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Dynamic Effect of a Change in the Exchange Rate System: From a Fixed Regime to a Basket-Peg or a Floating Regime

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Abstract

This paper theoretically evaluates the dynamic effects of a shift in an exchange rate system from a fixed regime to a basket peg, or to a floating regime, and obtains transition paths for the shift based on a dynamic stochastic general equilibrium model of a small open economy. We apply quantitative analysis using data from the People's Republic of China and Thailand and find that a small open country would be better off shifting to a basket peg or to a floating regime than maintaining a dollar-peg regime with capital controls over the long run. Furthermore, due to the welfare losses associated with volatility in nominal interest rates, the longer the transition period, the larger the benefits of shifting suddenly to a basket-peg regime from a dollar-peg regime than proceeding gradually. Regarding sudden shifts to desired regimes, the welfare gains are higher under a shift to a basket peg if the exchange rate fluctuates significantly. Finally, shifting to a managed-floating regime is less attractive than moving to a basket peg, as the interventions necessary to maintain the exchange rate for certain periods result in higher losses and the authority lacks monetary policy autonomy.

JEL Classification: F33, F41, F42

Contents

1. INTRODUCTION

One of the two major culprits of the 1997–1998 Asian financial crisis was the adoption of dollar pegs by East Asian countries.[1] The other was the discrepancy in maturity between lending and borrowing by financial institutions in these countries. Financial institutions in Republic of Korea, Indonesia, and Thailand borrowed in the short term from abroad and lent to domestic firms in the long term. Sudden withdrawals of funds made domestic banks in East Asia vulnerable to the crisis.[2]

Several economists have supported the desirability of a basket-peg regime in East Asia. For example, Kawai (2004), Ito, Ogawa, and Sasaki (1998), Ito and Park (2003), Ogawa and Ito (2002), and Yoshino, Kaji, and Suzuki (2004) recommend that East Asian countries embrace a basket-peg regime.[3] For countries with close economic relationships with the European Union, Japan, and the United States, the rationale for adopting a basket-peg regime is that exchange rate stabilization, through a basket comprising the currencies from these countries, is beneficial because it removes the problem of large fluctuations in exchange rates. Yoshino, Kaji, and Asonuma (2004) argue that, in addition to a basket-peg regime, a floating regime is also an option for East Asian countries.[4] Similarly, Adams and Semblat (2004) emphasize that one currency regime option is to adopt a floating regime with inflation targeting.

The superiority of a basket-peg or a floating regime relative to a dollar-peg regime has been analyzed only in a static context, not in a dynamic context. For countries like the People's Republic of China (PRC) and Malaysia, there is still a big question of how to move from the current de facto fixed regime to other exchange rate regimes. Before adopting a basket peg or a floating regime, these countries need to abandon their de facto dollar pegs. On the one hand, a shift from a dollar-peg regime to a basket-peg regime would involve one of two processes: (i) starting with a dollar-peg regime with strict capital controls, shifting to a basket-peg regime with loose capital controls, and finally reaching a basket-peg regime without capital controls, i.e., gradual adjustments of both the degree of capital control and the basket weight; or (ii) starting with a dollar-peg regime with strict capital controls and then suddenly shifting to a basket-peg regime without capital controls by removing capital controls, i.e., a sudden shift of both capital controls and basket weight. On the other hand, a shift to a floating regime would involve the following process: starting with a dollar-peg regime with strict capital controls and suddenly shifting to a floating regime by removing capital controls. Therefore, it is necessary to analyze the advantages and disadvantages of these shifts in a dynamic context, rather than in a static context. To our knowledge, this paper is the first to theoretically and quantitatively evalute the dynamic effect of shifts from a fixed regime to a basket-peg regime or to a floating regime. We obtain two transition paths from a dollar peg to a basket-peg regime (a gradual adjustment and a sudden shift)

[1] Ito, Ogawa, and Sasaki (1998) and Ogawa and Ito (2002) emphasize this point and advocate adoption of a basket-peg regime in East Asia so countries can avoid being negatively affected by fluctuations in the US dollar–yen exchange rate.

[2] McKibbin and Martin (1999) also address the argument that the primary cause of the East Asia Crisis was a fundamental reassessment of the profitability of investments in the region.

[3] On composition of a basket, Ogawa and Ito (2002) and Kawai (2004) claim a G-3 currency (US dollar, yen, euro) basket, while Yoshino, Kaji, and Asonuma (2005) suggest that East Asian countries should adopt a basket containing both G-3 currencies and East Asian currencies.

[4] However, there is also a drawback in adopting a floating regime; excess fluctuation of exchange rates affects the economy negatively as shown in Yoshino, Kaji, and Ibuka (2003).

and two transition paths from a dollar peg to a floating regime, or a managed-floating regime (both sudden shifts).

The major findings of the paper are as follows. First, the cumulative losses of four transition policies are obtained theoretically as well as empirically. The five policies, including one without any change in the exchange rate regime, which we consider in this paper, are (1) maintaining a dollar peg (with strict capital controls), (2) a gradual shift from a dollar peg to a basket peg without capital controls (a gradual adjustment of both capital controls and basket weight), (3) a sudden shift from a dollar peg to a basket peg without capital controls (a sudden removal of capital controls and a sudden change in basket weights), (4) a sudden shift from a dollar peg to a floating regime (a sudden removal of capital controls and a sudden increase in flexibility in exchange rate), and (5) a sudden shift from a dollar peg to a managed-floating regime (a sudden removal of capital controls and a sudden increase in flexibility in exchange rate with occasional interventions). We find that maintaining a dollar-peg regime is desirable only over the short run, indicating that the country will be better off shifting to either a basket-peg regime or a floating regime over the long run.

Second, given the choice between a gradual adjustment, policy (2), toward the target basket-peg regime or a sudden shift to the target basket-peg regime, policy (3), the longer the transition period, the larger the benefits the country receives from reaching the desired regime at once.

Third, given the comparison between sudden shifts to a basket-peg regime, policy (3), and to a floating regime, policy (4), the welfare of the country would be higher under a shift to a basket-peg regime if the exchange rate fluctuates significantly. The country would be able not only to stabilize the negative impacts of exchange rate fluctuations on trades and capital inflows but also to assist the private sector in formulating exchange rate expectations precisely by committing to a basket regime for certain periods. Finally, it is less attractive to adopt a shift to a managed-floating regime than to move to a basket peg. This is because intervening in the foreign exchange market for certain periods leads to higher losses, as the authority lacks monetary policy autonomy. Our quantitative analysis using PRC and Thai data supports these findings.[5] The analysis conducted in this paper can be applied to any small open country that is considering a shift from a fixed regime to a basket peg or to a floating regime.

The rest of the paper is organized as follows. After reviewing the existing literature, Section 2 provides a dynamic stochastic general equilibrium (DSGE) model of a small open economy. Section 3 analyzes how the economy reaches the stable equilibrium under four regimes. We define four transition policies together with maintaining the current dollar-peg regime in Section 4. Section 5 focuses on the optimal transition policy. Simulation exercises using PRC and Thai data are provided in Section 6.[6] A brief conclusion summarizes the discussion.

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[5] Yoshino, Kaji, and Asonuma (2012) analyze the comparison between a basket peg and a floating regime by implementing some instrumental rules. They show that, in the case of Singapore and Thailand, applying a basket weight rule under a basket-peg regime will lead to a smaller cumulative loss than adopting an interest rate rule or a money supply rule under a floating regime.

[6] It is apparent that the optimal basket weight obtained from our analysis using PRC and Thai data is different from that mentioned in Ogawa and Shimizu (2006), which is calculated based on shares in regional GDP measured at purchasing power parity (PPP) and their trade volume shares (sum of the exports and imports).

1.1 Literature Review

This paper is related to two streams of the literature. One debates the desirability of a basket-peg regime in East Asia. Ito, Ogawa, and Sasaki (1998) and Ogawa and Ito (2002) analyze the optimality of a basket peg with a general equilibrium model, which does not include capital movements. Yoshino, Kaji, and Suzuki (2004) and Yoshino, Kaji, and Asonuma (2004) also claim that it is better for the country to adopt a basket peg rather than a dollar peg based on a general equilibrium model that incorporates capital movements across countries. Bird and Rajan (2002) argue that pegging a currency against a more diversified composite basket of currencies would have enabled Southeast Asian countries to deal more effectively with the "third currency phenomenon," which contributed to the crisis.[7] Other perspectives, such as Shioji (2006a, 2006b), consider the basket-peg regime under two different invoicing schemes: producer currency pricing and vehicle currency pricing. For empirical analysis, McKibbin and Lee (2004) investigate which exchange rate the East Asian countries should peg to using several shocks, such as country-specific (asymmetric) and regional (symmetric) shocks.

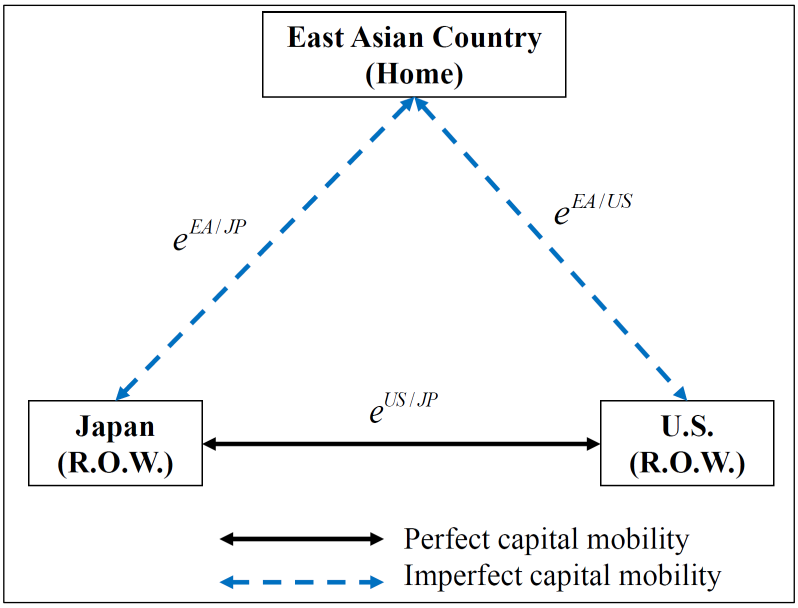
The other stream deals with a floating regime in the region. Adams and Semblat (2004) emphasize that one currency regime option is to adopt a floating regime with inflation targeting. Following this argument, Sussangkarn and Vichyanond (2007) mention that a managed-floating regime, combined with inflation targeting, suits an emerging market environment such as that in Thailand. Similarly, Yoshino, Kaji, and Asonuma (2004) find that a floating regime is also a possible option for East Asian countries, together with a basket-peg regime. Finally, Kim and Lee (2008) show that exchange rate flexibility provides greater monetary policy independence based on their empirical findings.

2. SMALL OPEN ECONOMY MODEL

In this section, we provide a dynamic stochastic general equilibrium (DSGE) model of a small open economy. Our model closely follows Yoshino, Kaji, and Suzuki (2002) and Dornbusch (1976), and we analyze it in a dynamic context. Although we do not derive equilibrium conditions directly from the optimal behavior of households and firms, our equilibrium conditions are the same as those in Yoshino, Kaji and Asonuma (2012), which are based on micro foundations. There are three countries in this model: the East Asian country, Japan, and the US. We assume the East Asian country to be the Home country and Japan and the US to be the rest of the world (ROW). The US dollar–yen exchange rate is exogenous to the East Asian country.

[7] They define "third currency phenomenon" as problems for emerging market countries that arise from fluctuations in the values of the currencies of their major trading partners against each other. In this regard, they also note that the composition of a basket of currencies and weights attached to individual currencies will need to change as circumstances alter and as the significance of major world currencies to a developing country's balance of payments changes.

Figure 1: Small Open Economy Model



Source: Authors' illustration.

Table 1: Description of Variables

Variable	Description
m	Stock of money supply
p	Price level in Home
p^e	Expected domestic price level
p^{US}	Price level in the US
p^{JP}	Price level in Japan
i	Home interest rate
i^{US}	US interest rate
y	Domestic GDP
$\bar{y}$	Potential GDP
$e^{EA/US}$	East Asian currency–US dollar exchange rate
$e^{EA/JP}$	East Asian currency–yen exchange rate
$e^{US/JP}$	US dollar–yen exchange rate
υ	Weight of the US dollar rate in a currency basket
α	Total productvitiy of Home
$\Delta e^{EA/US}$	US dollar exchange rate risk
$\Delta e^{EA/JP}$	Yen exchange rate risk

GDP = gross domestic product.

Note: All the variables, except interest rates, are defined in natural logs.

We assume that domestic and foreign assets are imperfect substitutes, whereas Japanese and US assets are perfect substitutes for domestic investors. An interest parity condition is shown as:

$$i_{t+1} - i_t = -\lambda \left[i_t - \left\{ i_t^{US} + e_{t+1}^{EA/US} - e_t^{EA/US} - \sigma e_t^{EA/US} \right\} \right] \quad (1)$$

where λ denotes the adjustment speed of the domestic interest rate, which also captures the degree of capital control. If λ is close to 0, it implies that the domestic interest rate does not respond to an interest rate differential. This means that the domestic interest rate is exogenous and totally independent. We regard this as a case of strict capital control. On the contrary, if λ approaches 1, it implies that the domestic interest rate responds completely to the foreign interest rate, which we consider to be a case without capital controls. Furthermore, $\sigma\, e_t^{EA/US}$ denotes a risk premium which depends on the US dollar exchange rate. If $\lambda = 1$, equation (1) can be rewritten as:

$$i_{t+1} = i_t^{US} + e_{t+1}^{EA/US} - e_t^{EA/US} - \sigma e_t^{EA/US} \quad (1')$$

As we explain in Section 3.1, under a dollar-peg regime with capital controls, equation (1) does not hold. The equilibrium condition for the money market is:

$$m_t - p_t = -\varepsilon i_{t+1} + \phi(y_t - \bar{y}) \quad (2)$$

The demand for goods depends on the real exchange rates, the real interest rate and the exchange rate risks written as:

$$y_t - \bar{y} = \delta \left(e_t^{EA/US} + p^{US} - p_t \right) + \delta' e_{t+1}^{EA/US,e} + \theta \left(e_t^{EA/JP} + p^{JP} - p_t \right) + \theta' e_{t+1}^{EA/JP,e}$$

$$-\rho\{ i_{t+1} - (p_{t+1}^e - p_t^e) \} - \tau \Delta e^{EA/US} - \varsigma \Delta e^{EA/JP} \quad (3)$$

where the term $(p_{t+1}^e - p_t^e)$ shows the expected rate of inflation. The last two terms correspond to exchange rate risks.

