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Policy Coordination in East Asia and across the Pacific

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POLICY COORDINATION IN EAST ASIA AND ACROSS THE PACIFIC♦

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ABSTRACT

This paper constructs an econometric model that describes the relationships in the Asia-Pacific region and gives quantitative insights into the recent policy debates on policy coordination among the East Asian economies. The model includes various monetary and currency policy rules that the actual East Asian economies adopt and creates an environment where one country's policymaking has economic impacts on its neighbors. We apply the model to three current policy issues: (i) the desirability of currency basket pegs in East Asia, (ii) the anticipated effects of China's currency reform, and (iii) the non-negativity constraint on the Japanese nominal interest rates.

I. INTRODUCTION

The rapid expansion of intra-regional trade is one of the remarkable facts about the recent economic developments in East Asia.[1] It is well-known that total exports and imports have grown faster than total production in East Asia (Figure 1.a). More interestingly, the intra-regional trade in East Asia has grown faster than the total trade. In fact, the share of intra-regional trade in East Asia, excluding Japan, increased from 20 percent in 1980 to 43 percent in 2002 (Figure 1.b).[2]

The emergence of international production network within East Asia has contributed to this rapid expansion of intra-regional trade.[3] The role of the East Asian economies in this network is to import parts and capital equipment from Japan, to trade parts and intermediate goods back and forth between themselves, and eventually to export final goods to huge markets such as the US and Japan.[4] This international dispersion of production process is one of the main forces that drive the expansion of intra-regional trade in East Asia.

The development of international production network has merits and demerits for small economies like those in East Asia. By devoting their limited resources to narrow fields, the East Asian economies have been able to enhance their international competitiveness as a whole. The *East Asian Miracle* was achieved as the result of this mutually complementary growth among the East Asian economies (Figure 4). The strong interdependence among the East Asian economies, however, also worked as a

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[1] In this paper, "East Asia" includes the NIES (South Korea, Hong Kong, Singapore, and Taiwan), the ASEAN (Thailand, the Philippines, Indonesia, and Malaysia), and China.

[2] The share of intra-East Asian trade, including Japan, out of the total trade volume in the area increased from 35 percent in 1980 to 53 percent in 2002.

[3] See Isogai, et al. (2002) for details on the recent intra-East Asian trade developments.

[4] East Asia has made itself as important a trading partner of Japan as the US: East Asia's share of the Japanese exports increased from 26 percent in 1980 to 42 percent in 2002 (Figure 2-1), while East Asia's share of the Japanese imports increased from 22 percent in 1980 to 41 percent in 2002 (Figure 3-1). In contrast, the expansion of the US share of the Japanese trade was not remarkable: The US share of the Japanese imports was 17 percent in 1980 and unchanged in 2002, although the US share of the Japanese exports rose somewhat from 24 percent in 1980 to 29 percent in 2002.

transmission of negative shocks experienced in one country to its neighbors. Thailand's financial hazard in 1997 developed immediately into the *Asian Currency Crisis* and paralyzed the financial system in some East Asian economies (Figure 5). The resulting production bottleneck in one country caused new production bottlenecks in other countries sequentially. In consequence, the total production in East Asia experienced substantial shrinkage during the crisis.

An increased intimacy among the Asia-Pacific economies has created an environment where one country's policymaking has economic impacts on others. Many economists have recommended currency basket pegs to the East Asian economies to stabilize their economic activity. Some go further to discuss the possibility of an Asian single currency. Recently, China's currency policy reform has become another world concern. There are strong arguments over the desirability of China's policy shift from the current *de facto* US dollar peg to a free floating system. The purpose of this paper is to construct a multi-country macro-econometric model describing the Asia-Pacific economy and to give quantitative insights on these current policy issues.

The paper is constructed as follows: In Section II, we build up the *Asian Economy Model*, which is an extension of the macro-econometric model for the Asian-Pacific area developed by Kamada, Nakayama, and Takagawa (2002) and models the Taiwan economy explicitly as a new component of "East Asia."[5] In Section III, we model a wide variety of monetary and currency policy combinations observed in the Asia-Pacific economy. Section IV examines the basic properties of the model via simulations. Section V discusses three current policy issues: the desirability of currency basket pegs in East Asia, the anticipated effects of China's currency policy reform, and the non-negativity constraints on the Japanese nominal interest rates. Section VI concludes our discussion.

II. BASIC STRUCTURE OF THE MODEL

In this section, we introduce the basic structure of the Asian Economy Model. The model comprises four building blocks: trade, production, prices, and policy rules.[6] We

[5] The model includes nine East Asian economies—Indonesia, Singapore, Thailand, the Philippines, Malaysia, South Korea, Hong Kong, Taiwan, and China—as well as Japan and the US. The countries that are not treated explicitly in the model constitute the "rest of the world."

[6] All in all, we have a macro-econometric model that consists of about 180 equations. A

explain the first three blocks here and postpone the explanation of the policy rule block until the next section.

A. Trade

The core of the Asian Economy Model is a set of aggregate import functions of individual countries. Import growth rates are determined as follows:

$$\Delta \ln M_i(t) = \Sigma_{k=0}^{3} \alpha_{1ik} \Delta \ln X_i(t+k) + \Sigma_{k=0}^{3} \alpha_{2ik} \Delta \ln D_i(t-k) + \Sigma_{k=0}^{3} \alpha_{3ik} \Delta \ln RE_i(t-k), \qquad (2\text{-}1)$$

where M_i denotes country i's aggregate imports, X_i its aggregate exports, D_i its domestic demand, RE_i its real effective exchange rate. The Δ is the first-difference operator. Aggregates of imports, exports, and domestic demand are all real values and denominated in local currencies.

Equation (2-1) is an orthodox aggregate import function in that aggregate imports depend on domestic demand and the real effective exchange rate. One characteristic of equation (2-1) worth thinking is the fact that exports affect imports. A large portion of East Asia's imports consists of parts and capital or intermediate goods, which are processed into high value-added intermediate or final goods and ultimately exported back out of the country. This well-developed international production network creates high correlation between a country's imports and exports. Another point that should be noted about equation (2-1) is that current imports are determined by future exports, reflecting that it takes time for imported intermediate goods to be exported after being processed.[7]

For simplicity, we fix import shares for each country. That is, we assume that other countries' respective shares of an individual country's imports are constant.[8]

TROLL program is available on demand.

[7] Bayoumi (1996) used a VECM to analyze the international trade among the APEC economies. His model includes export volume in import functions and thus shares the same properties as our model. Two differences between the Bayoumi model and ours should be noted here. First, our model uses lead values of exports to incorporate the forward-looking factors into the model, while the Bayoumi model uses only lagged values of exports. Second, our model does not incorporate cointegration relationships between exports and imports, while the Bayoumi model assumes them in his model. See Appendix B for further discussion on cointegration relationships in import functions.

[8] This is a difference between our model and that of Kamada, et al. (1998). Import shares of

Under the assumption of fixed import shares, growth rates of bilateral imports are equal to those of aggregate imports.

$$\Delta \ln M_{ji}(t) = \Delta \ln M_{j}(t), \tag{2-2}$$

where M_{ji} denotes country j's imports from country i. The assumption of fixed import shares allows practitioners to save the time that it would take to estimate too many bilateral import functions. Moreover, the assumption is roughly supported by data from a short run perspective. When the trade structure transforms dramatically, however, the assumption of fixed import shares appears unrealistic. In particular, confronted with the very rapid increase in China's share of Japan's imports since the 1990s, it is evident that we should take the model as only a rough approximation of reality.

Aggregate export functions are derived from the aggregate import functions. Denote country i's aggregate exports by X_i and country i's exports to country j by X_{ij}. Then one country's aggregate exports are given by $X_i(t) = \Sigma_j X_{ij}(t)$. Log-linearizing this relationship gives us

$$\Delta \ln X_i(t) = \Sigma_j \theta_{ij} \Delta \ln X_{ij}(t), \tag{2-3}$$

In equation (2-3), θ_{ij} is the share of country i's exports that go to country j ($\theta_{ij} = X_{ij} / X_i$), which is assumed constant, as are import shares. Notice that country i's exports to country j are equal to country j's imports from country i. Therefore, using equation (2-2), we obtain growth rates of aggregate exports as follows:

$$\Delta \ln X_i(t) = \Sigma_j \theta_{ij} \Delta \ln M_{j}(t), \tag{2-4}$$

which tells us that each country's export growth rate is an average of the growth rates of foreign countries' imports weighted by their export shares.

The real effective exchange rates, one of the explanatory variables in the import functions, are defined in terms of wholesale prices (or producer prices) so as to emphasize imports of production materials.[9] That is,

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individual countries are allowed to vary in the latter, where import functions are constructed bilaterally.

[9] Instead of wholesale prices, consumer prices are used for China, where production-side price indices are unavailable.

$$\Delta \ln RE_i(t) = \{\Delta \ln WPI_i(t) - \Delta \ln E_i(t)\} - \Sigma_j \delta_{ij} \{\Delta \ln WPI_j(t) - \Delta \ln E_j(t)\}, \quad (2\text{-}5)$$

where WPI_i denotes country i's wholesale price index, E_i its nominal exchange rate against the US dollar (denominated in its local currency), and δ_{ij} the share of country i's imports that come from country j.[10]

B. Production

We make domestic demand as simple as possible. Basically, the determinants of domestic demand are past income and the real long-term interest rate.[11]

$$\Delta \ln D_i(t) = \Sigma_{k=0}^{3} \beta_{1ik} \Delta \ln Y_i(t-k) - \beta_{2i} \Delta RL_i(t) + \beta_{3i} RC_i(t-1), \quad (2\text{-}6)$$

where RL_i is country i's real long-term interest rate, defined later. Note that the domestic demand function includes the ratio of the current account balance to potential output, RC_i, as an explanatory variable. This is to model the situation in which looking at a country's current account deterioration, foreign investors pull out their operating capital or refrain from making new investment, thereby hindering that country's production activity. This effect is expected to be serious for some East Asian countries, while it is less of an issue in Japan and the US (see Goldstein et al. [2000]).

By definition, GDP is equal to the sum of domestic demand and foreign demand, that is, $Y \equiv D + X - M$. Log-linearizing this relationship around the benchmark-year level gives

$$\Delta \ln Y_i(t) = \mu_{1i} \Delta \ln D_i(t) + \mu_{2i} \Delta \ln X_i(t) - \mu_{3i} \Delta \ln M_i(t), \quad (2\text{-}7)$$

where $\mu_{1i} = D_i / Y_i$, $\mu_{2i} = X_i / Y_i$, and $\mu_{3i} = M_i / Y_i$, which are all fixed.

We assume that potential output follows the trend of actual output. Explicitly, a potential growth rate is given by a two-year moving average of actual growth rates:

$$\Delta \ln PY_i(t) = \Delta \ln Y_i(t-8, t-1), \quad (2\text{-}8)$$

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[10] The data for the real effective exchange rates are necessary to estimate equation (2-1) and are constructed, as defined by equation (2-5). We treat δ_{ij} as time-variant in the estimation, while we fix δ_{ij} at the year 2002 average in the model simulation.

[11] For Japan, we divide domestic demand into private demand and public demand and treat the latter as exogenous.

where PY_i is country i's potential output and $A(t-h,t-k)$ stands for a moving average of variable A from period $t-h$ to $t-k$. When potential output is considered to move more slowly, the length of the moving average should be longer.[12]

The output gap is defined as

$$GAP_i(t) = \ln Y_i(t) - \ln PY_i(t) . \tag{2-9}$$

Note that equation (2-8) alone leaves the level of potential output undetermined; the level of the output gap is also undetermined in equation (2-9). In this paper, we calculate the level of potential output so that the output gap is averaged to zero over the course of the sample period.

The real short-term interest rate is obtained from the Fisher equation:

$$RS_i(t) = I_i(t) - \Delta \ln CPI_i(t+1), \tag{2-10}$$

where RS_i is country i's short-term interest rate and CPI_i is the consumer price index. We use the term structure model of interest rates and define the real long-term interest rate as a 2-quarter forward moving average of the real short-term interest rates:

$$RL_i(t) = RS_i(t, t+1) \tag{2-11}$$

Various assumptions are admissible for the length of the moving average.

Next, we define the ratio of the current account balance to potential output, which is one of the key elements in the domestic demand functions, as described below. By definition, we have $RC \equiv (X-M)/PY$. Log-linearizing this, we obtain the following relationship.

$$\Delta RC_i(t) = \lambda_{1i} \Delta \ln X_i(t) - \lambda_{2i} \Delta \ln M_i(t) - \lambda_{3i} \Delta \ln PY(t), \tag{2-12}$$

where $\lambda_{1i} = X_i / PY_i$, $\lambda_{2i} = M_i / PY_i$, and $\lambda_{3i} = (X_i - M_i)/PY_i$, which are all fixed. Notice that we standardize the current account balance by potential output rather than by actual output. This is because a country's foreign deficit should be evaluated against its ability to repay.

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[12] We can make the model more sensitive to external shocks by using a shorter moving average of real output as a proxy of potential output. A longer moving average of real output may be appropriate, however, when we make use of the output gap as a measure of economic welfare.

C. Prices

In this paper, the entire structure of prices is based on wholesale prices (WPI). For country i, the inflation rate in wholesale prices is determined by the Phillips curve:

$$\Delta \ln WPI_i(t) = \gamma_{0i} + \gamma_{1i}\Delta \ln WPI_i(t-1) + \gamma_{2i}GAP_i(t-1) - \gamma_{3i}\{\Delta \ln RE_i(t) - \Delta \ln WPI_i(t)\}. \quad (2\text{-}13)$$

The current inflation rate depends primarily on past inflation rates and the output gap. A secondary effect on the inflation rate comes from import prices; we include the depreciation rate of the nominal effective exchange rate ($\Delta \ln RE_i - \Delta \ln WPI_i$) as an explanatory variable for the inflation rate.

Changes in wholesale prices are transmitted into the consumer price index gradually over time. Explicitly, we let the inflation rate of consumer prices be a one-year moving average of the inflation rates of wholesale prices.

$$\Delta \ln CPI_i(t) = \Delta \ln WPI_i(t-3, t). \quad (2\text{-}14)$$

The length of the moving average should reflect the speed at which cost changes in upstream industries are passed into price changes in downstream industries. Thus, it may be better to adopt different lengths of moving average across different countries.

III. MONETARY AND CURRENCY POLICY RULES

The exchange rate and interest rates in a country are closely linked with those in foreign countries. In particular, in a country allowing free capital movements, the uncovered exchange rate parity condition implies strong international linkages between interest rates and exchange rates. Consequently, a country cannot determine its interest rates and exchange rate in isolation. In other words, one country's monetary policy, currency policy, and capital policy are subject to international restriction.

This international policy restriction is summarized by the concept of the *open-economy tri-lemma*, which tells us that the three policy goals—independent monetary policy, free capital mobility, and exchange rate stability—cannot be achieved simultaneously.[13] If a country desires to pursue an independent monetary policy to

[13] The open-economy tri-lemma is also called *unholy trinity*, *impossible theorem*, *inconsistent trinity*, and *incompatible trinity*, etc.

stabilize its domestic economy, then it has to give up either exchange rate stability or free capital movement. Similarly, if a country likes to invite foreign capital by stabilizing its exchange rate and liberalizing its capital markets, then it has to abandon an independent monetary policy. These theoretical relationships are vital, when we construct individual countries' actual policy combinations.

We classify the eleven countries into four groups according to their adopted monetary and currency policy: Policy-making in Japan and the US may be reasonably described by the *Taylor rule*.[14] Malaysia, Hong Kong, and China can be considered to have adopted a *US dollar peg exchange rate* policy and its variants. Singapore, Indonesia, and Taiwan are interpreted to make use of a *currency basket system*. Thailand, the Philippines, and South Korea adopt *inflation-targeting policy*. Reader should see Table 1 and Appendix A for precise description of monetary and currency policy in East Asia. Here, we try to avoid excessive generalization of the diverse policy combinations observed actually in the East Asian economies and take the greatest care to keep the individual characteristics of each country's real policy-making process. Below, we first describe the monetary and currency policy rules in Japan and the US and then proceed to show what modifications are required to model the remaining countries' monetary and currency policy.

A. Japan and the US

Since capital movements are free in Japan, the exchange rate should satisfy the uncovered exchange rate parity. Denote country i's nominal short-term interest rate by I_i and the US rate by I_{us}. Let $RISK_i$ be country i's risk premium relative to the US's. Then, uncovered exchange rate parity is satisfied when

$$I_i(t) = I_{us}(t) + \Delta \ln E_i(t+1) + RISK_i(t). \qquad (3\text{-}1)$$

The short-term interest rate is determined by the well-known Taylor rule, according to which the monetary authority controls the nominal short-term interest rate, paying attention to the CPI inflation rate and the output gap:

$$I_i(t) = C_i(t) + \chi_{1i}\{\Delta \ln CPI_i(t) - \Delta \ln CPI_i^*\} + \chi_{2i} GAP_i(t), \qquad (3\text{-}2)$$

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[14] Since the zero interest rate policy (1999) and the quantitative easing policy (2001), the uncollateralized overnight call rate (the Japanese monetary policy instrument) has remained at the zero percent level in Japan. Clearly, the Taylor rule is not an appropriate policy rule under this situation. We return to this problem in Section V.

where $\Delta \ln CPI_i^*$ denotes the steady-state rate of consumer price inflation. C_i summarizes all factors other than the inflation rate and the output gap. Explicitly, it is the sum of the steady-state real interest rate, the steady-state inflation rate, and the deviation of the risk premium from its steady-state value:

$$C_i(t) = RS_i^* + \Delta \ln CPI_i^* + \kappa_i \{RISK_i(t) - RISK_i^*\}, \qquad (3\text{-}3)$$

where RS_i^* is the real short-term interest rate in the steady state.[15]

This paper's standard assumption is $\kappa_i = 1$ in equation (3-3). This implies that the nominal short-term interest rate rises in exactly the same amount as an increase in the risk premium for Japan. Together with equations (3-1) and (3-2), this means that the nominal exchange rate of the yen vis-à-vis the US dollar is independent of the risk premium. This relationship holds, when Japan's credit risk is properly evaluated in its domestic financial market and there is no difference in the degree of risk aversion between Japan and the US. To the contrary to the assumption, suppose that Japanese investors undervalue Japan's credit risk relative to their US counterparts. This implies that $\kappa_i < 1$. In such a case, the yen would depreciate against the US dollar. This is because the yen would have to appreciate in the future to compensate for the smaller increase in its nominal short-term interest rate. We consider the latter case when we simulate the situation of a country's risk premium shock in Section V.

The US financial sector is almost the same as Japan's. Differences are that in the US case, it is not necessary to specify the uncovered exchange rate parity condition and that the US risk premium is zero by definition.

B. East Asian Economies

The East Asian economies adopt various combinations of monetary and currency policy. In addition, the extent to which capital controls remain in place differs across countries. In this paper, we try to balance two objectives: adequate reflection of this diverse reality against the need to keep our model of monetary policy, currency policy, and capital controls as simple as possible.

