

The Post-crisis Exchange Rate Management in Selected East Asian Countries

- Flexibility of Exchange Rate and Sensitivity to Inflation Rate -

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Abstract

The 1997-98 Asian crises have refocused attention on exchange rate management of East Asian countries. Most views expressed criticize the pre-crisis US dollar peg regime as one of the causes of the crisis. Then, the question arises as to whether, after the crisis, the East Asian countries are simply returning to the pre-crisis US dollar standard, or whether they have learned a lesson from the crisis and are finding another path to follow. This article examines post-crisis exchange rate management in selected East Asian countries. The main findings are as follows: First, we found that the exchange rate flexibility of all the sample countries has increased from the pre-crisis period towards the post-crisis period. Second, we further found that the post-crisis managed exchange rates of Korea, the Philippines, Thailand have been sensitive to domestic inflation rates, and that Korea has raised the weight assigned to the Japanese yen while reducing the US dollar dominance in her post-crisis exchange rate management. Third, we cannot necessarily say that there is robust evidence that a regional coordination in the sample countries' exchange rate management has been strengthened as a whole in the post-crisis period.

1. Introduction

Exchange rate management is one of the central issues of macroeconomic policies. Since the postwar period, there has been a long-term debate over the merits of fixed versus floating exchange rates. The debate, which is typically framed in terms of the trade-off between credibility and flexibility, has gone through several swings of the pendulum. Recently, the debate on exchange rate regimes has become focused on whether or not the intermediate regimes such as target zones, crawling and basket pegs are vanishing, in other words, whether or not exchange rate regimes are moving to a corner solution with the “hard peg” or the “free float”. So far, no clear consensus has been reached.

The 1997-98 Asian crises have refocused attention on exchange rate management of East Asian countries. Most views expressed criticize the pre-crisis US dollar peg regime as one of the causes of the crisis. It is said that this regime induced short-term external over-borrowing and caused the appreciation of real exchange rates with the loss of competitiveness. Then, the question arises as to whether, after the crisis, the East Asian countries are simply returning to the pre-crisis US dollar standard, or whether they have learned a lesson from the crisis and are finding another path to follow.

This article examines post-crisis exchange rate management in selected East Asian countries. Specifically, the two main questions are these: whether the flexibility in the managed exchange rate has increased from the pre-crisis period (of the dollar peg system) towards the post-crisis period, and whether a regional coordination in the post-crisis exchange rate management has been strengthened.

The rest of the paper is organized as follows: Section 2 reviews the debates on exchange rate regimes and clarifies this article’s position among the debates. Section 3 conducts empirical studies of the post-crisis exchange rate management on the selected East Asian countries. Section 4 presents concluding remarks.

2. Debates on Exchange Rate Regimes and This Article’s Position

This section reviews the debates on exchange rate regimes and clarifies this article’s position among the debates. We first summarize the

long-term history of debates over the merits of fixed versus floating exchange rates since the postwar period. We then focus on recent debates over the exchange rate regimes: the corner solutions hypothesis, the “Fear of Floating” hypothesis, and the regional cooperation in exchange rate policies. Based on the reviews, we clarify this article’s position among the debates on exchange rate regimes.

2.1 Long-term Debates: Fixed versus Floating Exchange Rates

We first review the long-term history of debates over the merits of fixed versus floating exchange rates since the postwar period. Frankel (1999) summarizes the advantage of each exchange rate regime as follows: the two big advantages of a fixed exchange rate are (1) that it reduces transactions costs and exchange-rate risk which can discourage trade and investment, and (2) that it provides a credible nominal anchor for monetary policy; the big advantage of a floating exchange rate is that it enables a country to pursue an independent monetary policy. In short, the adoption of a fixed regime automatically acquires all the credibility accumulated by the issuer of the anchor currency, while floating rates maximize the flexibility with which the authorities can use monetary policy for economic stabilization. Therefore, the history of debates can be framed in terms of the trade-off between credibility and flexibility.