Since one of the three exchange rates is not independent, the yen rate can be expressed as:

$$e_t^{EA/JP} = e_t^{EA/US} + e_t^{US/JP} \quad (4)$$

The inflation rate depends on total productivity, excess demand for goods, the real US dollar rate, the real yen rate, and the expected rate of inflation, shown as:

$$p_{t+1} - p_t = -\alpha_t + \psi(y_t - \bar{y}) + \eta\left(e_t^{EA/US} + p^{US} - p_t\right) + \eta' e_t^{EA/US,e} + \mu\left(e_t^{EA/\mathrm{JP}} + p^{\mathrm{JP}} - p_t\right)$$

$$+ \mu' e_t^{EA/JP,e} + (p_{t+1}^e - p_t^e) + \chi \Delta e^{EA/US} + \xi \Delta e^{EA/JP}$$

(5)

where the first term on the right-hand side shows the total productivity of the Home country and the last two terms denote the dollar exchange rate risk and the yen exchange rate risk. We assume aggregate production depends on total productivity, imported materials from Japan and the US, and the inflation rate. The East Asian country is assumed to import materials from Japan and the US and export final goods to Japan and the US. Both aggregate demand and aggregate supply depend also on the exchange rate expectation, as exporting and importing firms are concerned with significant deviations of the exchange rate for the next period from the current level. Among the variables, α_t, $\bar{y}$, p^{US}, p^{JP}, $e_t^{US/JP}$, $\Delta e^{EA/US}$, and $\Delta e^{EA/JP}$ are common exogenous variables under any exchange rate regime. We assume that all exogenous variables except $e_t^{US/JP}$, $\Delta e^{EA/US}$, $\Delta e^{EA/JP}$, m, and i are constant (= 0) in the analysis below. All the coefficients above are positive.

3. EXCHANGE RATE REGIME

In this section, we derive the long-term equilibrium together with equilibrium values at period t. We consider five cases:

(A) dollar-peg regime with strict capital controls,

(B) basket-peg regime with weak capital controls,

(C) basket-peg regime without capital controls,

(D) floating regime without capital controls, and

(E) dollar-peg regime under perfect capital mobility.

3.1 Dollar-Peg Regime with Strict Capital Controls (A)

Under a dollar-peg regime, the dollar rate ($e_t^{EA/US}$) becomes exogenous ($e_t^{EA/US} = 0$). Thus, the expectation of the exchange rate in the next period is identical to the current exchange rate. Furthermore, in this case, the money supply (m_t) becomes endogenous, implying that the monetary authority implements capital controls in order to keep the US dollar rate constant. Since the monetary authority restricts domestic residents' holdings of foreign assets, equation (1) does not exist. Domestic interest rate (i_{t+1}) is a policy instrument (exogenous) in this case. As the East Asian currency–US dollar rate is fixed, from equation (4):

$$e_t^{EA/JP} = e_t^{US/JP} \quad (4')$$

The endogenous variables in this case are m_t, y_t, and p_t. Solving equations (2), (3), (4'), and (5) for the price level and money supply, the following semi-reduced form equations are obtained:

$$p_{t+1} - p_t = -\alpha_t - [\psi(\delta + \theta) + (\eta + \mu)]p_t + \psi\theta e_t^{US/JP} + \psi(\theta' + \mu')e_{t+1}^{US/JP,e} + (1 + \psi\rho)(p_{t+1}^e - p_t^e) + (\xi - \psi\varsigma)\Delta e^{EA/JP} - \psi\rho i_{t+1} \quad (6)$$

$$m_t = [1 - \phi(\delta + \theta) + (\eta + \mu)]p_t + \phi\theta e_t^{US/JP} + \phi\theta' e_{t+1}^{US/JP,e} + \phi\rho(p_{t+1}^e - p_t^e) - \phi\varsigma\Delta e^{EA/JP} - (\varepsilon + \phi\rho)\rho i_{t+1} \quad (7)$$

The long-run equilibrium values for the price level and money supply under the US dollar-peg regime are:[8]

$$\bar{p}_A = \frac{1}{E_1}\left[\{\psi(\theta + \theta') + \mu'\}\bar{e}^{US/JP} - \psi\rho\bar{\iota} - \bar{\alpha}\right] \quad (8)$$

$$\bar{m}_A = \left[\frac{E_1'}{E_1}\{\psi(\theta + \theta') + \mu'\} + \phi(\theta + \theta')\right]\bar{e}^{US/JP} - \frac{E_1'}{E_1}\bar{\alpha} - \left[\frac{E_1'}{E_1}\psi\rho + (\varepsilon + \phi\rho)\right]\bar{\iota} \quad (9)$$

where $E_1 = \psi(\delta + \theta) + (\eta + \mu)$ and $E_1' = 1 - \phi(\delta + \theta) + (\eta + \mu)$.

$\hat{X}_t = X_t - \bar{X}$ expresses the deviation from the long-run equilibrium value. We assume that the US dollar–yen rate moves from its initial equilibrium value (= 0) to $\hat{e}_t^{US/JP}$ at time *t* and remains at the new equilibrium after time *t* + 1 (= $\hat{e}_t^{US/JP}$). As the price level is sticky over the short run, $p_0 = 0$ at time 0. We assume the initial equilibrium values $\bar{p}_0 = \bar{e}_0 = 0$. The new equilibrium value after the US dollar–yen rate change is:

$$\bar{p}_A = \frac{1}{E_1}\left[\psi\theta\hat{e}_t^{US/JP} + (\psi\theta' + \mu')\hat{e}_{t+1}^{US/JP,e} + (1 + \psi\rho)(\hat{p}_{t+1}^e - \hat{p}_t^e) + (\xi - \psi\varsigma)\Delta\hat{e}^{EA/JP} - \psi\rho i_{t+1}\right] \quad (10)$$

where we assume that total productivity remains unchanged by exchange rate shocks, i.e., $\hat{\alpha}_t = 0$.

[8] We assume that $p_{t+1}^e = p_t^e$ and $\Delta e^{EA/JP} = 0$ at the long-rum equilibrium.

We solve for the rational expectation and obtain expressions for $\mathrm{y_t} - \mathrm{\bar{y}'_A}$ and $\mathrm{p_t} - \mathrm{\bar{p}'_A}$ such that:[9]

$$y_t - \bar{y}'_A = A_1(t)\hat{e}_t^{US/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i_{t+1} \quad (11)$$

$$p_t - \bar{p}'_A = A_1^p(t)\hat{e}_t^{US/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} + A_3^p(t)i_{t+1} \quad (11a)$$

Furthermore, we denote the deviation of output and the price level from the new long-run equilibrium value under a basket-peg regime without capital controls (C) as:

$$y_t - \bar{\bar{y}}'_A = (y_t - \bar{y}'_A) + (\bar{y}'_A - \bar{\bar{y}}'_A)$$

$$= \{A_1(t) + A'_1(t)\}\hat{e}_t^{US/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A'_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i_{t+1}$$

(11')

$$p_t - \bar{\bar{p}}'_A = (p_t - \bar{p}'_A) + (\bar{p}'_A - \bar{\bar{p}}'_A)$$

$$= \{A_1^p(t) + A_1'^p(t)\}\hat{e}_t^{US/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} + A_2'^p(t)\Delta\hat{e}^{EA/JP} + A_3^p(t)i_{t+1}$$

(11'a)

Note that $\bar{\bar{y}}'_A \equiv \bar{y}'_C$ and $\bar{\bar{p}}'_A \equiv \bar{p}'_C$. A clear shortcoming of a dollar-peg regime with capital controls is that capital inflow is restricted, which leads to a lower long-run equilibrium value, compared with that under a basket-peg regime without capital controls.

3.2 Basket-Peg Regime with Weak Capital Controls (B)

As a basket peg is an exceptional case of a fixed regime, endogenous variables are the same as under a US dollar-peg regime. In this case, the monetary authority adjusts the money supply by intervening in the foreign exchange market in order to maintain the value of the basket. Thus, the impacts of the foreign market intervention have been considered in this case as well. As mentioned above, a basket is a weighted average of the US dollar rate and yen rate. Equation (2) together with the basket equation, which becomes:

$$v e_t^{EA/US} + (1-v)e_t^{EA/JP} = \Gamma \quad (12)$$

where Γ is the value of basket. From this equation and equation (4), we can obtain:

$$e_t^{EA/US} = -(1-v)e_t^{US/JP}, \qquad e_t^{EA/JP} = v e_t^{US/JP} \qquad (12a)$$

[9] Expressions $A_1(t)$, $A_2(t)$, $A_3(t)$, $A_1^p(t)$, $A_2^p(t)$, $A_3^p(t)$ are shown in Appendix A2.

Solving equation (1), (3), (5), and (12a) for the price level and interest rate, the following semi-reduced form equations are obtained:

$$p_{t+1} - p_t = -\alpha_t + E_1 p_t + [\psi\{\theta\upsilon - \delta(1-\upsilon)\} + \mu\upsilon - \eta(1-\upsilon)]e_t^{US/JP}$$
$$+ [\psi\{\theta'\upsilon - \delta'(1-\upsilon)\} + \mu'\upsilon - \eta'(1-\upsilon)]e_t^{US/JP,e} - \psi\rho i_{t+1}$$
$$+ (\chi - \psi\tau)\Delta e^{EA/US} + (\xi - \psi\varsigma)\Delta e^{EA/JP} + (1+\psi\rho)(p_{t+1}^e - p_t^e)$$

(13)

$$i_{t+1} - i_t = -\lambda i_t - \lambda(1-\upsilon)e_{t+1}^{US/JP,e} + \lambda(1+\sigma)(1-\upsilon)e_t^{US/JP} \quad (14)$$

As in Section 3.1, we assume the same exogenous US dollar–yen rate change. The new equilibrium value after the US dollar–yen rate change is:

$$\bar{p}'_B = \frac{1}{E_1}\Bigg\{[\psi\{\theta\upsilon - (\delta + \rho + \rho\sigma)(1-\upsilon)\} + \mu\upsilon - \eta(1-\upsilon)]\hat{e}_t^{US/JP} + (\chi - \psi\tau)\Delta\hat{e}^{\frac{EA}{US}}$$
$$+ (\xi - \psi\varsigma)\Delta\hat{e}^{\frac{EA}{JP}} - \psi\rho i_{t+1} + (1+\psi\rho)(\hat{p}_{t+1}^e - \hat{p}_t^e)$$
$$+ [\psi\{\theta'\upsilon + (1-\upsilon)(\rho - \delta')\} + \mu'\upsilon - \eta'(1-\upsilon)]\hat{e}_t^{\frac{US}{JP},e}\Bigg\}$$

(15)

$$\bar{\imath}'_B = (1-\upsilon)\left[(1+\sigma)\hat{e}_t^{US/JP} - \hat{e}_{t+1}^{US/JP,e}\right] \quad (16)$$

We solve for the rational expectation and obtain expressions for $y_t - \bar{y}'_B$, $p_t - \bar{p}'_B$, and $i_t - \bar{\imath}'_B$[10]

$$y_t - \bar{y}'_B = B_1(t)\upsilon\hat{e}_t^{US/JP} + B_2(t)\hat{e}_t^{US/JP} + B_3(t)\hat{z}_t \quad (17)$$

$$p_t - \bar{p}'_B = B_1^p(t)\upsilon\hat{e}_t^{US/JP} + B_2^p(t)\hat{e}_t^{US/JP} + B_3^p(t)\hat{z}_t \quad (17a)$$

$$i_t - \bar{\imath}'_B = -(1-\upsilon)[(1+\sigma)(1-b_4)](1-\lambda)^t\hat{e}_t^{US/JP} \quad (17b)$$

where $B_3(t)\hat{z}_t$ and $B_3^p(t)\hat{z}_t$ comprises both $\Delta\hat{e}^{EA/US}$ and $\Delta\hat{e}^{EA/JP}$.

3.3 Basket-Peg Regime without Capital Controls (C)

As in Section 3.2, we use equation (12a) in this case. Since we assume perfect capital mobility, we use equation (1') with $\lambda = 1$. Solving equations (2), (3), (5), and (12a) for

[10] We show how to solve for the rational expectation and derive equations (17) and (17a) and expressions $B_1(t)$, $B_2(t)$, $B_3(t)$, $B_1^p(t)$, $B_2^p(t)$, $B_3^p(t)$ in Appendix A.2.

the price level and money supply, we have an identical semi-reduced form as in equation (13) and the following equation:

$$i_{t+1} - i_t = -(1-\upsilon)e_{t+1}^{US/JP,e} + (1+\sigma)(1-\upsilon)e_t^{US/JP} \quad (14')$$

As in Section 3.1, we assume the same exogenous US dollar–yen rate change. The new equilibrium value after the US dollar–yen rate change is $\bar{y}_C' = \bar{y}_B'$ and $\bar{p}_C' = \bar{p}_B'$. We solve for the rational expectation and obtain expressions for $y_t - \bar{y}_C'$ and $p_t - \bar{p}_C'$ and such as:[11]

$$y_t - \bar{y}_C' = C_1(t)\upsilon\hat{e}_t^{US/JP} + C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t \quad (18)$$

$$p_t - \bar{p}_C' = C_1^p(t)\upsilon\hat{e}_t^{US/JP} + C_2^p(t)\hat{e}_t^{US/JP} + C_3^p(t)\hat{z}_t \quad (18a)$$

3.4 Floating Regime without Capital Controls (D)

Under a floating regime, the money supply (m_t) becomes exogenous. Solving equations (1'), (3), and (5), we obtain the following two equations:

$$e_t^{EA/US} = \frac{1}{E_2}\Big[-m_t - \big(\epsilon - \phi(\delta+\theta)\big)p_t + \phi\theta e_t^{EA/JP} + \phi\rho(p_{t+1}^e - p_t^e) + \phi\theta' e_{t+1}^{EA/JP,e}$$

$$+ \{\epsilon + \phi\rho + \phi(\delta' + \theta')\}e_{t+1}^{EA/US,e} - \phi\tau\Delta e^{EA/US} - \phi\varsigma\Delta e^{EA/JP}\Big]$$

(19)

$$p_{t+1} - p_t = -\alpha_t - E_3 p_t + E_4 m_t + E_5 e_t^{US/JP} + E_6(p_{t+1}^e - p_t^e) + E_7 e_{t+1}^{EA/US,e} + E_8 e_{t+1}^{EA/JP,e}$$

$$+ E_9\Delta e^{EA/US} + E_{10}\Delta e^{EA/JP}$$

(20)

where $E_2 = (1+\sigma)(\epsilon + \phi\rho) - \phi(\delta + \theta)$.