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[15] Equation (3-3) has to hold even in the steady-state, implying the following equation:

$$RISK_i^* = (RS_i^* + \Delta \ln CPI_i^*) - (RS_{us}^* + \Delta \ln CPI_{us}^*).$$

That is, the risk premium in the steady-state is equal to the difference in the steady-state nominal interest rate between country i and the US.

(i) Malaysia, China, and Hong Kong

Consider first the currency policy adopted by Malaysia, China, and Hong Kong. For Malaysia, the US dollar peg means that the ringgit is fixed against the US dollar and thus can be expressed as follows:

$$\Delta \ln E_i(t) = 0 . \qquad (3\text{-}4)$$

We can describe Malaysia's exchange rate policy by replacing equation (3-2) with equation (3-4). For simplicity, we assume the same relationship for China's *de facto* dollar peg and Hong Kong's currency board system. Note that the uncovered exchange rate parity does not hold for Malaysia and China, since relatively strict capital controls are maintained in these countries, compared to other East Asian countries. Instead, we treat the nominal interest rates in Malaysia and China as exogenous.

(ii) Singapore, Indonesia, and Taiwan

We construct Singapore's currency basket by averaging the depreciation rates of other countries' currencies, using their import shares as currency weights.[16] To obtain Singapore's currency basket policy, we equate the depreciation rate of the currency basket to that of the Singapore dollar:

$$\Delta \ln E_i(t) = \Sigma_j \delta_{ij} \Delta \ln E_j(t) . \qquad (3\text{-}5)$$

We can describe Singapore's monetary policy by replacing equation (3-2) with equation (3-5).

Indonesia is planning to adopt inflation-targeting policy, but the introduction has not yet completed. For this reason, we assume that the Indonesian government pegs the rupiah to a currency basket, consisting of the US dollar and the yen. Taiwan is a unique economy that adopts monetary-aggregate-targeting policy. Since we have incorporated no "money" in the model, however, we treat Taiwan similarly to Indonesia.[17]

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[16] Singapore has been using a currency basket since 1981, but the weight of each currency in the basket has not been announced. In this paper, we substitute import shares for currency weights for simplicity. Alternatively, we could use estimation results from Frankel and Wei (1994), Kwan (1995), and Fukuda and Ji (2001).

[17] We construct the target currency basket for Indonesia and Taiwan, consisting of the Japanese yen and the US dollar with reference to Kawai (2002).

(iii) South Korea, Thailand, and the Philippines

Some of the East Asian countries adopt inflation-targeting policy (South Korea in 1998, Thailand in 2000, and the Philippines in 2002).[18] Since the history of inflation-targeting policy is rather short in these countries, we have only limited knowledge of the mechanism with which they commit themselves to this policy. For this reason, we should be satisfied, for the time being, with estimating the following equation.

$$I_i(t) = \phi_{0i} + \phi_{1i}\Delta \ln CPI_i(t) + \phi_{2i}\Delta \ln E_i(t). \qquad (3\text{-}6)$$

That is, monetary authorities monitor not only inflation rates of consumer prices, but also depreciation rates of their currencies, since the latter are a possible cause of future inflation.[19]

IV. BASIC PROPERTIES OF THE MODEL

In this section, we investigate the basic properties of the Asian Economy Model via simulation. We consider the effects of the following four types of shocks: (i) The growth rate of the Japanese domestic demand decreases by 1 percent; (ii) the growth rate of the US domestic demand decreases by 1 percent; (iii) the growth rate of the East Asian domestic demand decreases by 1 percent (excluding Japan); (iv) the growth rate of the Asia-Pacific domestic demand decreases by 1 percent. Key simulation results are summarized in Table 2.

(i) A 1 percent decline in the growth rate of the Japanese domestic demand

First, we simulate the situation where the growth rate of the Japanese domestic demand decreases by 1 percent per annum (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). The effects on the Japanese economy are shown in Figure 6-1. The declines in the Japanese exports are driven by three forces. First, the yen

[18] Thailand adopts a managed floating currency system, which is considered to be a *de facto* currency basket peg policy. Taking into Kawai's (2002) report into consideration, we construct a currency basket consisting of the Japanese yen and the US dollar.

[19] If the Phillips curve does not include the output gap as an explanatory variable, inflation-targeting and exchange-rate-targeting have almost the same effects.

depreciation caused by the Japanese recession works to increase its exports. Second, however, the decrease in the Japanese domestic demand causes a decline in its imports and thus decreases in foreign countries' exports. This results in a decrease in foreign countries' imports from Japan, i.e., a decrease in the Japanese exports. Third, the worsening of the current account causes capital outflow from the East Asian economies; the resulting financial restriction slows their production activity. This shrinkage reduces demand for goods exported from Japan. The current simulation shows that the second and third forces outweigh the first forces with a consequence of the declines in the Japanese exports.

The decreases in prices are also worth remarking. There are two opposing forces that drive price movements in Japan. First, the depreciation of the yen puts upward pressure on Japan's price level. Second, however, prices are put under downward pressure generated by the negative output gap due to the recession. The current simulation says that the second force is overwhelming in comparison to the first.

Faced with the worsening of the output gap and the deflation, the monetary authority lowers the nominal short-term interest rate in accordance with the Taylor rule. Since the late 1990s, however, the short-term interest rate has already reached zero percent in Japan. Thus the monetary authority no longer has the option to lower the short-term interest rate. In this case, the economic slump and the resulting deflation are likely to be severer than shown in the simulation here. We return to this issue in Section V below.

Next, we turn to the effects of the Japanese recession on the Thai economy (Figure 6-2). The Thai baht depreciates against the US dollar. This is a consequence of market investors foreseeing that the monetary authority will lower the interest rate when the negative output gap expands in future. What is more important, however, is that the real effective exchange rate will appreciate for the first two years in spite of the Thai baht depreciation, since many of other countries' currencies depreciate more than the baht. Consequently, the Thai exports and real GDP continue deteriorating. In addition, the decline in foreign demand leads to a decrease in the ratio of the current account balance to potential output, which impacts negatively on the Thai domestic demand (see equation 2-6).

(ii) A 1 percent decline in the growth rate of the US domestic demand

Next, we simulate the situation where the growth rate of US domestic demand declines by 1 percent per annum (a -0.25 percent decline every quarter for four quarters <periods

1 to 4>). A point worth remarking is the effect on the Japanese exports, shown in Figure 7-1. Japan's exports fall below their baseline by -2 percent after a year and -4 after two years (see also Table 2). Since the US is Japan's biggest export market, it is quite natural that a recession in the US economy has a direct impact on the Japanese economy.

Nonetheless, the magnitude of the impact is quite large, when we remember that the US share of Japan's total exports is at most 30 percent. The following additional effects are important in explaining this: The recession in the US induces a reduction in the East Asian exports to US markets; this in turn reduces Japan's exports to East Asia. At the same time, Japan experiences the appreciation of the real effective exchange rate, which squeezes its net exports further. With all these factors combined, the US demand shock produces an extra proportional effect on the Japanese economy.

(iii) A 1 percent decline in the growth rates of the East Asian domestic demand (excluding Japan)

We also simulate the case where the growth rates of domestic demand decrease across all of the ASEAN, the NIES, and China by 1 percent per annum (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). As shown in Figure 8-1 and Table 2, the decrease in Japanese exports is one third of that observed in the case of the US recession scenario after a year and one fifth after two years.

This result has an important implication, when combined with the results obtained in the earlier simulation of a decrease in the US domestic demand. The US share of the Japanese exports (30 percent) is smaller than the East Asia's share (40 percent). Nevertheless, the impact of the US demand shock on the Japanese economy is larger than that of the East Asian demand shock. This reflects the respective roles that the two economic areas play in the world economy: the US as the "world's largest consumer" and the East Asian economies as the "world factory." A decrease in domestic demand in the East Asian economies, which are not final destinations of consumption goods, has a relatively small impact on Japan, and indeed on the global economy.

Another mechanism to amplify the effects of US demand shocks is closely related to the nature of the current policy reaction rules adopted by the US and East Asian economies. In the case of the US demand shock, the US monetary authority lowers the interest rate to boost up its economy, which in turn induces the Japanese yen to appreciate against the US dollar. Additionally, most of the East Asian economies peg

their currencies to or restrain them from appreciating much against the US dollar, whereby the yen appreciates against the East Asian currencies. In either case, the appreciation of the yen raises the Japanese import and reduces its domestic production instead. In the case of the East Asian demand shock, however, the US monetary authority does not lower the interest rate much; thus the yen/dollar exchange rate is relatively free from the shock. Furthermore, most of the East Asian monetary authorities are reluctant to lower the interest rates; they choose to keep their currencies from depreciating against the US dollar rather than to boot up their domestic demands by lowering their interest rates. In any event, the appreciation of the yen is relatively small in the case of the East Asian demand shock. In consequence, the negative impacts of the US demand shock on the Japanese economy is larger than those of the East Asian demand shock.

(iv) A 1 percent decline in the growth rates of the Asia-Pacific domestic demand

As a final demand shock scenario, we simulate the situation where the growth rates of domestic demand decrease in all of the Asia-Pacific economies by 1 percent per annum (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). The resulting effects on Japan and Thailand are shown in Figures 9-1 and 9-2, respectively. As observed in Table 2, the effects of this scenario are nearly equal to the sum of the effects of the preceding three scenarios.

This simulation tells us clearly to what extent demand shocks are amplified dynamically through the international production network developed in the Asia-Pacific region. Table 2 shows that an Asia-Pacific demand shock is amplified 1.5 times in a year and 2.5 times in two years on average. The most vulnerable country is Thailand: Its real GDP declines 2 percent in a year and more than 4 percent in two years. The table also shows that South Korea and Singapore are likely to suffer from severe decreases in real GDP. To the contrary, the impact on Hong Kong's real GDP is relatively small.

V. POLICY ANALYSIS

In this section, we conduct policy simulation, using the model developed in the preceding sections. In the previous section, we explore the model's properties under the policy rules being employed by the East Asian economies in 2004. As observed

there, the international production network developed within the East Asia has created an environment where one country's policymaking has effects on foreign countries. The purpose of this section is to give useful insights to the following three issues, based on our econometric model: the desirability of currency basket pegs for East Asia, the anticipated effects of China's currency reform on the Asia-Pacific region, and the spillover effects of the non-negativity constraint on the Japanese nominal interest rates.

A. The Desirability of Currency Basket Pegs for East Asia

Here we discuss desirable monetary and currency policies for East Asia. There are many advocates of currency basket pegs after the Asian Currency Crisis in 1997. There is a little quantitative evidence on this topic, however. The purpose here is to use our econometric model and to quantify the stabilization effects of currency basket pegs in East Asia.

Since it is unrealistic to examine all the possible policy combinations for the nine East Asian economies, we introduce two counterfactual policy regimes as well as the current regime described in Section III. The first regime is called the *US dollar peg regime*, where all the economies, except for Japan and the US, peg their own currencies to the US dollar.[20] This regime is broadly consistent with the situation before the 1997 Asian Currency Crisis. As history demonstrates, it was not only a key determinant of the East Asian Miracle, but also proved to be instrumental in compounding the effects of the crisis swiftly. The second policy regime is called the *currency basket regime*, where all the economies, except for Japan and the US, peg their currencies to their respective currency baskets. Here we assume that the East Asian economies construct their own currency baskets with import shares as currency weights.[21, 22]

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[20] Remember that Malaysia, Hong Kong, and China currently employ the US dollar peg policy and its variants. Therefore, there are six economies (Indonesia, Singapore, Thailand, South Korea, the Philippines, and Taiwan) that would be required to change their policy rules to conform to the US dollar peg regime.

[21] We have already assumed the same scheme for Singapore.

[22] It should be kept in mind that the above counterfactual experiment on East Asia's regime shift is subject to the so-called Lucas critique, according to which the model parameters, including import and export shares, will change after a regime shift and thus the simulation results based on the old model will be invalid. For those who take this critique seriously, a stochastic dynamic general equilibrium (SDGE) model with a representative agent maximizing her lifetime utility is an alternative to the current model. It will be extremely difficult to construct

To evaluate policy regimes, we prepare three scenarios: (i) the Thai demand and risk premium shocks, (ii) the US demand shock, and (iii) the Japanese risk premium shock. First, when investigating the effects of the Thai demand and risk premium shocks, we have in mind the 1997 Asian Currency Crisis, which was initiated by a speculative attack on the Thai baht and subsequently had negative impacts on the real economic activity. Second, when examining the effects of the US demand shock, we consider the IT depression originated in the US from 2001 for instance. The deterioration of US high-tech industries was transmitted to the East Asian economies, amplified in their production network, and spilled over to dampen the world economic growth eventually. Third, when most East Asian economies pegged their own currencies to the US dollar before the 1997 Asian Currency Crisis, a Japanese risk premium shock creates a fluctuation in the yen/dollar exchange rate and thus economic turbulence in the East Asian economies.

To create the Thai demand and risk premium shocks, we assume a 10 percent decline in the growth rate of the Thai domestic demand (a -2.5 percent decline every quarter for four quarters <periods 1 to 4>) and a 10 percent rise in the Thai risk premium (once in period 1).[23] In Table 3, the top panel is a summary of standard deviations of the output gaps.[24] In the bottom panel, we put an "o (x)" on a country whose standard deviation of the output gap decreases (increases) more than 5 percent by switching from one policy regime to an alternative. We use the Pareto optimality criterion to judge the desirability of one policy regime against the other. Consider two policy regimes A and B. Regime A is judged superior to B, if and only if a regime

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a multi-country SDGE model which is realistic enough to describe the developing economies and sufficiently easy to be applied to practical issues. The model presented in this paper has the big advantage that it is easy to manipulate and produces realistic dynamics, as reported in the previous section.

[23] In the above argument, we assume $\kappa_i = 0$ as an alternative to our standard assumption $\kappa_i = 1$. As pointed out in Section III, a rise in the Thai risk premium has no impact on the baht under the latter assumption. Under the former assumption, however, the domestic evaluation of credit toward Thailand is higher than the overseas evaluation, which induces the depreciation of the Thai baht.

[24] A question arises about the appropriate criteria to use in evaluating the preferred policy rule. There is a consensus for developed countries to use both the volatility of their business cycles (the output gap or the volatility of GDP) and inflation rates. There is no consensus, however, on whether the same criteria are applicable for the East Asian economies. Although this paper uses the output gap volatility as a welfare criterion, we do not exclude other options.

switch from A to B harms no East Asian economies and benefits at least one East Asian economy. Applying this criterion to Table 3, we can conclude that the currency basket regime is superior to the US dollar peg regime: A regime shift from the US dollar peg regime to the currency basket regime harms no East Asian economies and benefits four East Asian economies. We cannot say anything more about the superiority among the three policy regimes, however.

Next, to create the US demand shock, we assume a 1 percent decline in the growth rate of the US domestic demand (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). Table 4 is the summary of policy regime evaluation in this case. Using the table, we can do the same Pareto optimality investigation as above. We find that the currency basket regime is superior to the US dollar peg regime. We can say nothing more than that, however, about the superiority among the three policy regimes.

These results partly support the claims of currency basket advocates: The East Asian economy is better off, when switching from the US dollar peg regime to the currency basket regimes. However, the superiority of the currency basket regime to the current regime is quite ambiguous. When shifting from the current regime to the currency basket regime, South Korea is worse off in the face of the Thai demand and risk premium shocks; Thailand and China are worse off in the face of the US demand shock. Put differently, the currency basket advocates are correct, only when the East Asian economies start from the US dollar peg regime and switch to another policy regimes. They may be wrong, however, under the fact that the East Asian economies have already switched to the current policy regime.

When we take other shocks in consideration, the desirability of the currency basket regime becomes more ambiguous. For instance, the Japanese risk premium shock creates a fluctuation in the yen/dollar exchange rate and destabilizes the economic activity in East Asia. To create the Japanese risk premium shock, we assume that the Japanese risk premium rises 1 percent (once in period 1) in the model. According to Table 5, we can conclude that the current regime is superior to the US dollar peg regime. The table, however, says nothing more about the superiority among the three policy regimes. Therefore, if the fluctuation of the yen/dollar exchange rate occurs in a sufficiently large scale, we cannot claim anymore that the currency basket regime is superior even to the US dollar peg regime.

B. China's Currency Policy Reform and its Anticipated Effects

China's recent economic achievements have been remarkable. The country's growth rate in the 1990s reached 9.7 percent on average.[25] In world rankings of nominal GDP, China climbed up from 11th in 1990 to 6th in 2000 (following the US, Japan, Germany, the UK, and France).[26] This high growth in China was primarily attributed to the government's export-oriented economic policy. Actually, China's exports almost quadrupled during the 1990s, and the country's share of world exports rose to about 5 percent in 2002.[27]

As China achieves high economic growth, there occurs much criticism on the current Chinese currency policy. As pointed out in Section III, China adopts a *de facto* US dollar peg system. Under this policy, the Chinese yuan does not appreciate, even when the economy grows fast. This can be a big economic threat to its neighbors. They insist loudly that the Chinese government should shift its currency policy to a free floating system. Under the latter system, the yuan is expected to appreciate in line with economic growth in China or with economic downturn in foreign countries.

Below, we first examine what is expected to occur with the yuan appreciation. By doing so, we have a numerical sense about the effects of the yuan's variability on the economic activity in the Asian-Pacific region. Second, we simulate the shift of China's currency policy from the current *de facto* US dollar peg to inflation-targeting policy and investigate its effects on the economic stability in the Asia-Pacific region.

First, we examine the effects of the yuan appreciation on the Asia-Pacific neighbors. To do so, we simulate the situation where the yuan appreciates by 10 percent (once in period 1), while keeping its *de facto* US dollar peg system. As shown in Figure 10, the yuan appreciation boosts up the Chinese imports and its neighbors' exports. From the quantitative point of view, however, a 10 percent appreciation of the yuan has only limited impacts on the growth rate outside China. For instance, as shown in the figure, the real output in Thailand increases only by 0.35 percent after two years, which is much smaller than its growth rate of 5.4 percent in 2002. The effects on Japan and the US are even smaller: The Japanese real output increases less than

[25] China, *Statistical Yearbook* (2001).

[26] IMF, *World Economic Outlook (WED) Database* (October 2001).

[27] IMF, *Direction of Trade Statistics*.

0.064 percent and the US real output rises only 0.019 percent after two years.[28]

In spite of the quantitatively limited impacts on the economic activity in the Asia-Pacific region, China's currency policy reform is a hot issue for the world economy. We explore the possible effects of China shifting its currency system from a *de facto* US dollar peg to a free floating system. We assume that China adopts inflation-targeting policy after it abandons the current policy and also that it is still interested in the stabilization of the yuan against the US dollar. We use equation (3-6) as an inflation-targeting formula and give China the averaged rules of South Korea, Thailand, and the Philippines.[29] Since the evaluation of China's currency policy reform depends on the nature of shocks, we consider three types of shocks here: (i) a negative demand shock originating in China, (ii) a negative demand shock originating in the US, and (iii) a negative demand shock originating in Japan.

We start with the case of a 1 percent decline in the growth rate of the Chinese domestic demand (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). A shift from the US dollar peg to the free floating system does not always harm the Chinese economy. Under the free floating system, the depressing shocks on the Chinese economy may be weakened, owing to a reduction in its imports that is caused by the depreciation of the yuan. Table 6 shows the standard deviations of the output gaps in the eleven economies. We put an "o (x)" on a country whose standard deviation of the output gap decreases (increases) more than 5 percent by the reform. Table 6(a) shows that China enjoys a substantial gain from its currency reform in the face of its own recession. In contrast, all the foreign countries will be annoyed with a greater economic instability due to a reduction in exports that is caused by the yuan depreciation.