The debates have gone through several swings of the pendulum, meeting the demands of the times. Frankel et al. (2000) reviews the postwar history of the debates as follows. At the time of Bretton Woods, the architects of the postwar system favored fixed exchange rates, attributing the economic instability of the interwar period, in part, to flexible rates. During the 1960s, a growing number of economists came to favor floating rates, responding to the widening US balance-of-payments disequilibrium that led to the breakdown of the Bretton Woods system. During the 1980s, the accumulating experience with high inflation in many parts of the world brought the pendulum back. Setting a target for the exchange rate came to be viewed as one way for central banks to realize monetary stabilization. New theories of rational expectation and dynamic consistency concluded that a commitment to such a nominal anchor, if credible, would even allow disinflation without the usual costs

of lost output and employment. In the late 1990s we faced the second complete swing of the pendulum out and back, as conventional wisdom blamed exchange rate targets. The trend toward increased preference for greater exchange rate flexibility reflects many instances in which countries faced balance of payment difficulties for crises in Mexico (1994-95), East Asia (1997-98), Russia (1998), and Brazil (1999). The debates over the exchange rate regime still seem to continue.

2.2 Recent Debate (1): Corner Solutions Hypothesis

We next focus on recent debates over the exchange rate regimes. The hypothesis of the "Corner Solutions" is one of the new propositions. As the latest study, Fischer (2001) discusses this hypothesis. This hypothesis involves opting either, on the one hand, for full flexibility, or, on the other, for rigid institutional commitments to fixed exchanges in the form of currency boards or full monetary union with the dollar or euro. It is said that the intermediate exchange rate regimes such as the target zones, crawling and basket pegs, are no longer feasible and are going to disappear.

This hypothesis has the following analytical backgrounds. First, the principle of the Impossible Trinity explains the hypothesis. This principle says that a country has to give up one of three goals: exchange rate stability, monetary independence, and financial market integration. It cannot have all three simultaneously. Summers (1999) suspect this means that as capital market integration increases, countries will be forced increasingly to more pure floating or more purely fixed regimes. ADB (2001) explained, from the practical viewpoint, that large and liquid international capital markets make it more difficult for national authorities to support a shaky currency peg, since the resources of the markets far outstrip the reserves of even the best-armed central banks and governments. Effective defense of exchange rates requires raising interest rates and restricting domestic credit, something that will have significant costs especially in emerging market economies with their fragile financial and political systems.

Second, Frankel et al. (2000) offered a theoretical rationale for the corners hypothesis by introducing the notion of "Verifiability" and suggested that a simple peg or a simple float may be more verifiable by

market participants than a more complicated intermediate regime. They also offered some empirical evidence that intermediate regimes do in fact inspire less credibility than institutional arrangements such as dollarization.¹

2.3 Recent Debate (2): “Fear of Floating” Hypothesis

There are some counter-arguments against the hypothesis of the “Corner Solutions”. One of them argues from empirical studies that many countries that are categorized as having floating currencies are, in effect, holding the intermediate exchange rate regimes. Calvo and Reinhart (2000) insisted that a careful reading of the evidence on exchange rate policy presents a strikingly different picture; countries that say they allow their exchange rate to float mostly do not – there seems to be an epidemic case of the “fear of floating”, particularly among emerging market economies. They presented an analytical model that suggests that, even in the best of times, when countries retain voluntary access to international capital markets, lack of credibility will lead to the “fear of floating”. They also found, in their empirical analyses across 154 exchange rate arrangements, a low variability of exchange rates and a high volatility of central bank reserves that suggest significant central bank intervention.²

When it comes to the issue of credibility, Frankel et al. (2000) argued that, since the 1990s was a period during which high inflation was no longer such a big problem as previously in most places, the focus is now more on establishing in the financial markets credibility that the local currency will not lose value against the dollar, than on credibility in the labor and goods markets that the currency will not lose value in terms of wages and prices. To be specific, the lack of credibility originates from incomplete domestic financial markets, as the “original sin” hypothesis tells us. Eichengreen and Hausmann (1999) explained that the “Original sin” is a situation in which the domestic currency cannot be used to borrow abroad or to borrow long term even domestically, and that the problem is that a country whose external liabilities are necessarily denominated in foreign exchange is by definition unable to hedge.³

Williamson (2000) also questioned the efficacy of the two-corner solution by stating that the currency boards have already been

subjected to substantial speculative pressure both in Argentina and in Hong Kong, and that a country with a freely floating rate may suffer from excess volatility of the exchange rate. He argued that the behavior of most of the emerging market countries is motivated not by an irrational, short-run “fear of floating”, but by legitimate concerns that floating will generate long-run misalignments. Williamson then recommends the BBC rules (basket, band, crawl) for emerging market economies.