[11] We show how to solve for the rational expectation and derive equations (18) and (18a) and expressions $C_1(t)$, $C_2(t)$, $C_3(t)$, $C_1^p(t)$, $C_2^p(t)$, $C_3^p(t)$ in Appendix A.3.

Long-run equilibrium values can be obtained from the equations below:

$$\bar{e}_{\mathrm{D}}^{EA/US} = -\frac{1}{f_4}\bar{m} - \frac{\epsilon - \phi(\delta+\theta)}{f_4}\bar{p}_D$$

(21)

$$\bar{p}_D = \frac{f_6}{f_5}\bar{m} + \frac{f_7}{f_5}\bar{e}_t^{US/JP} - \frac{1}{f_5}\bar{\alpha}$$

(22)

where $f_4 = \sigma(\epsilon + \phi\rho) - 2\phi(\delta + \theta)$.

As in Section 3.1, we assume the same exogenous US dollar–yen rate shock. The new equilibrium values after the shock are:

$$\bar{p}_D' = \frac{f_3 + \psi\rho f_1}{E(\epsilon+\phi\rho)}\widehat{m}_t + \frac{\phi\theta f_3 + \psi\theta\epsilon f_1}{E(\epsilon+\phi\rho)}\hat{e}_t^{EA/JP} + g_1(\hat{p}_{t+1}^e - \hat{p}_t^e) + g_2 \Delta\hat{e}^{EA/US} + g_3 \Delta\hat{e}^{EA/JP}$$

(23)

$$\bar{e}_D'^{EA/US} = -\frac{f_4 + \psi\rho f_2}{E(\epsilon+\phi\rho)}\widehat{m}_t + \frac{\phi\theta f_3 + \psi\theta\epsilon f_1}{E(\epsilon+\phi\rho)}\hat{e}_t^{EA/JP} + g_1'(\hat{p}_{t+1}^e - \hat{p}_t^e) + g_2' \Delta\hat{e}^{EA/US} + g_3' \Delta\hat{e}^{EA/JP}$$

(24)

Solving for the the rational expectation yields expressions for $y_t - \bar{y}_D'$ and $p_t - \bar{p}_D'$.[12]

$$y_t - \bar{y}_D' = D_1(t)\hat{e}_t^{US/JP} + D_2(t)\hat{z}_t + D_3(t)m_t \quad (25)$$

$$p_t - \bar{p}_D' = D_1^P(t)\hat{e}_t^{US/JP} + D_2^p(t)\hat{z}_t + D_3^p(t)m_t \quad (25a)$$

3.5 Dollar-Peg Regime under Perfect Capital Mobility (E)

As in Section 3.1, the East Asian currency–US dollar rate ($e_t^{EA/US}$) is totally exogenous ($e_t^{EA/US} = 0$) whereas money supply is endogenous. Under free capital mobility, we have equation (1'), and the domestic interest rate (i_{t+1}) is fixed at the level of the US interest rate (endogenous), i.e., $i_{t+1} = i_t^{US}$.

The long-run equilibrium values for the price level and the money supply under this regime are the same as in equations (8) and (9): $\bar{y}_E = \bar{y}_A$ and $\bar{p}_E = \bar{p}_A$. As in the previous subsection, we assume the same exogenous US dollar–yen rate shock. New equilibrium values after the shock are the same under a US dollar peg with capital controls: $\bar{p}_E = \bar{p}_A$.

[12] We show how to solve for the rational expectation and derive equations (25) and (25a) and expression $D_1(t)$, $D_2(t)$, $D_3(t)$, $D_1^p(t)$, $D_2^p(t)$, $D_3^p(t)$ in Appendix A.4.

Solving for the rational expectation yields expressions for $y_t - \bar{y}'_E$ and $p_t - \bar{p}'_E$:

$$y_t - \bar{y}'_E = A_1(t)\hat{e}_t^{EA/JP} + A_2(t)\Delta\hat{e}^{EA/JP} \quad (26)$$

$$p_t - \bar{p}'_E = A_1^p(t)\hat{e}_t^{EA/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} \quad (26a)$$

4. THE TRANSITION PATH TO OTHER EXCHANGE RATE REGIMES

In this section, we define four transition policies and one for maintaining the current regime. Yoshino, Kaji, and Suzuki (2004) find that when compared with a one-period loss, it would be desirable for a small open economy, like Thailand, to adopt a basket peg or a floating regime rather than a dollar-peg regime. In our context, this implies that the desirable regime is either a basket-peg regime without capital controls (C) or a floating regime without capital controls (D) over the long run.[13] We consider the following four transition paths to the preferred regimes and maintaining the status quo, such as a US dollar-peg regime with capital controls (A).

(1) Maintaining a dollar-peg regime (with strict capital controls): (A) – (A) – (A)

(2) A gradual shift from a dollar-peg to a basket-peg regime without capital controls (gradual adjustments of both capital controls and basket weight): (A) – (B) – (C)

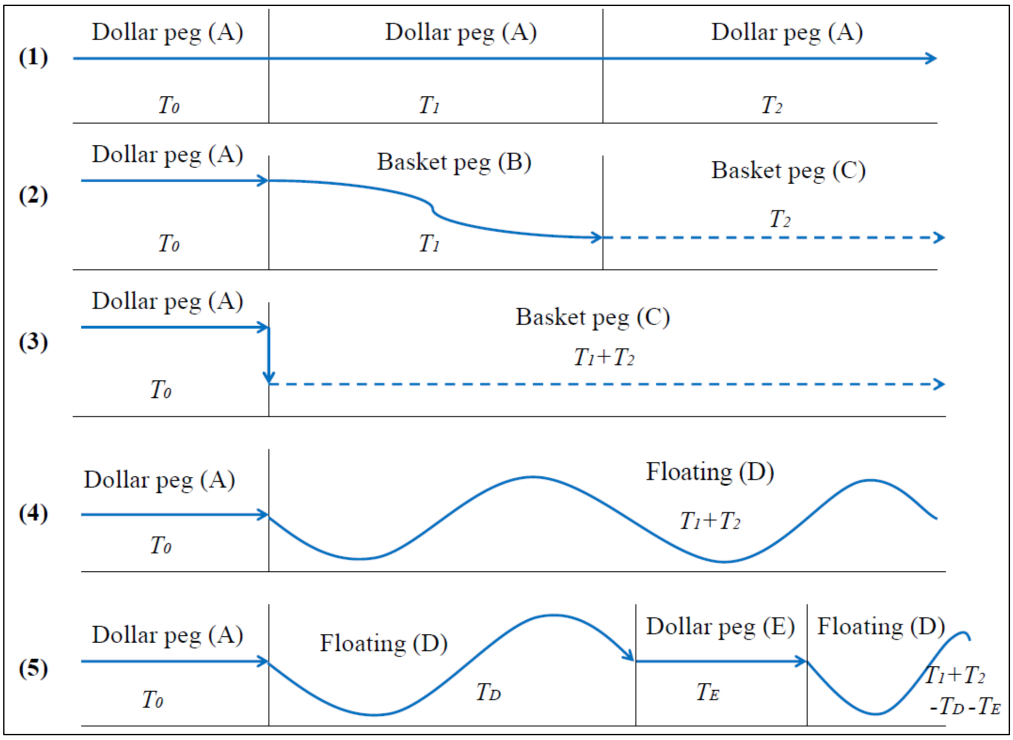
(3) A sudden shift from a dollar-peg to a basket-peg regime without capital controls (a sudden removal of capital controls and a sudden shift of basket weights): (A) – (C) – (C)

(4) A sudden shift from a dollar-peg to a floating regime (a sudden removal of capital controls and a sudden increase of flexibility in the exchange rate): (A) – (D) – (D)

(5) A sudden shift from a dollar peg to a managed-floating regime (a sudden removal of capital controls and a sudden increase of flexibility in the exchange rate with occasional intervention): (A) – (D) – (E) – (D).

[13] Yoshino, Kaji, and Asonuma (2004) confirm that it is also the case for two interdependent small open economies that the desirable regime is either a basket peg without capital controls (C) or a floating regime without capital controls.

Figure 2: Transition Policies Toward the Desired Regime



Source: Authors' illustration.

The first policy is sustaining a dollar-peg regime. The monetary authority imposes capital controls and fixes a weight on the dollar rate at 1. The second policy includes a transition period (B), which reflects an adjustment period of capital controls and basket weights. This policy starts from a dollar-peg regime and undergoes a transition period (B) and arrives at a basket-peg regime without capital controls (C). The third policy does not include a transition period (B); therefore, the monetary authority shifts from a dollar-peg regime to a basket-peg regime without any interim period, implying the economy will jump to the desired basket-peg regime. The fourth is that the monetary authority shifts from a dollar peg to a floating regime without a transition period, implying that the economy will suddenly jump to a floating regime. The fifth policy is that the monetary authority shifts from a dollar-peg regime to a managed-floating regime without a transition period. Under a managed-floating regime, if the exchange rate fluctuation is significant, the monetary authority intervenes in the foreign exchange market to maintain the exchange rate at a constant rate (E). Otherwise, the monetary authority allows the exchange rate to fluctuate as long as the exchange rate does not deviate substantially from its desired level.

We assume that the time interval for the initial dollar-peg regime is T_0. Furthermore, we regard the transition period as T_1 and the time interval after the authority reaches the target regime as T_2. We set a discount factor as β. Figure 2 displays the five policies.

Throughout this section, we consider the case of the monetary authority aiming to minimize output fluctuations, shown as: [14]

$$L(T_1, T_2) = \sum_{t=1}^{T_0+T_1+T_2} \beta^{t-1} (y_t - \bar{y}')^2 \tag{27}$$

Note that a reduced form $y_t - \bar{y}'$ varies depending on the exchange rate regimes, as explained in Section 3.

4.1 Maintaining a Dollar-Peg Regime (1)

The country continues a dollar-peg regime for the entire time period $T_0 + T_1 + T_2$, and its cumulative loss, given optimal interest rate i*, is expressed as follows:[15]

$$L_1(i^*, T_1 + T_2) = \sum_{t=1}^{T_0} \beta^{t-1} \left(y_t - \bar{y}'_{\mathrm{A}}\right)^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1} \left(y_t - \bar{\bar{y}}'_{\mathrm{A}}\right)^2$$

$$= \sum_{t=1}^{T_0} \beta^{t-1} (y_t - \bar{y}'_{\mathrm{A}})^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1} \begin{bmatrix} \{A_1(t) + A'_1(t)\}\hat{e}_t^{US/JP} + A_2(t)\Delta\hat{e}^{EA/JP} \\ +A'_2(t)\Delta\hat{e}^{EA/US} + A_3(t)i^* \end{bmatrix}^2 \tag{28}$$

$$i^* = argmin\, L_1(i^*, T_1 + T_2) \tag{28'}$$

where $y_t - \bar{y}'_A = A_1(t)\hat{e}_t^{\mathrm{US}/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i^*$. Note that i^* is chosen to minimize the cumulative loss in terms of deviation from its stable equilibrium value under a dollar-peg regime.

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[14] In the case of price level stability, the cumulative loss can be shown as

$$L^P(T_1, T_2) = \sum_{t=1}^{T_0+T_1+T_2} \beta^{t-1} (p_t - \bar{p}')^2 \tag{27a}$$

[15] The cumulative loss evaluated in terms of deviation of the price level from the steady state is shown as follows:

$$L_1^p\left(i_p^*, T_1 + T_2\right) = \sum_{t=1}^{T_0} \beta^{t-1} \left(p_t - \bar{p}'_A\right)^2 + \sum_{t=T_0}^{T_0+T_1+T_2} \beta^{t-1} (p_t - \bar{\bar{p}}'_A)^2 \tag{28a}$$

$$i_p^* = argmin\, L_1^p\left(i_p^*, T_1 + T_2\right) \tag{28'a}$$

where $p_t - \bar{\mathrm{p}}'_{\mathrm{A}} = A_1^p(t)\hat{e}_t^{\mathrm{US}/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} + A_3^p(t)i_p^*$.

