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# Exchange Rate Regime Transition Dynamics In East Asia

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**Abstract**

This paper investigates the currency regime choices of six East Asian emerging countries, namely, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand, for the period 1973-99 from the optimum currency area (OCA), macroeconomic stabilization and currency crisis perspectives. It finds that regime transition dynamics in these countries are statistically insignificant for the period under consideration, but static regime choice is largely consistent with the predictions of international macroeconomics. The empirical results suggest that a more fixed or flexible regime is suitable for these East Asian countries.

**Keywords**: East Asia, exchange rate regime, multi-state Markov model.
**JEL classification codes**: F3, G0.

## 1. Introduction

Before the 1997/98 crisis, some East and Southeast Asian economies, namely, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand (hereinafter referred to as "East Asian economies"), had adopted a variety of intermediate exchange rate regimes. At the advent of the crisis, most of them were forced to float. However, after the crisis, some of these floaters have reverted to a *de facto* intermediate regime (Hernandez and Montiel, 2003). Now the question

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arises: How do these East Asian economies choose their exchange rate regimes? Economists have developed various answers to the question.

The pre-crisis (before 1997) exchange rate rigidity is believed to be one of the main reasons for the occurrence of crisis in East Asia. Some authors argue that the currency crises of the 1990s resulted from a combination of some form of exchange rate pegging with high capital mobility. They conclude that countries exposed to large capital flows must avoid intermediate regimes and are left with two corner solutions: a very hard peg (such as a currency board, a currency union or dollarization) or freely floating regime (Eichengreen, 1994; Obstfeld and Rogoff, 1995; Summers, 2000).

However, many economists do not think that the corner solution is the best for East Asian economies. Some of them argue that adopting a basket of G3 (the yen, dollar and the euro) currencies with appropriate weights could help these countries achieve stability (Williamson, 2000; Kawai and Takagi, 2000; Ogawa and Ito, 2002; Rajan, 2002). According to these authors, such an arrangement can ensure flexibility of exchange rates, reduce asymmetric response to dollar depreciation and prevent East Asian economies from future crises. On the other hand, Ohno (1999) argued that the pre-crisis exchange rates in crisis-hit East Asian countries were not seriously overvalued that might have caused the crisis, and a common currency basket will not bring as much stability as others suggest. McKinnon and Schnabl (2004a, 2004b) show that crisis-hit East Asian countries have returned to the dollar peg in the post-crisis period. They argue that this reversion implies that only dollar pegging can bring more stability as these countries' foreign trade is mainly invoiced in U.S. dollars. Besides these opinions, a number of observers and policy makers, from a long term perspective, are concerned over the possibility of

forming a *monetary union* in this region (ASEAN Hanoi summit, 1998; Eichengreen and Bayoumi, 1999a, 1999b; Kawai and Motonishi, 2004; Zhang and Sato, 2004).

The collapse of the exchange rate regime in emerging countries in the late 1990s has led to a surge in researches on regime choice. Many of the recent papers geared towards the choice of exchange rate regimes in emerging countries (Calvo and Mishkin, 2003, Poirson, 2001, Von Hagen and Zhou, 2004). The present study belongs to this line of research. The main question posed in this study is: How can the choice of regimes in East Asia be explained? To answer this question, I analyze the dynamics of exchange rate regime transition as well as the determinants of static regime choice of Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand for the period 1973-1999. The period 1973-99, which includes the crisis period, is chosen in order to understand the reasons of the regime choice of the East Asian countries in the post-crisis period as well as to understand the long-term regime transition dynamics.

I apply the multi-state Markov model (MSM) to analyze exchange rate regime transitions and the ordered logit model to analyze static regime choices. Since various authors' recommendations on appropriate exchange rate regimes in East Asian are based on the optimum currency area (OCA), macroeconomic stabilization and crisis perspectives, I choose variables implied by the OCA, macroeconomic stabilization and crisis models as explanatory variables.

The remainder of this paper is set out as follows. Section 2 discusses the *de jure* and *de facto* regimes in the pre- and post-crisis period. Section 3 discusses the data. Section 4 presents the empirical results and Section 5 provides a discussion on the possibility of completely fixed or floating regime. Finally, Section 6 concludes the paper.

## 2. Exchange rate arrangements in East Asia

In this section I discuss the characteristics of pre and post-crisis *de jure* and *de facto* exchange rate regimes of the selected East Asian countries. For this purpose, I rely on information provided by the IMF's *de jure* classifications published in the *Annual Report on Exchange Arrangements and Exchange Restrictions* (Table 1) and the *de facto* regime classification proposed by Reinhart and Rogoff (2004) (Table 2).