Kawai (2002), recognizing that the two-corner solution approach does not to be realistic in many emerging East Asian economies because of the “fear of floating”, stated that a reasonable exchange rate policy for the region would be to stabilize rates to a basket of currencies consisting of the US dollar, the yen and the euro, given emerging East Asia’s diversified trade and FDI relationships with the United States, Japan, and the European Union and given the continued high exchange-rate volatility among the tri-polar currencies. French and Japanese staff (2002) also argued that a possible solution for many emerging market economies could be a managed floating exchange rate regime whereby the currency moves within a given band with its center targeted to a basket of currencies including the dollar, the yen and the euro.

2.4 Recent Debate (3): Regional Cooperation

The recent debates over the exchange rate regimes are going a step further, arguing that there must be coordination in selecting an exchange rate regime among countries in the region with similar trading structures and with high intra-regional trading shares. Ogawa and Ito (2000) argued that: An optimal exchange rate regime of country A (say, Thailand) depends on the exchange rate regime of country B (say, Malaysia), with which country A has a high proportion of trade; The dollar weights in the currency baskets of the two countries are determined as a Nash equilibrium; It may be helpful to calculate and publish the typical currency basket unit for the region so that the coordination failure may be avoided. Kawai (2002) also insisted that for intra-regional exchange rate stability, greater coordination on the currency basket policy would be desirable, and this needs to be supported by regional surveillance and financing mechanisms.⁴

As for the possibility of an optimal currency area in East Asia,

Bayoumi, Eichengreen, and Mauro (2000) made an empirical analysis by using a structural VAR model. This paper analyzed the extent to which ASEAN may be suitable for a regional monetary arrangement. On the economic front, it reviewed evidence on patterns of trade, economic shocks, the extent of factor mobility, and the monetary transmission mechanism, and found that ASEAN today is less suitable for a regional monetary arrangement than the euro area was before the Maastricht Treaty. On the political front, it analyzed the prerequisites for monetary integration in light of 50 years of European experience. It concluded that a firm political commitment would be the key to ensuring the form of a regional monetary arrangement.

2.5 This Article's Position in the Debates on Exchange Rate Regimes

Ito (2001) stated that the debate over what would be desirable exchange rate regimes for Asian countries seems likely to continue, although the selection of an exchange rate regime will be crucial for Asian countries' further recovery and beyond. For the empirical analysis in the following section, we here clarify this article's position among the fore-mentioned debates on exchange rate regimes.

First, among the recent debates of Section 2.2 to 2.4, we follow the "Fear of Floating" hypothesis, considering that the two-corner solution approach does not seem to be realistic in many emerging East Asian economies; we presume that emerging East Asian economies have adopted "soft peg" regime in the exchange rate management, namely, intermediate regime placed between free floating and such a rigid fixed system as currency board. Taguchi (2002), by examining the volatilities of their foreign exchange reserves, showed that Indonesia, Korea, the Philippines and Thailand are holding to the "soft peg" even in the post-crisis period regardless of their announcement of the "free float".

Second, we then examine whether the flexibility in the managed exchange rate has increased from the pre-crisis period (of the dollar peg system) towards the post-crisis period, under the framework of the intermediate exchange rate regime. Concerning with the principle of the Impossible Trinity, Frankel et al. (2000) makes a negative comment on the explanation of "Corner Solutions" by Summers (1999), by stating that economists tend to believe in interior solutions for most problem, and that

there is nothing that prevents the government from pursuing a managed float in which half of every fluctuation in demand for its currency is accommodated by intervention and half is allowed to be reflected in the exchange rate. Following this argument, the intermediate regime can be an interior solution by giving up a bit of all three. As capital market integration increases, one of the interior solutions will force countries to raise the flexibility of exchange rate. We can speculate that the 1997-98 Asian crisis had been caused by the inconsistent policy to stick to the dollar peg regime (inflexible exchange rate) under the capital market integration. Therefore, It may be crucial whether the crisis-experienced East Asian countries, learning a lesson from the crisis, have raised the flexibility of exchange rate in the post-crisis period.⁵

Third, we will not step further into the issue of whether there must be coordination in selecting an exchange rate regime among countries in the East Asian region. As Bayoumi, Eichengreen, and Mauro (2000) implied, it seems to be premature for emerging East Asian economies to form the optimum currency area. This paper, as a very first step of approaching to regional coordination issues, simply examines whether a regional coordination in the East Asian post-crisis exchange rate management has been strengthened, through analyzing actual exchange rate movements.