Next, we consider the case of a 1 percent decline in the US domestic demand growth rate (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). Table 6(b) shows that under the free floating system, the yuan appreciation in the face of the US recession harms the Chinese economy. In contrast, its neighbors can avoid substantial drops in their exports, owing to the yuan appreciation. As for the US, it gains nothing by China's currency reform. It is also worth noting that Hong Kong

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[28] Note that we do not take into account the possible effect that the yuan appreciation shifts China's exports to its neighbors. Therefore, the effects of China's currency policy reform estimated above may be subject to underestimation.

[29] The parameter on $\Delta \ln CPI$ is 3.6 and that on $\Delta \ln E$ is 0.35.

economy suffers from a big shrinkage of real output in accordance with China's economic deterioration.

Finally, we discuss the case where the growth rate of the Japanese domestic demand declines by 1 percent per annum (a -0.25 percent decline every quarter for four quarters <periods 1 to 4>). We are sure that the Japanese yen depreciates, but not sure theoretically whether the yuan appreciates against the US dollar. According to the simulation result, the yuan appreciates against the dollar only slightly; China's currency reform has no big impacts on the Asia-Pacific region in the case of the Japanese recession. Looking at Table 6(c), we can see that there are no substantial changes observed in the stability of the economies outside China.

To sum up, China's currency policy reform benefits China itself, but harms its neighbors in the face of the Chinese economic recession. In the case of the US recession, China's currency reform harms the Chinese own economy, but benefits most of its neighbors. We also examine impacts of a recession originating in Japan, but find no substantial effects on the Asia-Pacific economies. These results imply that a progression in China's currency reform depends on which shocks the Chinese government takes most seriously.

The above results are derived under the simplified assumption that the desirability of the yuan's reform is measured by the variability of the output gap. When the reform advances actually, however, a wide variety of costs and benefits will be considered. Among all, a free floating system increases price variability of agricultural goods and destabilizes incomes earned in rural areas, which are extremely low in comparison to those earned in urban areas. The Chinese government will be hesitant to promote yuan's reform until this large income inequality disappears.

C. The Non-Negativity Constraint on Nominal Interest Rates

Here we discuss the spillover effects of the non-negativity constraint on the Japanese nominal interest rates on the Asia-Pacific region. Since the zero interest rate policy (1999) and the quantitative easing policy (2001), the uncollateralized overnight call rate has remained on the zero percent level in Japan. The negative effects of the non-negativity constraint on the Japanese economy have been discussed intensively for a long time, but those on foreign countries have not attracted much attention so far. Clearly, depressing shocks originating in Japan will spill over the Asia-Pacific region, when the Bank of Japan fails to kill them due to the non-negativity constraint on

nominal interest rates. Eventually, the effects on the East Asian economies will feed back to the Japanese economy through the production network in which the Japanese economy is involved.

We examine the above complicated effects of the non-negativity constraint by simulation analysis, based on the Asian Economy Model developed in the preceding sections. For simplicity, we impose the non-negativity constraint only on the Japanese nominal interest rates. Clearly, when other countries confront a non-negativity constraint, overall economic dynamics in the Asia-Pacific region will be different from those presented below. Nonetheless, we stick to the current simplified assumption so as to derive clear implications of the non-negativity constraint on the East Asian economies as well as on the Japanese economy.

We simulate a scenario in which the growth rate of the Japanese domestic demand decreases. Big and persistent negative shocks are required to create the situation where the nominal short-term interest rate hits a non-negativity constraint. To do so, we assume that negative demand shocks, ε_D, on the Japanese growth rate follow a long-lasting autoregressive process with big innovations, η_D:

$$\varepsilon_{Dt} = \rho_D \varepsilon_{Dt-1} + \eta_{Dt} . \qquad (5\text{-}1)$$

For concreteness, we assume ρ_D =0.8 and η_D =-0.025 for consecutive four quarters (periods 1 to 4; 10 percent shock per annum in total).

The effects on the Japanese economy are shown in Figure 11-1, where the two dynamics are generated with and without the non-negativity constraint on the Japanese nominal interest rates. Note that in the figure, the short-term nominal interest rate is shown as a deviation from its steady state level, which is 4.2 percent in the current case (the sample mean of the uncollateralized overnight call rate in Japan). Thus, the non-negativity constraint is given by the dashed horizontal line of -4.2 percent level. In the current scenario, the short-term interest rate hits the zero-bound for about 3 years from the 4th quarter to the 15th quarter. The biggest discrepancy from the non-negativity constraint is 5.6 percent in the 9th quarter. As pointed out in Section IV, the economic slump and the resulting deflation are severer than those obtained if there were no non-negativity constraint.

The non-negativity constraint on the Japanese nominal interest rates has two opposing effects on the East Asian economies. First, the non-negativity constraint restricts a further decline in the Japanese short-term interest rate. Therefore the yen

fails to depreciate much and the Thai real effective exchange rate avoids big appreciation in foreign countries. This has a positive effect on the East Asian economies. In Figure 11-2, which depicts impulse responses of the Thai economy, we find that the non-negativity constraint on the Japanese interest rate makes no difference in the output gap during the first six quarters, but allows larger negative output gap during the period of the 7th to 15th quarters than that obtained without the non-negativity constraint. Second, however, the depression in the Japanese economy slows its import and spills over the East Asian economies. We can see in the figure that the second effect overweighs the first one during periods 6 to 13 in the case of Thailand, while the net effect on the Thai economy is moderate in comparison to the direct effect on the Japanese economy.

VI. CONCLUSION

In this paper, we build up a macro-econometric model that describes the Asia-Pacific economy and apply the model to discuss current policy issues on policy coordination among the East Asian economies. One of the most remarkable achievements by the recent East Asian economies is the international production network developed spontaneously across the Asia-Pacific area. As history demonstrates, this network has not only prompted the fast economic growth in this area, but also facilitates the transmission of one country's economic turmoil all over the region.

The open-economy tri-lemma tells us that the three policy goals—independent monetary policy, a stable exchange rate, and free capital mobility—cannot be pursued simultaneously. In the late 1980s and the early 1990s, some East Asian economies encouraged capital inflows to finance the growth money and achieved it by pegging their currencies to the US dollar. A result is that the governments lost the controllability over economic activity and were eventually driven into financial hazard caused by the massive capital flight. The 1997 Asian Currency Crisis was a consequence of the wrong policy pursued by some growth-oriented East Asian economies combined with the highly conductive international production network developed in East Asia.

We prepare a complete set of policy combinations observed actually in East Asia and incorporate it into the macro-econometric model. We can create various policy regimes by replacing the incorporated policy rules with alternatives and evaluate their

performance in economic stabilization. One question is whether currency basket pegs are recommendable to the East Asian economies. Our simulation analysis suggests that currency basket pegs seem superior to US dollar pegs in the face of their own economic crisis as well as the US recession. Taking into consideration other types of shocks, however, the superiority of currency basket pegs becomes ambiguous. Moreover, after some East Asian economies did policy reforms, it is dubious that all the East Asian economies will be better off by switching further to currency basket pegs.

Our model can be used to give insights into a wide variety of current policy debates. China's currency policy reform is one of the hottest issues among them. First, our simulation analysis shows that a 10 percent depreciation of the yuan is too small to have substantial impacts on the economic activity outside China. Second, China and other East Asian economies have conflicting interests toward China's currency reform from the current *de facto* US dollar peg to a free floating system: The reform benefits China and harms most of the Asia-Pacific economies in the face of China's own recession. To the contrary, the reform benefits most of the Asia-Pacific economies and harms China in the face of the US recession. These results suggest that the US should be involved in the negotiation process in order to realize China's currency reform successfully.

The econometric model introduced in this paper has wide applicability beyond the policy coordination problem analyzed above. In addition, the model is so easy to handle that anyone who has experience in operating econometric models can apply it immediately to practical issues. One remaining problem is the limitation of data availability. There is no effective way to overcome this problem other than the accumulation of long and consistent data, however.

APPENDIX A

BRIEF CHRONOLOGY OF CURRENCY SYSTEMS IN EAST ASIA

The high growth in East Asia from the mid-1980s through the early 1990s was praised as the "East Asian miracle." This growth was supported by massive capital inflows from Japan, the US, and Europe. Many East Asian countries adopted a *de facto* US dollar peg policy to promote capital inflows from abroad. At the same time, many monetary authorities in East Asia preferred to adopt independent monetary policies. It was in this economic environment that the depreciation of the Thai baht in 1997 triggered the Asian Currency Crisis. In order to survive in the international community, East Asian countries were urged not only to deal with the crisis that confronted them, but also to establish a new currency system after the crisis passed away.

In this appendix, we discuss how the East Asian countries have operated their financial markets over the two decades since the early 1980s. Due to limitations of space, we are unable to present a comprehensive history of the Asian financial system. Instead, we focus on the major historical events that are indispensable for understanding the arguments in this paper. In doing so, we emphasize that the Asian Currency Crisis forced the monetary authorities in East Asia to acknowledge the risk of pursuing their economic goals in ignorance of the *open-economy tri-lemma*. We review the evolution of policy systems in the East Asian economies, taking special note of exchange rate market operations, monetary policy in pursuit of domestic economic stability, and capital controls.

Indonesia

In 1978, Indonesia abandoned its fixed exchange rate system (the US dollar peg) and adopted a managed floating exchange rate system. The latter system was maintained until the Asian Currency Crisis in 1997. Capital and exchange transactions have been deregulated gradually over the past thirty years and have contributed to the high economic growth during the 1990s in Indonesia.

The outbreak of the Asian Currency Crisis in 1997 forced Indonesia to adopt an independent floating exchange rate system. When the depreciation of the Thai baht triggered the currency crises, the effects were transmitted all over East Asia and the Indonesian rupiah was also exposed to substantial downward pressure. At the beginning of the crisis, the monetary authority sought to preserve its managed floating

system by widening the exchange rate target band. However, the authority was eventually forced to give up the target band.

Indonesia currently maintains a managed floating exchange rate system and there has been some "non-internationalization" of the rupiah (regulations on offshore transaction of the rupiah) since 2001. Indonesia is now preparing to introduce an inflation targeting policy to replace the exchange rate as a nominal anchor.[30]

Singapore

In 1973, when the Bretton Woods System collapsed, the Monetary Authority of Singapore (MAS) adopted a managed floating exchange rate system in line with other industrialized countries. In 1981, the MAS shifted to a currency basket system and has maintained this system to date.[31]

The "non-internationalization" of the Singapore dollar is at the heart of this country's capital control policy. The purpose of this policy is to protect the Singapore dollar from being sold speculatively by non-residents. There is some discussion that the non-internationalization policy blocked currency speculation and limited the damage of the Asian Currency Crisis on the Singapore dollar.

In Singapore, the currency basket system is one of the measures by which to achieve price stability. The MAS operates domestic monetary policy in accordance with this system. As for capital controls, the non-internationalization policy is gradually being liberalized to foster the domestic capital market. For instance, non-residents are now allowed to buy the Singapore dollar necessary to buy stocks and bonds denominated in Singapore dollars.

Thailand

In 1984, Thailand adopted a currency basket system in place of its fixed exchange rate system (the US dollar peg). At first, the composition of the currency basket was determined on a trade-volume basis. As time passed, however, the weight of the US dollar became dominant in the currency basket. We can therefore consider Thailand to

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[30] The central bank had been a part of the government in Indonesia. In May 1999, the government amended the banking law and assured independence to the central bank.

[31] The MAS currency basket, composed of the currencies of the country's main trading partners, is managed so that it moves within a certain target band. So far, the MAS has kept secret both the currency composition of the basket and the target band.

have been employing a *de facto* US dollar peg system, when the Asian Currency Crisis occurred. Though somewhat skewed in its make-up, the Thai currency basket system lasted 13 years until the 1997 crisis.

During the first half of the 1990s, Thailand eased regulations on inward investment. In particular, the Bangkok International Bank Facilities (BIBF; an offshore financial market established in 1993) allowed non-resident-to-resident transactions as well as non-resident-to-non-resident transactions. The BIBF played a significant role in raising the enormous funds necessary for the country's economic growth.

In the second half of 1996, Thai exports slowed, putting the brakes on GDP growth. Against this background, market investors began to suspect that the Thai baht might be overvalued. Finally, in May 1997, foreign speculators began a massive sell-off of the baht. In July, the monetary authority ran short of foreign currency reserves and could not protect the baht anymore. The currency basket system was abandoned eventually.

Faced with this situation, the Thai government started to regulate capital inflows to the BIBF and resumed a de facto currency basket. Furthermore, non-internationalization of the Thai baht (regulations on offshore transactions denominated in Thai baht) was introduced after the crisis. As for domestic monetary policy, Thailand adopted an inflation targeting policy in May 2000, which it hoped would provide a new nominal anchor.

The Philippines

From 1994 to 1998, the Philippines employed a *de facto* US dollar peg. Exchange control was implemented according to the "real demand principle" of exchange contracts. Actual exchange control, however, was not very complete due to the existence of the *forex corporations*.

The Philippine peso weakened in the midst of the Asian Currency Crisis. The monetary authority was forced to devaluate the peso in 1997. The impact of the crisis on the Philippine economy, however, was smaller than on other ASEAN economies. This was because the low ratings of private companies under the Marcos Administration have discouraged foreign funds from entering the country in the first place.

The Philippines has been under an independent floating exchange rate system since 1998. To provide a new nominal anchor, an inflation targeting policy has been in operation since 2002. After the crisis, the government strengthened regulations on the

forex corporations.

Malaysia

When the Asian Currency Crisis occurred in 1997, Malaysia was under a managed floating exchange rate system. Even after a substantial depreciation during the crisis, the Malaysian ringgit still found itself under strong downward pressure due to the unstable financial system—a crash of equity prices and a rise in the non-performing-loan ratio.

Malaysia overcame the Asian Currency Crisis without assistance from the IMF. This was largely owing to restrictions on overseas borrowing that limited the amount of short-term debt, and also due to the country's adequate holdings of foreign exchange reserves. In 1998, new capital regulations (suspension of the offshore ringgit market and of overseas remission of equity-sales proceeds by non-residents) were introduced. At the same time, a fixed exchange rate system (the US dollar peg) was adopted.

As the Asian Currency Crisis receded, the government gradually removed the regulations governing overseas remission of equity-sales proceeds. To date, these regulations have been completely withdrawn. In contrast, the offshore ringgit market is still suspended. Thus, non-residents cannot carry out short-sales of the ringgit.

South Korea

In 1980, South Korea adopted a currency basket system in place of its fixed exchange rate system (the US dollar peg). In 1990, the country then adopted a managed floating exchange rate system and limited daily movements of the exchange rate. As for exchange controls, South Korea accepted its obligations under Article VIII of the IMF Article of Agreement in 1988 and removed all the restrictions on the won trading necessary for current account transactions. Of the restrictions on the capital account, the first to be liberalized was outward investment. This followed the emergence of the excess liquidity problem after South Korea became a current-account surplus country toward the end of the 1980s.

From 1995, however, a heating-up of South Korean domestic demand increased imports, while the combination of a strong won and a weakened yen reduced exports substantially. As a result, South Korea's current account fell into substantial deficit. A large portion of this deficit was financed with short-term loans from the country's local banks. From 1997, following the bankruptcy of some *chaebols* (South Korean conglomerates), non-performing loans piled up in the banking sector. When short-term

foreign funds fled overseas, the Korean won experienced a dramatic depreciation. At the end of 1997, the South Korean monetary authority was forced to shift to an independent floating exchange rate system.

In 1997, South Korea called for IMF economic assistance and started a series of structural reforms: tightening of macroeconomic policy, reform of its financial and corporate sectors, liberalization of capital transactions (especially related to inward investment). South Korea adopted an inflation targeting policy in 1998 and placed "price stability" at the heart of its monetary policy.

Hong Kong

In 1974, following the breakdown of the Bretton Woods System, Hong Kong abandoned its currency board system, in which the Hong Kong dollar was pegged to the British pound, and adopted a floating exchange rate system instead. In 1983, however, the Hong Kong monetary authority returned to the currency board system in response to the massive speculation triggered by the dispute over Hong Kong's reversion to China from the UK.

A currency board system differs from a fixed exchange rate system in that it requires bank notes to be fully backed by foreign reserves. This requirement is considered to enhance the stability of the exchange rate by reinforcing the credibility of the government commitment to exchange the currency for foreign reserves on demand. In 1998, during the Asian Currency Crisis, foreign speculators started what is known as "double trading," i.e., selling short both in the Hong Kong dollar market and in the Hong Kong stock market. The Hong Kong Monetary Authority, however, tamed the stock market successfully through its aggressive market intervention.

Under the currency board system, Hong Kong is unable to control monetary aggregates freely. Therefore, it cannot ease monetary policy and expand the money supply to stimulate the domestic economy. The corollary of Hong Kong's desire to stabilize its exchange rate is that it gives up its independent monetary policy instead.

Taiwan

Taiwan is only one East Asian economy that escaped from the Asian Currency Crisis in 1997.[32] To shut down the impacts of the Asian Currency Crisis, Taiwan's currency and

[32] The New Taiwan (NT) dollar experienced the second smallest depreciation during the crisis, next to the Hong-Kong dollar among the East Asian currencies.

monetary policy plays an important role. Taiwan established a foreign exchange market and shifted its exchange rate policy from a fixed exchange rate system to a managed floating system in 1979. At the start of the market, the NTD was managed by the central bank and big private commercial banks. In 1982, however, the Taiwan government adopted a more flexible managed floating, which requires an exchange rate to stay within the band of yesterday's average rate plus/minus 2.25 %. Lastly, in 1989, under the pressure of currency appreciation due to the surplus in current account and the accumulation of foreign reserves, Taiwan abandoned the target band policy and adopted a weakly managed floating system.

The deregulation of capital account is very slow and many restrictions remain on capital transactions in Taiwan. In 1952, the Taiwan government relaxed capital imports—both foreign direct investment and portfolio investment—to absorb new technologies from overseas economy. Capital exports, however, were not allowed until 1959 for foreign direct investment and until 1986 for foreign portfolio investment.[33] With the 1987 amendment to the foreign exchange law (amended again in 1995 substantially), Taiwan changed its currency policy stance drastically, encouraging outflow of domestic capital, while regulating inflow of foreign capital.

Taiwan's banking system liberalization started with the 1989 amendment to the banking law, which prompted the establishment of commercial banks and privatization of national banks in the 1990s and removed the regulation on deposit and loan interest rates. As for monetary policy, the Central Bank of China (Taiwan's central bank) adopts monetary targeting as its intermediate goal, by which the central bank aims at containing the growth rate of money supply in a target band.

To sum up, the Taiwan government faced the Asian Currency Crisis successfully with a following combination of monetary and currency policy: a relatively free managed floating exchange rate system, a restrictive capital control, especially for capital imports, and monetary aggregate targeting as monetary policy. The NTD was free from overvaluation under the free floating system and created no incentives for foreign capital to make speculation. Since there was a limited volume of foreign capital, Taiwan experienced a limited amount of capital flight. Because there was no need to protect the NTD against speculation by foreign investors, the Taiwan government could assign monetary policy to the stabilization of domestic economy.