Until 1997, Indonesia's rupiah was officially pegged to a basket of undisclosed currencies, but *de facto* it was a crawling peg to the US dollar, a premium that was consistently below 20% and mostly in single digits. Korea had followed crawling peg with a band width less than +/- 1% until 1994. Then it had widened the band width to around +/- 2%. Singapore's exchange rate was pegged to the US dollar until 1990 and then it had adopted a basket of currencies with a band width of +/- 2%.

The pre-crisis official exchange rate regime in Malaysia was a basket with a band width of +/- 2%. But *de facto* it was a moving band around the US dollar. Thailand had maintained a basket of currencies before the crisis in 1997/98. Before moving to the floating exchange rate in late 1984, the Philippine peso was pegged to the US dollar. Although the Philippines had maintained floating regime officially, its *de facto* exchange rate regime was managed floating. However, just before the crisis (during 1995-97), the peso was again pegged to the US dollar.

The above discussion indicates that six East Asian countries had maintained a variety of intermediate regimes before the crisis in 1997/98. But, using high frequency data in a Frankel-Wei-type regression, McKinnon (2000) recognized that East Asian countries' exchange rate was pegged to the dollar in the pre-crisis period. However, as Ohno (1999) argued and the discussion

above indicates, these East Asian countries targeted their currencies to the dollar more loosely by discretionary adjustments.

At the time of crisis, aside from Malaysia, the other five economies officially adopted a freely floating regime. Malaysia adopted single currency dollar pegged regime. But, after the crisis, most of the officially floaters reverted to a *de facto* intermediate regime, more particularly, to a managed floating regime (see Hernandez and Montiel, 2003). However, using high frequency data, McKinnon and Schnabl (2004a) identified that East Asian countries reverted to *de facto* dollar pegging soon after the crisis. Now it is our interest to know whether the choice of regime in East Asian countries is consistent with their macroeconomic goals. In other words, we want to know the determinants of exchange rate regime choice.

## 3. Data

As already mentioned, this study aims to investigate the regime choice of Indonesia, Malaysia, Thailand, Korea, Philippines and Singapore for the period 1973-1999. As already mention in the Introduction, the sample period is chosen in order to analyze the regime transition (choice) in the pre-crisis and crisis periods so that the choice of regime in the post-crisis period can be predicted (or evaluated). Annual regime classification is our dependent variable. Since the *de jure* and *de facto* classifications do not vary considerably for the three broad categories, fixed, intermediate and floating, I consider mainly the *de jure* regime classification for empirical investigation. The explanatory variables are considered from the competing paradigms of exchange rate regime choice, such as the OCA, macroeconomic stabilization and crisis models

following Von Hagen and Zhou (2005) and Poirson (2001)[2]. A brief description of the explanatory variables is given below.

The economic fundamentals considered in this study are the degree of trade openness, measured by the ratio of export plus import to GDP (OPENNESS), the commodity concentration of foreign trade (COMCON), terms of trade and per capita GDP growth (GDPPC). Commodity concentration (COMCON) is measured as the percentage of all of a country's exports done in a single commodity. Denote exports of commodity $i$ from country $j$ by $x_{ij}$ and country $j$'s total export by $x_j$, the Gini-Hirschman coefficient of COMCON is then defined as $\sqrt{\sum_i \left(x_{ij}/x_j\right)^2}$ . The main justification for the use of this measure is that it is the most commonly used measure of dependence on exports, in other words, it is a measure of trade diversification. Terms of trade (TOT) is measured as the ratio between the prices of total exports and imports. Terms of trade and oil price (OILPRICE) shocks usually call for a flexible regime being chosen (among others, see Broda, 2001).

Traditionally, the ratio of broad money to GDP is used as a proxy for financial sector development, which is a rough indicator of financial sector development. In this study, a cross-country index of financial liberalization (FLI) that ranges between 0 and 18 is considered as a proxy for financial sector development, which is recently developed by Abiad and Mody (2005) (Figure 1). This index is available only for the period 1973-1996. For the rest three years (1997,

[2] Based on Mundell's (1961) seminal work, the early literature found that the fundamentals identified by the OCA approach provide some guidance for observed regime choices (McKinnon, 1963; Heller, 1978; Dreyer, 1978). Recently, by analyzing the regime choice of 93 countries, Poirson (2001) shows that trade openness, the existence of a dominant trading partner, labor mobility and nominal flexibility are associated with a fixed regime, while economic development, diversification of production and exports and size of the economy are associated with a floating exchange rate regime. On the other hand, currency crisis models suggest a large number of endogenous variables such as inflation rate, real exchange rate volatility, GDP growth rate, unemployment rate, fiscal deficit, level of reserves, growth of domestic credit etc. as some of the determinants of exchange rate regime choice. Von Hagen and Zhou (2005) find support for some of the above-mentioned variables that may have guided regime choice of a group of 25 Eastern European transition economies.