3. Empirical Studies on Selected East Asian Countries

We here conducted an empirical analysis of the post-crisis exchange rate management on the selected East Asian countries. We here focus, as sample countries, on the hardest-hit crisis countries among the East Asian countries: Indonesia, the Republic of Korea, the Philippines, and Thailand (we here exclude Malaysia because she has formally adopted the US dollar peg system since 1998). In this section, we first review the previous studies analyzing directly the post-crisis exchange rate management in East Asian countries. Second, we examine whether exchange rate flexibility has really increased from the pre-crisis period towards the post-crisis period in the sample countries. Third, we then analyze the factors to make exchange rate movements more flexible in the post-crisis period. Fourth, we examine whether a regional coordination in the sample countries' post-crisis exchange rate

management has been strengthened.

3.1. Previous Studies

We here pick up some important studies on the post-crisis exchange rate management selectively. First, Mckinnon (2001) analyzed how the post-crisis exchange rate regime has evolved since 1998. According to his analyses, dollar exchange rates, particularly when observed on a high-frequency (daily) basis, have become as stable as they were before the crisis. Therefore, he stated that the East Asian dollar standard, except for Indonesia, seems to be resurrecting itself, and that the “fear of floating” identified by Calvo and Reinhart (2000) is shown at higher frequencies to be a rational response to capital market conditions in emerging markets. Second, Kawai (2002) also examined the evolution of exchange rate arrangements in East Asia’s emerging market economies over the last ten years. According to his analyses, in the post crisis period the dollar has regained prominence in some countries (notably in Malaysia), while its dominance has been reduced and exchange rate flexibility has risen in others (notably in Indonesia). Interesting is the observation that Korea and Thailand appear to have shifted to a de facto currency basket arrangement with significant weights on the US dollar and the yen, similar to Singapore’s managed floating arrangement.

To sum up, McKinnon (2002) argues that the post-crisis East Asian exchange rate managements are simply returning to the pre-crisis de fact dollar peg system, while Kawai (2002) insists that exchange rate flexibility has risen with the US dollar dominance reduced. We have to notify that both analyses focus on the highly -frequent (daily) exchange rate management.

3.2. Examining Exchange Rate Flexibility

We turn to the empirical examination on whether exchange rate flexibility has really increased from the pre-crisis period towards the post-crisis period.

According to the IMF classification, after the crisis, Indonesia, Korea and Thailand moved from Managed Float to Independent Float. The

Philippines keep Independent Float. (Malaysia, on the contrary, shifted from Managed Float to Pegged to US dollar in 1998.) The IMF classification of exchange rate arrangements, however, does not necessarily reflect actual exchange rate management, since it is based on member countries' formally announced regimes. Here comes the necessity to observe actual data on exchange rates as well as official pronouncements.

For the purpose of seeing exchange rate flexibility, we calculate the coefficient of variation in the nominal exchange rate year by year. We use the monthly data of nominal exchange rate, taken from the International Financial Statistics of the International Monetary Fund. We divide the sample period into two parts: the pre-crisis one from 1993 to 1996 and the post-crisis one from 1999 to 2002. Figure 1 and Table 1 simply show the movements of nominal exchange rate indexes expressed as the US dollar price of a unit of local currency. Figure 2 and Table 2 report the trends of the coefficient of variation in the nominal exchange rate.

We observe that: before the crisis, the Values of Won, Peso and Baht (except Rupiah) nearly leveled off, while after the crisis, they have shown monthly fluctuation; the coefficient of variation of all currencies has clearly enlarged from the pre-crisis period to the post-crisis period. From this observation, we speculate that: in the pre-crisis period the de facto dollar peg system was simply maintained except for in Indonesia; the exchange rate flexibility of all the sample countries has increased from the pre-crisis period towards the post-crisis period.

