effect on the current account of the home country for all of the sample countries except for the Philippines. The accumulated response of the Philippine current account to the Chinese yuan shock is small and fluctuates as time passes. Thus, the Chinese yuan revaluation improves the current account of all other East Asian countries with the exception of the Philippines. This evidence implies that the countries' have trade structures that are substitutes with the trade structure of China.

We obtain the following analytical results for the five-variable VAR model. The real effective exchange rate of the home currency has a negative effect on the current account of the home country for all of the sample countries. The real effective exchange rate of the Chinese yuan has a positive total effect on the current account of the home country for Japan, Korea, Indonesia, and Thailand. In contrast, the real effective exchange rate for the Chinese yuan has a negative total effect on the current account of the home country for Singapore and Malaysia. The accumulated response of the Philippine current account to the Chinese yuan shock is small and fluctuates as time passes. Thus, the Chinese yuan revaluation improves the current accounts of Japan, Korea, Indonesia, and Thailand. This evidence implies that the countries' trade

structures are substitutable with that of China. On the other hand, the Chinese yuan revaluation deteriorates the current accounts of Singapore and Malaysia because the negative indirect effect through GDP is larger than the direct effect.

In sum, the results of the five-variable VAR analysis show that a revaluation of the Chinese yuan would improve the current accounts of other East Asian countries which include Japan, Korea, Indonesia, and Thailand. The major countries of East Asia such as Japan and Korea and some ASEAN member countries would see an improvement in their current accounts as a result of a revaluation of the Chinese yuan.

5. Conclusion

This paper uses structural VAR models with contemporaneous restrictions based on the neo-classical and Keynesian theories to analyze the determinants of the current accounts of East Asian countries. In particular, we investigate whether currency revaluation contributes to a reduction in the current account imbalance. The analytical results suggest that China is the only country for which domestic GDP, or aggregate domestic demand, is a major determinant of the current account while it is the exchange rate, rather than domestic GDP or U. S. GDP that contributes to the current accounts of other East Asian countries.

A comparison between the neo-classical and Keynesian models shows that Chinese GDP, or aggregate domestic demand, mainly determines the Chinese current account. Therefore, the "saving glut" in China is responsible for the current account surplus of China. On the other hand, a revaluation of the Chinese yuan would probably contribute little to a reduction of the current account surplus of China. In contrast, the current accounts of the other East Asian countries are well explained by the Keynesian model, and it is this model that the request for a revaluation or appreciation of currencies relies on. The "saving glut" argument relies on the neoclassical model. A revaluation or appreciation of currencies should contribute to a reduction in the current account surpluses of the other East Asian countries.

In addition, three-variable and five-variable VAR models, which include the real effective exchange rate of the home currency and the Chinese yuan, and the current account in terms of domestic GDP are used to investigate whether a revaluation of the Chinese yuan improves or deteriorates the current accounts or saving-investments balance of other East Asian countries. The analytical results show that a revaluation of the Chinese yuan improves the current accounts of Japan, Korea, Indonesia, and Thailand. In other words, the current accounts of major countries in East Asia, for

example, Japan and Korea, and several ASEAN member countries such as Thailand and Indonesia, increase in response to a revaluation of the Chinese yuan.

Thus, although the U.S. government has requested that the Chinese government revalue the Chinese yuan, such a revaluation would have little effect on the Chinese current account itself. At the same time, the revaluation would improve the current accounts of other major East Asian countries including Japan, Korea, Indonesia, and Thailand. Thus, a revaluation of the Chinese yuan would not contribute to a reduction in the current account imbalance between the United States and East Asia. In fact, it might actually increase this current account imbalance.

The results have several policy implications for the current account imbalances of the Asia-Pacific region. First, if we focus on the current account imbalance of China. The "saving glut" in China is responsible for the current account surplus, but a revaluation of the Chinese yuan would have little effect on the current account. The Chinese government should stimulate aggregate domestic demand, including domestic private consumption and private investment, in order to reduce excess savings in China and, in turn, to reduce the Chinese current account surplus. A fiscal expansion conducted by the Chinese government would be effective for stimulating domestic demand. In addition, raising minimum wage rates in China might stimulate domestic private consumption. Moreover, it has been pointed out that inefficient financial intermediation through domestic financial markets cannot provide a well-functioning conduit for domestic savings to flow to domestic investments.

Second, a revaluation of the Chinese yuan alone would lead to improvements in the current accounts of other East Asian countries while having little effect on the Chinese current account. Thus, the revaluation might aggravate the current account imbalance that exists between the United States and East Asia. It is not only the Chinese yuan but also other East Asian currencies that need to be revalued or allowed to appreciate against the US dollar in order to reduce the current account imbalance. Coordinated exchange rate policy among the East Asian countries is necessary to solve the global imbalance.

Lastly, the U.S. government should reduce its own fiscal deficits to improve the saving-investment imbalance and, in turn, the current account deficit. Coordinated macroeconomic policy for external adjustments in the Asia-Pacific region, which include not only coordinated exchange rate policy in East Asia but also reduced fiscal deficits for the U.S. government, are needed to solve the global imbalance.

References

Bergsten, Fred C. (2007) "The Dollar and the Renminbi," Statement before the Hearing on US Economic Relations with China: Strategies and Options on Exchange Rates and Market Access, Subcommittee on Security and International Trade and Finance, Committee on Banking, Housing and Urban Affairs, United States Senate, May 23, 2007.

Bernanke, Ben S. (2005) "The Global Saving Glut and the U.S. Current Account Deficit," Remarks at the Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, Mach 10, 2005.

Blanchard, Oliver J. and Danny Quah (1989) "The Dynamic Effects of Aggregate Demand and Supply Disturbances," *American Economic Review*, vol.79, 655-673.

Chakraborty, Suparna and Robert Dekle (2008) "Can International Productivity Differences Explain U.S. Current Account Deficits?" Mimeo.

Chinn, Menzie D. and Hiro Ito (2007) "Global Current Account Imbalances: American Fiscal Policy versus East Asian Savings," *Review of International Economics*, forthcoming.

Christiano, L. J., M. Eichenbaum, and C. L. Evans (1999), "Monetary Policy Shocks: What Have We Learned and to What End?" in Taylor, J. B. and M. Woodford (eds.), *Handbook of Macroeconomics* Vol.1A, Amstererdam: Elsevier Science, pp. 65-178.

Christiano, L. J., M. Eichenbaum, and C. L. Evans (2005), "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy", *Journal of Political Economy*, vol. 113 (1), pp. 1-45.

Debla-Norris, Era and Holger Floerkemeier (2006) "Transmission Mechanisms of Monetary Policy in Armenia: Evidence from VAR Analysis," *IMF Working Paper*, WP/06/248.

Engel, Charles and John Rogers (2006) "The U.S. Current Account Deficit and the Expected Share of World Output," *Journal of Monetary Economics*, 53, 1063-1093.

Goldstein, Morris and Nicholas R. Lardy (2003) "Two-Stage Currency Reform for China," *Asian Wall Street Journal*, September 12, 2003.

Goldstein, Morris (2007) "Assessing Progress on China's Exchange Rate Policies," Testimony before the Hearing on "Risk and Reform: The Role of Currency in the US-China Relationship" Committee on Finance, US Senate, March 28, 2007.

Hamilton, James (1994) *Time Series Analysis*, Princeton University Press.

Hunt, Benjamin and Alessandro Rebucci (2005) "The U.S. Dollar and the Trade Deficit: What Accounts for the Late 1990s?" *International Finance*, 8, 3, 299-434.

Jang, Kyungho and Masao Ogaki (2004) "The Effects of Monetary Policy Shocks on Exchange Rates: A Structural Vector Error Correction Model Approach," *Journal of the Japanese and International Economies*, vol. 18, 99-114.

Mann, Catherin L. (2002) "Perspectives on the U.S. current account deficit and sustainability," *Journal of Economic Perspectives*, 16, 131-152.

Mio, Hitoshi (2002) "Identifying Aggregate Demand and Aggregate Supply Components of Inflation Rate: A Structural Vector Autoregression Analysis for Japan," *Monetary and Economic Studies*, Vol.20, no.1, 33-56.

Ogawa, Eiji and Takeshi Kudo (2007) "Asymmetric responses of East Asian currencies to the US dollar depreciation for reducing the US current account deficits," *Journal of Asian Economics*, 18, 175-194.

Ogawa, Eiji and Michiru Sakane (2006) "Chinese Yuan after Chinese Exchange Rate System Reform," *China & World Economy*, Vol.14, No.6, 39-57.

Woo, Wing Thye and Geng Xiao (2007) "Facing Protectionism Generated by Trade Disputes: China's Post-WTO Blues," a paper prepared for the China Update 2007 Conference, Integrating Markets in China: Domestic and International, to be held at The Shine Dome, Acton, Australian National University in Canberra, Australia on 12 July, 2007.