4.2 Gradual Adjustment to a Basket Peg without Capital Controls (2)

First, we denote an optimal basket weight as υ^* assuming $0 \leq \upsilon^* \leq 1$. As explained above, the monetary authority starts by adopting a dollar-peg regime with capital controls (A), indicating that its basket weight is equal to 1. Then it shifts to a basket-peg regime and gradually loses a degree of capital control under regime (B). Simultanously, the authority decreases its basket weight by $(1-\upsilon^*)/T_1$ each period during its transition period in order to arrive at a basket-peg regime without capital controls. Once the monetary authority adopts the targeted basket-peg regime, it maintains its optimal basket weight at υ^*. The cumulative loss of transition policy (2) with an optimal basket weight υ^* can be expressed as[16]

$$L_2(\upsilon^*, T_1, T_2) = \sum_{t=1}^{T_0} \beta^{t-1}(y_t - \bar{y}'_A)^2 + \sum_{t=T_0+1}^{T_0+T_1} \beta^{t-1}(y_t - \bar{y}'_B)^2 + \sum_{t=T_0+T_1+1}^{T_0+T_1+T_2} \beta^{t-1}(y_t - \bar{y}'_C)^2$$

$$= \sum_{t=1}^{T_0} \beta^{t-1}(y_t - \bar{y}'_A)^2 + \sum_{t=T_0+1}^{T_0+T_1} \beta^{t-1}\left[B_1(t)\upsilon(t)\hat{e}_t^{US/JP} + B_2(t)\hat{e}_t^{US/JP} + B_3(t)\hat{z}_t \right]^2$$

$$+ \sum_{t=T_0+T_1+1}^{T_0+T_1+T_2} \beta^{t-1}\left[C_1(t)\upsilon^*\hat{e}_t^{US/JP} + C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t \right]^2 \quad (29)$$

where $y_t - \bar{y}'_A = A_1(t)\hat{e}_t^{EA/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i^*$ and $\upsilon(t) = 1 - \frac{1-\upsilon^*}{T_1}(t - T_0)$.

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16 The cumulative loss evaluated in terms of the deviation of the price level from its steady state is defined as follows:

$L_2^p(\upsilon_p^*, T_1 + T_2) = \sum_{t=1}^{T_0} \beta^{t-1}(p_t - \bar{p}'_A)^2 + \sum_{t=T_0+1}^{T_0+T_1} \beta^{t-1}(p_t - \bar{p}'_B)^2 + \sum_{t=T_0+T_1+1}^{T_0+T_1+T_2} \beta^{t-1}(p_t - \bar{p}'_C)^2$ (29a)

where $p_t - \bar{p}'_A = A_1^p(t)\hat{e}_t^{\mathrm{US/JP}} + A_2^p(t)\Delta\hat{e}^{\mathrm{EA/JP}} + A_3^p(t)i_p^*$ and υ_p^* is the optimal basket weight for the transition policy of stabilizing the price level.

Note that the second and the third terms on the right-hand side of equation (29) show losses under transition periods and under the basket-peg regime (C), respectively. The optimal weight is derived by minimizing the cumulative loss $L_2(\upsilon^*, T_1 + T_2)$ with respect to the weight υ^*:

$$\upsilon^* = \frac{-1}{H_1}\left[\sum_{t=T_0+T_1+1}^{T_0+T_1+T_2} \beta^{t-1} C_1(t)\hat{e}_t^{US/JP}\left(C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t\right) + \sum_{t=T_0+1}^{T_0+T_1} \beta^{t-1} B_1(t)\left(\frac{t-T_0}{T_1}\right)\hat{e}_t^{US/JP}\begin{pmatrix} B_1(t)\left(\frac{t-T_0}{T_1}\right)\hat{e}_t^{US/JP} \\ +B_2(t)\hat{e}_t^{US/JP} + B_3(t)\hat{z}_t \end{pmatrix}\right]$$

(29')

where $H_1 = \left[\sum_{t=T_0+1}^{T_0+T_1} \beta^{t-1}\left(B_1(t)\left(\frac{t-T_0}{T_1}\right)\hat{e}_t^{US/JP}\right)^2 + \sum_{t=T_0+T_1+1}^{T_0+T_1+T_2} \beta^{t-1}\left(C_1(t)\hat{e}_t^{US/JP}\right)^2\right]$.

4.3 Sudden Shift to a Basket Peg without Capital Controls (3)

As mentioned, the monetary authority starts with a dollar-peg regime with capital controls (A), implying that its basket weight is fixed at 1, and suddenly shifts to a basket-peg regime implementing an optimal weight (υ^{**}) without capital controls (C). The cumulative loss for policy (3) with the optimal basket weight υ^{**} and target regime period $T_1 + T_2$ is shown as:[17]

$$L_3\left(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) = \sum_{t=1}^{T_0} \beta^{t-1}(y_t - \bar{y}_A')^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1}(y_t - \bar{y}_C')^2$$

$$= \sum_{t=1}^{T_0} \beta^{t-1}(y_t - \bar{y}_A')^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1}\left[C_1(t)\upsilon^{**}\hat{e}_t^{US/JP} + C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t\right]^2$$

(30)

$$\upsilon^{**} = \frac{-1}{H_2}\left[\sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1} C_1(t)\hat{e}_t^{US/JP}\left(C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t\right)\right]$$

(30')

[17] The cumulative loss for stabilizing the price level is shown as follows:

$$L_3^p\left(\upsilon_p^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) = \sum_{t=1}^{T_0} \beta^{t-1}(p_t - \bar{p}_A')^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2} \beta^{t-1}(p_t - \bar{p}_C')^2$$

(30a)

where $p_t - \bar{p}_A' = A_1^p(t)\hat{e}_t^{\mathrm{US}/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} + A_3^p(t)i_p^*$ and υ_p^{**} is the optimal weight for stabilizing the price level.

Where $y_t - \bar{y}_A' = A_1(t)\hat{e}_t^{\mathrm{US}/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i^*$ and
$H_2 = \left[\sum_{t=T_0+T_1+1}^{T_0+T_1+T_2}\beta^{t-1}\left(C_1(t)\hat{e}_t^{US/JP}\right)^2\right]$. $\tilde{e}_t^{EA/US,2} = \sum_{t=T_0+1}^{T_0+T_1+T_2}\beta^{t-1}\left(\hat{e}_t^{US/JP}\right)^2$

denotes a sum of discounted squares of the US dollar rate. The impacts of exchange rate volatility after the shift are included in the second terms on the right-hand side of equation (30). When compared with the basket weight obtained in section 4.2, υ^{**} is different from υ^* as long as the transition period exists, $T_1 \neq 0$.

4.4 Sudden Shift from a Dollar-Peg to a Floating Regime (4)

The monetary authority starts by adopting a dollar-peg regime with capital controls (A), and it suddenly jumps to a floating regime without capital controls. The cumulative loss under policy (4) with an optimal money supply m^* and the target regime period $\mathrm{T}_1 + \mathrm{T}_2$ is shown as follows:[18]

$$L_4\left(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) = \sum_{t=1}^{T_0}\beta^{t-1}(y_t - \bar{y}_A')^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2}\beta^{t-1}(y_t - \bar{y}_D')^2$$

$$= \sum_{t=1}^{T_0}\beta^{t-1}(y_t - \bar{y}_A')^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2}\beta^{t-1}\left[D_1(t)\hat{e}_t^{US/JP} + D_2(t)\hat{z}_t + D_3(t)m^*\right]^2 \qquad (31)$$

$$m^* = \frac{-1}{H_3}\left[\sum_{t=T_0+1}^{T_0+T_1+T_2}\beta^{t-1}D_3(t)\hat{e}_t^{US/JP}\left(D_1(t)\hat{e}_t^{US/JP} + D_2(t)\hat{z}_t\right)\right] \qquad (31')$$

where $y_t - \bar{y}_A' = A_1(t)\hat{e}_t^{US/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i^*$ and

$H_3 = \left[\sum_{t=T_0+T_1+1}^{T_0+T_1+T_2}\beta^{t-1}\left(D_3(t)\right)^2\right]$.

The impacts of exchange rate volatility associated with the shift are included in the second term on the right-hand side of equation (31).

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[18] The cumulative loss for stabilizing the price level is defined as follows:

$$L_4^p\left(m_p^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) = \sum_{t=1}^{T_0}\beta^{t-1}\left(p_t - \bar{p}_A'\right)^2 + \sum_{t=T_0+1}^{T_0+T_1+T_2}\beta^{t-1}\left(p_t - \bar{p}_D'\right)^2 \qquad (31a)$$

where

$p_t - \bar{p}_A' = A_1^p(t)\hat{e}_t^{R/yen} + A_2^p(t)\Delta\hat{e}^{R/yen} + A_3^p(t)i_p^*$ and m_p^* is an optimal money supply for stabilizing the price level.

4.5 Sudden Shift from a Dollar-Peg to a Managed-Floating Regime (5)

Following the previous section, we denote an optimal money supply under the floating regime as m^{**}. The monetary authority starts by adopting a dollar-peg regime with capital controls (A), and it suddenly shifts to a floating regime without capital controls. Occasionally, when the US dollar rate fluctuates significantly, it intervenes in the foreign exchange market to maintain the US dollar rate at a constant level under perfect capital mobility (E). After the volatility of the dollar rate moderates, it adopts a floating regime. These interventions are implemented only temporarily to avoid large fluctuations of the exchange rate. The cumulative loss under policy (5) with whole period $T_1 + T_2$, period of a floating $\mathrm{T_D}$, and temporal period of a dollar peg $\mathrm{T_E}$ is shown as:[19]

$$L_5\left(m^{**}, T_1 + T_2, T_D, T_E, \tilde{e}_{t,E}^{R/\$,2}\right)$$

$$= \sum_{t=1}^{T_0} \beta^{t-1}(y_t - \bar{y}_A')^2 + \sum_{t=T_0+1}^{T_0+T_D} \beta^{t-1}(y_t - \bar{y}_D')^2 + \sum_{t=T_0+T_D+1}^{T_0+T_D+T_E} \beta^{t-1}(y_t - \bar{y}_E')^2 + \sum_{t=T_0+T_D+T_E+1}^{T_0+T_1+T_2} \beta^{t-1}(y_t - \bar{y}_D')^2 \tag{32}$$

$$m^{**} = \frac{-1}{H_4}\left[\sum_{t=T_0+1}^{T_0+T_D} \beta^{t-1} D_3(t)\left(D_1(t)\hat{e}_t^{US/JP} + D_2(t)\hat{z}_t\right) + \sum_{t=T_0+T_D+T_E+1}^{T_0+T_1+T_2} \beta^{t-1} D_3(t)\left(D_1(t)\hat{e}_t^{US/JP} + D_2(t)\hat{z}_t\right)\right] \tag{32'}$$

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[19] The cumulative loss for stabilizing the price level is defined as follows:

$$L_5^p\left(m_p^{**}, T_1 + T_2, T_D, T_E, \tilde{e}_{t,E}^{R/\$,2}\right)$$

$$= \sum_{t=1}^{T_0} \beta^{t-1}(p_t - \bar{p}_A')^2 + \sum_{t=T_0+1}^{T_0+T_D} \beta^{t-1}(p_t - \bar{p}_D')^2 + \sum_{t=T_0+T_D+1}^{T_0+T_D+T_E} \beta^{t-1}(p_t - \bar{p}_E')^2 + \sum_{t=T_0+T_D+T_E+1}^{T_0+T_1+T_2} \beta^{t-1}(p_t - \bar{p}_D')^2 \tag{32a}$$

where $p_t - \bar{p}_A' = A_1^p(t)\hat{e}_t^{\mathrm{US/JP}} + A_2^p(t)\Delta\hat{e}^{\mathrm{EA/JP}} + A_3^p(t)i_p^*$ and m_p^{**} is an optimal money supply for stabilizing the price level.

where $y_t - \bar{y}'_A = A_1(t)\hat{e}_t^{EA/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i^*$, $y_t - \bar{y}'_E = A_1(t)\hat{e}_t^{EA/JP} + A_2(t)\Delta\hat{e}^{EA/JP}$ and $H_4 = \left[\sum_{t=T_0+1}^{T_0+T_D} \beta^{t-1}\left(D_3(t)\right)^2 + \sum_{t=T_0+T_D+T_E+1}^{T_0+T_1+T_2} \beta^{t-1}\left(D_3(t)\right)^2\right]$.

$\tilde{e}_{t,E}^{EA/US,2} = \sum_{t=T_0+T_D+1}^{T_0+T_D+T_E} \beta^{t-1}\hat{e}_{t,E}^{EA/US,2}$

is defined as a sum of discounted squares of the dollar rates during the intervention periods. The impacts of the exchange rate volatility associated with the shift are included in the second term on the right-hand side of equation (32). When compared with an optimal money supply obtained in Section 4.4, m^{**} is different from m^* as long as the intervention period exists $T_E \neq 0$.

5. COMPARISON OF TRANSITION POLICIES

In this section, we consider the optimal policy for the monetary authority in order to stabilize output fluctuations.[20] Our discussion centers on two questions throughout this section: (i) Is it desirable for the monetary authority to maintain a dollar-peg regime over the long run? (ii) What would be an optimal policy, given that the authority decides to deviate from the status quo? We advance our argument in three steps. First, we apply some implications from static analysis into this dynamic context. Then, we compare the cumulative loss of the current policy, policy (1), with other transition policies to preferred regimes. After we find that maintaining a dollar-peg is not the appropriate solution over the long run, we look for an optimal outcome for the authority from among the four transitional policies.

5.1 Implications for Static Analysis

First, we reflect on some implications from static analysis. Using a static small open-economy general equilibrium model, Yoshino, Kaji, and Suzuki (2004) show that it is not desirable for the country to adopt a dollar peg compared with a basket-peg or a floating regime;[21] the value of the welfare loss under a dollar peg is higher than that under a basket peg or a floating regime at the steady state for one period. We can express these implications by using a one-period loss in this model as follows:[22]

$$(y_t - \bar{\bar{y}}'_A) > (y_t - \bar{y}'_C) \quad (33)$$

$$(y_t - \bar{\bar{y}}'_A) > (y_t - \bar{y}'_D) \quad (33')$$

Note that these results hold under regimes that have been maintained for several periods.

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[20] A discussion concerning stabilizing the price level is also provided in the footnotes of this paper.

[21] Furthermore, Yoshino, Kaji, and Asonuma (2004) find that this is also the case for two small open economies, which are mutually dependent in a static analysis.