1998 and 1999), the FLI is assumed to be constant for which DFLI ($Fli_t - Fli_{t-1}$) is zero. The literature shows that financial liberalization may better represent financial sector development. Various studies show that countries with strong institutions are likely to both liberalize and deploy complementary policy reforms, creating positive statistical correlations between financial integration and a variety of beneficial economic outcomes (Levine, 1997; Abiad, Oomes and Ueda, 2004).

Two variables are used to proxy macroeconomic stabilization process: volatility of real exchange rate (RERVOL) and inflation (CPIG). Real exchange rate (RER) volatility is measured as standard deviation of yearly change in the RERs.

To account for the risk of currency crisis, four variables are considered: the ratio of reserve (minus gold) to broad money (RESERVE), the ratio of general government budget balance to GDP (PUBFIN1), the ratio of external debt to GDP (PUBFIN2) and capital mobility. The variable 'RESERVE' is used as a measure for the availability of internal liquidity. The variables 'PUBFIN1' and 'PUBFIN2' are used as proxies of fiscal performance. The U.S capital flows to emerging countries (CAPFLOW) is used to proxy global capital mobility.

The sources of data are the *International Financial Statistics* of the IMF, WTO trade statistics and the World Bank.

## 4. Methodologies and empirical results

### *4.1 The dynamic MSM Model of regime transition*

The multi-state Markov (MSM) model is applied to analyze exchange rate regime transition dynamics in East and Southeast Asian countries. The model assumes continuous time Markov chain and explicitly takes the duration of a regime into account (see Kay, 1986; Marshall

and Jones, 1995). This model has been widely used in the biomedical sciences to analyze transition between disease states. I became interested to apply the MSM model because it gives the estimates of transition intensities as a non-linear function of explanatory variables by taking into account the "duration" of a regime explicitly. Note that the Markov model assumes that transition to an alternative regime depends on the current regime, irrespective of past history. Masson (2001) argues that although the Markov assumption appears to be somewhat restrictive, as a first approximation, it would seem to be an adequate framework for examining exchange rate regime transitions as "it supposes that a typical currency will face the same likelihood that some shock will push it to an alternative regime" (p. 573).

The model is specified as

$$\lambda_{ij}(t \mid z) = \lambda_{ij} e^{\beta_{ij} Z}, \text{ (i, j = 1, 2, 3)} \qquad (1)$$

where $\lambda_{ij}$ represents transition intensities, that is, the rate of transition from regime *i* to *j*, which can be defined as

$$\lambda_{ij} = \lim_{\Delta t \to 0} \frac{Pr\{transition\ from\ regime\ i \to j\ in(t, t+\Delta t] \mid regime\ i\ at\ time\ t\}}{\Delta t}. \qquad (2)$$

The vector Z in Eq. (1) consists of explanatory variables DFLI, TOT, CAPFLOW, GDPPCG, OILPRICE, CPIG, OPENNESS, RERVOL, RESERVE, PUBFIN1 and $\beta_{ij}$ denotes the coefficients of explanatory variables on the transition from regime *i* to *j*.

Suppose, countries make transitions and reverse transitions within three broad categories of exchange rate regimes— fixed (1), intermediate (2) and floating (3), either voluntarily or involuntarily. It is found that there is no absorbing state in the exchange rate regime transition process in East Asia. Therefore, the transition intensity matrix is defined as,

$$\Gamma = \begin{pmatrix} -(\lambda_{12} + \lambda_{13}) & \lambda_{12} & \lambda_{13} \\ \lambda_{21} & -(\lambda_{21} + \lambda_{23}) & \lambda_{23} \\ \lambda_{31} & \lambda_{32} & -(\lambda_{31} + \lambda_{32}) \end{pmatrix}. \qquad (3)$$

The elements of the matrix $\Gamma$, $\lambda_{ij}$'s are defined in (2). Assume that the transition intensities i.e. instantaneous rate of transition are independent of time and the intensities follow the property $\lambda_{ii} = -\sum_{i \neq j} \lambda_{ij}$ ; $i, j = 1, 2, 3$, that is, *row sum is zero*.