Figure1: Current Account Imbalances between the United States and Asia

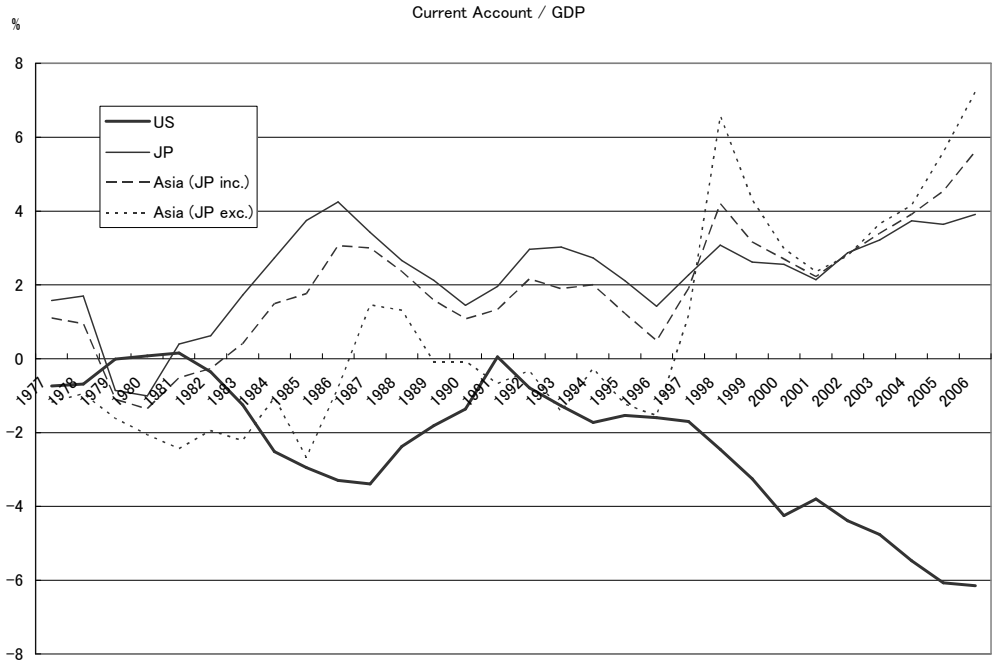
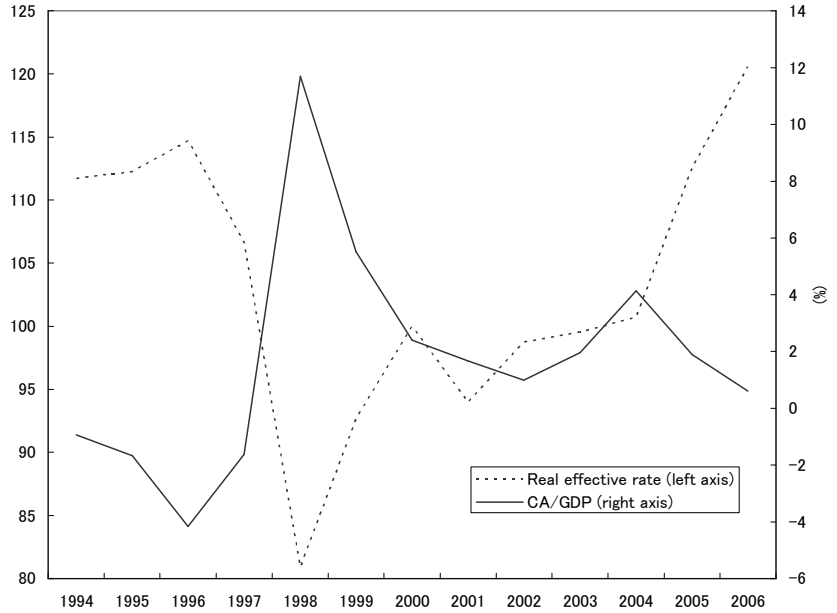
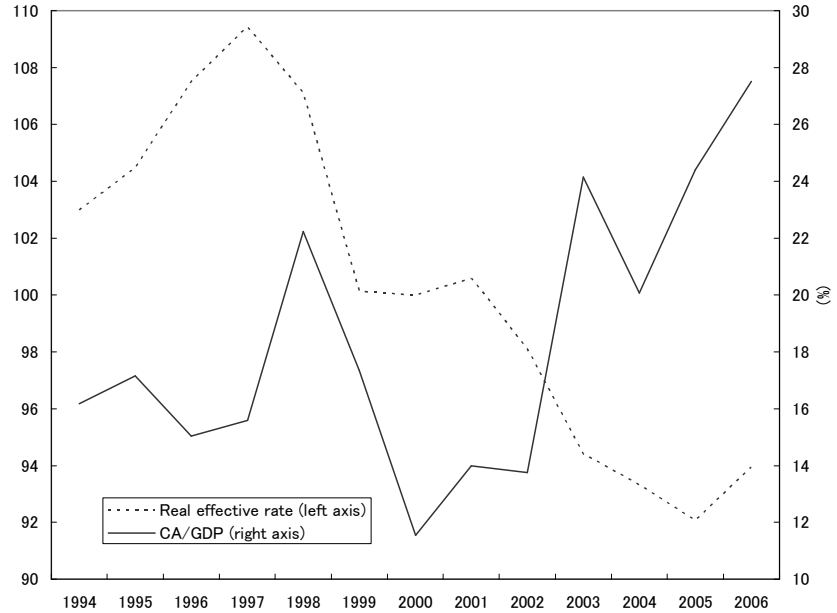