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[33] The foreign direct investment into China was deregulated in 1991.

China

China abolished its dual exchange rate system, whereby official and market rates coexisted, in 1994 and has only a single market exchange rate today. China employs a managed floating exchange rate system. Nonetheless, the Chinese yuan moves against the US dollar by only tiny amounts. Thus, we can consider this to be a *de facto* US dollar peg system.

China continues to impose strict exchange controls, even after it accepted in principle its obligations under Article VIII of the IMF Article of Agreement in 1996. The purpose of exchange control is to achieve exchange rate stability. In China, (i) currency trading necessary for current account transactions is free; but (ii) that necessary for capital transactions is strictly controlled. It is thanks to this strict regulation as well as its great current account surplus that China managed to keep the yuan stable in the face of the Asian Currency Crisis, despite the rumors of the yuan depreciation.

As described above, China pursues exchange rate stability, while controlling capital movements strictly. This leaves the Chinese government room for conducting monetary policy to manage the domestic economy.

The WTO accession in December 2001, however, is changing the environment surrounding the Chinese system of regulations. The main obligation incurred in the country's accession to the WTO was the removal of regulations on trade and direct investment, including reductions in import tariffs and removal of non-tariff barriers. As the Chinese market opens up to the global economy, there will emerge considerable pressure for it to deregulate its capital controls. If China wishes to keep its monetary policy independent and to relax capital controls, it will have to allow the Chinese yuan to move more flexibly than to date.

APPENDIX B

NOTES ON ESTIMATION AND CALIBRATION OF THE MODEL

This appendix gives notes on the estimation and calibration of the model equations. We discuss the estimation of import functions, domestic demand functions, Phillips curves, and policy reaction functions below. We admit that it is desirable to employ an estimation technique with which we can avoid simultaneous equation bias, e.g., the full information maximum likelihood estimator or the three step least square estimator. However, there are many equations to be estimated in the current model. For this reason, we estimate the individual equations separately by OLS. The estimation results are shown in Tables 7 to 10.

(i) Import Functions

As Goldstein and Khan (1985) mention, there are many difficulties involved in estimating import functions. In particular, researchers often encounter problems with the sign of estimated parameter on the real effective exchange rate. This has been known to suggest that a country's imports will increase when its currency depreciates. This is counterintuitive when we think about imports of final goods. The depreciation of the importing country's currency raises the prices of imported goods relative to those of domestic goods and should thus reduce import demand.

This problem of sign reversal on the real effective exchange rate is not necessarily ridiculous, when we consider that the demand for imports is in part derived from exports. Suppose the Japanese yen depreciates. The prices of Japanese export goods decline relative to foreign equivalents; thus demand for them increases. As a result, new demand is created for imports of intermediate goods. If the increase in imports of intermediate goods were to exceed the decrease in final goods coming from the depreciation of the yen, Japanese net imports would increase.

As pointed out before, the import functions, equation (2-1), include export volumes as explanatory variables. The first term on the right hand side of equation (2-1) is interpreted as a derived demand for import goods springing from current and future exports. If we follow the above argument and include this term in the import function, then it absorbs any increase in imports caused by currency depreciation; thus the estimated parameter on the real effective exchange rate takes the expected sign; and the intuition that currency depreciation reduces import volumes is restored.

Table 7 presents the estimation results of aggregate import functions. The sample period spans the 1990s (quarterly bases). The fit of the equations is not bad. This shows empirically the potential of equation (2-1) as a general form for import functions. We should also note that, for all countries other than the US, Indonesia, Singapore, the Philippines, and Malaysia, the parameter on the real effective exchange rate takes the theoretically expected sign, though insignificant in most cases. The import function of the rest of the world takes a simple form which assumes neither domestic demand nor real effective exchange rates.

As pointed out in Section II, we exclude the possibility of cointegration among imports and exports. To see whether a cointegration relationship exists, we first regress each country's imports on its exports, domestic demand, and real effective exchange rate and then test the existence of unit roots in the regression residuals. The augmented Dickey-Fuller test for cointegration tells us, however, that these four variables do not necessarily cointegrate for the 11 economies included in our model. Since we like to apply the same form of import functions to all economies, we assume no cointegration relationships in our model.

(ii) Domestic Demand Functions

Table 8 shows the estimation results of domestic demand functions (quarterly bases). Most of samples span over the 1990s, though only short samples are available for some countries. Looking at our OLS estimates, we see that the fit of the domestic demand function is unsatisfactory for most countries. The fit is extremely poor for China. Thus, we treat China's domestic demand as exogenous in the analysis. The low coefficients of determination may imply that the current treatment of domestic demand is too simple to adequately reflect reality. Thus, improvements will be required in future.

Let us examine the significance of the ratio of the current account balance to potential output in the domestic demand function. This ratio is not statistically significant in the domestic demand functions for most countries. Yet, it has some impacts on the domestic demand of Thailand, the Philippines, Malaysia, and Taiwan and we have left this ratio to reflect the possibility that trade deficits cause outflows of foreign capital, which in turn discourage both investment and production activities.

(iii) Phillips Curves

Table 9 shows the estimation results of the Phillips curves. For most countries, the output gaps are significant explanatory variables, guaranteeing the applicability of the

Phillips curve relationships. Exceptions are Indonesia and Malaysia, for which the effects of the output gaps on prices are insignificant. It is remarkable that a 94 percent of Indonesia's price movement is explained only by a lagged inflation rate and the nominal effective exchange rate.

(iv) Policy Reaction Functions

Finally, Table 10 presents the estimation results of the Taylor rule in equation (3-2) for Japan and the US.[34] As for South Korea, Thailand, and the Philippines, which have adopts inflation targeting policies, we estimate equation (3-6), considering that a change in the exchange rate has more significant effects on the inflation rate than that in the output gap does.[35] According to the estimation results, these policy rules suit the data rather well. Note, however, that the results are based on a limited sample period (the period following the Asian Currency Crisis). Thus, we should be careful when using these results.

[34] See Kamada and Muto (2000).

[35] Only a few years have passed since South Korea, Thailand, and the Philippines first adopted inflation targets. Taking into consideration this limited data availability, we estimate policy reaction functions since 1998, immediately following the Asian Currency Crisis.

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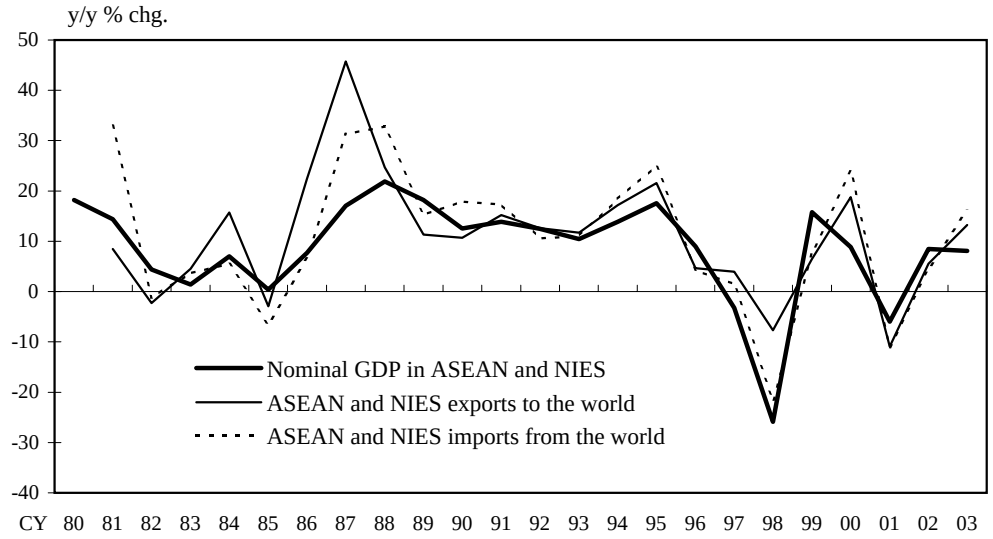
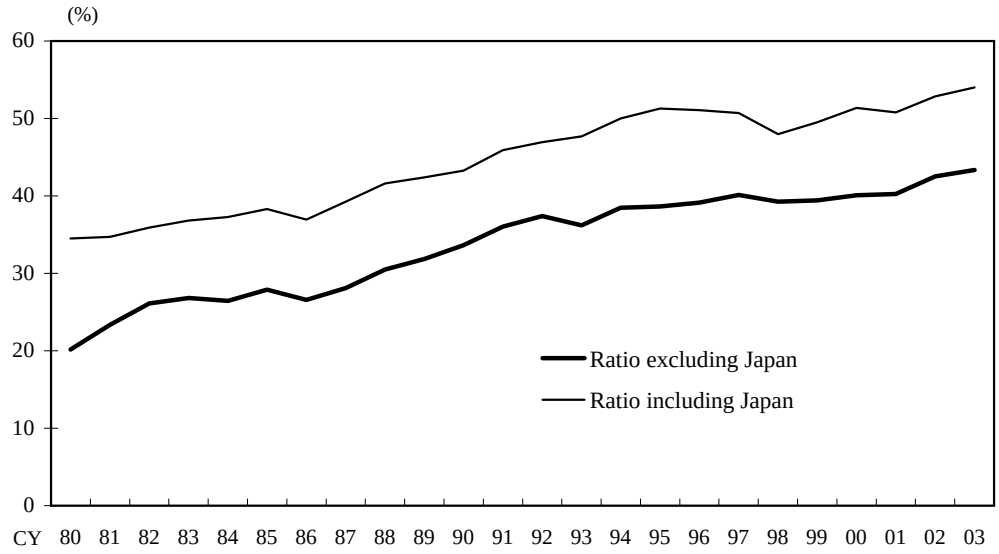
Figure 1

Output and Trade in the Asia-Pacific Region

a. Nominal GDP and Trade



b. Intra-regional Trade Ratio in East Asia



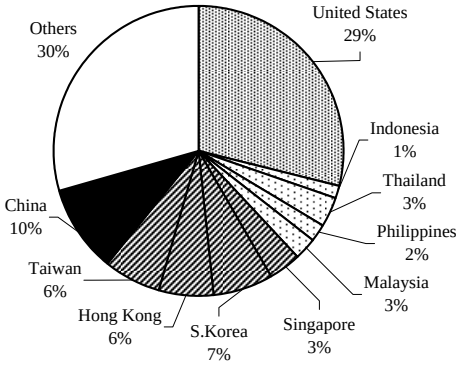
Note: "Nominal GDP," "Exports," and "Imports" are year-to-year percent changes of aggregated nominal GDP, exports, and imports denominated in dollars, respectively.

Sources: International Monetary Fund, "International Financial Statistics," "Direction of Trade Statistics." CEIC database.

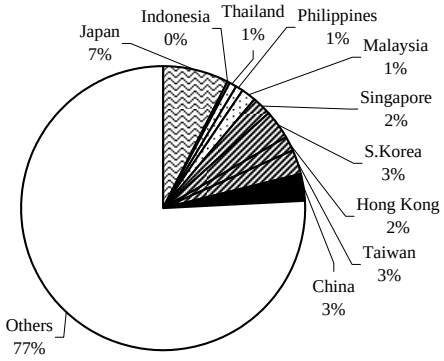
Figure 2-1

Export Shares (1)

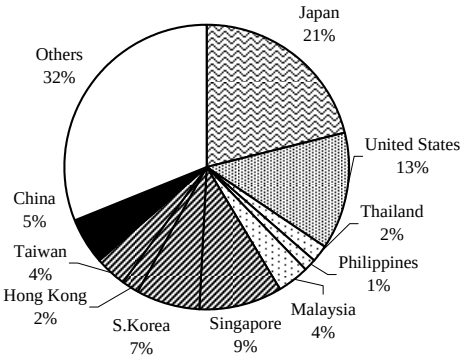
a. Japan



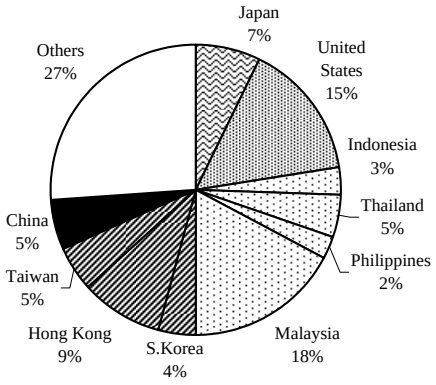
b. The United States



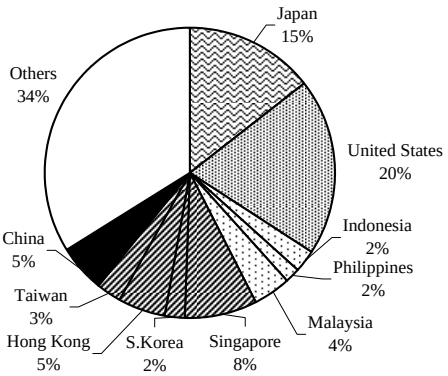
c. Indonesia



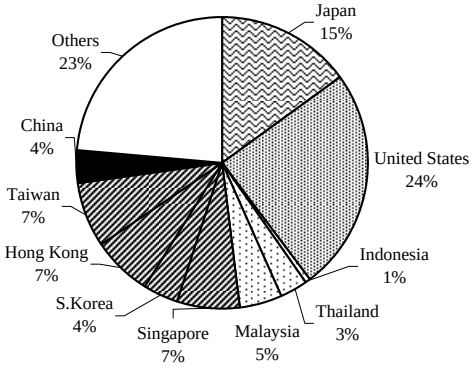
d. Singapore



e. Thailand



f. The Philippines

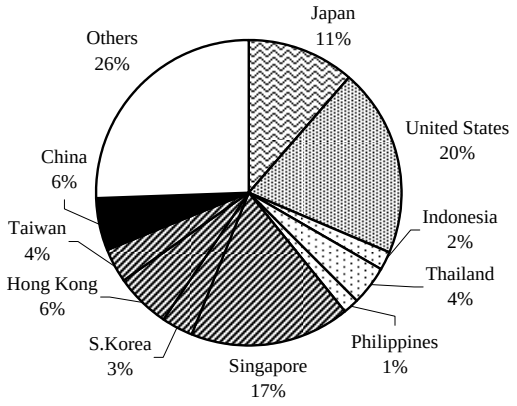


Note: Figures are average values of quarterly data in 2002.
Source: International Monetary Fund, “Direction of Trade Statistics.”

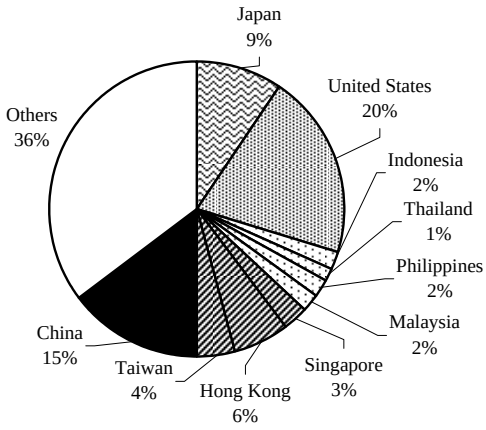
Figure 2-2

Export Shares (2)

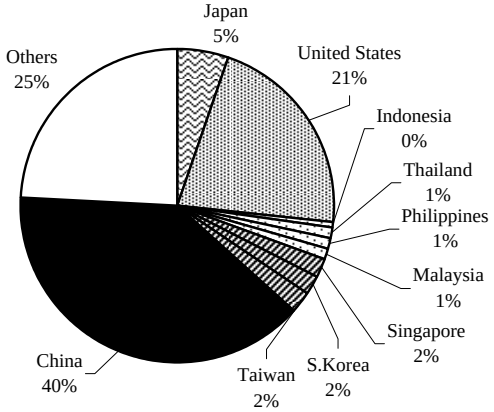
g. Malaysia



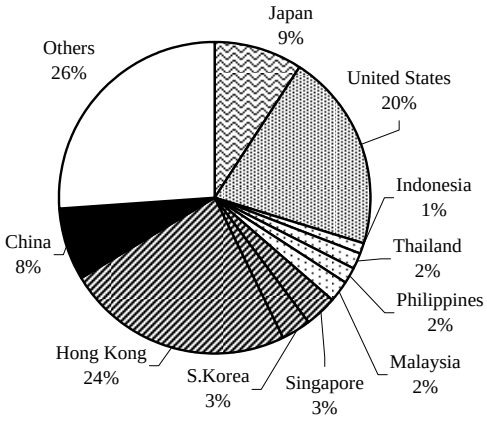
h. South Korea



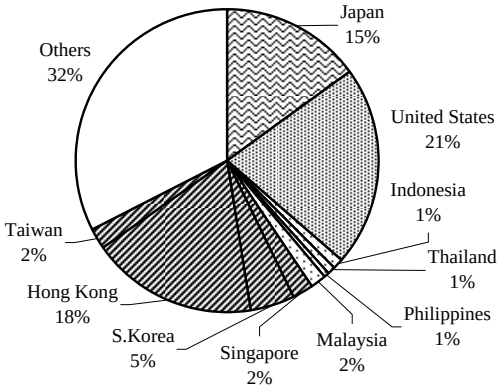
i. Hong Kong



j. Taiwan



k. China



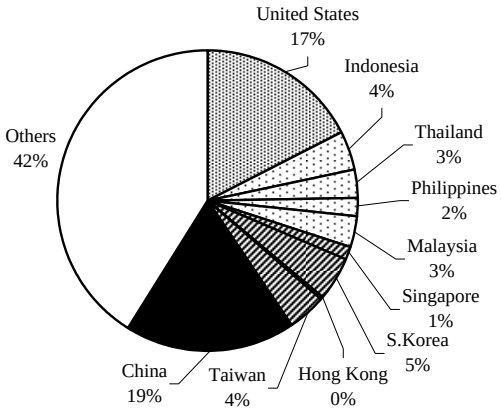
Note: Figures are average values of quarterly data in 2002.

Sources: International Monetary Fund, “Direction of Trade Statistics.”
CEIC database.