The relationship between the transition probability matrix **P**(t) and the transition intensity matrix $\Gamma$ can be established with the Kolmogorov forward differential equation

$$\frac{\partial \mathbf{P(t)}}{\partial \mathbf{t}} = \mathbf{P(t)}\Gamma , \qquad (4)$$

where the (i,j)th element of the matrix **P**(t), $p_{ij}$ (i,j = 1, 2, 3) represents the probability of transition from state $i$ to $j$ in a time interval $t$. Thus the transition probability matrix **P**(t) can be expressed as

$$\mathbf{P}(t) = \begin{pmatrix} p_{11} & p_{12} & p_{13} \\ p_{21} & p_{22} & p_{23} \\ p_{31} & p_{32} & p_{33} \end{pmatrix} \qquad (5)$$

where row sum of *P(t)* is one.

**The Likelihood function**

A general method for evaluating the likelihood for a multi-state Markov model in continuous time, applicable to any form of transition is discussed here (for details, see Kalbfleisch and Lawless, 1985; Kay, 1986). The likelihood is calculated from the transition probability matrix **P**(t). The likelihood function is the product of all individual contributions and the total contribution of an individual country to the likelihood function is the result of the product of the contribution from each observed transition.

For a country *k*, the likelihood function is formulated as:

$$L(\theta) = \prod_k \left[P_{k11}(t \mid z)\right]^{s_{11}} \left[P_{k12}(t \mid z)\right]^{s_{12}} \left[P_{k13}(t \mid z)\right]^{s_{13}} \left[P_{k21}(t \mid z)\right]^{s_{21}} \left[P_{k22}(t \mid z)\right]^{s_{22}} \left[P_{k23}(t \mid z)\right]^{s_{23}} \left[P_{k31}(t \mid z)\right]^{s_{32}} \left[P_{k32}(t \mid z)\right]^{s_{32}} \left[P_{k33}(t \mid z)\right]^{s_{33}} \quad (6)$$

where $\theta = (\lambda, \beta)$, $\lambda = (\lambda_{ij})$ and $\beta = (\beta_{ij})$ for *i, j* = 1, 2, 3. The variable $s_{ij}$ takes the value 1 if transition occurs and 0 if otherwise. For example, if at time *t*, a country is in state 1 (fixed regime), at time *t+1*, the country can be in either of the states 1 (fixed), 2 (intermediate) or 3 (float). Therefore, $s_{11+} s_{12} + s_{13} = 1$, and so on. The log-likelihood function can be calculated by taking the log of the likelihood function.

The maximum likelihood estimates of $\theta = (\lambda,\beta)$ can be obtained by maximizing the log likelihood, and applying any of the iterative procedures such as the quasi-Newton algorithm or Nelder-Mead simplex-based algorithm. The MSM model is estimated in this paper using the "msm" package of **R** software.

Using the multi-state Markov (MSM) model, I first analyze regime transition dynamics among the three regime categories: *fixed*, *intermediate* and *floating* in Table 4. Note that hard pegs like currency union, currency board or dollarization do not exist among the sample countries, so fixed regime category includes only single currency pegs.

Since the explanatory variables are not truly exogenous to the regime choices in reality, all the explanatory variables (except CAPFLOW and OILPRICE) are instrumentalized using their own one-year lagged values as instruments. The results are reported in Table 4. The last row of Table 4 reports the estimated transition intensities, $\lambda_{ij}$ (or, the rate of transition). It is found that the rates of transition between regimes in six East Asian countries are subtle and most are insignificant, indicating that past regime choices do not strongly influence current decisions. This finding is reasonable because East Asian economies have a common history of persistently

following a particular regime (e.g. intermediate) over a long time. Only the coefficient on the transition from single currency peg to limited flexibility (intermediate) is moderately significant.

Considering the effect of explanatory variables on transitions, $\beta_{ij}$, Table 4 shows that none of the variables implied by OCA or macroeconomic stabilization or currency crisis are significant to the regime transitions in East Asia. This is expected as the transition intensities ($\lambda_{ij}$) are statistically insignificant.

*The dynamics of de facto regime transitions*

In this section, I examine the transition intensities among five *de facto* regimes ($\lambda_{ij}$, i,j = 1,2,…,5) as classified in Table 2. The transition intensity matrix reported in Table 5 shows that the rates of transitions among more specific *de facto* regimes are insignificant. But the last row of the matrix shows that the rate of transition from freely falling category (if monthly inflation > 40%) to other conventional regimes is higher than the other rates, indicating that East Asian countries often move to *de facto* rigid regimes to stabilize high inflation.