[22] Similarly, we can express these implications by using a one-period loss in terms of the deviation of the price level from the steady state as follows:

$(p_t - \bar{\bar{p}}'_A) > (p_t - \bar{p}'_C)$ (33a)

$(p_t - \bar{\bar{p}}'_A) > (p_t - \bar{p}'_D)$ (33'a)

5.2 Comparison of Policy (1) and Other Transition Policies

We discuss the desirability of a dollar peg over the long run by comparing policy (1) and other transition policies to a basket peg or a floating regime. We start with a comparison between maintaining a dollar peg, policy (1), and a sudden shift to a basket-peg regime without capital controls, policy (3). We define a threshold time period T_C^* such that:

$$L_1(i^*, T_C^*) = L_3\left(\upsilon^{**}, T_C^*, \tilde{e}_t^{EA/US,2}\right)$$

expressing a time interval under which the cumulative loss of maintaining a dollar peg is equal to one of shifting to a basket peg. Taking into account that the above equation holds under the target regime period, we obtain the following statements:[23]

$$L_1(i^*, t) < L_3\left(\upsilon^{**}, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t < T_C^* \quad (34)$$

$$L_1(i^*, t) > L_3\left(\upsilon^{**}, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t > T_C^* \quad (34')$$

This means that if *t* is shorter than the threshold time period T_C^*, then the cumulative loss of maintaining a dollar peg is smaller than that of transitioning to a basket peg. This could happen only if the exchange rate volatility negatively affects the economy.[24] However, if t is longer than the threshold time period T_C^*, then a cumulative loss of maintaining a dollar-peg regime is higher than a sudden shift to a desired basket-peg regime. The longer the time period of adopting a basket peg, the more benefits the country can obtain from shifting to a basket-peg regime as shown in equation (34').

Next, we compare the losses under maintaining a dollar-peg, policy (1), to shifting to a floating regime, policy (4). We define a threshold time period T_D^* such that:

$$L_1(i^*, T_D^*) = L_4\left(m^*, T_D^*, \tilde{e}_t^{EA/US,2}\right)$$

denoting the time interval under which a cumulative loss of maintaining a dollar peg is equal to that of shifting to a floating regime. Reflecting that the above equation holds under the target regime period after the shift, the following conditions hold:

$$L_1(i^*, t) < L_4\left(m^*, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t < T_D^* \quad (35)$$

$$L_1(i^*, t) > L_4\left(m^*, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t > T_D^* \quad (35')$$

[23] For the price level stability, similar statements will be satisfied:

$$L_1^p\left(i_p^*, t\right) < L_3^p\left(\upsilon_p^{**}, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t < T_C^{*p} \quad \text{(34a)}$$

$$L_1^p\left(i_p^*, t\right) > L_3^p\left(\upsilon_p^{**}, t, \tilde{e}_t^{EA/US,2}\right) \quad if \quad t > T_C^{*p} \quad \text{(34'a)}$$

where

$$L_1^p\left(i_p^*, T_C^{*p}\right) = L_3^p\left(\upsilon_p^{**}, T_C^{*p}, \tilde{e}_t^{EA/US,2}\right)$$

[24] As we explain in Section 4.3, the effect of the exchange rate volatility due to the shift is included in the expression of the cumulative loss under policy (3). Therefore, when the target regime is short, the losses of maintaining the current regime are smaller than those of policy (3) because the monetary authority can avoid the negative effect of the exchange rate volatility associated with the shift.

These imply that the longer the period of adopting a floating regime, the larger the benefits the country can obtain from shifting to a floating regime as shown in equation (35').

Summarizing the results mentioned above, maintaining a dollar-peg regime is desirable only in the short term, i.e., $t < min[, T_C^*, T_D^*]$.[25] As the target time period gets longer, the country can obtain greater benefits from shifting suddenly to either a basket peg or a floating regime.

5.3 Comparison among Transition Policies

We then examine an optimal policy among three transition policies. There are benefits and costs for the three transition policies (2), (3), and (4), as shown in Table 2. For components of costs, estimates based on numerical analysis are provided in Table 3.

Table 2: Benefits and Costs of Transition Policies

Policy	Benefits	Costs
(1) Maintaining a dollar peg	a. No volatility of $e^{EA/US}$	a. Limited capital inflows
(2) Gradually shifting to a basket peg	a. Small volatility of i b. Small volatility of $e^{EA/US}$, $e^{EA/JP}$ c. Small deviations of $e^{EA/US,e}$, $e^{EA/JP,e}$	a. Time to reach stable regime b. Adjustment costs
(3) Suddenly shifting to a basket peg	a. Reaching stable regime at once (higher benefits under stable regime) b. No adjustment costs c. Small deviation of $e^{EA/US,e}$, $e^{EA/JP,e}$	a. High volatility of i. b. High volatility of $e^{EA/US}$, $e^{EA/JP}$
(4) Suddenly shifting to a free floating regime	a. Reaching stable regime at once (higher benefits under desirable regime) b. No adjustment costs	a. High volatility of i b. High volatility of $e^{EA/US}$, $e^{EA/JP}$ c. Large deviations of $e^{EA/US,e}$, $e^{EA/JP,e}$
(5) Suddenly shifting to a managed floating regime	a. Reaching stable regime at once (higher benefits under desirable regime) b. No adjustment costs c. Limited exchange rate fluctuations	a. High volatility of i b. No monetary policy autonomy during interventions

Source: Authors' compilation.

[25] For the case of price stability, $t < min\left[, T_C^{*p}, T_D^{*p}\right]$.

Table 3: Estimates of Costs under the Five Policies

Policy	Costs	Estimates	
		PRC	Thailand
(1) Maintaining a dollar peg	a. Limited capital inflows	0.033[a]	0.003[a]
(2) Gradually shifting to a basket peg	a. Time to reach stable regime b. Adjustment costs	0.003[b] 0.0066[c]	0.000096[b] 0.00000079[c]
(3) Suddenly shifting to a basket peg	a. High volatility of i. b. High volatility of $e^{EA/US}$,$e^{EA/JP}$	0.0028[d] 0.0030[e]	0.00000037[d] 0.00018[e]
(4) Suddenly shifting to a free floating regime	a. High volatility of i b. High volatility of $e^{EA/US}$,$e^{EA/JP}$ c. Large deviations of $e^{EA/US,e}$, $e^{EA/JP,e}$	0.0034[d] 0.034[e] 0.0013[f]	0.0000038[d] 0.0050[e] 0.000024[f]
(5) Suddenly shifting to a managed floating regime	a. High volatility of i b. No monetary policy autonomy during interventions	0.0034[d] 0.023[g]	0.0000038[d] 0.00038[g]

PRC = People's Republic of China.

[a] The estimate is the cumulative loss over 9 quarters (one initial period and 2 years).
[b] The estimate is the difference between cumulative losses under a transition period of 14 quarters and one of 18 quarters.
[c] The estimate is the difference between cumulative losses based on baseline λ and on a 20% deviation from the baseline λ.
[d] The estimate is the change in cumulative losses due to an increase in interest rates originally driven by a 0.001-unit deviation $e^{US/JP}$ shock.
[e] The estimate is a change in cumulative losses due to a 0.001-unit $e^{US/JP}$ shock.
[f] The estimate is a change in cumulative losses due to a 0.001-unit $e^{US/JP,e}$ shock.
[g] The estimate is a fraction of cumulative losses during intervention periods.
Source: Authors' calculations.

These benefits and costs are taken into account by evaluating the cumulative losses expressed by equations (29), (30), and (31). By comparing cumulative losses, we can analyze an optimal transition policy should the monetary authority decide to shift from a dollar-peg regime.

We start by comparing a gradual adjustment to a basket peg, policy (2), and a sudden shift to a basket peg, policy (3). Given time period T_2, we define T_1^* such that

$$L_2(v^*, T_1^*, T_2) = L_3\left(v^{**}, T_1^* + T_2, \tilde{e}_t^{EA/US,2}\right)$$

reflecting a time interval for the transition period under which the cumulative loss of a gradual adjustment policy is equal to a sudden shift to a basket peg.

Based on the fact that terms in $L_3(\upsilon^{**}, T_1^* + T_2, \tilde{e}_t^{EA/US,2})$ include a highly volatile exchange rate and interest rate due to the shift, it is apparent that the following results will hold:[26]

$$L_2(\upsilon^*, T_1, T_2) < L_3(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad T_1 < T_1^* \quad (36)$$

$$L_2(\upsilon^*, T_1, T_2) > L_3(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad T_1 > T_1^* \quad (36')$$

This implies that the longer the transition period of adjustment, the more benefits will accrue from reaching the target regime suddenly. However, as long as the interval for the transition period is in the range, $T_1 < T_1^*$, the monetary authority will gain benefits from avoiding large fluctuations of exchange rates.

Next, we consider the contrast between policy (3) and policy (4). We cannot obtain explicit theoretical conditions for optimality between policy (3) and policy (4). Given time periods T_1 and T_2, the optimal basket weight υ^{**} and money supply m^*, we define $\tilde{e}_t^{EA/US,2*}$ such that

$$L_3(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2*}) = L_4(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2*})$$

reflecting a sum of discounted squares of the US dollar rate in which the cumulative loss of shifting to a basket peg is equal to that of a sudden shift to a floating regime. If the US dollar rate fluctuates significantly, the country benefits from committing to a basket peg by stabilizing the negative impacts of the exchange rate fluctuations on trade and capital flows and minimizing unexpected deviations of the exchange rate expectations. Thus, the following statements hold:

$$L_3(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) < L_4(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad \tilde{e}_t^{EA/US,2} > \tilde{e}_t^{EA/US,2*} \quad (37)$$

$$L_3(\upsilon^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) > L_4(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad \tilde{e}_t^{EA/US,2} < \tilde{e}_t^{EA/US,2*} \quad (37')$$

This clearly shows that the country will be better off choosing a sudden shift to a basket peg rather than to a floating regime, given the large exchange rate fluctuations. However, if the magnitude of the exchange rate fluctuations is relatively modest, the authority would be better off adopting a floating regime.

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[26] For the case of price level stability, similar statements will hold as follows:

$$L_2^p(\upsilon_p^*, T_1, T_2) < L_3^p(\upsilon_p^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad T_1 < T_1^* \quad (36a)$$

$$L_2^p(\upsilon_p^*, T_1, T_2) > L_3^p(\upsilon_p^{**}, T_1 + T_2, \tilde{e}_t^{EA/US,2}) \quad if \quad T_1 > T_1^* \quad (36'a)$$

where $L_2^p(\upsilon_p^*, T_1^{*p}, T_2) > L_3^p(\upsilon_p^{**}, T_1^{*p} + T_2, \tilde{e}_t^{EA/US,2})$

Finally, we consider whether it is desirable to shift to a managed-floating regime, policy (5), rather than a free-floating regime, policy (4). Given time period $T_1 + T_2$, T_D, T_E, money supply m^* and m^{**}, and exchange rate volatility for the whole period $\tilde{e}_t^{EA/US,2}$, we define the exchange rate volatility for intervention periods $\tilde{e}_{t,E}^{EA/US,2**}$;

$$L_5\left(m^{**}, T_1 + T_2, T_D, T_E, \tilde{e}_{t,E}^{EA/US,2**}\right) = L_4\left(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2**}\right)$$

reflecting a sum of discounted squares of the US dollar rate during intervention periods in which the cumulative loss of shifting to a managed-floating regime is equal to that of a shift to a free-floating regime. If the exchange rate fluctuates significantly during the short periods, the country will be better off intervening to avoid the negative impacts of the exchange rate swing on trade and capital flows. This can be expressed as:

$$L_5\left(m^{**}, T_1 + T_2, T_D, T_E, \tilde{e}_{t,E}^{EA/US,2}\right) < L_4\left(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) \quad if \quad \tilde{e}_{t,E}^{EA/US,2} > \tilde{e}_{t,E}^{EA/US,2**} \tag{38}$$

$$L_5\left(m^{**}, T_1 + T_2, T_D, T_E, \tilde{e}_{t,E}^{EA/US,2}\right) > L_4\left(m^*, T_1 + T_2, \tilde{e}_t^{EA/US,2}\right) \quad if \quad \tilde{e}_{t,E}^{EA/US,2} < \tilde{e}_{t,E}^{EA/US,2**} \tag{38'}$$

Thus, it is desirable for the country to shift to a managed-floating rather than to a free-floating regime, given the large exchange rate fluctuations during the short periods of the interventions. However, if the magnitude of the exchange rate fluctuations during these intervention periods is relatively small, the country will be better off shifting to a free-floating regime to take advantage of having monetary policy autonomy for the whole period. When comparing shifts to a basket-peg regime and to a managed-floating regime, we are not able to derive explicit theoretical conditions. Instead, we reply on the quantitative examples explained in the next section.

Summarizing the results in this subsection, when considering the optimality between policy (2) and policy (3), the longer the transition period of the adjustment, the more benefits the monetary authority will gain from reaching a basket-peg regime at once. When comparing sudden shifts to a basket-peg regime, policy (3), and to a floating regime, policy (4), the welfare of the country is higher under a shift to a basket peg if the exchange rate fluctuations are large. Similarly, if we compare a sudden shift to a managed-floating regime, policy (5), and to a free-floating regime, policy (4), the country will be better off shifting to a managed-floating regime, given the large exchange rate fluctuations during the short periods.

6. SIMULATION EXERCISES: THE PRC AND THAILAND

In this section, we report simulation exercises using PRC and Thai data. Using estimated parameters for the two countries, we quantify cumulative losses for transitional policies. Our quantitative results support the theoretical findings explained in Sections 5.2 and 5.3; first, among the five policies, maintaining a dollar peg, policy (1), leads to the highest losses in both the PRC and Thai cases. Second, when contrasting two transition policies to a basket-peg regime, a gradual adjustment rather than a sudden shift is desirable in both countries. Finally, when comparing a shift to a basket peg with a shift to a floating regime, for Thailand it is better to shift to a basket peg. For the PRC, the results depend on policy goals: for stabilizing output, a shift to a basket peg is preferable, while for stabilizing the price level, a shift to a floating regime is better.