Figure 2: Current account and real effective exchange rate

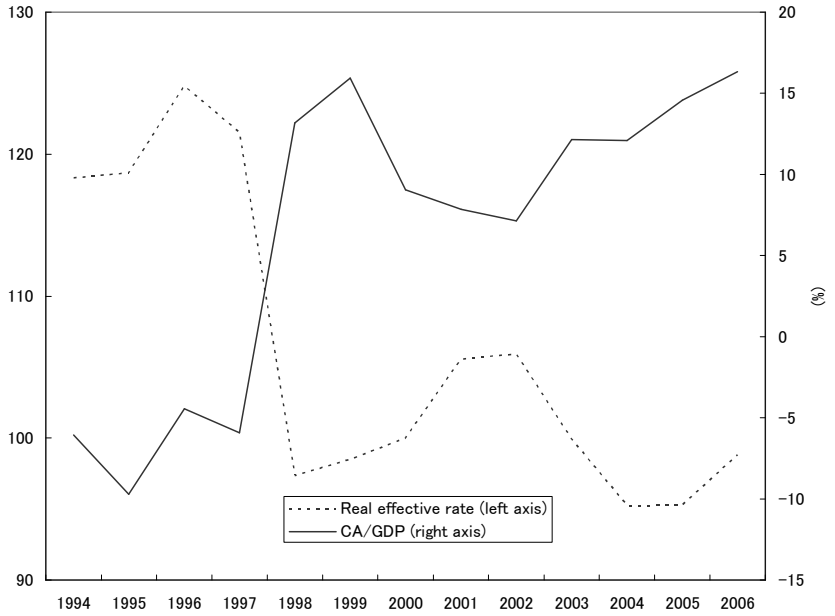
Korea



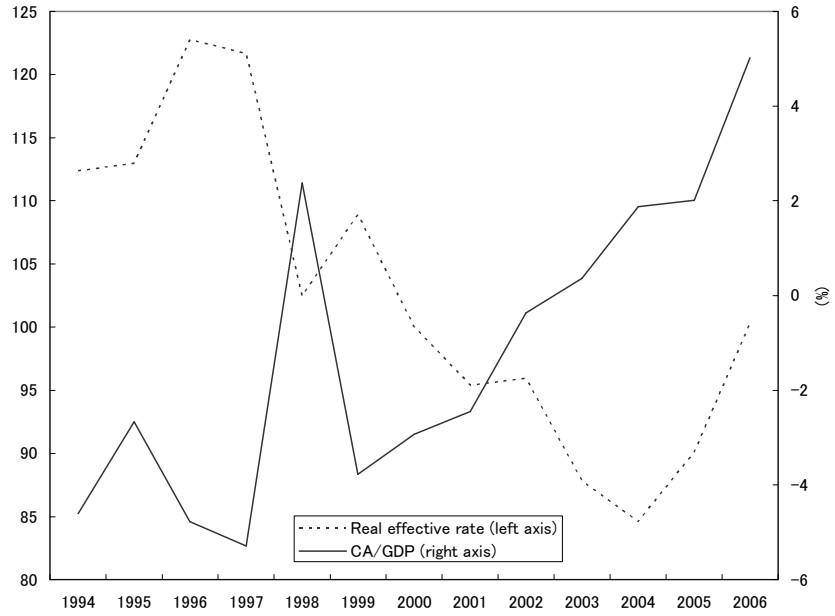
Singapore



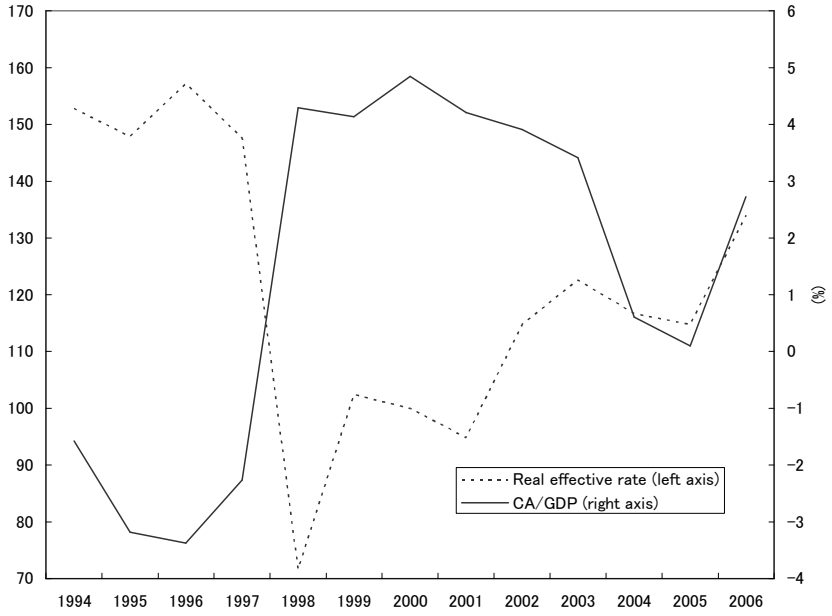
Malaysia



The Philippines



Indonesia



Thailand

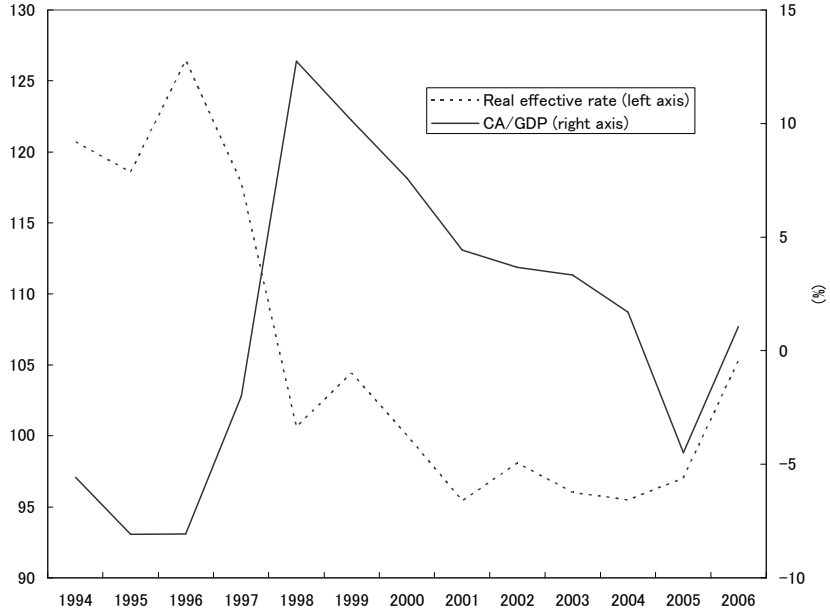
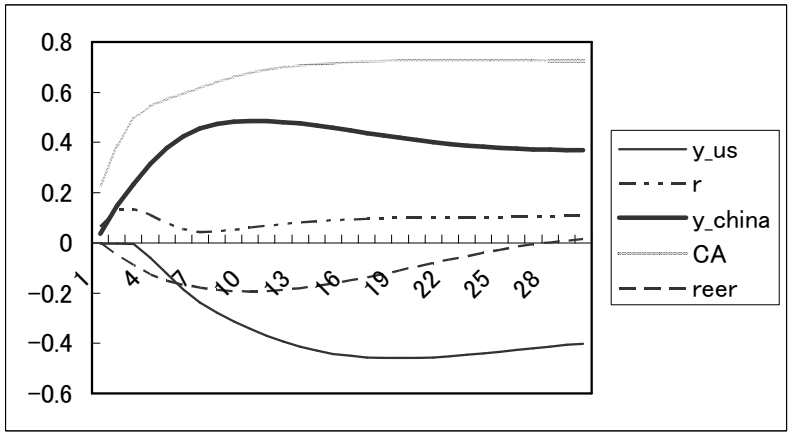
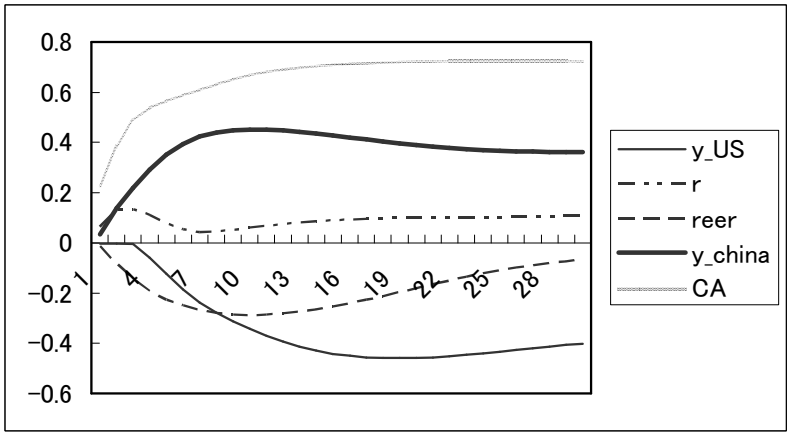


Fig. 3-1 China
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

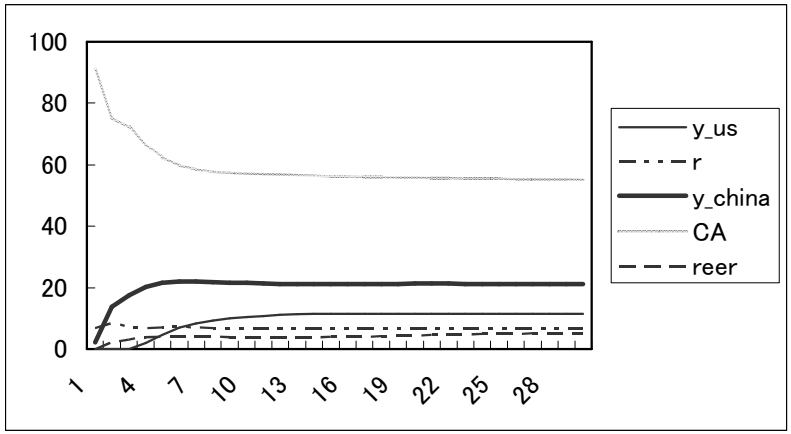
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

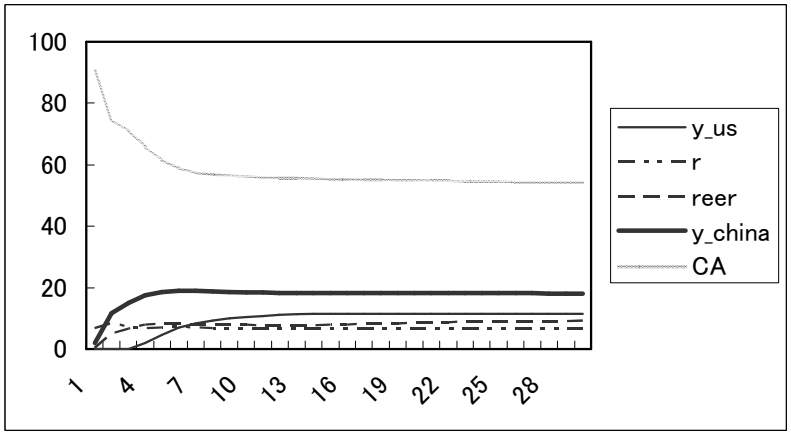
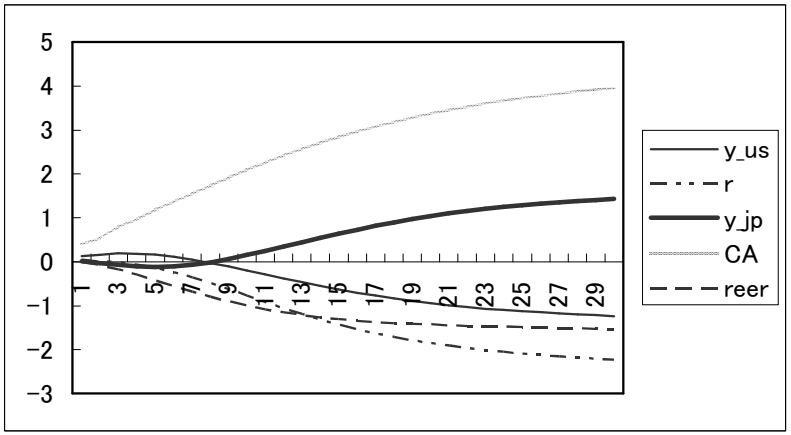
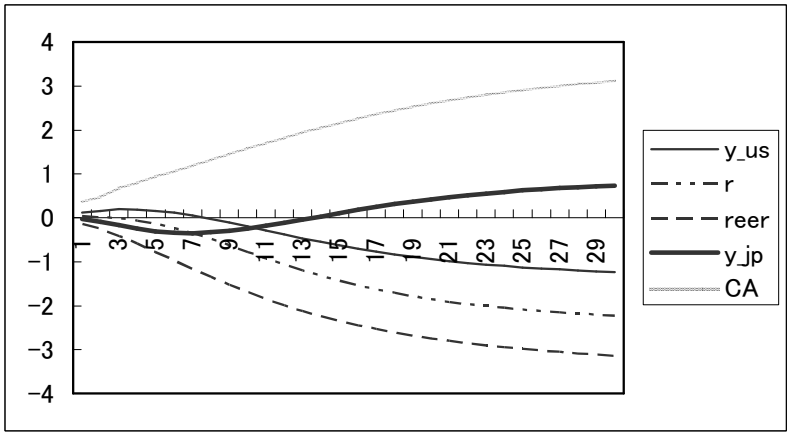