The empirical results on regime transitions indicate that East Asian countries prefer staying in a particular regime (e.g. intermediate regime) over time and, hence, analyzing static regime choice could provide better results to increase our understanding of the determinants of regime choice.

### *4.2 A static ordered logit model of regime choice*

This section investigates the determinants of static regime choice by using the ordered logit model. Given the discrete ordinal nature of the dependent variable 'regime', which consists of fixed = 1, intermediate = 2 and floating = 3, I have used the ordered logit model. The ordered

logit model extends the traditional logit to allow for multiple discrete outcomes that can be ranked. A larger value of the dependent variable indicates that a more flexible regime is desirable for a country in the period under consideration. The explanatory variables used are those discussed in Section III. The model is specified with country fixed effects because of small sample size as follows:

$$\begin{aligned}\text{Regime} = {} & \gamma_1 \text{DFLI} + \gamma_2 \text{TOT} + \gamma_3 \text{CAPFLOW} + \gamma_4 \text{GDPPCG} + \gamma_5 \text{OILPRICE} + \\ & \gamma_6 \text{CPIG} + \gamma_7 \text{OPENNESS} + \gamma_8 \text{RERVOL} + \gamma_9 \text{RESERVE} + \gamma_{10} \text{PUBFIN1} + \\ & \gamma_{11} \text{PUBFIN2} + \gamma_{12} \text{COMCON} + \varepsilon_{it} \qquad (7)\end{aligned}$$

In Eq. (7), one-year lagged values of all explanatory variables are used except for exogenous capital mobility and oil price. A positive sign associated with an explanatory variable means that a larger value raises the probability of more flexible regimes being chosen. The error term $\varepsilon_{it}$ is assumed to be independently and identically distributed with a logistic distribution function (for details of the model, see Greene, 2000).

Table 6 reports the results. From OCA perspectives, the variables, DFLI ($FLI_t - FLI_{t-1}$), GDPPC and OPENNESS are found to be significant. Financial liberalization and economic development (represented by per capita GDP) significantly increase the probability of a fixed regime being selected. Openness increases the probability of a flexible regime, which contradicts the traditional OCA prediction. Trade structures such as terms of trade and commodity concentration do not have any significant impact on the regime choices in this region. Oil price (OILPRICE) shock has not been found significant to the choice of a regime.

From macroeconomic stabilization perspective, high real exchange rate volatility (RERVOL) is found significant to the choice of a flexible regime. Higher inflation (CPIG) leads

to the choice of a fixed regime. These findings are consistent with the predictions of conventional models of macroeconomic stabilization.

From currency crisis perspectives, reserve sufficiency does not play any significant role to the choice of a regime in East Asia. This is understandable since there is no reason to expect that there is a necessary link between total reserves and the type of exchange rate arrangements. Although movement towards a fixed regime requires that the country hold a strong reserve position, it is not inconsistent for a country to move to flexibility with a large stock of reserves. Large fiscal deficit (PUBFIN1) has significant influence on the choice of a flexible regime. The coefficient on global capital mobility (CAPFLOW) is positive and significant, indicating that high intensity of global capital mobility increases the probability of a flexible regime being selected.

The results of this study are compared with some existing studies in Table 7. This comparison shows that regime choices in East Asia are largely consistent with the predictions of international macroeconomics.

## 5. Complete fixity or flexibility: A discussion

The analysis in this study suggests that while the reasoning of optimum currency area literature provides considerable guidance for the choice of a fixed exchange rate regime in East Asia, macroeconomic stabilization and crisis literature both provide guidance for the choice of a floating exchange rate regime. A case in point is the adoption of a common currency union, which is not likely in the near future since there is no indication of such political will and consensus among the policy makers that can make it possible. On the other hand, the present trends of regime choice suggest that East Asian countries are not willing to adopt a currency

board or dollarization (or "yenization") soon. Hence, our focus is on the possibility of adopting a freely floating regime in East Asia.

Note that, with the exception of Malaysia, the other five economies Philippines, Thailand, Korea, Singapore and Indonesia officially adopted a freely floating regime at the time of crisis. They have done so to stabilize exchange rate movements by slowing the pace of depreciation and to accumulate a "war chest" of dollar reserves to avert any future crisis. However, their reversion to *de facto* intermediate regime in the form of managed floating poses the question as to whether East Asian countries are eligible for adopting a floating regime.