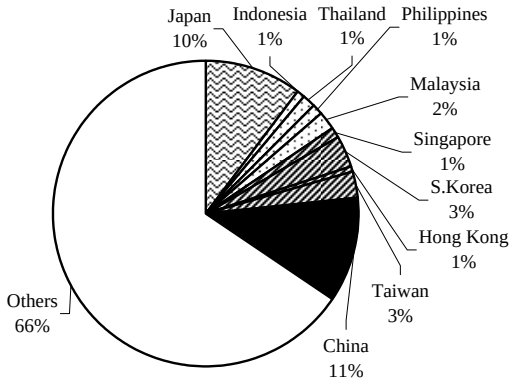
Figure 3-1

Import Shares (1)

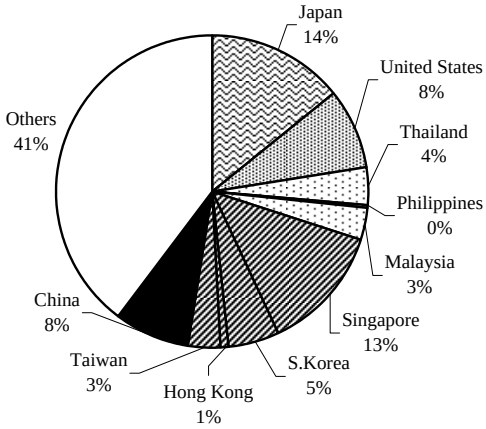
a. Japan



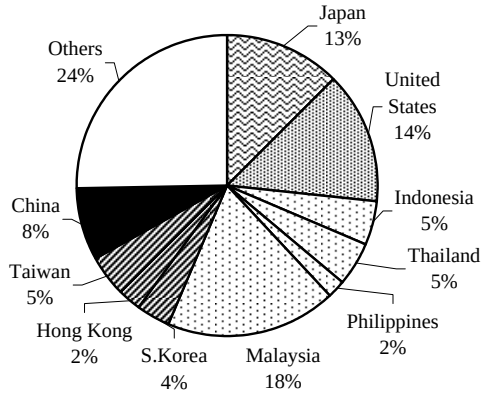
b. The United States



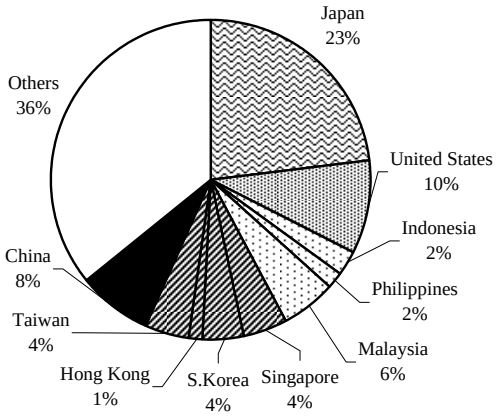
c. Indonesia



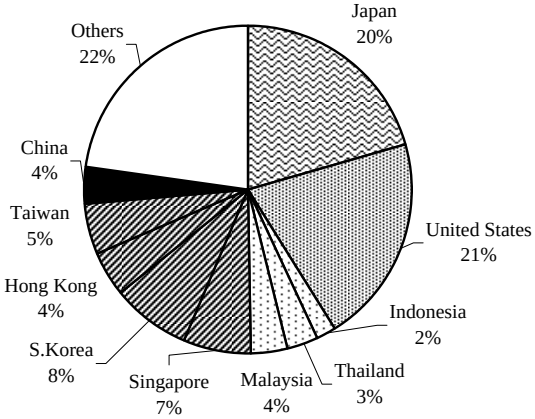
d. Singapore



e. Thailand



f. The Philippines

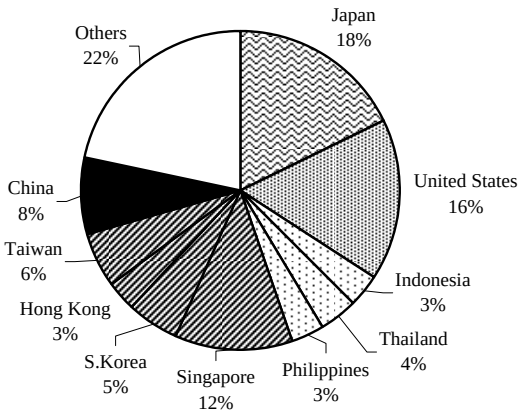


Note: Figures are average values of quarterly data in 2002.
Source: International Monetary Fund, “Direction of Trade Statistics.”

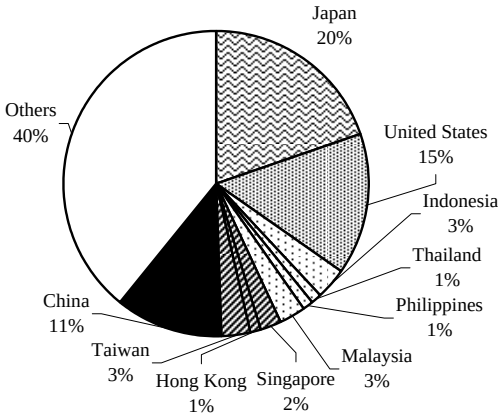
Figure 3-2

Import Shares (2)

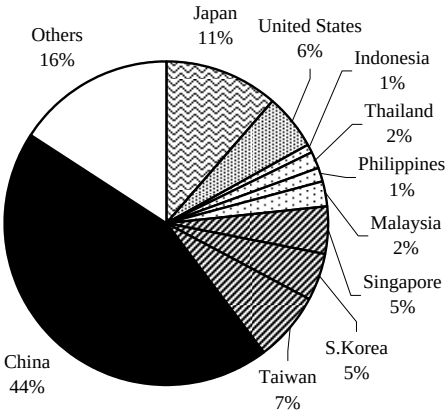
g. Malaysia



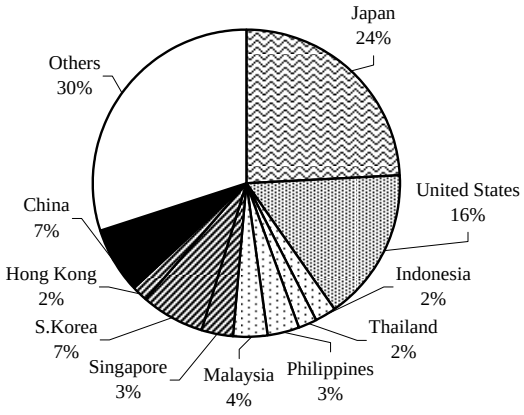
h. South Korea



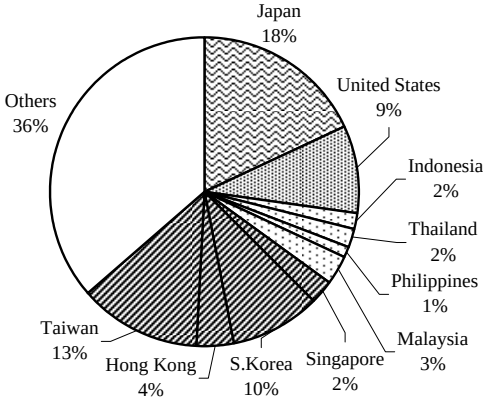
i. Hong Kong



j. Taiwan



k. China

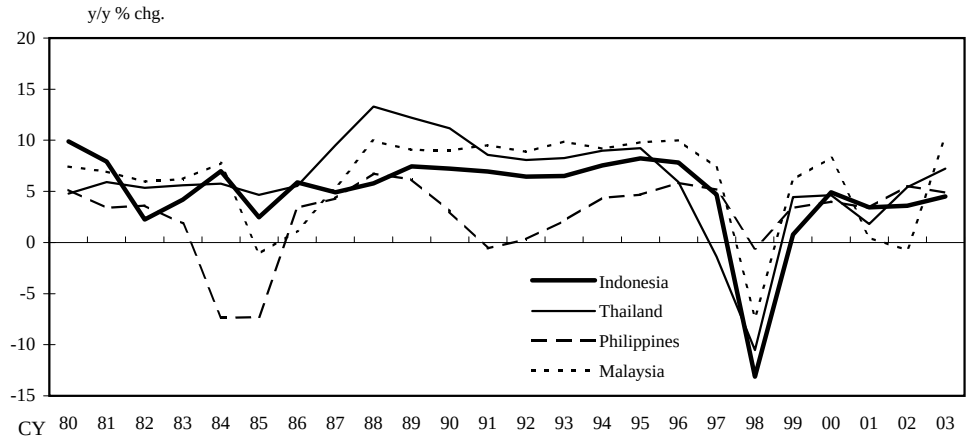


Note: Figures are average values of quarterly data in 2002.
Sources: International Monetary Fund, “Direction of Trade Statistics.”
CEIC database.

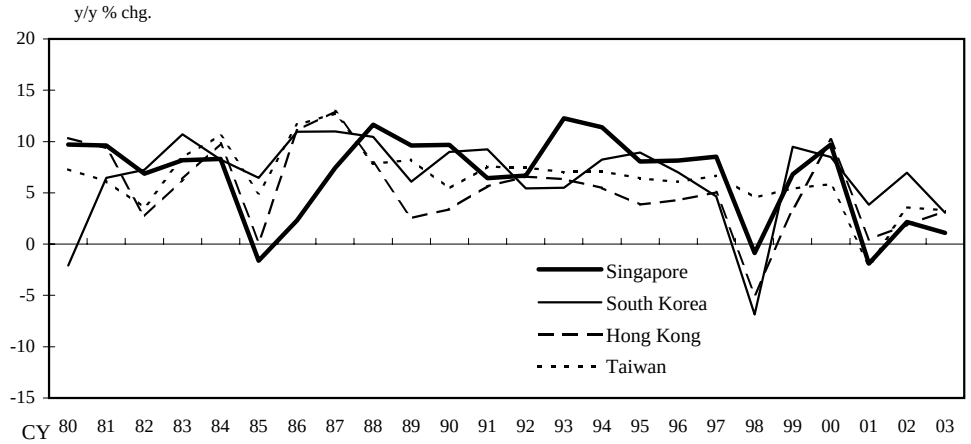
Figure 4

Real GDP Growth in the Asia-Pacific Region

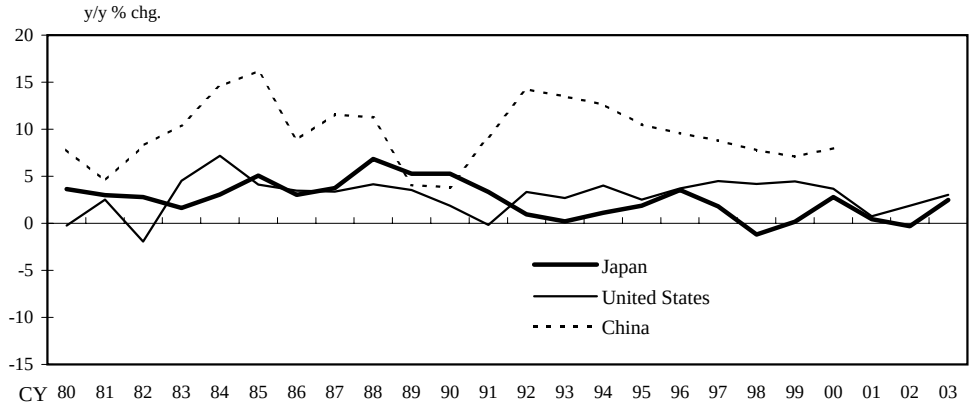
a. ASEAN



b. NIES



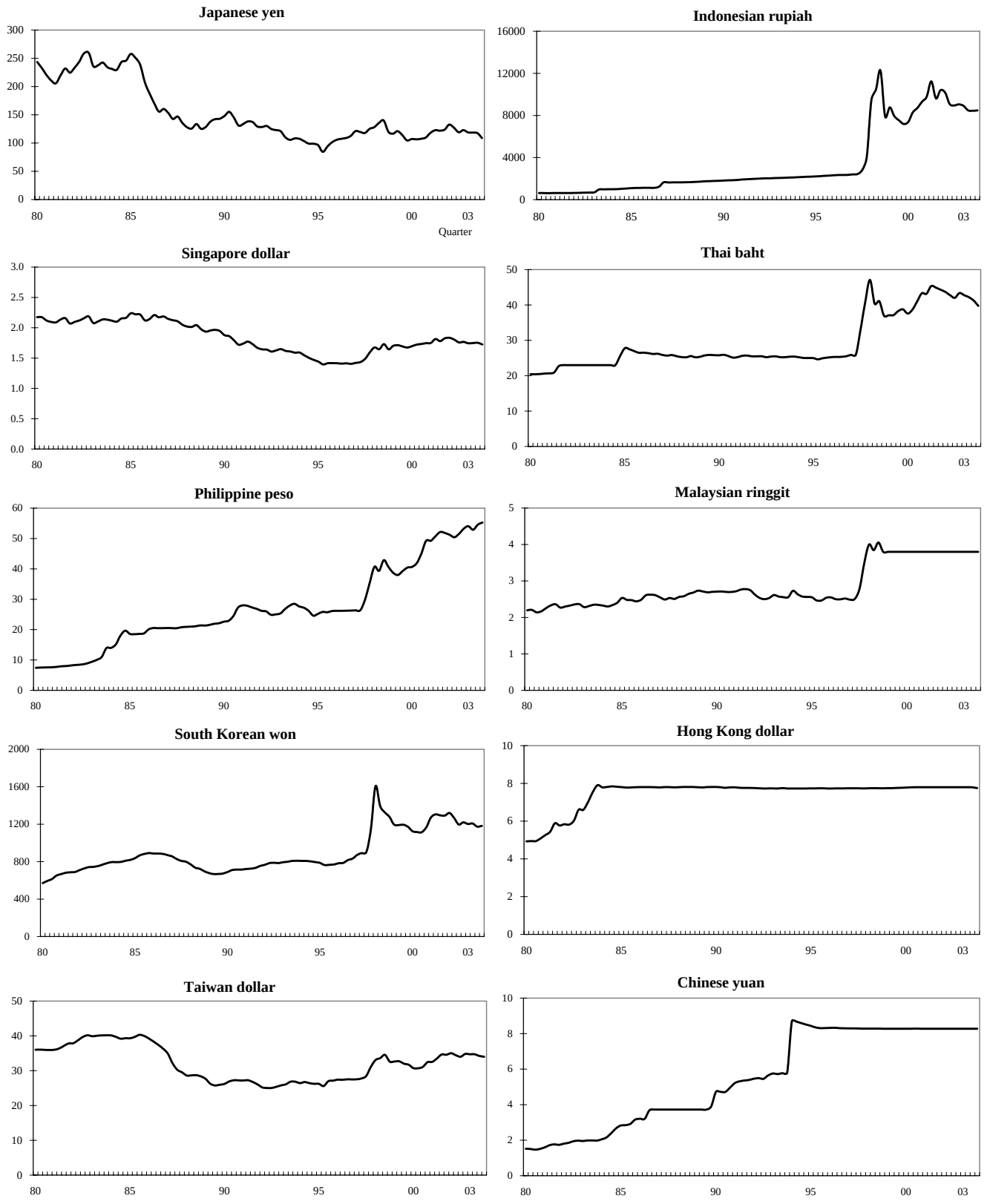
c. Large countries



Sources: International Monetary Fund, "International Financial Statistics."
CEIC database.

Figure 5

Nominal Exchange Rates of East Asian Currencies against the U.S. Dollar



Sources: International Monetary Fund, "International Financial Statistics."
CEIC database.

Figure 6-1

Impulse Response: (i) A 1 percent decline in the growth rate of the Japanese domestic demand <Effects on Japan>

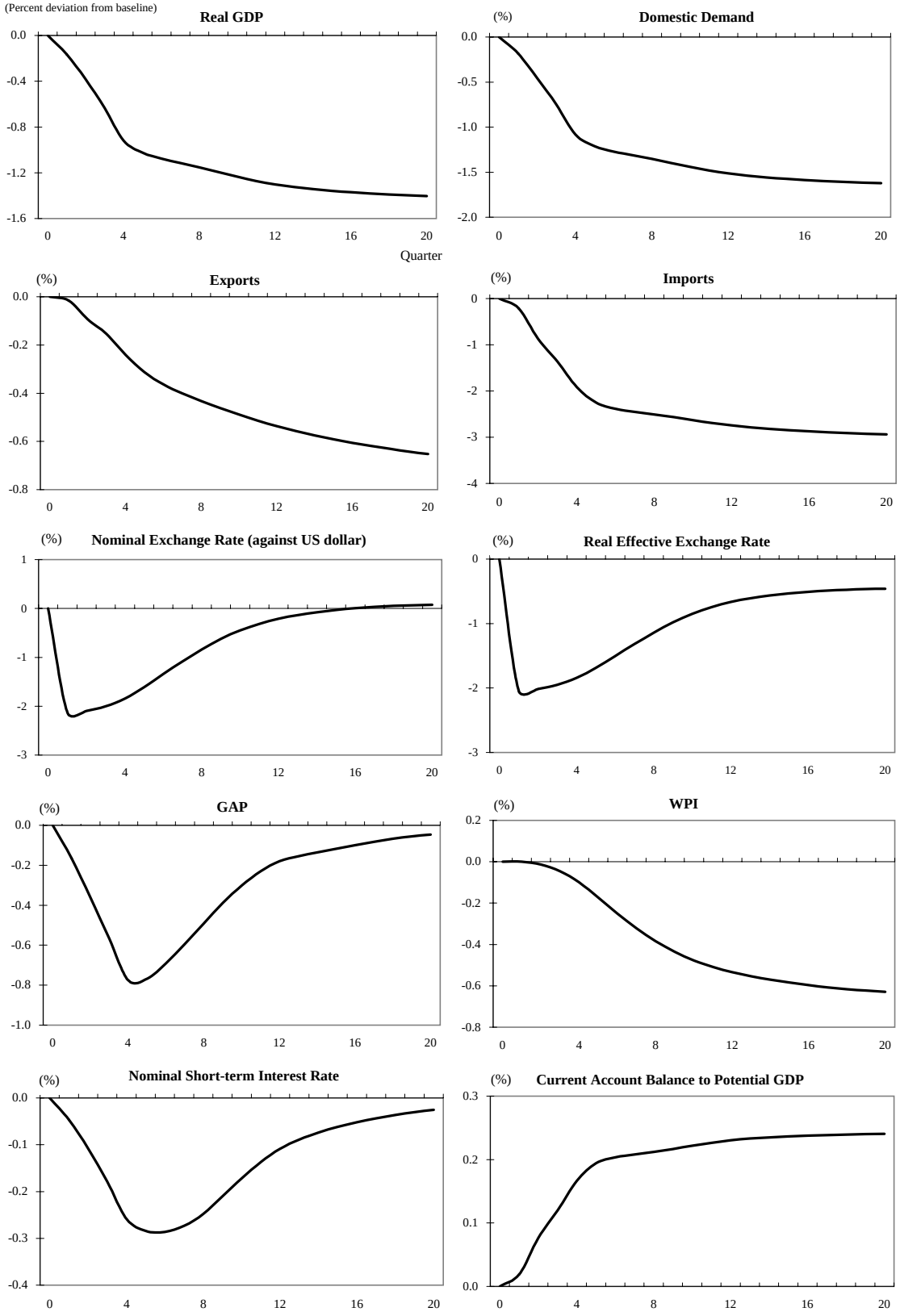


Figure 6-2

Impulse Response: (i) A 1 percent decline in the growth rate of the Japanese domestic demand <Effects on Thailand>