Fig. 3-2 Japan
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

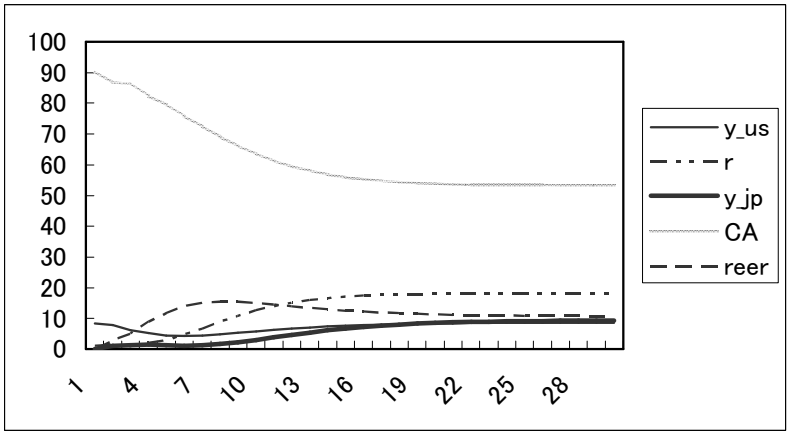
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

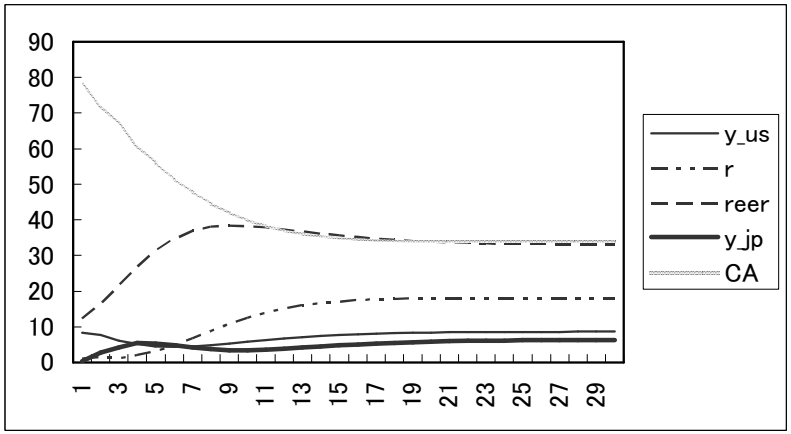
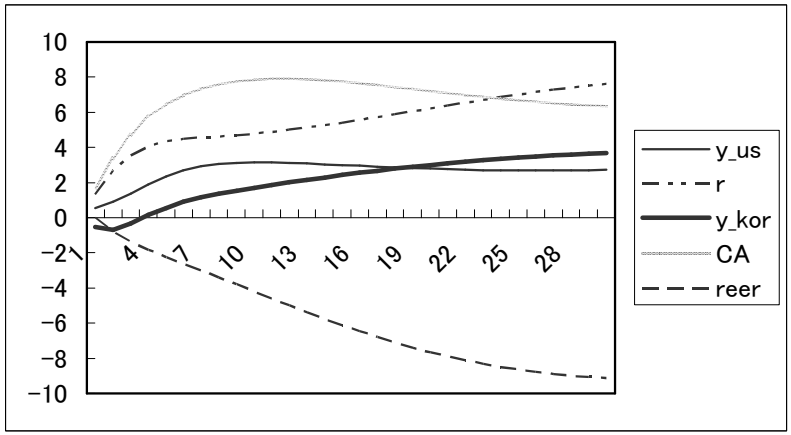
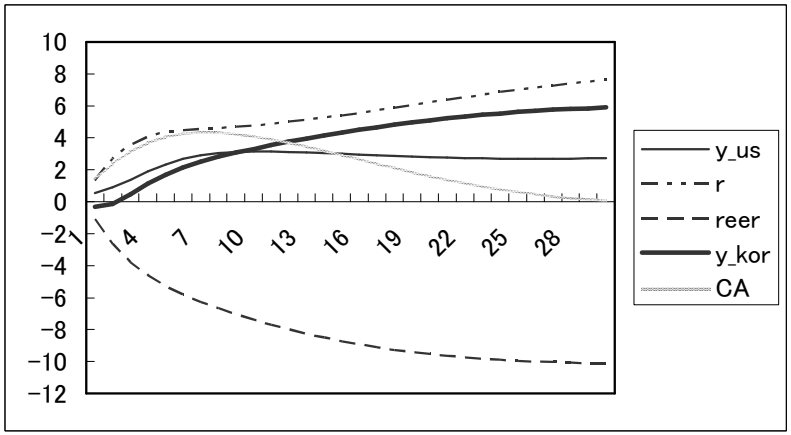


Fig. 3-3 Korea
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

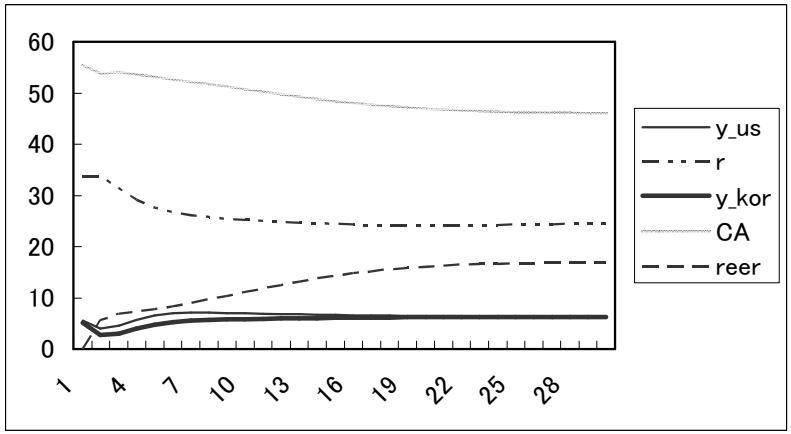
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

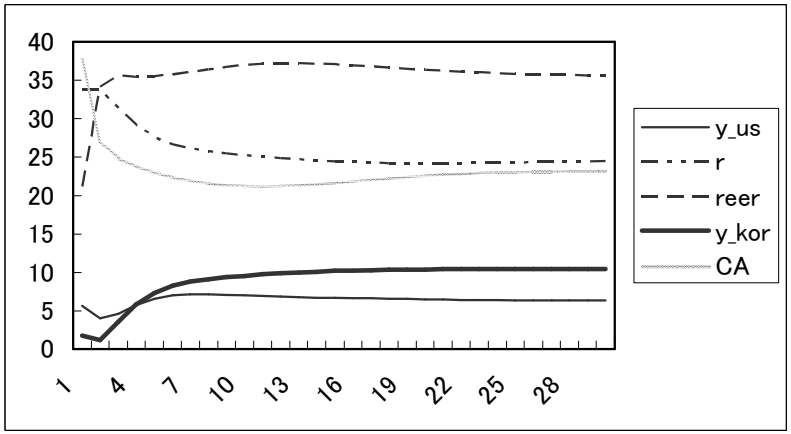
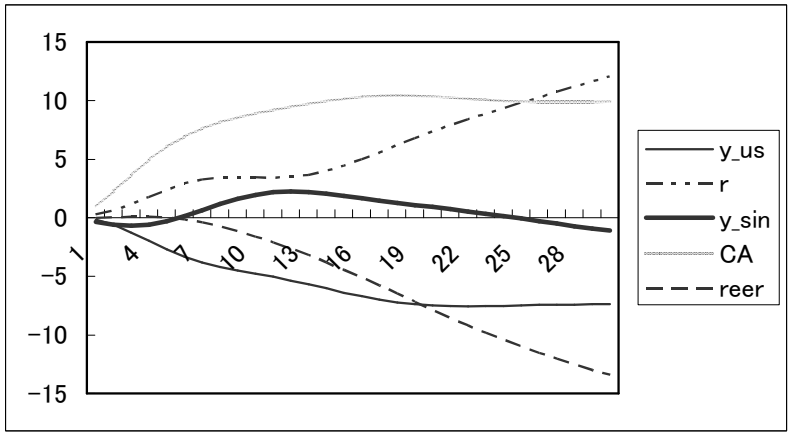
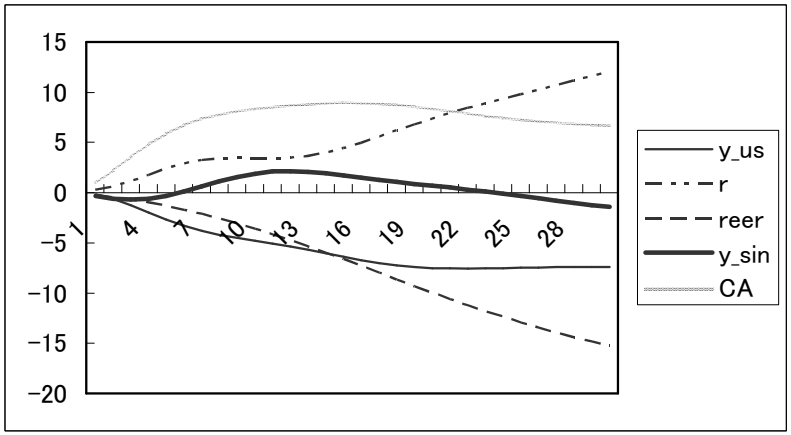