Current managed floating can be viewed as "learning to float" because, with the adoption of a managed floating, policy makers can learn how to conduct optimal monetary policies under a floating regime. "It may take time, for example, for the central bank to refine the new internal procedures and communication strategies involved in inflation targeting" (Rogoff et al., 2003; p. 52). Also, authorities and market agents may take the opportunity of this period of managed floating to become comfortable with exchange rate flexibility. More particularly, learning is a process that requires reforms and building institutions that may reduce the risks associated with freely floating exchange rate regime. The East Asian countries underwent massive financial liberalization during the 1980s and 1990s and recently they are working toward establishing an Asian (ASEAN+3) bond market that could help them reduce "liability dollarization" through borrowing abroad in their own currencies. In addition, East Asian countries have a good history of macroeconomic discipline and have acquired strong reserve positions (see Terada-Hagiwara, 2005). All these are stimulating factors for adopting a floating regime and indicative to "learning to float".

The advantages of adopting a floating regime are well known. These include: monetary independence, automatic adjustment to trade shocks, the retention of seigniorage and lender of last resort capability and avoidance of speculative attacks. The main concern is on the possible adverse effect of high exchange rate volatility on the economy induced by a floating rate regime. In fact, this concern is related to the choice of a proper nominal anchor in floating regime. Frankel (2003) discusses a wide array of possible nominal anchors from which East Asian countries can choose in the case of floating. According to Frankel, East Asian countries may target either the growth of the money supply, nominal income or inflation, which may help them keep volatility at a tolerable level.

Furthermore, more importantly, an argument for flexibility implies that there is a little room for these countries to benefit from a peg or an intermediate regime option. In this regard, Rogoff et al. (2003) argued: "With economic advancement, the inflation benefit of pegged and intermediate regimes is lost, perhaps because policy credibility and track record are well established. At the same time, the risk associated with exchange rate flexibility declines as it becomes easier for governments and private agents to borrow in their own currencies" (p. 54).

Based on the above discussion on the relative merits of adopting a floating exchange rate regime, East Asian authorities may find intermediate regimes, including a common currency basket less attractive. Moreover, a common basket is plagued with problems of assigning appropriate weights to currencies as well as proper management.

## 6. Conclusion

This study presents an empirical investigation of the determinants of the choice of exchange rate regimes of six East Asian countries. The results indicate that the transition

dynamics of exchange rate regime in East Asian countries are subtle, implying a common bias toward a particular regime or monetary standard in this region. This finding also gives an indication that one exchange rate regime is likely to hold sway across East Asia.

The static regime choices are found largely consistent with the predictions of international macroeconomics during the period under consideration. The variables, economic development, financial sector development and inflation are significant to the fixed regime choice. On the other hand, high degree of trade openness, capital mobility, real exchange rate volatility and fiscal performance increase the likelihood of a more flexible regime being selected. Hence, these findings suggest that either a more fixed or a flexile regime is likely to be adopted in East Asia. However, as far as macroeconomic vulnerability and crisis are concerned, it is more likely that managed floating regimes will give way to freely floating regimes.

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Table 1 *De jure* exchange rate regimes in East Asian countries, 1973-99

| Year | Indonesia | Korea | Malaysia | Philippines | Singapore | Thailand |
|---|---|---|---|---|---|---|
| 1973 | 1 | 1 | 2 | 3 | 1 | 1 |
| 1974 | 1 | 1 | 2 | 3 | 1 | 1 |
| 1975 | 1 | 1 | **1** | 3 | 1 | 1 |
| 1976 | 1 | 1 | 1 | 3 | 1 | 1 |
| 1977 | 1 | 1 | 1 | 3 | 1 | 1 |
| 1978 | **2** | 1 | 1 | 3 | 1 | 1 |
| 1979 | 2 | 1 | 1 | 3 | 1 | 1 |
| 1980 | 2 | 2 | 1 | 3 | 1 | 1 |
| 1981 | 2 | 2 | 1 | 3 | 1 | 1 |
| 1982 | 2 | 2 | 1 | 3 | 1 | **2** |
| 1983 | 2 | 2 | 1 | **2** | 1 | 2 |
| 1984 | 2 | 2 | 1 | 3 | 1 | **1** |
| 1985 | 2 | 2 | 1 | 3 | 1 | 1 |
| 1986 | 2 | 2 | 1 | 3 | 1 | 1 |
| 1987 | 2 | 2 | 1 | 3 | **2** | 1 |
| 1988 | 2 | 2 | 1 | 3 | 2 | 1 |
| 1989 | 2 | 2 | 1 | 3 | 2 | 1 |
| 1990 | 2 | 2 | 1 | 3 | 2 | 1 |
| 1991 | 2 | 2 | 1 | 3 | 2 | 1 |
| 1992 | 2 | 2 | 1 | 3 | 2 | 1 |
| 1993 | 2 | 2 | **2** | 3 | 2 | 1 |
| 1994 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1995 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1996 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1997 | **3** | **3** | 2 | 3 | 2 | **2** |
| 1998 | 3 | 3 | 2 | 3 | 3 | **3** |
| 1999 | 3 | 3 | **1** | 3 | 3 | 3 |

*Note:* 1= Fixed regime, 2 = Intermediate regime, 3 = Floating regime; Bold figures indicate regime change. *Source:* the IMF.