6.1 Data and Regression Results

We use PRC and Thai quarterly data from IMF International Financial Statistics (IFS). Most variables, except interest rates, are defined in natural logs. For exchange rate risks, we use the variance of monthly exchange rate data as a proxy. Applying the Dicky-Fuller generalized least squares (DF-GLS) unit root tests, we find some variables have unit roots. Then we move onto Johansen cointegration tests (Johansen 1992, 1995) and prove that all variables in both the PRC and Thai samples are stationary.[27] We apply the instrumental variable (IV) method to estimate parameters simultaneously. We differentiate two sample periods based on regime: for the PRC case (i) Q1 1999–Q2 2005 for a dollar peg regime and (ii) Q3 2005–Q4 2010 for a floating regime.[28] As the PRC has never adopted a de facto floating regime, we use estimated coefficients obtained for a basket-peg regime (ii). For the Thai case, we set (i) Q1 1993–Q2 1997 for a dollar peg and a basket peg and (ii) Q3 1997–Q1 2006 for a floating regime. A dummy variable is used to exclude impacts of the Asian currency crisis period Q3 1997–Q2 1998 for the Thai case (5th column in Table 4).

[27] Results of unit-root tests and cointegration tests are reported in Appendix C.

[28] Yoshino, Kaji, and Asonuma (2014) find empirically that the estimated weight of the US dollar rate in the currency basket of the PRC decreased from 1.0 to 0.82 over the sample period.

Table 4: Estimation Results

Coefficient	PRC		Thailand	
	Fixed, basket peg	Floating [a]	Fixed, basket peg	Floating
Sample	Q1 1999–Q2 2005	Q3 2005–Q4 2010	Q1 1993–Q2 1997	Q3 1997–Q1 2006
λ	-	0.26*** (0.09)	-	0.51** (0.07)
σ	-	0.05** (0.03)	-	0.006 (0.02)
ϵ	3.20*** (0.89)	10.13*** (1.89)	0.05 (0.08)	1.70** (0.82)
ϕ	0.23*** (0.05)	0.50*** (0.10)	0.94*** (0.19)	0.44 (0.36)
δ, δ'	-1.20 (2.51)	1.27* (0.69)	-0.73*** (0.08)	0.01 (0.10)
θ, θ'	0.70** (0.33)	-0.007 (0.42)	0.27*** (0.07)	-0.005 (0.08)
ρ	-0.52 (0.38)	0.63** (0.25)	-3.73*** (0.50)	1.13*** (0.34)
τ	-36.11 (46.78)	-0.14 (0.77)	0.05 (0.22)	0.002 (0.009)
ς	0.40 (1.50)	8.66 (15.91)	-2.00 (2.55)	0.53 (0.94)
α	0.16*** (0.02)	0.13*** (0.04)	0.01*** (0.003)	0.007*** (0.001)
ψ	-0.04* (0.02)	0.012** (0.005)	-0.25*** (0.04)	0.20*** (0.05)
η, η'	-0.06* (0.03)	-0.15** (0.07)	-0.19*** (0.03)	0.02 (0.02)
μ, μ'	-1.32*** (0.26)	-0.35*** (0.11)	0.07*** (0.02)	0.02 (0.02)
χ	-7.28*** (3.13)	-0.001 (0.14)	0.01 (0.06)	0.002 (0.002)
ξ	-5.87*** (0.88)	-7.80*** (2.80)	-0.55 (0.66)	-0.30 (0.23)
a_4, b_4	0.71*** (0.16)	0.49*** (0.19)	0.71*** (0.14)	0.74*** (0.11)
d_5	-	0.98*** (0.07)	-	0.38** (0.16)
d_6	-	0.48*** (0.06)	-	0.31*** (0.12)
β	0.99	0.99	0.99	0.99

PRC = People's Republic of China.

Note: The values in parentheses denote the standard errors of the coefficients. ***, **, and * indicate 1%, 5%, and 10% levels of significance, respectively.

[a] As the PRC has never adopted a de facto floating regime we use estimated coefficients for a basket-peg period.

Source: Authors' calculations.

6.2 Simulation Results using Estimated Parameters

We quantify optimal values of instruments and values of cumulative losses according to the transition policies. For the exchange rates and exchange rate risks, we use the actual data for the period Q1 1999–Q4 2010 for the PRC and period Q1 1993–Q1 2006 for Thailand, respectively. As we define exogenous shocks and other variables as deviations from the long-run vales, we use the deviation from the Hodrick Prescott (H-P) filtered trend values. We assume the time period for the dollar peg as 1 quarter ($T_0 = 1$), the interval for the transition period as 18 quarters ($T_1 = 18$), and the period for the target regime as 18 ($T_2 = 18$) quarters. Table 5 and 6 report values of cumulative losses and optimal instruments of five policies for stabilizing output and the price levels, respectively.

Table 5: Cumulatative Losses for Output Stability

A. People's Republic of China

	Policy (1)	Policy (2)	Policy (3)	Policy (4)	Policy (5) ($T_E = 5$)[b]
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 4.34$	$v^* = 0.58$	$v^{**} = 0.68$	$m^* = 0.016$	$m^{**} = 0.017$
Cumulative loss (value)	17.04	1.80	1.91	2.67	2.31
Cumulative loss (% of $\bar{y}^2$)[a]	23.4	2.4	2.6	3.7	3.2

[a] We calcuate the value of $\bar{y}^2$ shown in section 3 and obtain $\bar{y}^2 = 72.8$.

[b] For $T_E = 7$, the cumulative loss is 3.54 ($m^{**} = 0.017$).

B. Thailand

	Policy (1)	Policy (2)	Policy (3)	Policy (4)	Policy (5) ($T_E = 5$)[b]
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 0.003$	$v^* = 0.68$	$v^{**} = 0.62$	$m^* = 0.082$	$m^{**} = 0.0082$
Cumulative loss (value)	0.0044	0.006	0.0026	0.0052	0.0053
Cumulative loss (% of $\bar{y}^2$)[/1]	15.0	1.3	5.7	11.3	11.5

[a] We calculate the value of $\bar{y}^2$ shown in Section 3 and obtain $\bar{y}^2 = 0.046$.

[b] For $T_E = 5$, the cumulative loss is 0.0057 ($m^{**} = 0.082$).

Table 6: Cumulatative Losses for Price Stability

A. People's Republic of China

	Policy (1)	Policy (2)	Policy (3)	Policy (4)	Policy (5) $(T_E = 5)$ [b]
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 1.14$	$\upsilon^* = 0.65$	$\upsilon^{**} = 0.78$	$m^* = 0.11$	$m^{**} = 0.01$
Cumulative loss (value)	0.30	0.020	0.021	0.013	0.033
Cumulative loss (% of $\bar{p}^2$) [a]	33.0	2.2	2.3	1.4	3.3

[a] We calculate the value of $\bar{p}^2$ shown in section 3 and obtain $\bar{p}^2 = 0.91$.

[b] For $T_E = 7$, the cumulative loss is 0.50 ($\mathrm{m}^{**} = 0.015$).

B. Thailand

	Policy (1)	Policy (2)	Policy (3)	Policy (4)	Policy (5) $(T_E = 5)$ [b]
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed floating
Adjustment	-	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 0.00005$	$\upsilon^* = 0.14$	$\upsilon^{**} = 0.59$	$m^* = 0.0011$	$m^{**} = 0.0019$
Cumulative loss (value)	0.0044	0.0022	0.0028	0.0038	0.0033
Cumulative loss (% of $\bar{p}^2$) /1	5.6	2.8	3.6	4.8	4.2

[a] We calculate the value of $\bar{\mathrm{p}}^2$ shown in Section 3 and obtain $\bar{p}^2 = 0.079$.

[b] For $T_E = 5$, the cumulative loss is 0.0033 ($m^{**} = 0.0024$).

Tables 5 and 6 confirm the theoretical findings discussed in Section 5. First, among the four policies, maintaining the dollar peg, policy (1), leads to the highest losses in both stabilizing output and the price level for the PRC and Thailand. It implies that the country will be better off shifting to the target basket peg or floating regime.

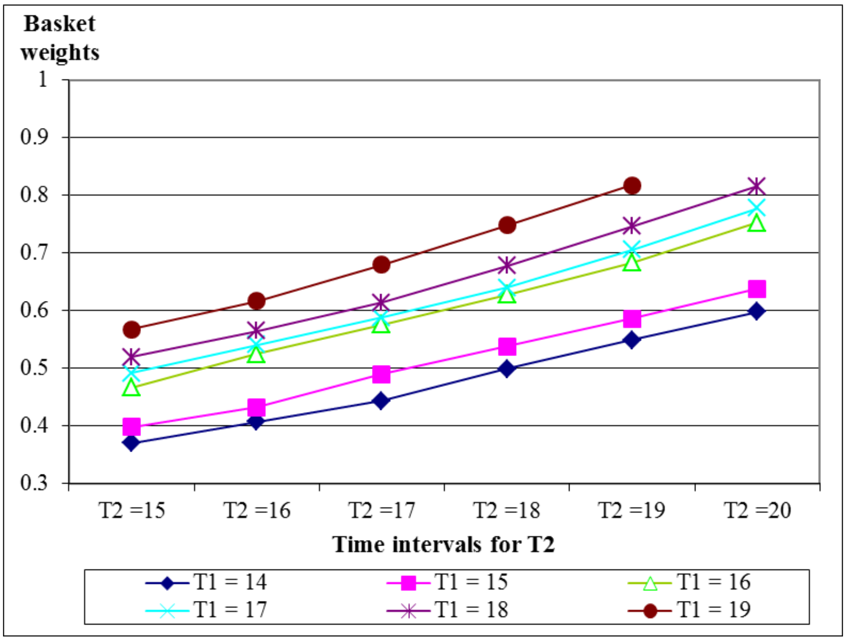
Second, comparing the two transition policies to a basket-peg regime, it is desirable for the country to adopt a gradual adjustment rather than a sudden shift in both stabilizing output and the price level for these two countries. This is because the interval of transition periods is not long enough for the country to gain the benefits of shifting suddenly to the target regime. Moreover, the optimal weights of policy (2) and policy (3) are different, as explained in Sections 4.2 and 4.3.

Third, when comparing shifting to a basket peg with shifting to a floating regime, for Thailand, shifting to a floating regime leads to higher losses, showing that the country will be better off shifting to the desired basket-peg regime for both stabilizing output and the price level. As mentioned in Section 5.3, this is a case where the country can receive the benefits of committing to a basket peg through smoothing the negative impacts of exchange rate fluctuations and following exchange rate expectations. In the case of the PRC, the results are mixed and depend on policy goals. If the authority prefers to stabilize output, it will be better off shifting to the desired basket-peg regime. However, if the authority chooses price stability, its decision will be to shift to a floating regime. This is because, unlike the choice to stabilize output, there are fewer negative impacts associated with exchange rate fluctuations on domestic prices. Finally, a shift to a managed-floating regime is less attractive than a move to a basket peg. For Thailand, shifting to a basket peg is more desirable than moving to a managed-floating regime in terms of both output and price level stability. This is the case for the PRC as well: shifting to a managed-floating regime results in higher losses than shifting to a basket peg. These results are because interventions in the foreign exchange market for certain periods lead to higher losses as the authority lacks monetary policy autonomy.

6.3 Time Intervals and Optimal Basket Weights

We analyze optimal basket weights under a basket peg under different time intervals using Thai data to examine the relationship between the two. First, we consider the case of a gradual adjustment to a basket-peg regime, policy (2). Given a fixed time interval for transition periods T_1 (for instance $T_1 = 18$), an optimal basket weight increases as time intervals under the desired basket peg increase. An increase in the length of the periods under the desired basket peg leads to an increase in the share of cumulative losses under the desired basket peg in total cumulative losses. In the case of Thailand, this increase in the length of periods results in an increase in the weight on the US dollar rate. However, given a fixed time interval under the desired basket-peg T_2 (for instance $T_2 = 18$), the longer the time intervals for transition become, the higher an optmial basket weight is. An increase in the length of the transition period leads to an increase in the share of cumulative losses during transition in total cumulative losses. This results in an increase in optimal basket weights for Thailand.

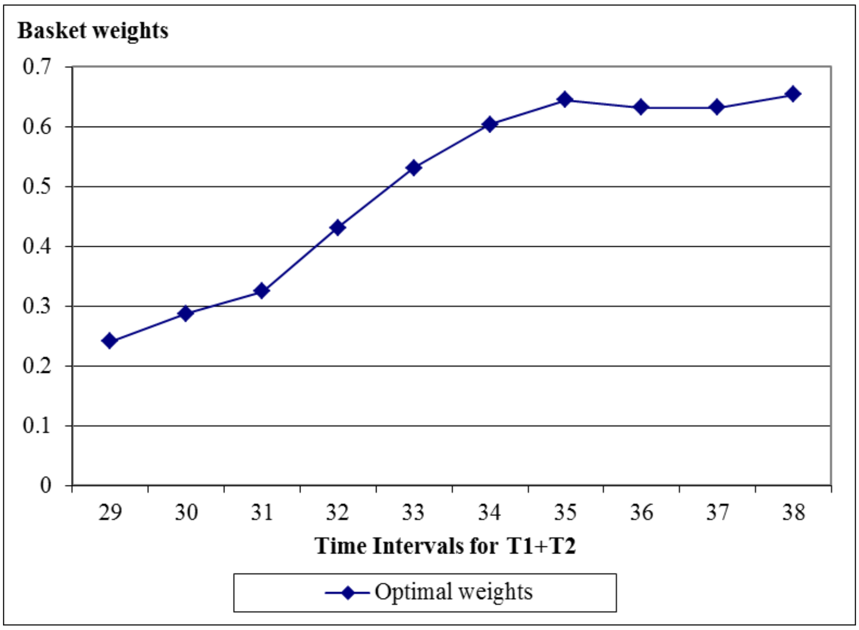
Figure 3: Optimal Basket Weights and Time Intervals under Policy (2)



Source: Authors.

Next, in the case of a sudden shift to a basket-peg regime, policy (3), the longer the time intervals under the desired basket peg get, the higher an optimal basket weight becomes. As in the previous case, if the time intervals under the desired basket peg become longer, the share of cumulative losses under the desired basket-peg regime in total cumulative losses increases. An increase in the time interval under the desired basket peg also results in higher optimal basket weights in the case of Thailand.

Figure 4: Optimal Basket Weights and Time Intervals under Policy (3)



Source: Authors.