3.3. Identifying the Factors for Raising Exchange Rate Flexibility

The next step is to identify the factors to make exchange rate movements more flexible in the post-crisis period. As we stated in Section 2.5, the previous studies show that Indonesia, Korea, the Philippines and Thailand are holding to the intermediate exchange rate policy even in the post-crisis period regardless of their announcement of the "free float". In this context, the rising flexibility of exchange rate means that the benchmark for the choice of a reference rate in the managed exchange rate may be diversified in the post-crisis period from the only US dollar in the pre-crisis period. To verify this point, we conduct regression analysis to identify the factors for the choice of a reference rate in managing

exchange rate.

Regression model

We follow the work of Frankel and Wei (1994) and specify the regression model in the following way.

$$\log(\text{Local Currency}/\text{SWF}) = \beta_1 \log(\text{USD}/\text{SWF}) + \beta_2 \log(\text{JPY}/\text{SWF}) + \beta_3 \log(\text{DEM}(\text{EURO})/\text{SWF}) + \beta_4 \log((\text{CPI} + \text{CPI}_{-1})/2) + \epsilon$$

Where SWF is the Swiss franc, USD is the US dollar, JPY is the Japanese yen, DEM is the German mark and ϵ is assumed to be a well-behaved error term, following $N(0, \sigma^2)$. EURO (the Euro currency) is used in the post-crisis period instead of DEM. CPI is the Consumer Price Index of the local country with a time lag to take the causality relationship between CPI and the value of local currency into account. The Swiss franc is chosen as an arbitrary *numéraire* for measuring variations in the exchange rate because it is an independently floating currency of an advanced country, which nonetheless carries little weight in Asia's trade. Based on the first difference of logarithms (percentage changes), the simple regression model is multivariate ordinary least squares for each country and time period. All the sample data are monthly ones taken from the International Financial Statistics of the International Monetary Fund, for the sample countries – Indonesia, Korea, the Philippines and Thailand.

According to Frankel and Wei (1994), if the local currency is tightly fixed to some particular value of the US dollar, then the regression coefficient β_1 should be discernable and approximately unity, while the others, β_2 and β_3 , are close to 0. Another crucial variable is the local CPI. If the coefficient of the local CPI, β_4 , is significantly positive, we assume that the domestic inflation rate can be one of the factors for determining a reference rate in managing exchange rate.

Before the regression, we test the stationarity of all the data series by using the unit root tests of the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test (for the test methodology, see Matsuura and McKenzie 2001). Appendix reports that at the 5 percent significance level, all the first-differenced data series are confirmed as stationary in both tests, thereby suggesting that a regression analysis using all the first-differenced data series is valid.

Analytical Method: Chow's Test and Dummy for Parameter

We here take two steps in our analysis. First, we conduct Chow's breakpoint test to examine whether there was a structural change in exchange rate management from the pre-crisis period to the post-crisis period. The data are broken up into two periods: the pre-crisis one from January 1993 to December 1996, and the post-crisis one from January 1999 to April 2003. We show the F-statistics with probabilities for the hypothesis of parameter stability over different periods. We then pick up the currencies in which a structural change is identified. Second, concerning the currencies with a structural change, we identify the factors to cause the structural change by examining whether each parameter in regression model has been significantly changed in the post-crisis period. For verifying the parameter change, we modify the regression model as follows.

$$\begin{aligned} \log(\text{Local Currency}/\text{SWF}) = & (\beta_1 + \beta_1 D) \log(\text{USD}/\text{SWF}) \\ & + (\beta_2 + \beta_2 D) \log(\text{JPY}/\text{SWF}) + (\beta_3 + \beta_3 D) \log(\text{DEM}(\text{EURO})/\text{SWF}) \\ & + (\beta_4 + \beta_4 D) \log((\text{CPI} + \text{CPI}_{-1})/2) + \beta_5 D + \end{aligned}$$

where D is the post-crisis dummy from January 1999 to April 2003. In this modified regression, if some coefficients β_i are significant, they are the causes of a structural change in the post-crisis period. So we can identify the changes in factors for determining a reference rate in the post-crisis exchange rate management.