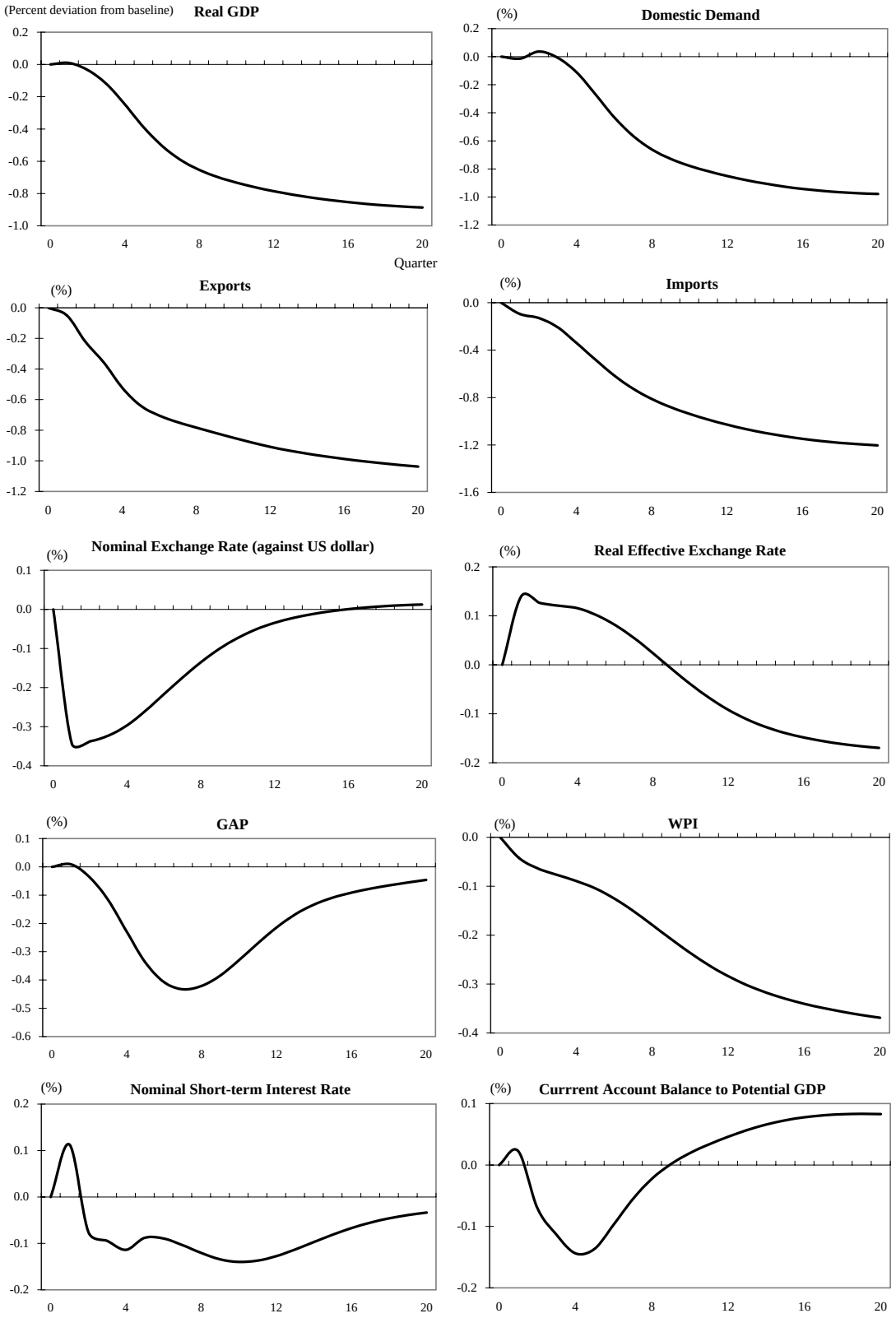


Figure 7-1

Impulse Response: (ii) A 1 percent decline in the growth rate of the US domestic demand <Effects on Japan>

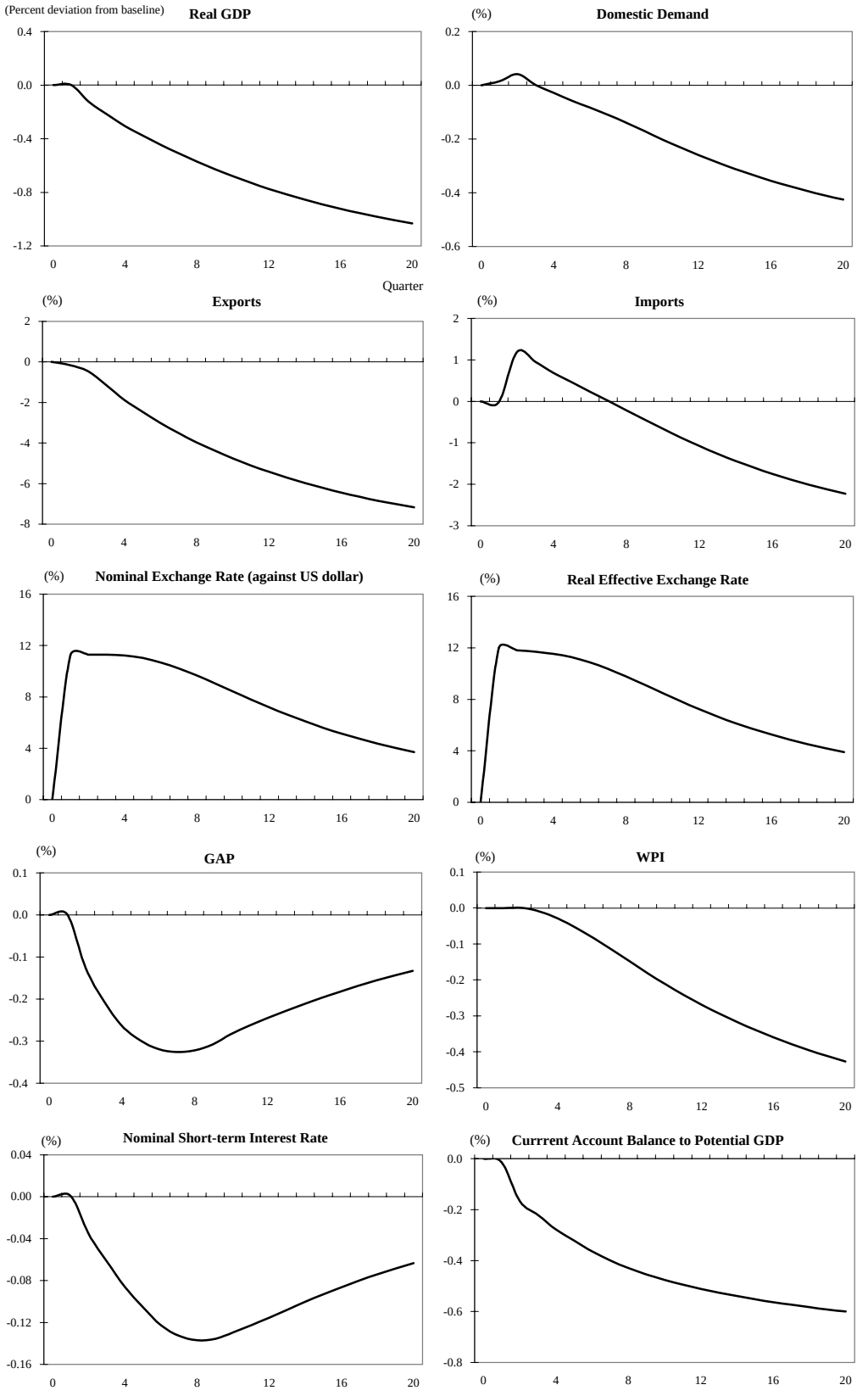


Figure 7-2

Impulse Response: (ii) A 1 percent decline in the growth rate of the US domestic demand <Effects on Thailand>

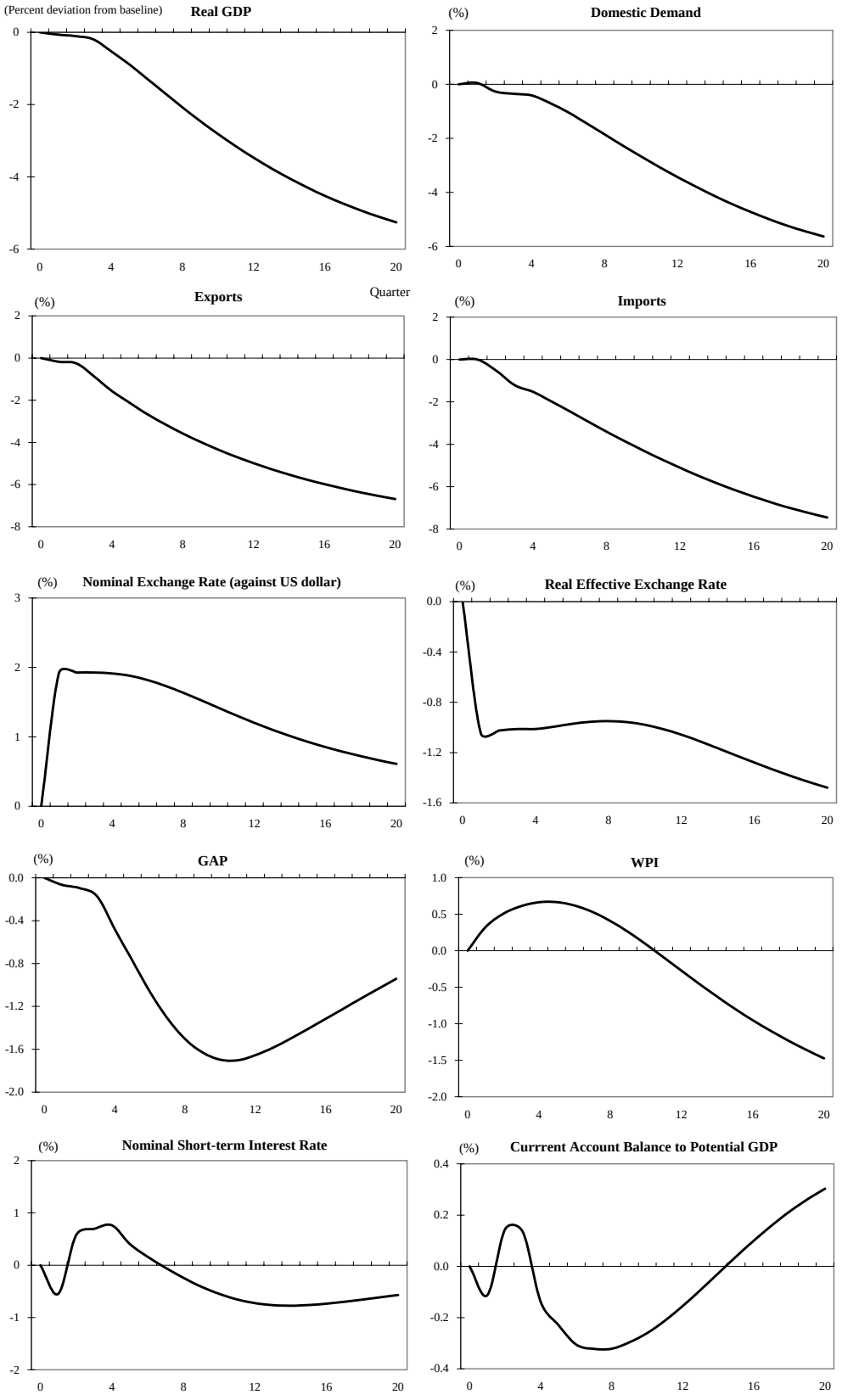


Figure 8-1

Impulse Response: (iii) A 1 percent decline in the growth rate of the East Asian domestic demand <Effects on Japan>

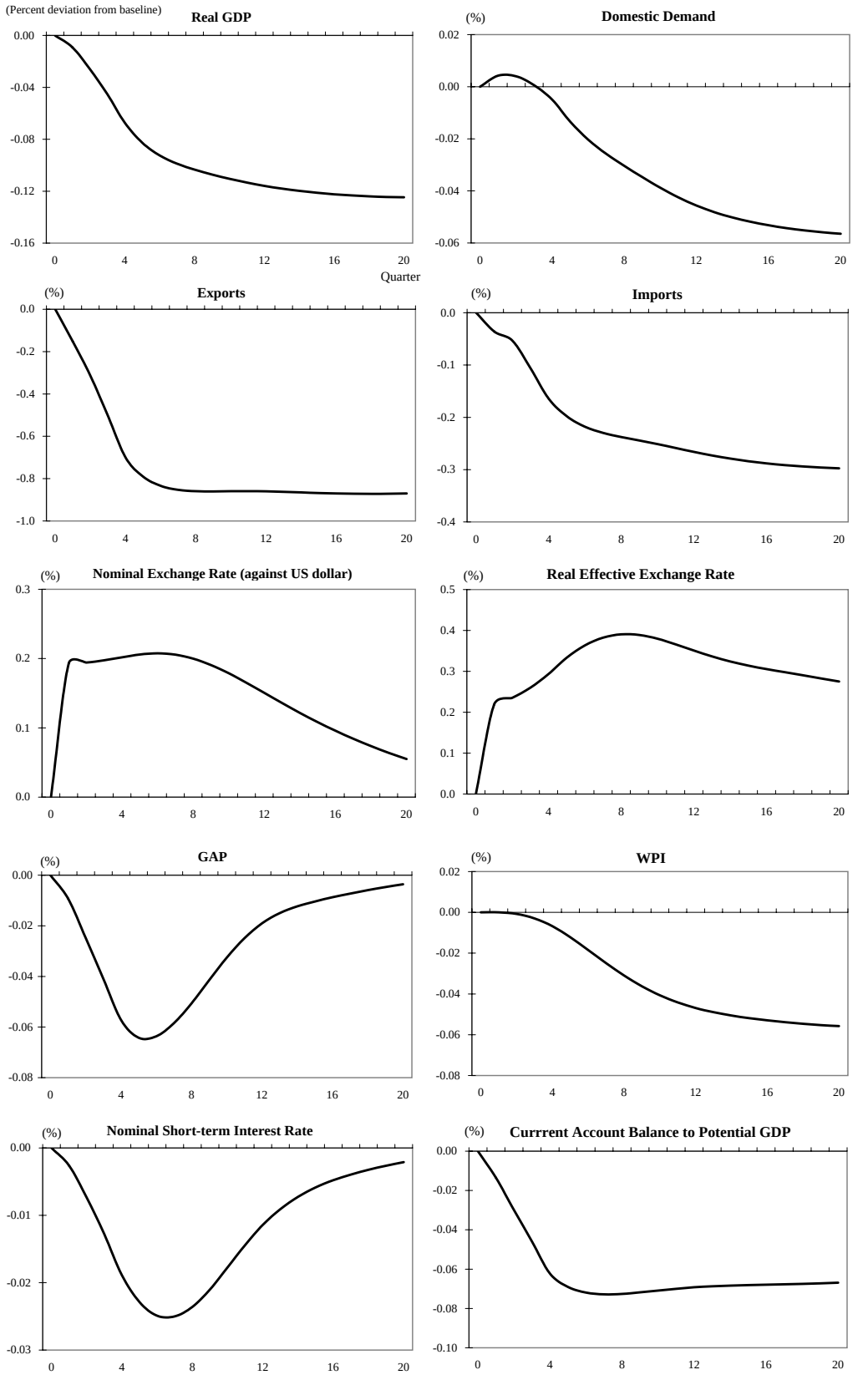


Figure 8-2

Impulse Response: (iii) A 1 percent decline in the growth rate of the East Asian domestic demand <Effects on Thailand>

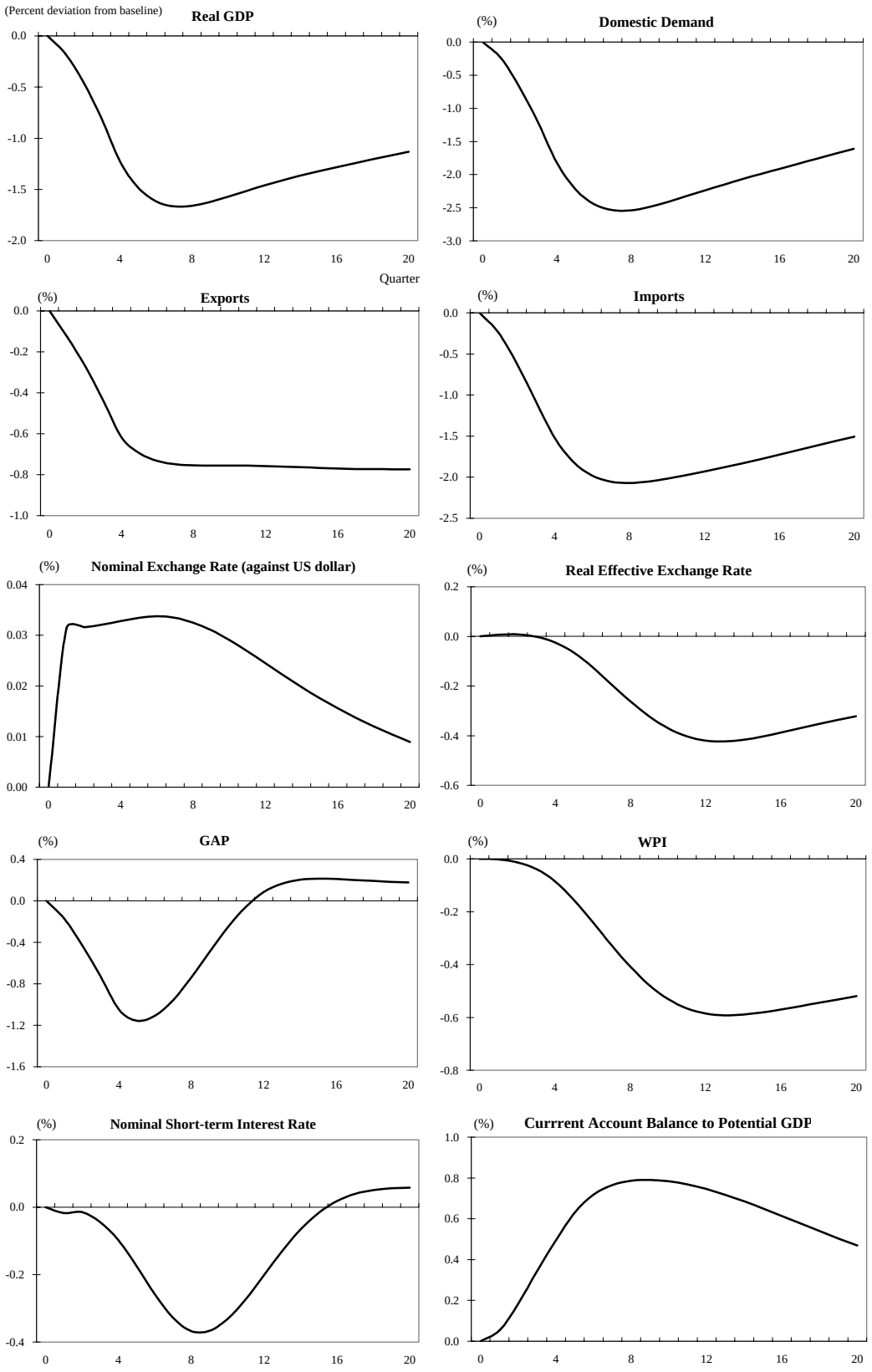


Figure 9-1

Impulse Response: (iv) A 1 percent decline in the growth rate of the Asia-Pacific domestic demand <Effects on Japan>