7. CONCLUSION

There is a broad debate on desirable exchange regimes for East Asian countries. The dollar peg was adopted by most East Asian countries abefore the Asian currency crisis and has been blamed as one of the culprits of the crisis. Several economists have advocated basket-peg regimes for Asia. The main reason for adopting a basket-peg regime is that for countries with close economic relationships with the European Union, Japan, and the United States, exchange rate stabilization through a basket comprising the currencies of these countries can be beneficial because it removes the problem of large fluctuations in exchange rates. Yoshino, Kaji, and Asonuma (2004) have shown that together with a basket-peg regime, a floating regime is an option for East Asian countries.

Previous research has analyzed the state an East Asian country reaches once it has adopted a basket peg or a floating regime. For countries like the PRC and Malaysia, which currently have a de facto dollar peg, there is still the big question of how they can transition to the new regime. This paper has attempted to compute the dynamic effect of changing from a fixed regime to a stable basket peg or a stable floating regime. We obtained two transition paths from a dollar peg to a basket-peg regime (a gradual adjustment of basket weights or a sudden shift) and one transition path from a dollar peg to a floating regime.

The major findings are as follows. First, the value of the cumulative losses of the four policies are obtained theoretically as well as empirically. We find that maintaining a dollar-peg regime is desirable only over the short run, indicating that the country will be better off shifting to either a basket-peg regime or a floating regime over the long run. Second, when considering the choice between a gradual adjustment toward the target basket-peg regime, policy (2), or a sudden shift to the target basket peg, policy (3), the longer the transition period, the greater the benefits the country receives from reaching the desired regime. Finally, in a comparison between a sudden shift to a basket-peg regime, policy (3), and a floating regime, policy (4), the welfare of the country is higher under a shift to a basket-peg regime if the exchange rate fluctuates significantly. The country would be able not only to stabilize the negative impacts of exchange rate fluctuations on trade and capital inflows but also to help the private sector formulate exchange rate expectations precisely by committing to a basket regime for certain periods. Our analysis using PRC and Thai data supports these findings. However, our analysis is still limited to a medium-term perspective compared with one based on a longer time span, such as 20 years or more. There is a possibility that a country may be better off adopting a floating regime over the long term (more than 20 years). If this is the case, the question concerning how a country shifts from a basket-peg regime to a floating regime remains a future research topic.

APPENDIX A. SOLVING FOR RATIONAL EXPECTATIONS

A.1. Dollar-peg regime (A)

Substituting equation (10) into equation (3), we obtain following equation such that

$$y_t - \bar{y}_A^{\prime} = \frac{-(\delta+\theta)}{D}\begin{bmatrix}\psi\theta\hat{e}_t^{US/JP} + (1+\psi\rho)(\hat{p}_{t+1}^e - \hat{p}_t^e) \\ -\hat{\alpha}_t - \psi\rho i_{t+1} - \psi\varsigma\Delta\hat{e}^{EA/JP}\end{bmatrix}[1-\{1-\psi(\delta+\theta)-\eta\}^t] +$$

$$\theta\hat{e}_t^{US/JP} + \rho(\hat{p}_{t+1}^e - \hat{p}_t^e) - \varsigma\Delta\hat{e}^{EA/JP} - \rho i_{t+1} \qquad \text{(A1)}$$

We take the expectation of both sides of equation (6)[29] and solve for $\hat{p}_{t+1}^e$:

$$\hat{p}_{t+1}^e = a_1\hat{e}_t^{US/JP} + a_2\hat{p}_t^e \qquad \text{(A2)}$$

Then we substitute for $\hat{p}_{t+1}^e$ in equation (6) and obtain an expression for $\hat{p}_t^e$ such that

$$\hat{p}_t^e = a_3\hat{e}_t^{US/JP} \qquad \text{(A3)}$$

Substituting equation (A2) and (A3) into equation (A1) and (10) respectively, we obtain

$$y_t - \bar{y}_A^{\prime} = A_1(t)\hat{e}_t^{US/JP} + A_2(t)\Delta\hat{e}^{EA/JP} + A_3(t)i_{t+1} \quad (11)$$

$$p_t - \bar{p}_A^{\prime} = A_1^p(t)\hat{e}_t^{US/JP} + A_2^p(t)\Delta\hat{e}^{EA/JP} + A_3^p(t)i_{t+1} \qquad (11a)$$

$$A_1(t) = -\frac{(\delta+\theta)[\psi\theta + (1+\psi\rho)(a_1 + a_2a_3 - a_2)]}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t] + \theta$$

$$+ \rho(a_1 + a_2a_3 - a_2)$$

$$A_2(t) = -\frac{\psi\varsigma(\delta+\theta)}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t] - \varsigma$$

$$A_3(t) = \frac{\psi\rho(\delta+\theta)}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t] - \rho$$

$$A_1^p(t) = -\frac{[\psi\theta + (1+\psi\rho)(a_1 + a_2a_3 - a_2)]}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t]$$

$$A_2^p(t) = -\frac{\psi\varsigma}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t],\ A_3^p(t) = \frac{\psi\rho}{D}[1-\{1-\psi(\delta+\theta)-\eta\}^t]$$

[29] We assume that exchange rate risk terms have a mean of zero, implying $\mathrm{E}(\Delta e^{EA/US}) = 0$ and $\mathrm{E}(\Delta e^{EA/JP}) = 0$.

A.2. Basket-peg regime with weak capital controls (B)

Substituting equation (13) into equation (3), we obtain following equation such as

$$y_t - \bar{y}'_B = \frac{-(\delta+\theta)}{D}\begin{bmatrix}\bar{G}\hat{e}_t^{US/JP} + (1+\psi\rho)(\hat{p}^e_{t+1} - \hat{p}^e_t) \\ -(\psi\tau - \chi)\Delta\hat{e}^{EA/JP} - \psi\varsigma\Delta\hat{e}^{EA/JP}\end{bmatrix}[1 - \{1 - \psi(\delta+\theta) - \eta\}^t] +$$

$$\{-\delta(1-\upsilon)\theta + \theta\upsilon\}\hat{e}_t^{US/JP} - \rho[1-(1-\lambda)^t](1-\upsilon)\sigma\hat{e}_t^{US/JP} + \rho(\hat{p}^e_{t+1} - \hat{p}^e_t) - \tau\Delta\hat{e}^{EA/JP} -$$

$$\varsigma\Delta\hat{e}^{EA/JP} \qquad \text{(A4)}$$

where $\bar{G} = [\psi\{\theta\upsilon - \delta(1-\upsilon) - \rho\lambda(1+\sigma)(1-\upsilon)\} - \eta(1-\upsilon)]$.

We take the expectations of both sides of equation (13) and solve for $\hat{p}^e_{t+1}$:

$$\hat{p}^e_{t+1} = (b_1\upsilon + b'_1)\hat{e}_t^{US/JP} + b_2\hat{p}^e_t \qquad \text{(A5)}$$

Then we substitute for $\hat{p}^e_{t+1}$ in equation (13) and obtain expression for $\hat{p}^e_t$ such that

$$\hat{p}^e_t = (b_3\upsilon + b'_3)\hat{e}_t^{US/JP} \qquad \text{(A6)}$$

Substituting equation (A5) and (A6) into equation (A4) and (13), we obtain

$$y_t - \bar{y}'_B = B_1(t)\upsilon\hat{e}_t^{US/JP} + B_2(t)\hat{e}_t^{US/JP} + B_3(t)\hat{z}_t \quad (17)$$

$$p_t - \bar{p}'_B = B_1^p(t)\upsilon\hat{e}_t^{US/JP} + B_2^p(t)\hat{e}_t^{US/JP} + B_3^p(t)\hat{z}_t \quad (17a)$$

$$B_1(t) = \frac{-(\delta+\theta)}{D}\left\{\begin{bmatrix}\eta + \psi(\theta + \delta + \rho\lambda(1+\sigma)) \\ +(1+\psi\rho)(b_1 + b_2b_3 - b_3)\end{bmatrix}\right\}[1 - \{1-\psi(\delta+\theta)-\eta\}^t] + (\delta+\theta)$$

$$+ \rho\sigma[1-(1-\lambda)^t] + \rho(b_1 + b_2b_3 - b_2)$$

$$B_2(t) = \frac{-(\delta+\theta)}{D}\left\{\begin{bmatrix}-\eta + \psi(-\delta - \rho\lambda(1+\sigma)) \\ +(1+\psi\rho)(b'_1 + b_2b'_3 - b'_3)\end{bmatrix}\right\}[1 - \{1-\psi(\delta+\theta)-\eta\}^t] - \delta$$

$$- \rho\sigma[1-(1-\lambda)^t] + \rho(b'_1 + b_2b'_3 - b'_3)$$

$$B_3(t)\hat{z}_t = \frac{(\delta+\theta)}{D}\begin{Bmatrix}(\psi\tau - \chi)\Delta\hat{e}^{\frac{EA}{JP}} \\ +\psi\varsigma\Delta\hat{e}^{EA/JP}\end{Bmatrix}[1 - \{1-\psi(\delta+\theta)-\eta\}^t] - \tau\Delta\hat{e}^{EA/JP} - \varsigma\Delta\hat{e}^{EA/JP}$$

$$B_1^p(t) = \frac{-1}{D}\left\{\begin{bmatrix}\eta + \psi(\theta + \delta + \rho\lambda(1+\sigma)) \\ +(1+\psi\rho)(b_1 + b_2b_3 - b_3)\end{bmatrix}\right\}\{1-\psi(\delta+\theta)-\eta\}^t$$

$$B_2^p(t) = \frac{-1}{D}\left\{\begin{bmatrix}-\eta + \psi(-\delta - \rho\lambda(1+\sigma)) \\ +(1+\psi\rho)(b'_1 + b_2b'_3 - b'_3)\end{bmatrix}\right\}\{1-\psi(\delta+\theta)-\eta\}^t$$

$$B_3^p(t)\hat{z}_t = \frac{-1}{D}\left\{-(\psi\tau - \chi)\Delta\hat{e}^{\frac{EA}{JP}} - \psi\varsigma\Delta\hat{e}^{EA/JP}\right\}\{1-\psi(\delta+\theta)-\eta\}^t$$

A.3. Basket-peg regime without capital controls (C)

Similar to A.2., substituting equation (13) into equation (3), we obtain following equation such that

$$y_t - \bar{y}'_C = \frac{-(\delta+\theta)}{D}\begin{bmatrix} \bar{G}'\hat{e}_t^{US/JP} + (1+\psi\rho)(\hat{p}_{t+1}^e - \hat{p}_t^e) \\ -(\psi\tau - \chi)\Delta\hat{e}^{EA/JP} - \psi\varsigma\Delta\hat{e}^{EA/JP} \end{bmatrix}[1 - \{1 - \psi(\delta+\theta) - \eta\}^t] +$$

$$\{-\delta(1-\upsilon) + \theta\upsilon - \rho(1+\sigma)(1-\upsilon)\}\hat{e}_t^{US/JP} + \rho(\hat{p}_{t+1}^e - \hat{p}_t^e) - \tau\Delta\hat{e}^{EA/JP} - \varsigma\Delta\hat{e}^{EA/JP}$$

(A7)

where $\bar{G}' = [\psi\{\theta\upsilon - \delta(1-\upsilon) - \rho(1+\sigma)(1-\upsilon)\} - \eta(1-\upsilon)]$.

We take the expectation of both sides of equation (13) and solve for $\hat{p}_{t+1}^e$:

$$\hat{p}_{t+1}^e = (c_1\upsilon + c'_1)\hat{e}_t^{US/JP} + c_2\hat{p}_t^e \qquad \text{(A8)}$$

Then we substitute for $\hat{p}_{t+1}^e$ in equation (13) and obtain expression for $\hat{p}_t^e$ such that

$$\hat{p}_t^e = (c_3\upsilon + c'_3)\hat{e}_t^{US/JP} \qquad \text{(A9)}$$

Substituting equation (A8) and (A9) into equation (A7) and (13), we obtain

$$y_t - \bar{y}'_C = C_1(t)\upsilon\hat{e}_t^{US/JP} + C_2(t)\hat{e}_t^{US/JP} + C_3(t)\hat{z}_t \quad \text{(18)}$$

$$p_t - \bar{p}'_C = C_1^p(t)\upsilon\hat{e}_t^{US/JP} + C_2^p(t)\hat{e}_t^{US/JP} + C_3^p(t)\hat{z}_t \quad \text{(18a)}$$

$$C_1(t) = \frac{-(\delta+\theta)}{D}\left\{\begin{bmatrix} \eta + \psi(\rho\sigma + \rho + \theta + \delta) \\ +(1+\psi\rho)(c_1 + c_2c_3 - c_3) \end{bmatrix}\right\}[1 - \{1 - \psi(\delta+\theta) - \eta\}^t] + (\delta+\theta)$$
$$+ \rho(1+\sigma) + \rho(c_1 + c_2c_3 - c_3)$$

$$C_2(t) = \frac{-(\delta+\theta)}{D}\left\{\begin{bmatrix} -\eta - \psi(\rho\sigma + \rho + \delta) \\ +(1+\psi\rho)(c'_1 + c_2c'_3 - c'_3) \end{bmatrix}\right\}[1 - \{1 - \psi(\delta+\theta) - \eta\}^t] - \theta$$
$$- \rho(1+\sigma)\theta + \rho(c'_1 + c_2c'_3 - c'_3)$$

$$C_3(t)\hat{z}_t = \frac{(\delta+\theta)}{D}\begin{Bmatrix} (\psi\tau - \chi)\Delta\hat{e}^{\frac{EA}{JP}} \\ +\psi\varsigma\Delta\hat{e}^{EA/JP} \end{Bmatrix}[1 - \{1 - \psi(\delta+\theta) - \eta\}^t] - \tau\Delta\hat{e}^{EA/JP} - \varsigma\Delta\hat{e}^{EA/JP}$$

$$C_1^p(t) = \frac{-1}{D}\left\{\begin{bmatrix} \eta + \psi(\theta + \delta + \rho(1+\sigma)) \\ +(1+\psi\rho)(c_1 + c_2c_3 - c_3) \end{bmatrix}\right\}\{1 - \psi(\delta+\theta) - \eta\}^t$$

$$C_2^p(t) = \frac{-1}{D}\left\{\begin{bmatrix} -\eta - \psi(+\delta + \rho(1+\sigma)) \\ +(1+\psi\rho)(c'_1 + c_2c'_3 - c'_3) \end{bmatrix}\right\}\{1 - \psi(\delta+\theta) - \eta\}^t$$

$$C_3^p(t)\hat{z}_t = \frac{(\delta+\theta)}{D}\{(\psi\tau - \chi)\Delta\hat{e}^{EA/US} + \psi\varsigma\Delta\hat{e}^{EA/JP}\}\{1 - \psi(\delta+\theta) - \eta\}^t$$