Results and Interpretations

Table 4 and Table 5 report the results of Chow's test and the modified regressions. The main observations and their interpretations are as follows. First, The results of Chow's breakpoint test indicate that the hypothesis of parameter stability over the pre- and post-crisis periods is rejected on Won at the one percent significance level, on Baht and Peso at the five percent level and accepted on Rupiah. The post-crisis structural change in exchange rate management is, therefore, verified on Baht, Peso and Won. Second, the results of the modified regression show that the coefficients of the US dollar in three currencies are significantly positive throughout the pre- and post- periods and that they

are an approximate unity at least in the pre-crisis period. Korea, the Philippines and Thailand, therefore, seem to be holding the “soft peg” to the US dollar, during not only the pre-crisis period but also the post-crisis period, regardless of its assigned weights. Third, in the modified regression for Won, the coefficient of the Japanese yen with the post-crisis dummy is significantly positive while the coefficient of the US dollar with the post-crisis dummy is significantly negative. The Won appears to shift the weight from the US dollar to the Japanese yen in the post-crisis period as a factor for determining a reference rate. In other currencies and in the German mark (Euro) as a reference rate, there seem to be no definite changes in the weights from the pre-crisis period to the post-crisis period. Fourth, the coefficients of the local CPI with the post-crisis dummy are significantly positive in all three currencies. Korea, the Philippines and Thailand, therefore, may have come to take the domestic inflation rates into account as one of the factors for determining a reference rate in the post- crisis period.

We here compare the result of the above estimation with that of Kawai (2002). Kawai (2002) shows that Korea and Thailand have significantly shifted the weight from the US dollar to the Japanese yen in their post-crisis managed floating arrangement. Our estimation identifies such a weight-shift in Korea but not in Thailand. We speculate that the difference in the result might mainly come from the difference in the frequency in exchange rate management to be analyzed; Kawai (2002) conducts a Frankel-Wei type of regression on a *daily* base for examining the highly- frequent exchange rate management (the original analysis by Frankel and Wei (1994) is on a *weekly* base). On the other hand, our analysis concentrates on the lower- frequent (*monthly*) exchange rate management. In fact, the data for the key variable in our analysis, CPI, is usually available only on monthly base.⁶

Real Exchange Rate

One of the results of regression analysis above tell us that, in Korea, the Philippines and Thailand, the factors for determining a reference rate in managing exchange rate may be diversified from the US dollar dominated in the pre-crisis period towards including the domestic inflation rate in the post-crisis period. We can interpret the results in such a way that the managed exchange rates in three of the sample countries

have been sensitive to their domestic inflation rates in the post-crisis period. We can also verify the sensitivity to domestic inflation rates by examining the trends of another index of *real* exchange rate.

The real exchange rate is an indicator for a country's international price competitiveness, specifically of a country's prices relative to those of other countries. A country's real exchange rate levels off when an exchange rate is fully sensitive according to a country's prices relative to those of other countries. We define the real exchange rate as follows (taking the Korean Won as an example).

$$RER_{(US\ dollar/Won)} = ER_{(US\ dollar/Won)} \times (CPI_{Korea} / CPI_{US\ dollar})$$

where RER is real exchange rate, ER is nominal exchange rate, CPI is consumer price index.

Figure 3 and Table 3 indicates the trends of real exchange rates. During the pre-crisis period, each real exchange rate shows a clear trend of appreciation. This is because in that period each country stick to the simple US dollar peg system so that its higher domestic inflation rate than US inflation rate make each real exchange rate appreciate. During the post-crisis period of 1999-2003, on the other hand, each real exchange rate indicates no clear trend of appreciation, and except for in Indonesia a rather stable movement. We can guess that the post-crisis managed exchange rates of three sample countries have been sensitive to domestic inflation rates compared with the pre-crisis ones.

Figure 4 directly describes the relationship between nominal exchange rate index (expressed as the US dollar price of a unit of local currency) and domestic consumer price index during both the pre- and post- crisis period. We can confirm the clear contrast of the picture between the pre-crisis period and the post-crisis period; while the pre-crisis nominal exchange rate keeps stability in spite of the hike of CPI, the post-crisis nominal exchange rate moves towards depreciation with successive CPI increase.

3.4. Examining Regional coordination of Exchange Rate

We turn to the issue of whether a regional coordination in the sample countries' post-crisis exchange rate management has been

strengthened. To materialize regional coordination in exchange rate management, we conduct Granger causality test on bilateral relation among regional currency values; we test, for example, that Baht Granger-cause Peso and that Peso Granger-cause Baht. We show the F-statistics with probabilities for the null hypothesis of Granger causality.