Fig. 3-4 Singapore
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

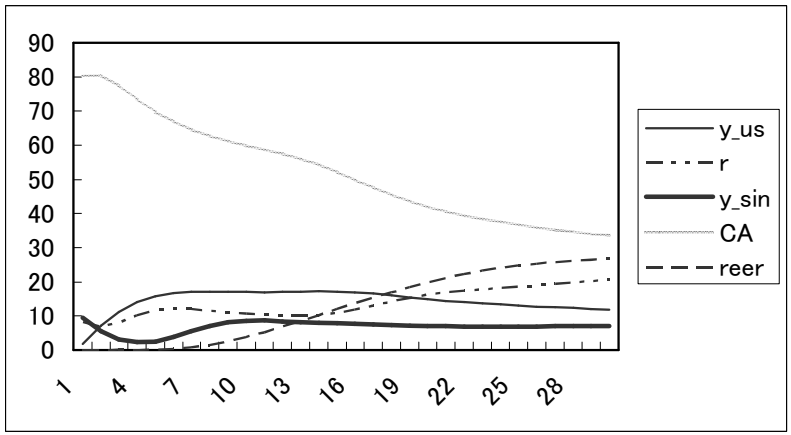
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

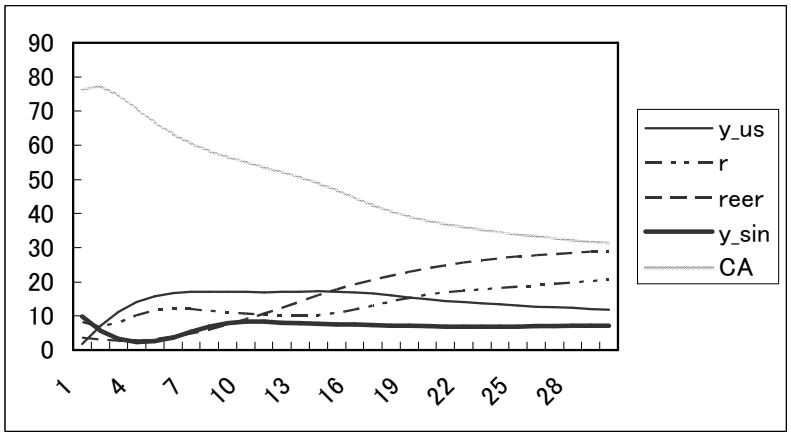
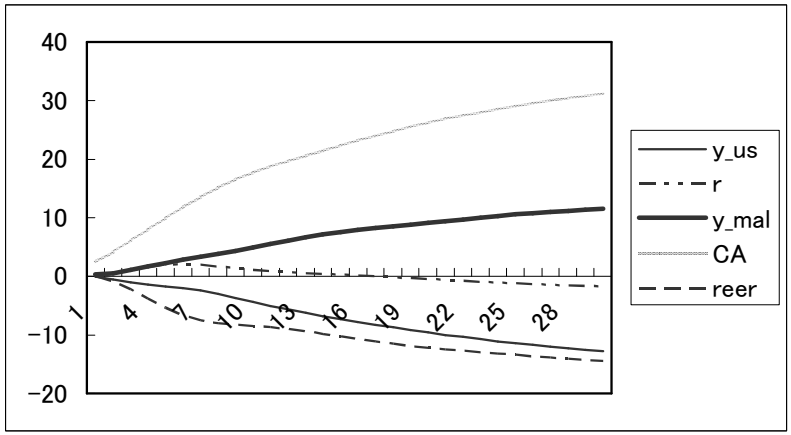
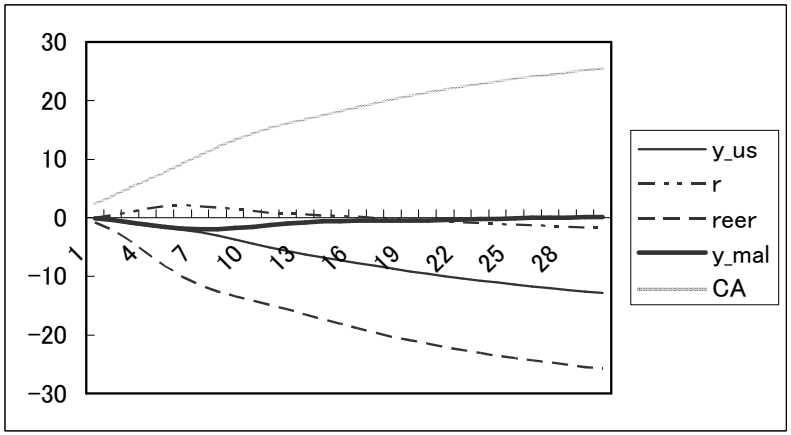


Fig. 3-5 Malaysia
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

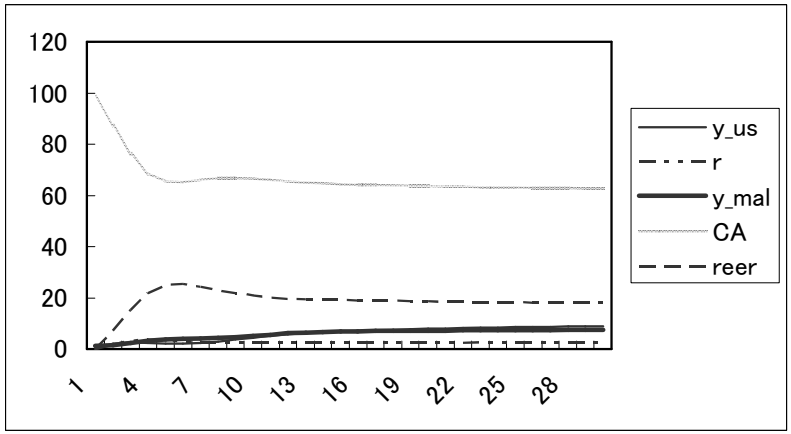
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

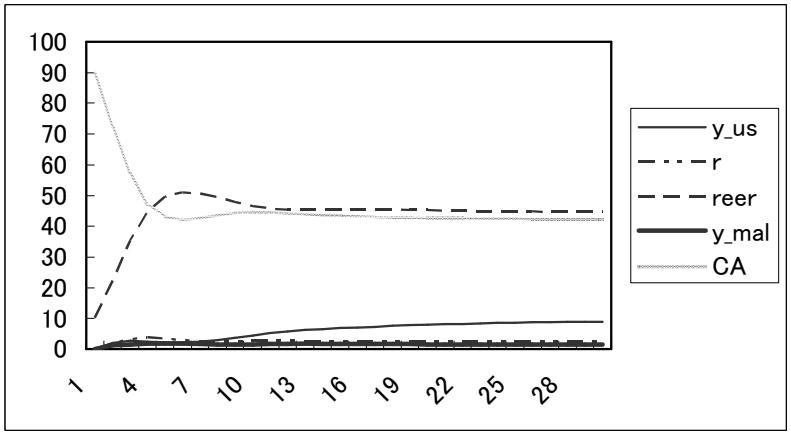
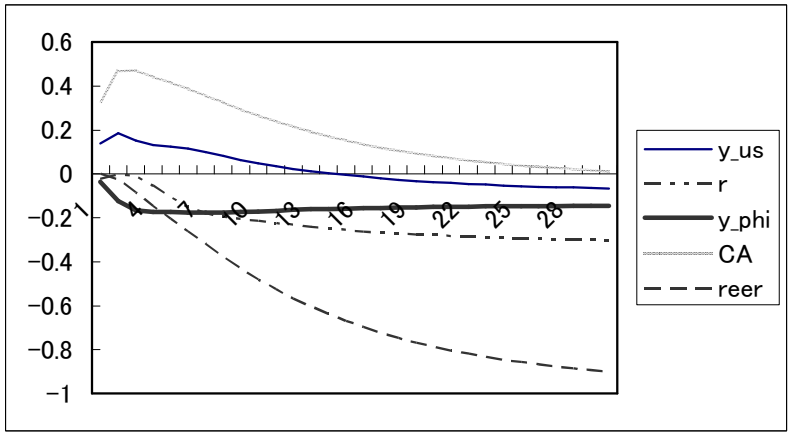
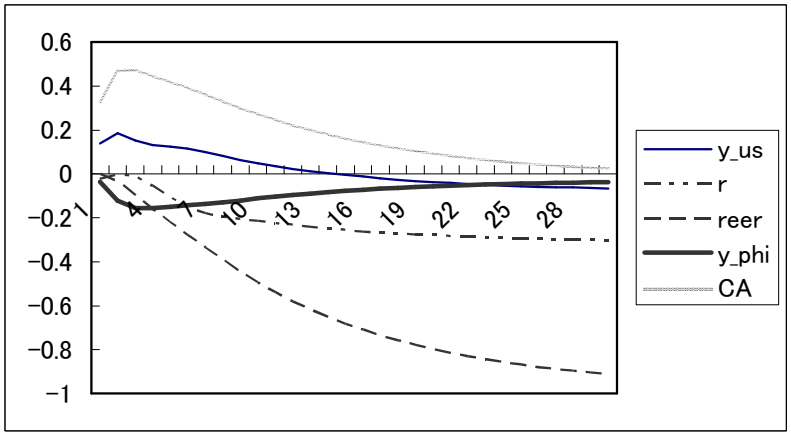