Table 2 *De facto* regime classification of East Asian countries

| Year | Indonesia | Korea | Malaysia | Philippines | Singapore | Thailand |
|---|---|---|---|---|---|---|
| 1973 | 5 | 3 | 1 | 3 | 2 | 1 |
| 1974 | **3** | **1** | 1 | 3 | 2 | 1 |
| 1975 | 3 | 1 | **2** | 3 | 2 | 1 |
| 1976 | 3 | 1 | 2 | 3 | 2 | 1 |
| 1977 | 3 | 1 | 2 | 3 | 2 | 1 |
| 1978 | 2 | 1 | 2 | 3 | 2 | 1 |
| 1979 | 2 | 1 | 2 | 3 | 2 | 1 |
| 1980 | 2 | **2** | 2 | 3 | 2 | 1 |
| 1981 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1982 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1983 | 2 | 2 | 2 | **5** | 2 | 1 |
| 1984 | 2 | 2 | 2 | 5 | 2 | 1 |
| 1985 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1986 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1987 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1988 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1989 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1990 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1991 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1992 | 2 | 2 | 2 | 2 | 2 | 1 |
| 1993 | 2 | 2 | 2 | **3** | 2 | 1 |
| 1994 | 2 | 2 | 2 | 3 | 2 | 1 |
| 1995 | 2 | 2 | 2 | 1 | 2 | 1 |
| 1996 | 2 | 2 | 2 | 1 | 2 | 1 |
| 1997 | **5** | **5** | **4** | **3** | 2 | **5** |
| 1998 | 5 | **4** | **1** | 3 | **3** | **3** |
| 1999 | **4** | 4 | 1 | 3 | 3 | 3 |

*Note*: Bold figures indicate regime change.
Source: Reinhart and Rogoff (2004), the codes are defined in Table 3.

Table 3 The *de facto* classification (RR) codes

| Code | Regime description |
|---|---|
| 1 | No separate legal tender |
| 1 | Pre announced peg or currency board arrangement |
| 1 | Pre announced horizontal band that is narrower than or equal to +/-2% |
| 1 | *De facto* peg |
| 2 | Pre announced crawling peg |
| 2 | Pre announced crawling band that is narrower than or equal to +/-2% |
| 2 | *De facto*r crawling peg |
| 2 | *De facto* crawling band that is narrower than or equal to +/-2% |
| 3 | Pre announced crawling band that is wider than or equal to +/-2% |
| 3 | *De facto* crawling band that is narrower than or equal to +/-5% |
| 3 | Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time) |
| 3 | Managed floating |
| 4 | Freely floating |
| 5 | Freely falling* |

* Freely falling category includes the cases that experience monthly inflation 40% or more.

Table 4 MSM model estimates (1973-99)

| | *De jure* regime transition coefficients | | | |
|---|---|---|---|---|
| | Fixed to intermediate ($\beta_{12}$) | Intermediate to fixed ($\beta_{21}$) | Intermediate to float ($\beta_{23}$) | Float to intermediate ($\beta_{32}$) |
| DFLI | -0.26 (1.91) | -0.13 (3.0) | -0.22 (1.49) | -0.03 (13.15) |
| TOT | -0.11 (0.15) | 0.017 (0.18) | 0.02 (0.13) | -0.11 (2.15) |
| CAPFLOW | -0.009(0.06) | 0.02 (0.09) | 0.08 (0.06) | -0.001(0.08) |
| GDPPCG | -0.08 (38.7) | -0.35 (121.6) | 0.28 (43.6) | 0.01 (150.60) |
| OILPRICE | 0.04 (0.27) | 0.14 (0.68) | 0.08 (0.33) | 0.06 (0.60) |
| CPIG | -0.04 (28.39) | -0.02 (75.77) | 0.05 (45.44) | -0.008 (42.13) |
| OPENNESS | -0.08 (38.7) | -0.05 (10.2) | -0.20 (3.29) | -0.08 (40.14) |
| RERVOL | -1.26 (19.8) | 0.02 (20.8) | 0.21 (5.7) | 0.01 (33.04) |
| RESERVE | -0.13 (10.08) | -0.11 (26.33) | -0.003 (7.6) | -0.03 (71.50) |
| PUBFIN1 | 0.19 (7.10) | 0.25 (27.2) | 0.12 (6.03) | 0.19 (49.5) |
| Transition intensities ($\lambda_{ij}$) | $\lambda_{12}$ = 0.01 (0.01) | $\lambda_{21}$ = 0.001 (0.007) | $\lambda_{23}$ = 0.002 (0.007) | $\lambda_{32}$ = 0.01 (0.15) |