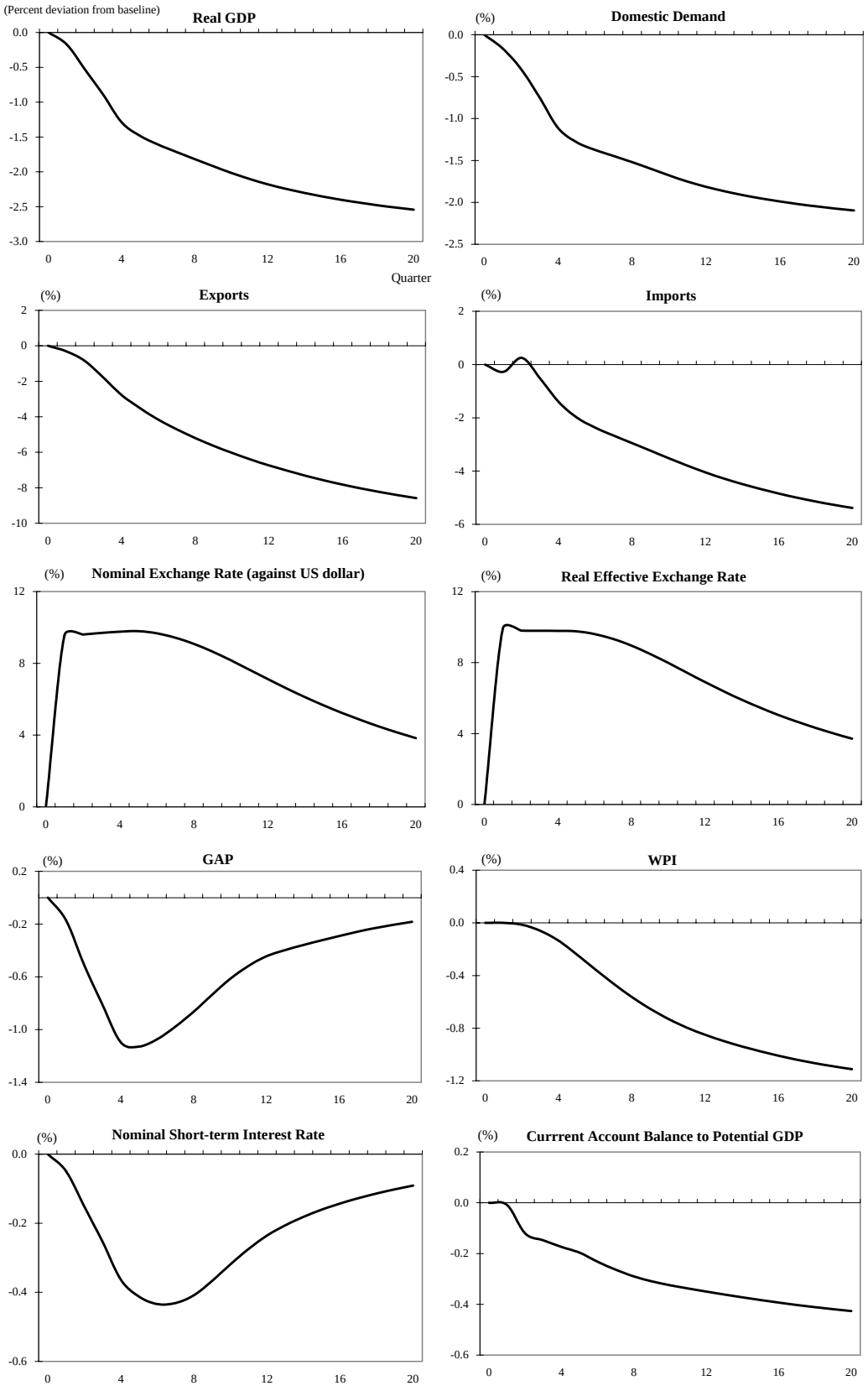


Figure 9-2

Impulse Response: (iv) A 1 percent decline in the growth rate of the Asia-Pacific domestic demand <Effects on Thailand>

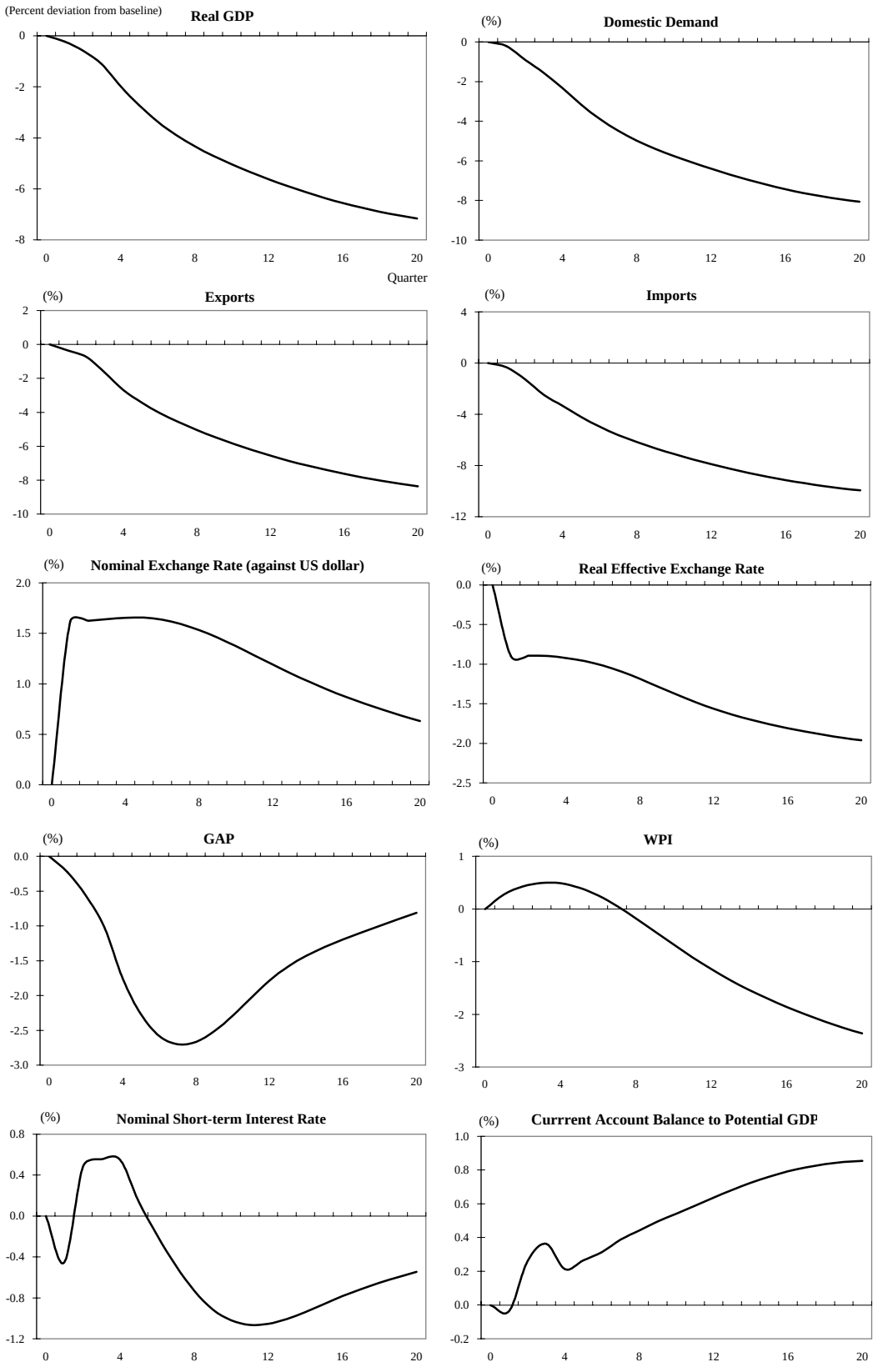
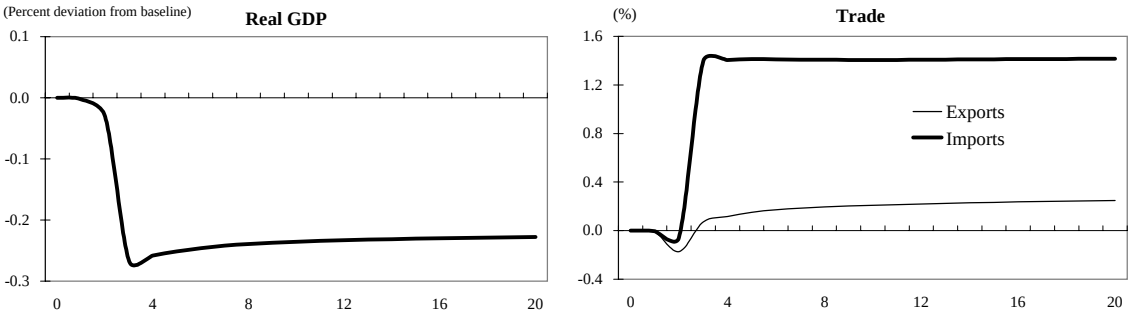


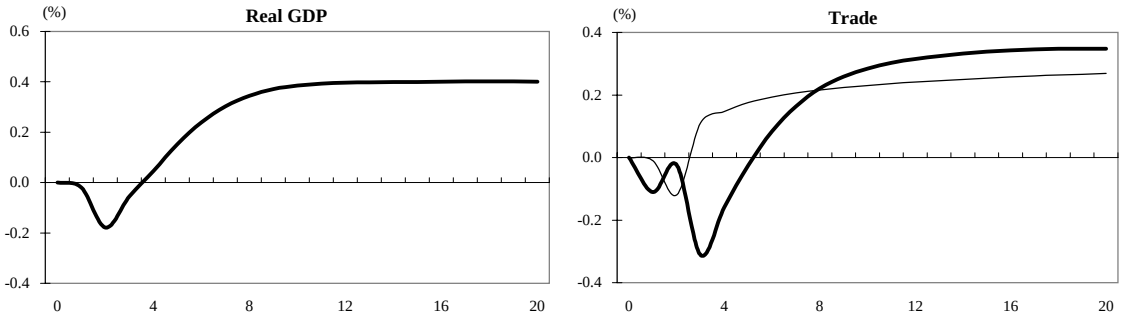
Figure 10

Effects of a 10 Percent Yuan Appreciation

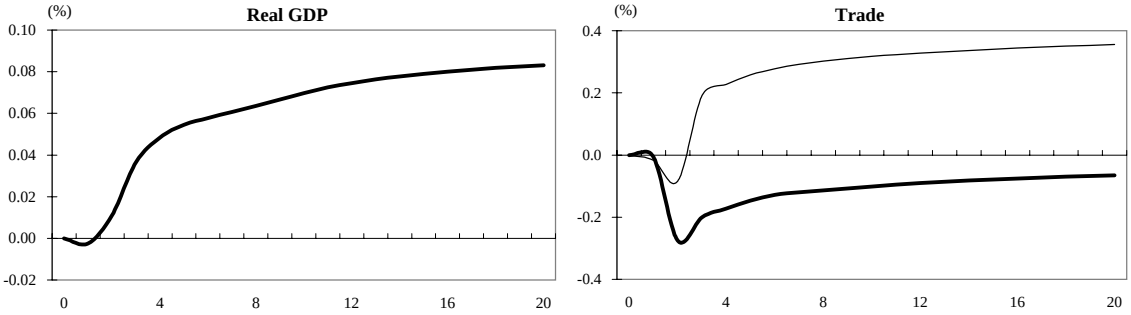
a. China



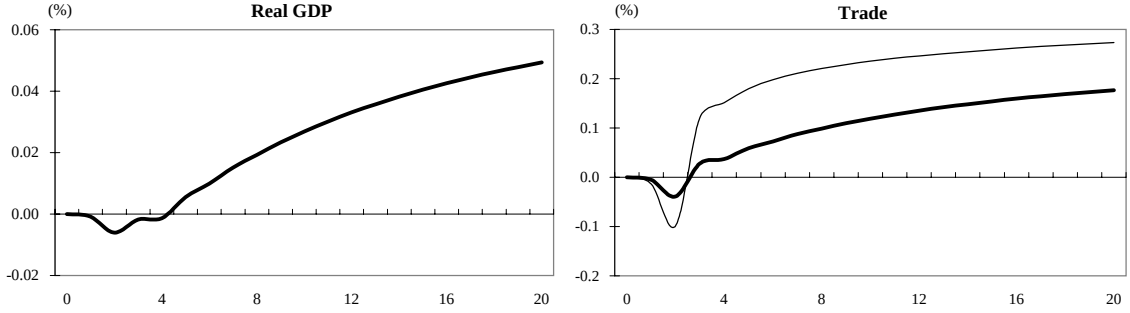
b. Thailand



c. Japan



d. US



Non-negativity Constraint on the Japanese Nominal Interest Rates
<Effects on Japan>

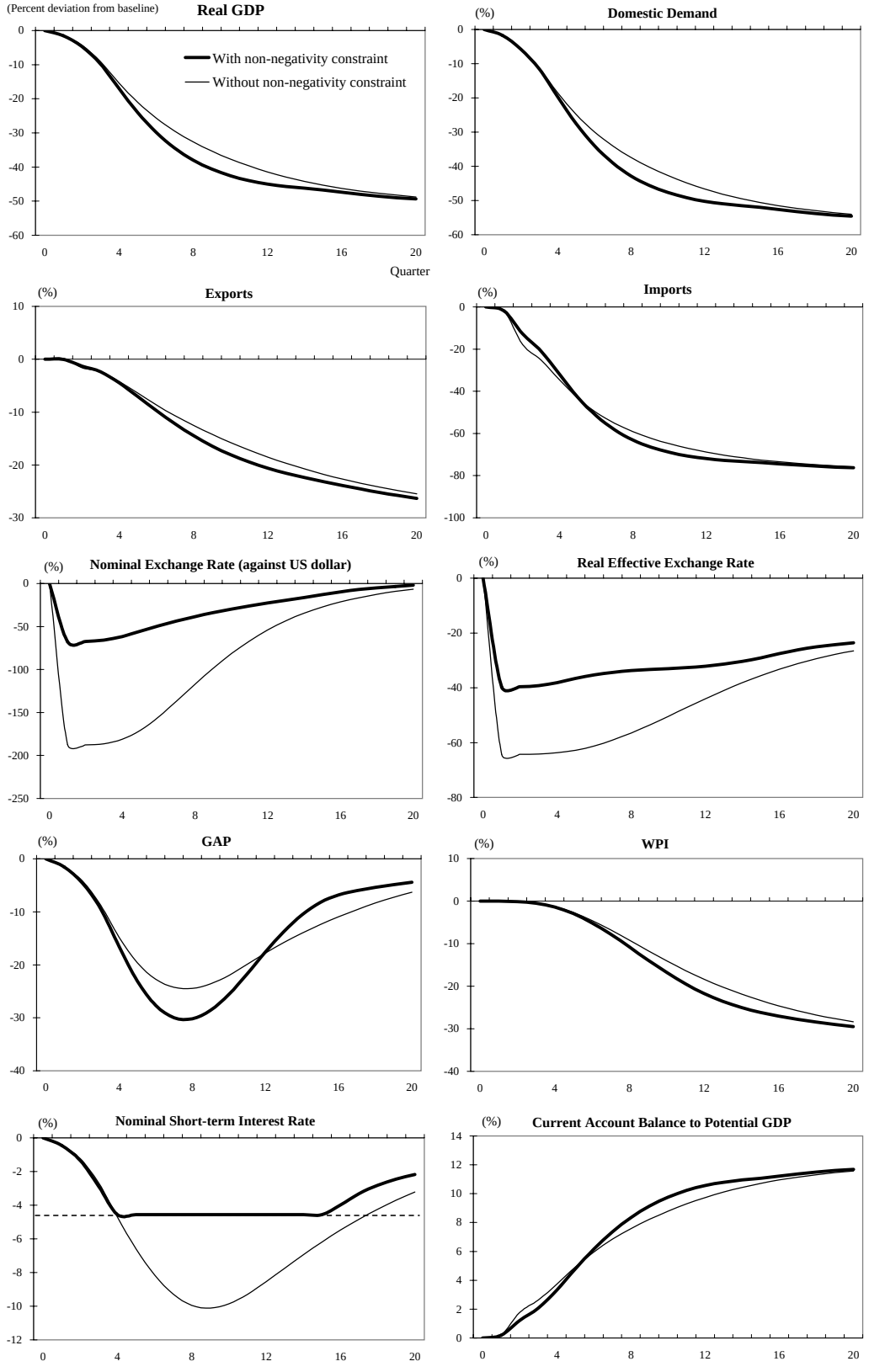


Figure 11-2

Non-negativity Constraint on the Japanese Nominal Interest Rates
<Effects on Thailand>

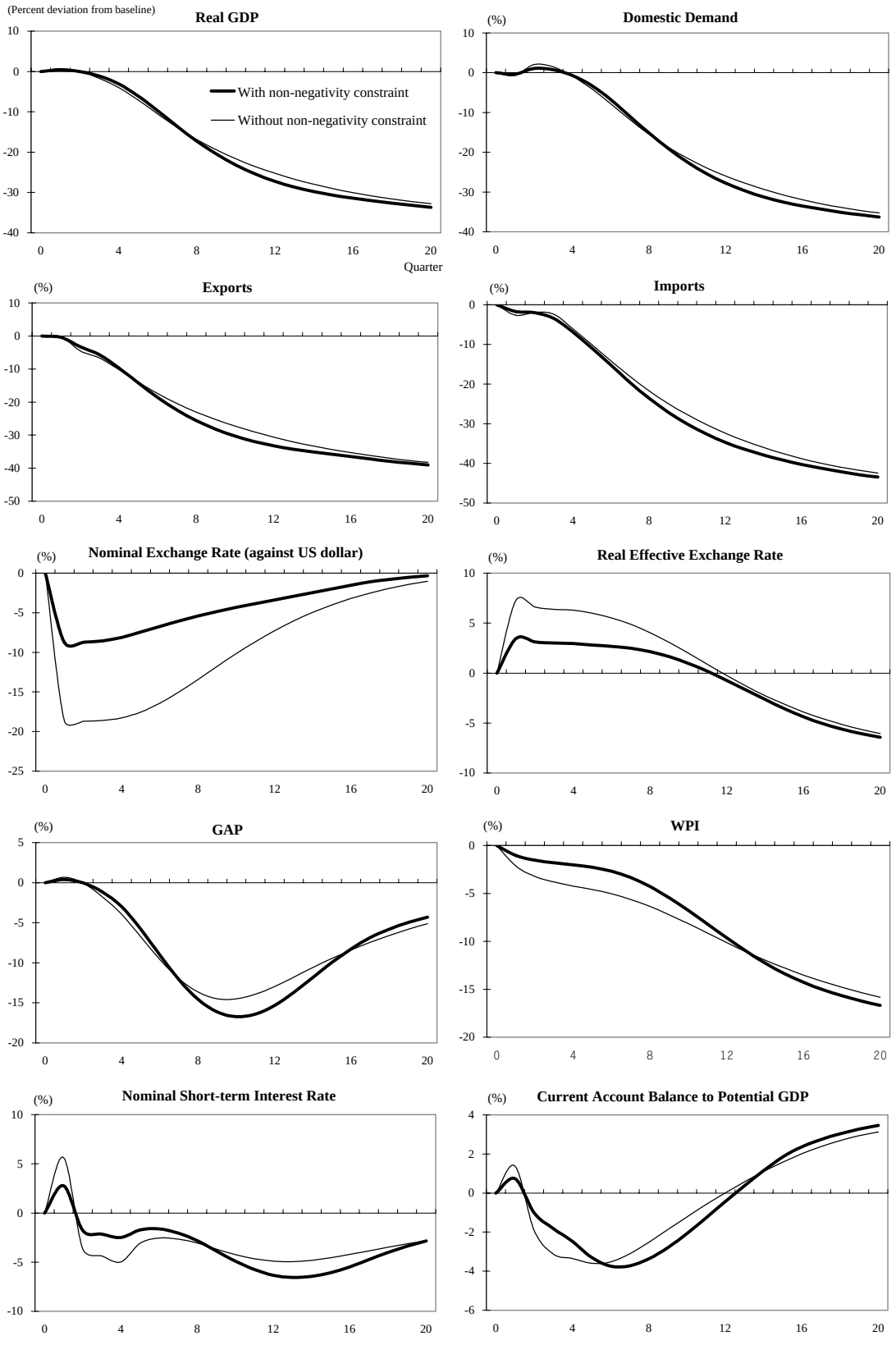


Table 1

Monetary and Exchange Rate Policies Both Before and After Asian Currency Crisis

	Before Asian Currency Crisis	After Asian Currency Crisis
Japan (yen)	Taylor Rule / Independently Floating (since February 1973)	
United States (dollar)	Taylor Rule / Independently Floating	
Indonesia (rupiah)	Managed Floating (since 1978)	Managed Floating (since 2001) / Preparing for Inflation Targeting
Singapore (Singapore dollar)	Managed Floating <Currency Basket> (since 1981)	
Thailand (baht)	Managed Floating <Currency Basket> (since November 1984)	Inflation Tageting (since May 2000) / Managed Floating (since July 1997)
The Philippines (peso)	Independently Floating <*de facto* Peg against the US dollar> (since December 1994)	Inflation Tageting (since 2002) / Independently Floating (since March 1998)
Malaysia (ringgit)	Managed Floating (since 1973)	Fixed Peg Arrangements (since September 1998)
South Korea (won)	Managed Floating (since March 1990)	Inflation Targeting (since September 1998) / Independently Floating (since December 1997)
Hong Kong (Hong Kong dollar)	Currency Board Arrangements (since October 1983)	
Taiwan (New Taiwan dollar)	Managed Floating (since 1979)	
China (yuan)	Fixed Peg Arrangements <*de facto* Peg against the US dollar> (since 1994)	

Note: Taiwan's classification is based on Fischer (2001).
Source: International Monetary Fund, “Annual Report.”