Fig. 3-6 The Philippines
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

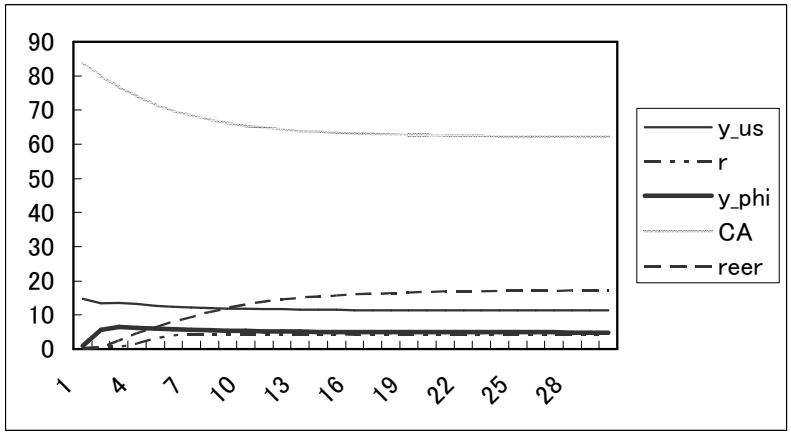
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

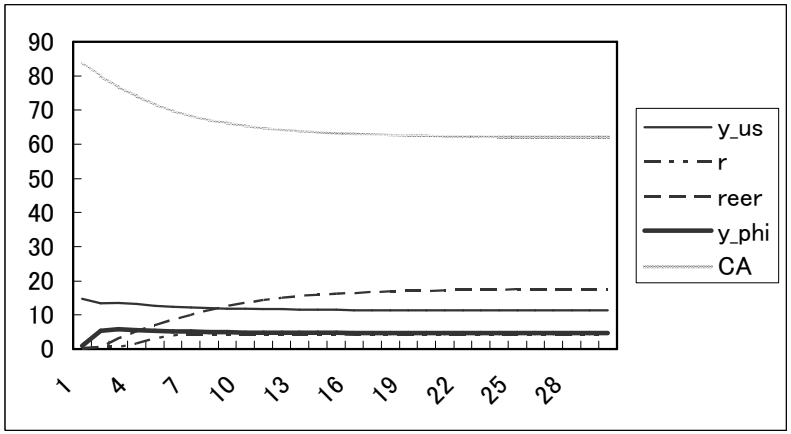
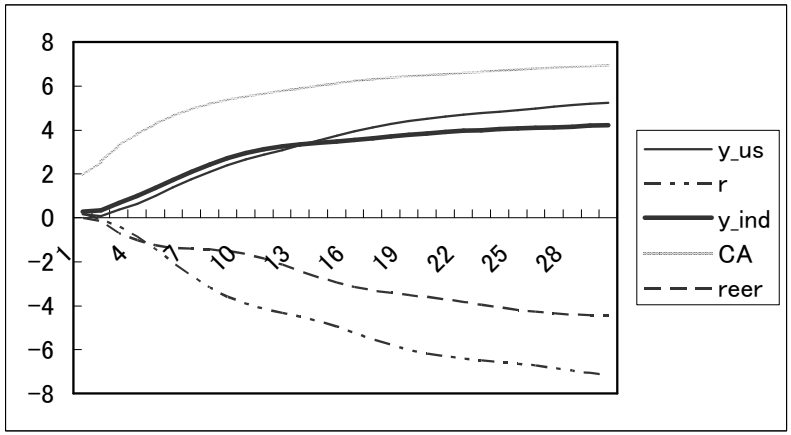
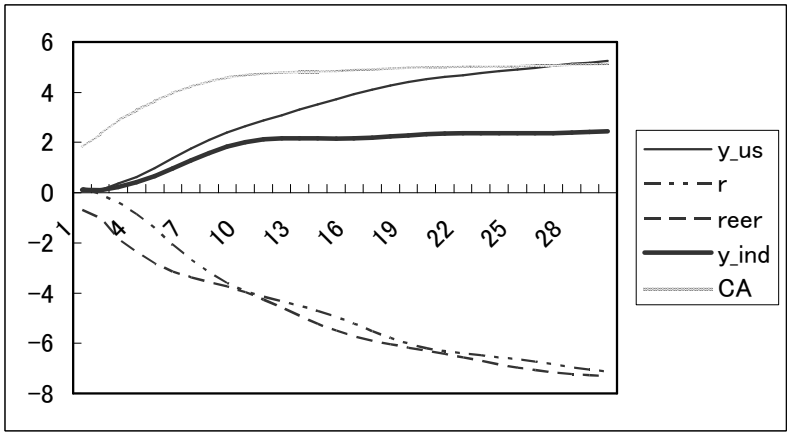


Fig. 3-7 Indonesia
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

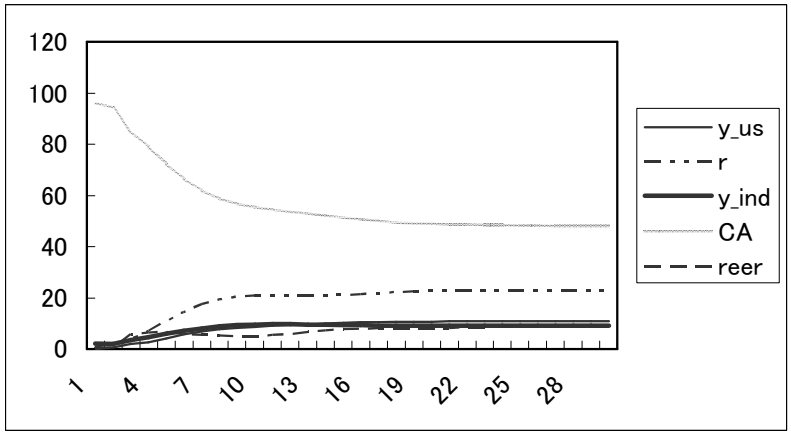
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

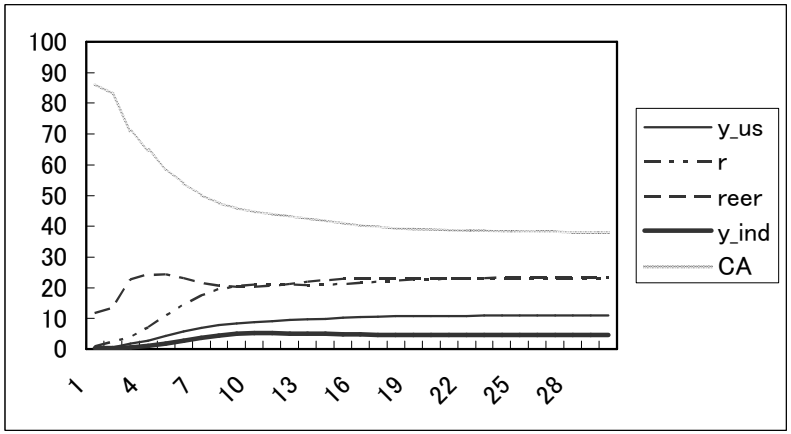
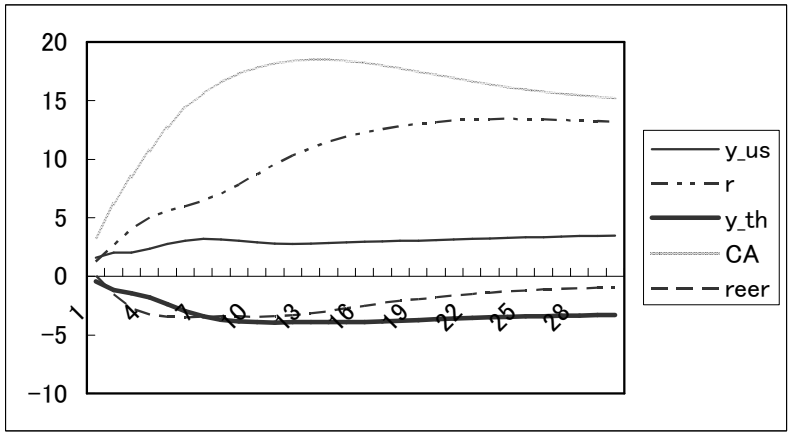
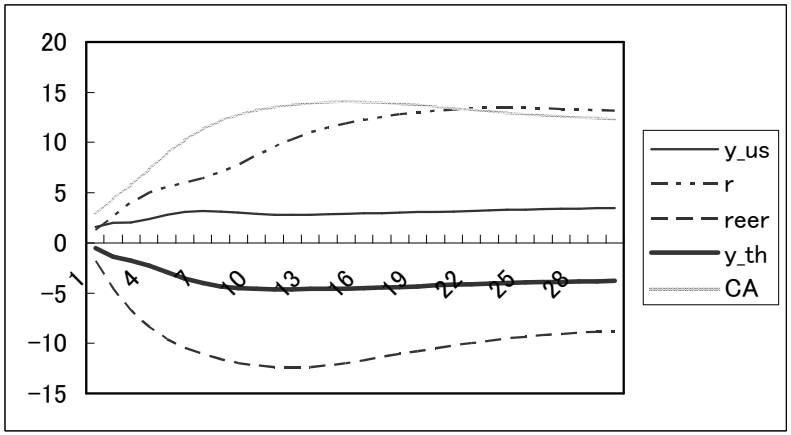