A.4. Floating regime without capital controls (D)

New equilibrium value after the dollar–yen rate change is

$$\bar{p}'_D = \frac{f_3 + \psi\rho f_1}{E(\epsilon + \phi\rho)} m_t + \frac{\phi\theta f_3 + \psi\theta\epsilon f_1}{E(\epsilon + \phi\rho)} \hat{e}_t^{EA/JP} + g_1(\hat{p}_{t+1}^e - \hat{p}_t^e) + g_2 \Delta\hat{e}^{EA/US} + g_3 \Delta\hat{e}^{EA/JP}$$

(23)

$$\bar{e}_D'^{EA/US} = -\frac{f_4 + \psi\rho f_2}{E(\epsilon + \phi\rho)} m_t - \frac{\phi\theta f_4 + \psi\theta\epsilon f_2}{E(\epsilon + \phi\rho)} \hat{e}_t^{EA/JP} + g'_1(\hat{p}_{t+1}^e - \hat{p}_t^e) + g'_2 \Delta\hat{e}^{EA/US} + g'_3 \Delta\hat{e}^{EA/JP}$$

(24)

where $g_1 = \frac{\phi\rho f_3 + \left(1+\psi\rho\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_1}{E(\epsilon+\phi\rho)}$, $g_2 = \frac{-\phi\tau f_3 + \left(\chi-\psi\tau\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_1}{E(\epsilon+\phi\rho)}$, $g_3 = \frac{\phi\varsigma f_3 - \left(\psi\varsigma\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_1}{E(\epsilon+\phi\rho)}$,

$g'_1 = -\frac{\phi\rho f_4 + \left(1+\psi\rho\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_2}{E(\epsilon+\phi\rho)}$, $g'_2 = \frac{-\phi\tau f_4 + \left(\chi-\psi\tau\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_2}{E(\epsilon+\phi\rho)}$, $g'_3 = \frac{-\phi\varsigma f_4 - \left(\psi\varsigma\left(1+\frac{\phi\rho}{\epsilon+\phi\rho}\right)\right) f_2}{E(\epsilon+\phi\rho)}$

Substituting equations (23) and (24) into equation (3), we obtain the following equation such that

$$y_t - \bar{y}'_D = H\bar{p}' + (\delta+\theta) h_1 \bar{e}_D'^{EA/US} + \frac{\rho}{\epsilon+\phi\rho} m_t + \theta h_2 \hat{e}_t^{EA/JP} + \rho h_2 (\hat{p}_{t+1}^e - \hat{p}_t^e) - \tau h_2 \Delta\hat{e}^{EA/US} - \varsigma h_2 \Delta\hat{e}^{EA/JP}$$

(A10)

where $H = \left[-(\delta+\theta)(1-\omega_2^t) + \frac{1+\phi(\delta+\theta)}{\epsilon+\phi\rho} - (\delta+\theta) h_1 \kappa \omega_2^t\right]$, $h_1 = 1 - \frac{\phi\rho}{\epsilon+\phi\rho}$ and $h_2 = 1 + \frac{\phi\rho}{\epsilon+\phi\rho}$.

We take the expectation of both sides of equation (20) and solve for $\hat{p}_{t+1}^e$:

$$\hat{p}_{t+1}^e = d_1 \hat{e}_t^{US/JP} + d_2 \hat{p}_t^e \qquad \text{(A11)}$$

Then we substitute for $\hat{p}_{t+1}^e$ in equation (20) and obtain an expression for $\hat{p}_t^e$ such that

$$\hat{p}_t^e = d_3 \hat{e}_t^{US/JP} \qquad \text{(A12)}$$

Substituting equations (A11) and (A12) into equations (A10) and (20), we obtain

$$y_t - \bar{y}'_D = D_1(t) \hat{e}_t^{US/JP} + D_2(t) \hat{z}_t + D_3(t) m_t \quad (25)$$

$$p_t - \bar{p}'_D = D_1^P(t)\hat{e}_t^{US/JP} + D_2^p(t)\hat{z}_t + D_3^p(t)m_t \quad (25a)$$

$$D_1(t) = H\frac{\phi\theta f_3 + \psi\epsilon\theta f_1}{E(\epsilon + \phi\rho)} - (\delta + \theta)\frac{\phi\theta f_4 + \psi\epsilon\theta f_2}{E(\epsilon + \phi\rho)}h_1$$

$$+ [Hg_1 + h_1 g_1'(\delta + \theta) + \rho h_2](d_1 + d_2 d_3 - d_3) + h_2\theta$$

$D_2(t)\hat{z}_t = \{Hg_2 + h_1 g_2'(\delta + \theta) - \tau h_2\}\Delta\hat{e}^{EA/US} + \{Hg_3 + h_1 g_3'(\delta + \theta) - \varsigma h_2\}\Delta\hat{e}^{EA/JP}$,

$D_3(t) = H\frac{f_3 + \psi\rho f_1}{E(\epsilon + \phi\rho)} - (\delta + \theta)h_1\frac{f_4 + \psi\rho f_2}{E(\epsilon + \phi\rho)} + \frac{\rho}{\epsilon + \phi\rho}$, $D_1^P(t) = -\omega_2^t\left[\frac{\phi\theta f_3 + \psi\theta\epsilon f_1}{E(\epsilon + \phi\rho)} + g_1(d_1 + d_2 d_3 - d_3)\right]$, $D_2^P(t) = -\omega_2^t\left[g_2\Delta\hat{e}^{EA/US} + g_3\Delta\hat{e}^{EA/JP}\right]$, and $D_3^P(t) = -\omega_2^t\left(\frac{f_3 + \psi\rho f_1}{E(\epsilon + \phi\rho)}\right)$.

APPENDIX B: SADDLE PATH STABILITY UNDER A FLOATING REGIME

Characteristic roots of difference equations (19) and (20) can be derived by solving the equation below:

$$\omega^2 - (2 + f_1 + f_4)\omega + (1 + f_1 + f_4 + E) = 0 \qquad \text{(A13)}$$

Soving this equation,

$$\omega_1, \omega_2 = \frac{1}{2}(2 + f_1 + f_4) \pm \frac{1}{2}\sqrt{(2 + f_1 + f_4)^2 - 4(1 + f_1 + f_4 + E)} \qquad \text{(A14)}$$

Now we assume some assumptions to satisfy saddle path stability, such as

(a) $(2 + f_1 + f_4)^2 - 4(1 + f_1 + f_4 + E) > 0$,

(b) $1 + f_1 + f_4 + E > 0$, and

(c) $2 + f_1 + f_4 - \sqrt{(2 + f_1 + f_4)^2 - 4(1 + f_1 + f_4 + E)} < 2$

First, under (a), both ω_1, ω_2 are real and distinct. It is easily found that $\omega_1 > 1$. Now under (b),

$$\omega_1\omega_2 = 1 + f_1 + f_4 + E > 0$$

Therefore, $\omega_2 > 0$. Lastly, under (c), it simply implies that $\omega_2 < 1$. The system is described by the unique stable saddle path. We can express the solution for the original variables as

$$e_D^{EA/US} - \bar{e}_D^{\prime EA/US} = \kappa(p_0 - \bar{p}_D')\omega_2^t \qquad \text{(A15)}$$

$$p_t - \bar{p}_D' = (p_0 - \bar{p}_D')\omega_2^t \qquad \text{(A16)}$$

From these equations above, the saddle path is

$$e_D^{EA/US} - \bar{e}_D^{\prime EA/US} = \kappa(p_t - \bar{p}_D') \qquad \text{(A17)}$$

Where $\kappa = \frac{\omega_2 - 1 - f_4}{f_3}$.

APPENDIX C: UNIT ROOT AND COINTEGRATION TESTS

This section discusses the results of the unit root and cointegration tests. We start by applying the Dicky-Fuller generalized least squares (DF-GLS) unit root tests. The results of the unit root test are presented in Table A1. Reflecting the 10% significance critical value on DF-GLS statistics, some variables, such as the real interest rates and the output gap, have a unit root. Then we move onto Johansen cointegration tests for the equations shown in Table A2. Using the 5% significance critical criteria, we find cointegration relationships among the variables in these equations for both the PRC and Thailand.

Table A1: DF-GLS Unit-Root Tests

A. People's Republic of China

Variables	Degree	Trend	Lag	DF-GLS Stat. [a]	Results
$e^{EA/US}$	Level	0	0	-2.67***	I(0) [b]
$e^{EA/JP}$	Level	0	1	-3.06***	I(0) [b]
i	Level	0	0	-1.65*	I(0) [b]
$i-(p^e_{t+1}-p_t)$	Level	0	8	0.17	
	1st diff.	0	7	-5.32***	I(1) [c]
i^{US}	Level	0	3	-2.68***	I(0) [b]
$m-p$	Level	0	5	-1.88*	I(0) [b]
$e^{EA/US}+p^{US}-p$	Level	0	0	-2.57**	I(0) [b]
$e^{EA/JP}+p^{\mathrm{JP}}-p$	Level	0	2	-3.22***	I(0) [b]
$e^{US/JP}$	Level	0	0	-2.80***	I(0) [b]
$\Delta e^{EA/US}$	Level	0	0	-3.31***	I(0) [b]
$\Delta e^{EA/JP}$	Level	0	0	0.17	
	1st diff.	0	0	-0.684***	I(1) [c]
$p_{t+1}-p_t$	Level	0	8	0.14	
	1st diff.	0	3	-4.95***	I(1) [c]
$y_t-\bar{y}$	Level	0	4	-1.61*	I(0) [b]

B. Thailand

Variables	Degree	Trend	Lag	DF-GLS Stat. [a]	Results
$e^{EA/US}$	Level	0	0	-2.90***	I(0) [b]
$e^{EA/JP}$	Level	0	0	-3.27***	I(0) [b]
i	Level	0	0	-5.24***	I(0) [b]
$i-(p_{t+1}^{e}-p_t)$	Level	0	0	-1.07	
	1st diff.	0	0	-5.60***	I(1) [c]
i^{US}	Level	0	0	-0.97	
	1st diff.	0	0	-4.04***	I(1) [c]
$m-p$	Level	0	2	-2.77***	I(0) [b]
$e^{EA/US}+p^{US}-p$	Level	0	0	-3.03***	I(0) [b]
$e^{EA/JP}+p^{\mathrm{JP}}-p$	Level	0	0	-2.21**	I(0) [b]
$e^{US/JP}$	Level	0	0	-2.20**	I(0) [b]
$\Delta e^{EA/US}$	Level	0	0	-3.81***	I(0) [b]
$\Delta e^{EA/JP}$	Level	0	0	-5.81***	I(0) [b]
$p_{t+1}-p_t$	Level	0	0	-3.23***	I(0) [b]
$y_t-\bar{y}$	Level	0	2	-0.97	
	1st diff.	0	3	-1.83*	I(1) [c]

[a] The critical values for the DF-GLS statistics are 5%, –1.98; and 10%, –0.62. Our results of the unit root are based on a 10% critical value.

[b] I(0) shows that the variable follows the stationary process at that level.

[c] I(1) shows that the variable has a unit root of degree 1.

Source: Authors' calculations.

Table A2: Johansen Cointegration Tests

A. People's Republic of China

Equation	Variables	Trend	Hypothesis	Trace Statistics [a]	P-values [b]
Aggregate demand[d]	$y_t - \bar{y}$	Deterministic	None [c]	162.3***	0.00
	$e^{EA/US} + p^{US} - p$		At most 1 [c]	118.9***	0.00
	$e^{EA/JP} + p^{JP} - p$		At most 2 [c]	75.8***	0.00
	$i - (p^e_{t+1} - p_t)$		At most 3 [c]	36.9***	0.00
	$\Delta e^{EA/US}$		At most 4 [c]	14.0*	0.08
	$\Delta e^{EA/JP}$		At most 5 [c]	2.7*	0.09
Aggregate supply[e]	$p_{t+1} - p_t$	Deterministic	None [c]	171.3***	0.00
	$y_t - \bar{y}$		At most 1 [c]	121.8***	0.00
	$e^{EA/US} + p^{US} - p$		At most 2 [c]	78.8***	0.00
	$e^{EA/JP} + p^{JP} - p$		At most 3 [c]	37.8***	0.00
	$\Delta e^{EA/US}$		At most 4 [c]	14.8*	0.04
	$\Delta e^{EA/JP}$		At most 5 [c]	2.7*	0.09

B. Thailand

Equation	Variables	Trend	Hypothesis	Trace Statistics [a]	P-values [b]
Aggregate demand[f]	$y_t - \bar{y}$	Deterministic	None [c]	162.3***	0.00
	$e^{EA/US} + p^{US} - p$		At most 1 [c]	118.9***	0.00
	$e^{EA/JP} + p^{JP} - p$		At most 2 [c]	75.8***	0.00
	$i - (p^e_{t+1} - p_t)$		At most 3 [c]	36.9***	0.00
	$\Delta e^{EA/US}$		At most 4 [c]	14.0*	0.08
	$\Delta \mathrm{e}^{\mathrm{EA/JP}}$		At most 5 [c]	2.7*	0.09

[a] Denotes 5% critical values.

[b] Denotes MacKinnon, Haug, and Michelis (1999) p-values.

[c] Denotes rejection of the hypothesis at the 5% significance level.

[d] Trace test indicates 3 cointegrating equations at the 5% signifiance level.

[e] Trace test indicates 3 cointegrating equations at the 5% significance level.

[f] Trace test indicates 3 cointegrating equations at the 5% significance level.

Source: Authors' calculations.

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* ADB recognizes China as the People's Republic of China.

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