*Note:* Standard errors are in parentheses. There is no evidence of transition from fixed to floating ($\lambda_{13}$) or floating to fixed regime ($\lambda_{31}$) in the sample countries during the period under consideration.

Table 5 Transition intensity matrix (RR *de facto* classification)

| Rates of transition from\ to ($\lambda_{ij}$: $i,j = 1,2,\ldots,5$) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | -- | 0.05 (0.04) | 0.02 (0.03) | 0 (0.0) | 0.04 (0.04) |
| 2 | 0.00 (0.0) | -- | 0.02 (0.02) | 0.005 (0.01) | 0.04 (0.03) |
| 3 | 0.09 (0.07) | 0.04 (0.06) | -- | 0 (0.0) | 0.07 (0.08) |
| 4 | 0.34 (0.35) | 0 | 0 | -- | 0 |
| 5 | 0 (0.0) | 0.23 (0.25) | 0.51 (0.38) | 0.38 (0.29) | -- |

*Note:* Standard errors are in parentheses; codes of regimes are given in Table 3.

Table 6 Ordered logit model estimates (with country fixed effects)

| | Coef. | Robust Std. Error | P>z |
|---|---|---|---|
| DFLI | -0.62 | 0.37 | 0.10 |
| TOT | 0.00 | 0.03 | 0.91 |
| CAPFLOW | 0.03 | 0.01 | 0.00 |
| GDPPCG | -21.97 | 12.32 | 0.07 |
| OILPRICE | 0.07 | 0.05 | 0.13 |
| CPIG | -17.12 | 5.62 | 0.00 |
| OPENNESS | 4.06 | 1.99 | 0.04 |
| RERVOL | 5.63 | 2.09 | 0.01 |
| RESERVE | 5.75 | 3.70 | 0.12 |
| PUBFIN1 | 6.41 | 3.53 | 0.07 |
| PUBFIN2 | -19.51 | 17.88 | 0.28 |
| COMCON | -0.89 | 1.43 | 0.54 |
| *Log-likelihood* | -49.73 | | |
| *Observations* | 143 | | |

Table 7 Determinants of regime choice

| Determinants | Proxies | Variables | Preferred regime (according to general literature) | Eastern European countries (Von Hagen and Zhou, 2005) | For East Asian countries (Present study) |
|---|---|---|---|---|---|
| *OCA fundamentals* | | | | | |
| High degree of economic openness | Trade openness | OPENNESS | Fixed | Fixed | Flexible |
| High trade concentration: Commodities | Com. Concentration | COMCON | Flexible | Flexible | Not significant |
| High level of economic development | Per capita GDP growth | GDPPCG | Ambiguous | Fixed | Fixed |
| High level of financial sector development | Financial liberalization index | FLI | Ambiguous | N/A | Fixed |
| High terms of trade | Terms of trade | TOT | Flexible | N/A | Not significant |
| *Optimal Stabilization* | | | | | |
| Dominance of real shocks | RER volatility (yearly level change) | RERVOL | Flexible | Fixed | Flexible |
| Transitory inflation shocks | Inflation (based on CPI) | CPIG | Fixed | Flexible | Fixed |
| Transitory oil price shock | Oil price in world market | OILPRICE | Flexible | N/A | Not significant |
| *Risk of currency crisis* | | | | | |
| Lack of international reserve | Ratio of Reserve (minus gold) to broad money | RESERVE | Flexible | Fixed | Not significant |
| Unsustainable public finance | Ratio of budget deficit to GDP | PUBFIN1 | Flexible | Not significant | Flexible |
| Capital mobility | Ratio of external debt to GDP | PUBFIN2 | Fixed | Not significant | Not significant |
| | U.S. Capital flows to emerging countries | CAPFLOW | Flexible | N/A | Flexible |

Figure 1 Financial liberalization index