Fig. 3-8 Thailand
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

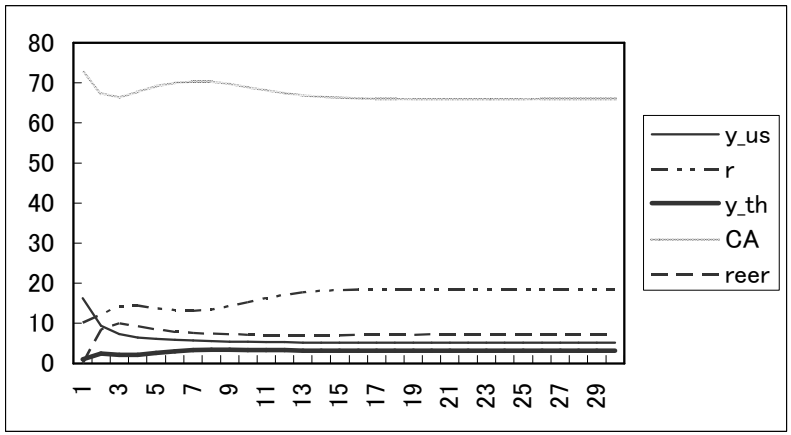
Neo-classical Model



Keynesian Model



Variance Decomposition of Current Account
Neo-classical Model



Keynesian Model

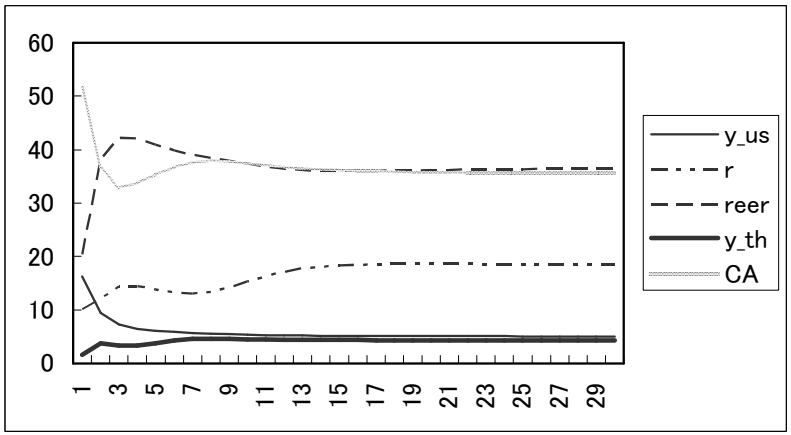
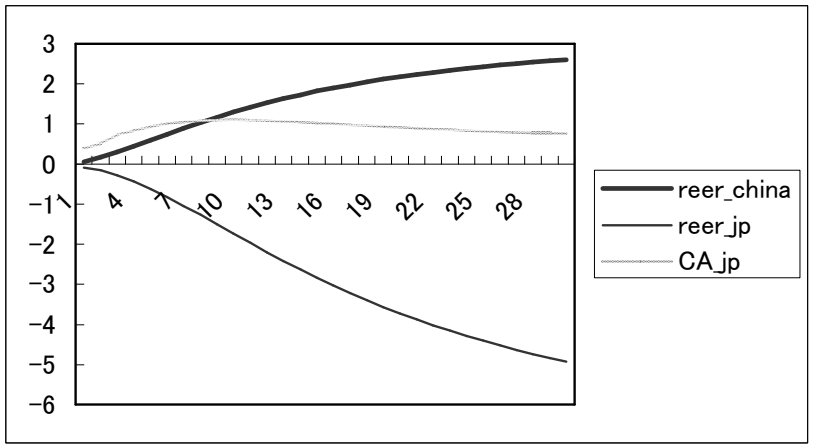
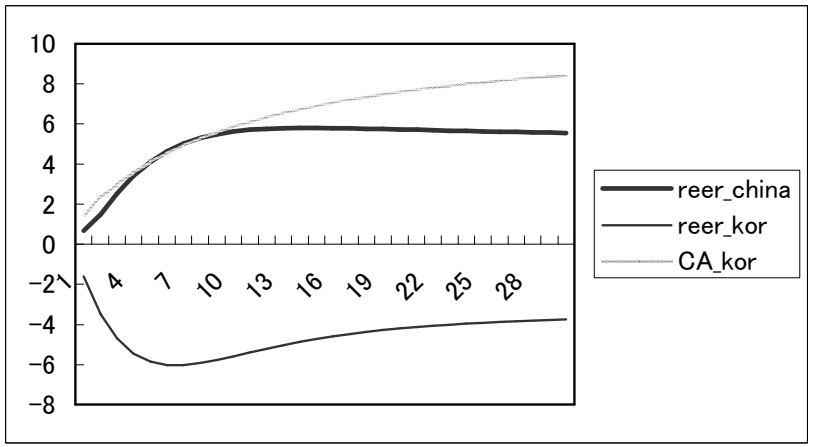


Fig. 4 Three-variable VAR Model
Accumulated Impulse Response of Current Account of East Asian Countries