Table 2

Responses of Real GDP and Exports to Demand Shocks

(i) A 1 percent decline in the growth rate of the Japanese domestic demand

	Real GDP		Exports	
	First year	Second year	First year	Second year
Japan	-0.92	-1.15	-0.24	-0.43
United States	-0.03	-0.08	-0.44	-0.68
Indonesia	-0.12	-0.21	-0.62	-0.91
Singapore	-0.24	-0.39	-0.42	-0.68
Thailand	-0.25	-0.65	-0.52	-0.78
Philippines	-0.12	-0.36	-0.50	-0.76
Malaysia	-0.20	-0.33	-0.46	-0.71
South Korea	-0.14	-0.25	-0.41	-0.64
Hong Kong	-0.12	-0.17	-0.29	-0.47
Taiwan	-0.21	-0.34	-0.42	-0.66
China	-0.11	-0.15	-0.52	-0.78

(ii) A 1 percent decline in the growth rate of the US domestic demand

	Real GDP		Exports	
	First year	Second year	First year	Second year
Japan	-0.31	-0.57	-1.86	-3.97
United States	-1.36	-2.63	-1.59	-3.57
Indonesia	-0.20	-0.65	-1.18	-3.00
Singapore	-0.89	-2.06	-1.56	-3.58
Thailand	-0.52	-2.08	-1.57	-3.58
Philippines	-0.27	-1.36	-1.52	-3.48
Malaysia	-0.66	-1.61	-1.54	-3.50
South Korea	-0.86	-2.07	-1.69	-3.63
Hong Kong	0.02	-0.48	-1.61	-3.30
Taiwan	-0.06	-0.99	-1.71	-3.73
China	-0.20	-0.57	-1.61	-3.66

(iii) A 1 percent decline in the growth rate of the East Asian domestic demand excluding Japan

	Real GDP		Exports	
	First year	Second year	First year	Second year
Japan	-0.07	-0.10	-0.70	-0.86
United States	-0.04	-0.09	-0.58	-0.73
Indonesia	-1.01	-1.24	-0.68	-0.83
Singapore	-0.57	-0.66	-0.85	-1.00
Thailand	-1.22	-1.66	-0.62	-0.75
Philippines	-0.99	-0.62	-0.61	-0.76
Malaysia	-0.44	-0.50	-0.71	-0.88
South Korea	-0.78	-0.77	-0.54	-0.66
Hong Kong	-0.55	-0.66	-0.52	-0.64
Taiwan	-0.75	-0.89	-0.70	-0.86
China	-1.00	-1.03	-0.64	-0.80

(iv) A 1 percent decline in the growth rate of the Asia-Pacific domestic demand

	Real GDP		Exports	
	First year	Second year	First year	Second year
Japan	-1.29	-1.82	-2.78	-5.20
United States	-1.43	-2.80	-2.60	-4.92
Indonesia	-1.33	-2.09	-2.47	-4.68
Singapore	-1.70	-3.08	-2.81	-5.20
Thailand	-1.98	-4.33	-2.69	-5.05
Philippines	-1.39	-2.33	-2.61	-4.94
Malaysia	-1.30	-2.42	-2.69	-5.02
South Korea	-1.77	-3.07	-2.62	-4.88
Hong Kong	-0.65	-1.30	-2.40	-4.37
Taiwan	-1.01	-2.21	-2.82	-5.19
China	-1.30	-1.74	-2.74	-5.17

Note: Figures are percent deviations from baseline.

Table 3

Summary of the Output- Gap Based Evaluations of the Three Policy Regimes
The Demand and Risk-Premium Shocks in Thailand

a. Standard Deviations of Output Gaps

	Current regime	US dollar peg regime	Currecy basket regime
Japan	0.03515	0.03510	0.03606
US	0.02728	0.02846	0.02790
Indonesia	0.06300	0.06499	0.06362
Singapore	0.24970	0.25580	0.25027
Thailand	3.42704	4.18987	3.44070
Philippines	0.16936	0.16646	0.16310
Malaysia	0.18322	0.18711	0.18437
South Korea	0.05770	0.06513	0.06182
Hong Kong	0.05739	0.05091	0.04480
Taiwan	0.11676	0.11349	0.10747
China	0.03809	0.03762	0.03599

b. Significant Changes

	From US dollar peg regime		From Current regime	
	To Current regime	To Currency basket regime	To US dollar peg regime	To Currency basket regime
Japan				
US				
Indonesia				
Singapore				
Thailand	○	○	×	
Philippines				
Malaysia				
South Korea	○	○	×	×
Hong Kong	×	○	○	○
Taiwan		○		○
China				○

Note: an o indicates that standard deviation of the output gap is reduced more than 5 percent by a regime shift;
an x indicates that standard deviation of the output gap is increased more than 5 percent by a regime shift.

Table 4

Summary of the Output- Gap Based Evaluations of the Three Policy Regimes
The Demand Shock in the US

a. Standard Deviations of Output Gaps

	Current regime	US dollar peg regime	Currecy basket regime
Japan	0.23372	0.24281	0.23826
US	1.05417	1.06179	1.05962
Indonesia	0.32892	0.33647	0.33587
Singapore	0.90062	0.91550	0.91708
Thailand	1.23198	1.41734	1.37685
Philippines	0.68072	0.69297	0.69033
Malaysia	0.71199	0.72472	0.72243
South Korea	0.89749	0.51084	0.45530
Hong Kong	0.37531	0.38864	0.39061
Taiwan	0.69246	0.71678	0.72042
China	0.27946	0.29117	0.29817

b. Significant Changes

	From US dollar peg regime		From Current regime	
	To Current regime	To Currency basket regime	To US dollar peg regime	To Currency basket regime
Japan				
US				
Indonesia				
Singapore				
Thailand	○		×	×
Philippines				
Malaysia				
South Korea	×	○	○	○
Hong Kong				
Taiwan				
China				×

Note: an o indicates that standard deviation of the output gap is reduced more than 5 percent by a regime shift;
an x indicates that standard deviation of the output gap is increased more than 5 percent by a regime shift.

Table 5

Summary of the Output- Gap Based Evaluations of the Three Policy Regimes
The Risk-Premium Shock in Japan

a. Standard Deviations of Output Gaps

	Current regime	US dollar peg regime	Currecy basket regime
Japan	0.00216	0.00213	0.00200
US	0.00029	0.00030	0.00034
Indonesia	0.00105	0.00114	0.00080
Singapore	0.00252	0.00364	0.00203
Thailand	0.00434	0.00916	0.01188
Philippines	0.00138	0.00151	0.00122
Malaysia	0.00190	0.00205	0.00152
South Korea	0.00440	0.00613	0.00810
Hong Kong	0.00506	0.00485	0.00060
Taiwan	0.00604	0.00679	0.00104
China	0.00170	0.00172	0.00097

b. Significant Changes

	From US dollar peg regime		From Current regime	
	To Current regime	To Currency basket regime	To US dollar peg regime	To Currency basket regime
Japan		○		○
US		×		×
Indonesia	○	○	×	○
Singapore	○	○	×	○
Thailand	○	×	×	×
Philippines	○	○	×	○
Malaysia	○	○	×	○
South Korea	○	×	×	×
Hong Kong		○		○
Taiwan	○	○	×	○
China		○		○

Note: an o indicates that standard deviation of the output gap is reduced more than 5 percent by a regime shift;
an x indicates that standard deviation of the output gap is increased more than 5 percent by a regime shift.

Table 6

China's Currency Reform

a. The Demand Shock in China

	Standard Deviations of Output Gaps		Significant Changes
	De Facto US dollar Peg	Free floating system	
Japan	0.00455	0.00765	×
US	0.00420	0.00547	×
Indonesia	0.00612	0.00874	×
Singapore	0.01865	0.02916	×
Thailand	0.02642	0.05679	×
Philippines	0.01278	0.01941	×
Malaysia	0.01334	0.02029	×
South Korea	0.00796	0.02593	×
Hong Kong	0.02708	0.11022	×
Taiwan	0.01775	0.03636	×
China	0.31787	0.29948	○

b. The Demand Shock in the US

	Standard Deviations of Output Gaps		Significant Changes
	De Facto US dollar Peg	Free floating system	
Japan	0.23372	0.21022	○
US	1.05417	1.03982	
Indonesia	0.32892	0.31073	○
Singapore	0.90062	0.83891	○
Thailand	1.23198	1.09547	○
Philippines	0.68072	0.63719	○
Malaysia	0.71199	0.66761	○
South Korea	0.89749	0.77308	○
Hong Kong	0.37531	0.79792	×
Taiwan	0.69246	0.67216	
China	0.27946	0.36180	×

c. The Demand Shock in Japan

	Standard Deviations of Output Gaps		Significant Changes
	De Facto US dollar Peg	Free floating system	
Japan	0.39683	0.39581	
US	0.03705	0.03647	
Indonesia	0.07325	0.07250	
Singapore	0.13637	0.13364	
Thailand	0.24197	0.23487	
Philippines	0.12455	0.12302	
Malaysia	0.11399	0.11212	
South Korea	0.08875	0.08519	
Hong Kong	0.05748	0.04010	○
Taiwan	0.11264	0.10783	
China	0.05177	0.05619	×

Note: an o indicates that standard deviation of the output gap is reduced more than 5 percent by a regime shift;
an x indicates that standard deviation of the output gap is increased more than 5 percent by a regime shift.

Table 7

Estimation Results for Import Functions

Dependent variable $\Delta \ln M_t$	Japan	United States	Indonesia	Singapore	Thailand	Philippines	Malaysia	Korea	Hong Kong	Taiwan	China	Rest of the world
$\Delta \ln X_t$	0.268 (2.078)	0.362 (4.073)	0.655 (6.722)	0.711 (22.697)	—	0.469 (4.492)	0.790 (10.209)	0.515 (4.019)	0.916 (25.466)	0.609 (7.080)	0.328 (3.055)	0.898 (25.292)
$\Delta \ln X_{t+1}$	—	—	—	—	0.500 (2.879)	0.213 (1.974)	—	—	—	—	—	—
$\Delta \ln X_{t+2}$	—	—	—	—	—	—	—	—	—	—	—	—
$\Delta \ln D_t$	1.132 (3.496)	1.718 (6.861)	1.258 (4.045)	0.557 (19.236)	0.679 (2.968)	0.773 (3.505)	0.714 (10.683)	1.236 (5.084)	0.416 (9.204)	1.145 (6.003)	0.325 (1.903)	—
$\Delta \ln D_{t-1}$	0.555 (1.680)	—	—	—	—	—	—	—	—	—	—	—
$\Delta \ln D_{t-2}$	—	—	—	—	—	—	—	—	—	—	—	—
$\Delta \ln RE_t$	0.110 (1.580)	—	—	—	—	—	—	0.394 (2.695)	—	—	—	—
$\Delta \ln RE_{t-1}$	—	—	—	—	—	—	—	—	0.103 (2.546)	0.376 (1.473)	—	—
$\Delta \ln RE_{t-2}$	—	—	—	—	0.259 (1.268)	—	—	—	—	—	0.138 (1.112)	—
Dummy											2000/1 0.186 (3.838)	
Sample period	93/2-03/4	90/1-03/4	93/2-03/4	90/1-03/3	93/4-03/3	90/1-03/3	91/2-03/4	93/2-03/4	93/3-03/4	93/3-03/4	94/2-00/3	86/4-03/4
R^2	0.218	0.544	0.557	0.943	0.403	0.368	0.791	0.745	0.971	0.746	0.551	0.905
DW	2.061	2.611	1.948	1.845	2.310	2.133	2.460	2.324	2.231	2.411	1.838	2.111

Note: t-values in parentheses.

Table 8

Estimation Results for Domestic Demand Functions

Dependent variable $\Delta \ln D_t$	Japan	United States	Indonesia	Singapore	Thailand	Philippines	Malaysia	South Korea	Hong Kong	Taiwan	China
$\Delta \ln Y_{t-1}$	0.619 (3.245)	0.464 (4.126)	0.641 (4.901)	0.506 (2.037)	1.122 (3.848)	1.043 (3.676)	1.330 (4.012)	0.749 (6.593)	0.892 (6.008)	0.686 (3.618)	–
$\Delta \ln Y_{t-2}$	–	0.514 (4.541)	–	–	–	–	–	–	–	0.469 (2.476)	–
$\Delta \ln Y_{t-3}$	–	–	–	–	–	–	–	–	–	–	–
ΔRL_t	-1.252 (-1.491)	-0.186 (-1.009)	–	–	-0.392 (-1.121)	–	–	-0.399 (-2.750)	–	–	–
RC_{t-1}	–	–	–	–	0.063 (1.237)	0.457 (3.855)	0.114 (1.797)	–	–	0.073 (1.709)	–
Dummy	97/2 -0.051 (-4.809)	2002/1 2003/3 0.012 0.010 (2.342) (1.978)	98/1 -0.147 (-6.525)	98/1,2 -0.110 (-3.623)		2002/2 -0.074 (-2.720)	98/1 -0.136 (-2.909)	98/1 -0.145 (-8.119)			
Sample period	93/1-04/1	91/1-04/1	93/3-03/4	90/1-03/3	94/1-04/1	90/1-04/1	92/2-04/1	90/1-04/1	90/1-04/2	87/1-04/2	-
R^2	0.409	0.222	0.609	0.252	0.274	0.271	0.352	0.640	0.323	0.251	-
DW	2.164	2.096	1.729	2.125	1.745	2.184	2.646	1.701	1.955	2.589	-

Notes: 1. t-values in parentheses.
2. We treat China's domestic demand as exogenous due to the poor fit.

Table 9

Estimation Results for Phillips Curves

Dependent variable $\Delta \ln WPI_t$	Japan	United States	Indonesia	Singapore	Thailand	Philippines	Malaysia	South Korea	Hong Kong	Taiwan	China
Constant	-0.002 (-3.696)	0.002 (1.167)	0.010 (3.414)	–	–	0.013 (4.382)	–	–	–	–	–
$\Delta \ln WPI_{t-1}$	0.176 (1.798)	0.287 (2.177)	0.273 (7.059)	–	0.464 (6.055)	0.112 (1.148)	0.223 (1.717)	0.295 (3.651)	–	–	–
GAP_{t-1}	0.083 (3.401)	0.219 (1.679)	–	0.089 (1.365)	0.040 (1.399)	0.145 (2.365)	–	0.052 (1.504)	0.063 (2.480)	0.088 (1.564)	0.120 (2.482)
$\Delta \ln RE_t - \Delta \ln WPI_t$	–	-0.184 (-1.403)	-0.410 (-23.034)	-0.755 (-3.197)	-0.234 (-9.531)	–	-0.373 (-4.684)	-0.142 (-5.994)	-0.074 (-1.947)	-0.498 (-6.519)	–
Dummy	97/2 0.018 (4.048)	2003/1 0.033 (3.228)				97/1 98/4 0.052 0.052 (2.433) (2.474)		97/4 0.034 (3.489)	2003/1 -0.013 (-2.214)	98/4 -0.041 (-4.247)	
Sample period	87/1-04/1	93/2-03/4	93/2-03/4	93/4-03/4	95/3-03/4	85/1-04/1	94/1-03/4	93/2-03/1	93/2-03/4	93/2-03/4	96/2-02/2
R^2	0.387	0.388	0.941	0.205	0.787	0.200	0.353	0.757	0.257	0.629	0.204
DW	1.876	1.655	1.893	1.780	2.375	1.764	1.890	1.597	1.505	1.189	2.552

Note: t-values in parentheses.

Table 10

Estimation Results for Policy Rules

Dependent variable I_t	Japan	United States	Indonesia	Singapore	Thailand	Philippines	Malaysia	South Korea	Hong Kong	Taiwan	China
Constant	0.038 (8.523)	0.052 (24.532)	0.100 (4.663)	–	-0.010 (-1.475)	0.052 (5.211)	–	0.037 (4.882)	–	–	–
$\Delta \ln CPI_t$	1.516 (2.474)	1.191 (4.619)	2.920 (9.482)	–	4.556 (6.646)	1.870 (3.234)	–	4.437 (5.289)	–	–	–
GAP_t	0.285 (2.137)	0.266 (1.827)	–	–	–	–	–	–	–	–	–
$\Delta \ln E_t$	–	–	0.103 (1.189)	–	0.471 (5.131)	0.387 (2.808)	–	0.185 (2.469)	–	–	–
Dummy					1998/2 2000/1 0.170 0.070 (6.273) (3.137)						
Sample period	86/4-95/4	86/1-02/2	97/3-04/1	-	98/1-04/1	98/1-04/1	-	98/1-04/1	-	-	-
R^2	0.358	0.305	0.815	-	0.871	0.390	-	0.647	-	-	-
DW	0.121	0.101	0.501	-	1.506	0.746	-	0.827	-	-	-

Note: t-values in parentheses.