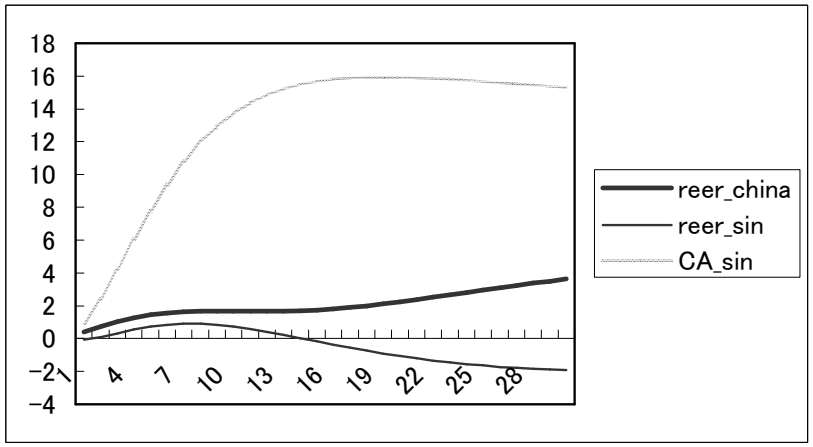
Japan



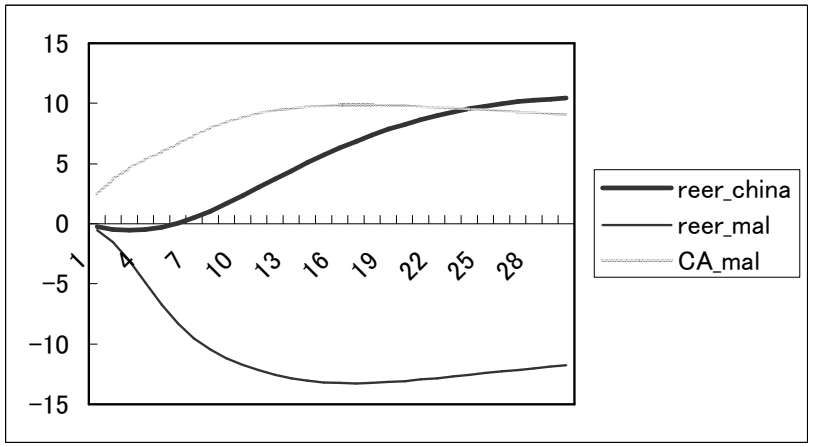
Korea



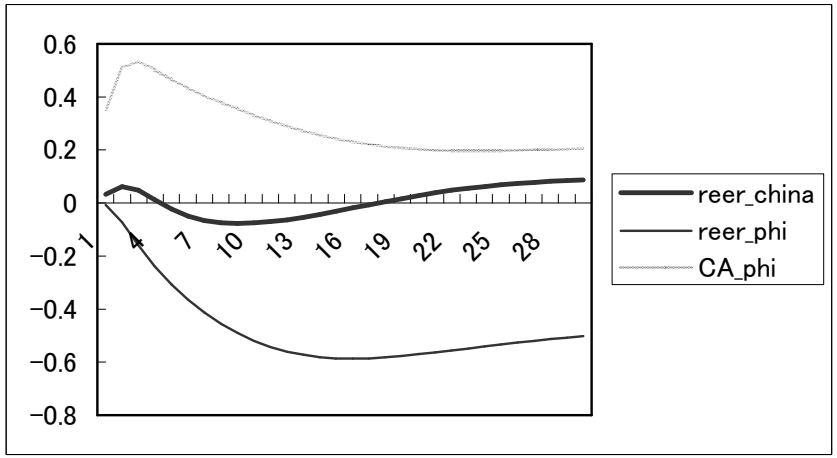
Singapore



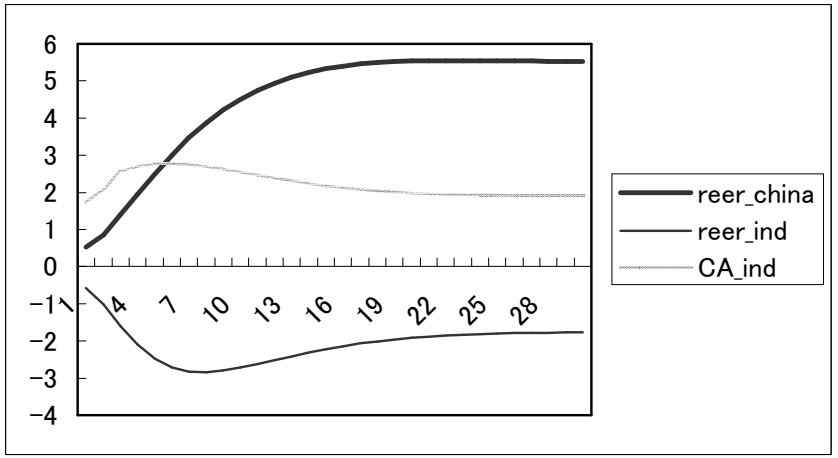
Malaysia



The Philippines



Indonesia



Thailand

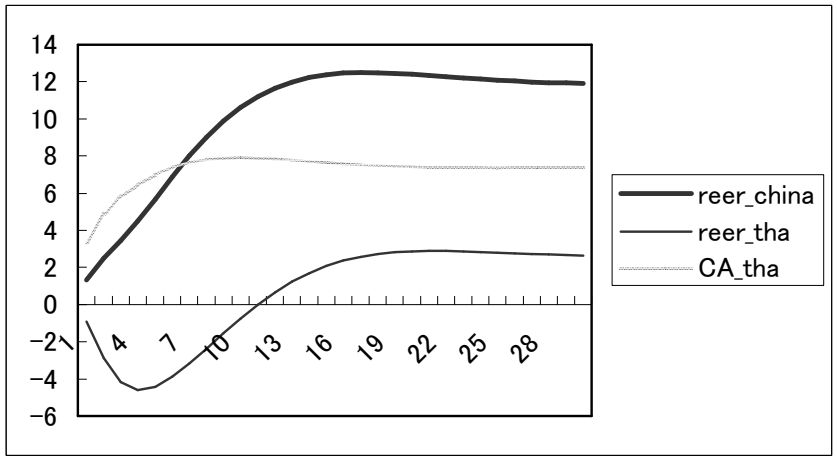
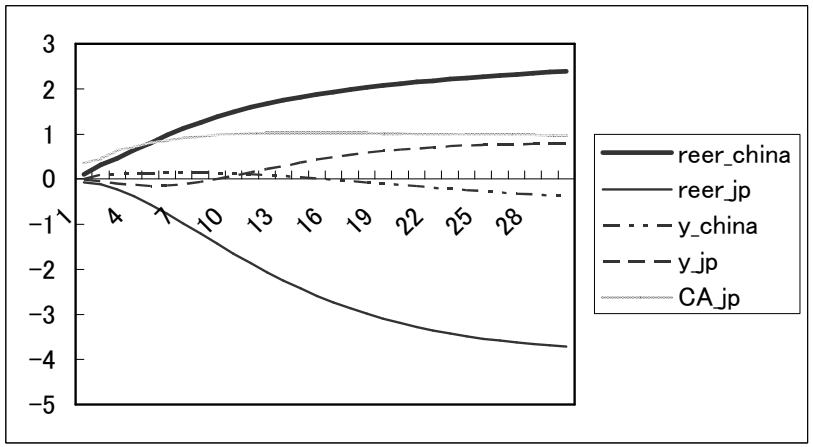
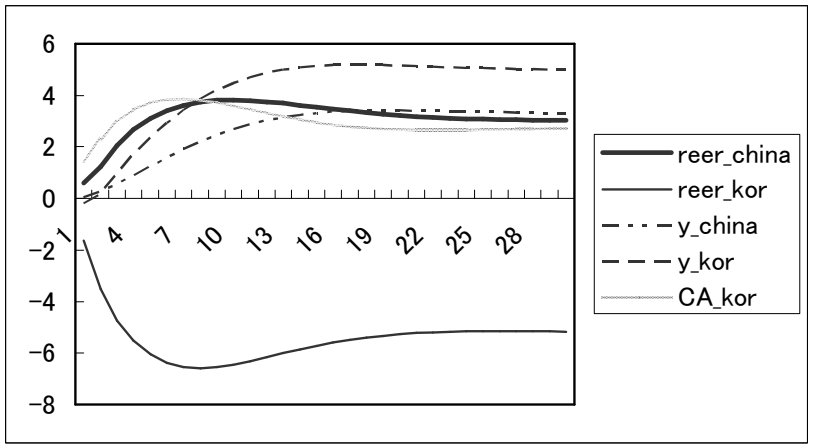


Fig. 5 Five-variable VAR Model
Accumulated Impulse Response of Current Account to Cholesky One S.D. Innovations

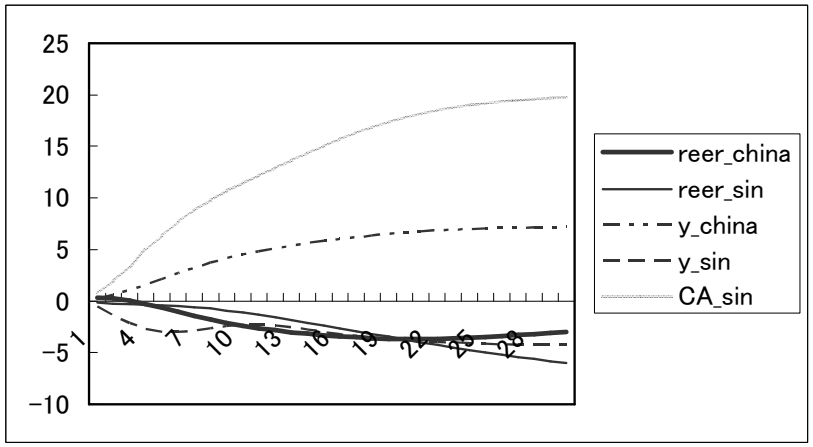
Japan



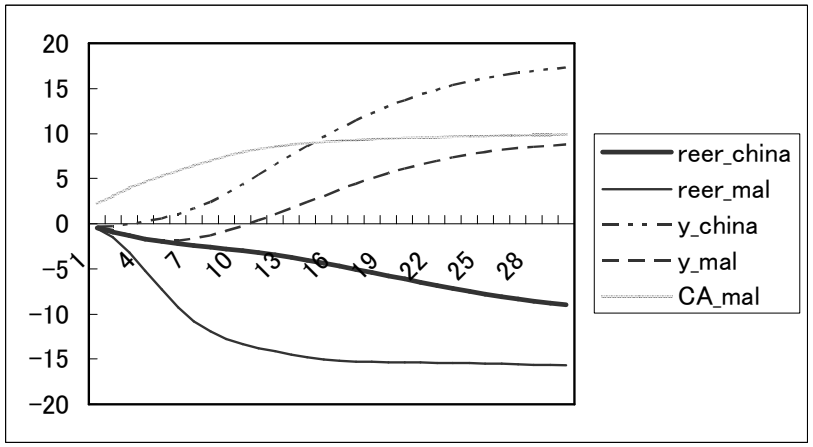
Korea



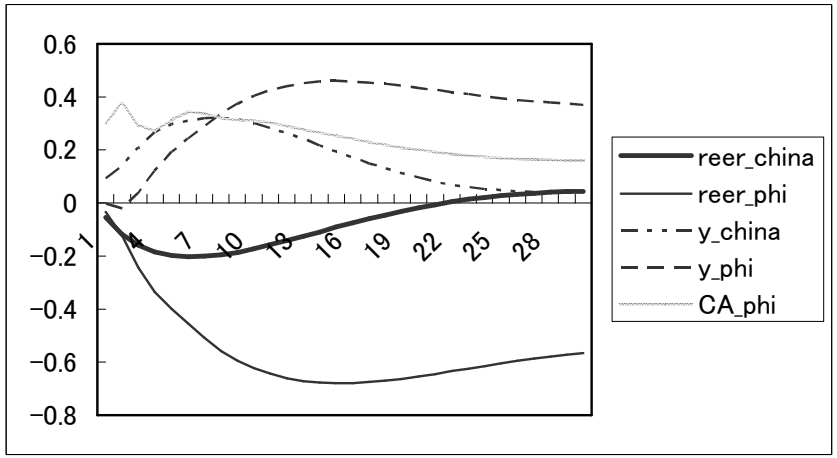
Singapore



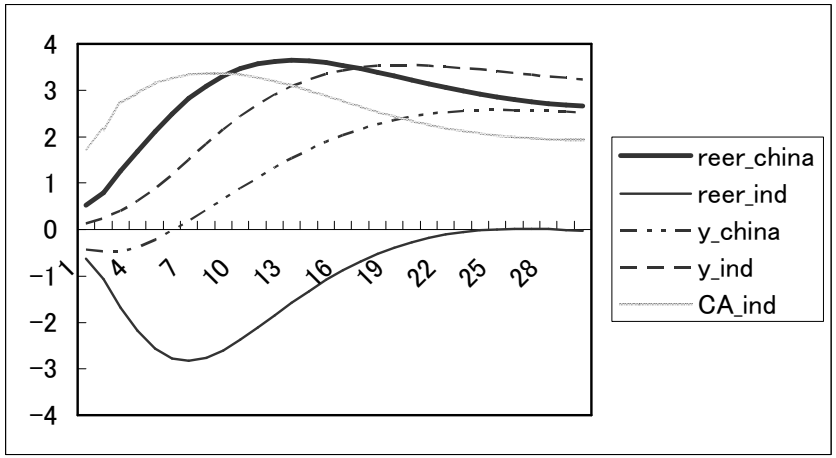
Malaysia



The Philippines



Indonesia



Thailand