Table 6 reports the results of Granger causality test. We observe the followings. First, in the pre-crisis period, the null hypothesis of Granger causality is accepted on all bilateral relations. There has been no evidence on regional coordination in the pre-crisis exchange rate management from the viewpoint of Granger approach. Second, in the post-crisis period, the null hypothesis is rejected on the causality from Peso to Won at the five percent significance level, and on the causality from Peso to Baht as the ten percent significance level. On all the other bilateral relations, however, the null hypothesis is accepted. Only from the results of Granger causality test above, we cannot necessarily say that there is robust evidence that a regional coordination in the sample countries' exchange rate management has been strengthened as a whole in the post-crisis period.

4. Concluding Remarks

In this article, we set out to examine, conducting empirical studies on the selected East Asian countries, whether the flexibility in the managed exchange rate has increased from the pre-crisis period (of the dollar peg system) towards the post-crisis period, and whether a regional coordination in exchange rate management has been strengthened in the post-crisis period.

First, we found that the exchange rate flexibility of all the sample countries has increased from the pre-crisis period towards the post-crisis period, by examining the trends of the coefficient of variation in the monthly nominal exchange rate. Second, we further found, through conducting Chow's test and regression analysis and investigating the trends of *real* exchange rates, that the post-crisis managed exchange rates of Korea, the Philippines, Thailand have been sensitive to domestic inflation rates, and that Korea has raised the weight assigned to the Japanese yen while reducing the US dollar dominance in her post-crisis exchange rate management. Third, Granger causality test does not

necessarily tell us that a regional coordination in the sample countries' exchange rate management has been strengthened as a whole in the post-crisis period.

The following issues still need analysis: First, the post-crisis period is a little too short to provide sufficient monthly data. We will, therefore, need the re-analyses to get more consolidated outcomes by keeping track of the upcoming data. Second, it may be useful for our analysis to extend to non-crisis countries and to develop through a comparative study between hardest-hit crisis countries and non-crisis countries.

Notes

1. In addition to the fore-mentioned arguments, some studies simply support floating exchange rate regimes. For example, Mussa et al. (2000) argued that floating regimes appear to have been helpful in handling a variety of economic shocks for many emerging market countries, by stating that the policy requirements for maintaining a pegged exchange rate can be very demanding in circumstances of high international capital mobility as seen in the tequila crisis of 1995 and the Asian/Russian/Brazilian crises of 1997-98. Eichengreen (1999) also stated that the IMF should more forcefully press for the adoption of more flexible exchange rates by most of its developing country members, especially by those with open capital accounts.
2. Masson (2000) also made a careful statistical examination of the way in which countries have changed their exchange rate regime over the years. He found that, although there has been some tendency for countries to polarize toward the extremes, it is far weaker than one would infer from the sort of summary of Latin American experience.
3. McKinnon (2001) also describes the emerging-market debtor economy with original sin in such a way that: the term structure of finance is short, and there is no history of central bank independence. Correspondingly, there is a potential lack of confidence in the long-term exchange rate unless the government can effectively restrain itself.
4. As a typical example of regional surveillance and financing mechanisms, the ASEAN+3 countries agreed to the Chiang Mai Initiative (CMI) of currency swaps and Surveillance at the Asian Development Bank meeting in Thailand in May 2000. However, the World Bank (2003) stated that it is too early to tell whether the CMI should be seen as a first step to establishing a collective system of common currency pegs, or as a mechanism for multilateral support to countries experiencing financial difficulties.

5. As for the analyses of the negative impacts of the dollar peg system on the external balances in the selected East Asian countries, see Taguchi (2003a) and Taguchi (2003b).
6. Even on the analysis of the highly- frequent (daily) exchange rate management, McKinnon (2001) shows the different results from Kawai (2002); McKinnon (2001) claims that the East Asian dollar exchange rates, particularly when observed on a high-frequency (daily) basis, have become as stable as they were before the crisis (implies no significant weight-shift from the US dollar towards the Japanese yen). The difference in the results might come from the difference in the post-crisis estimation periods; Kawai (2002) estimates from January 1999 to June 2002 as the post-crisis period, while McKinnon (2001) does from January 1999 to May 2000. In the estimate of Kawai (2002), the significant weight-shifts from the US dollar to the Japanese yen in Korea and Thailand are identified mainly after July 2000, which is beyond the estimate period of McKinnon (2001).

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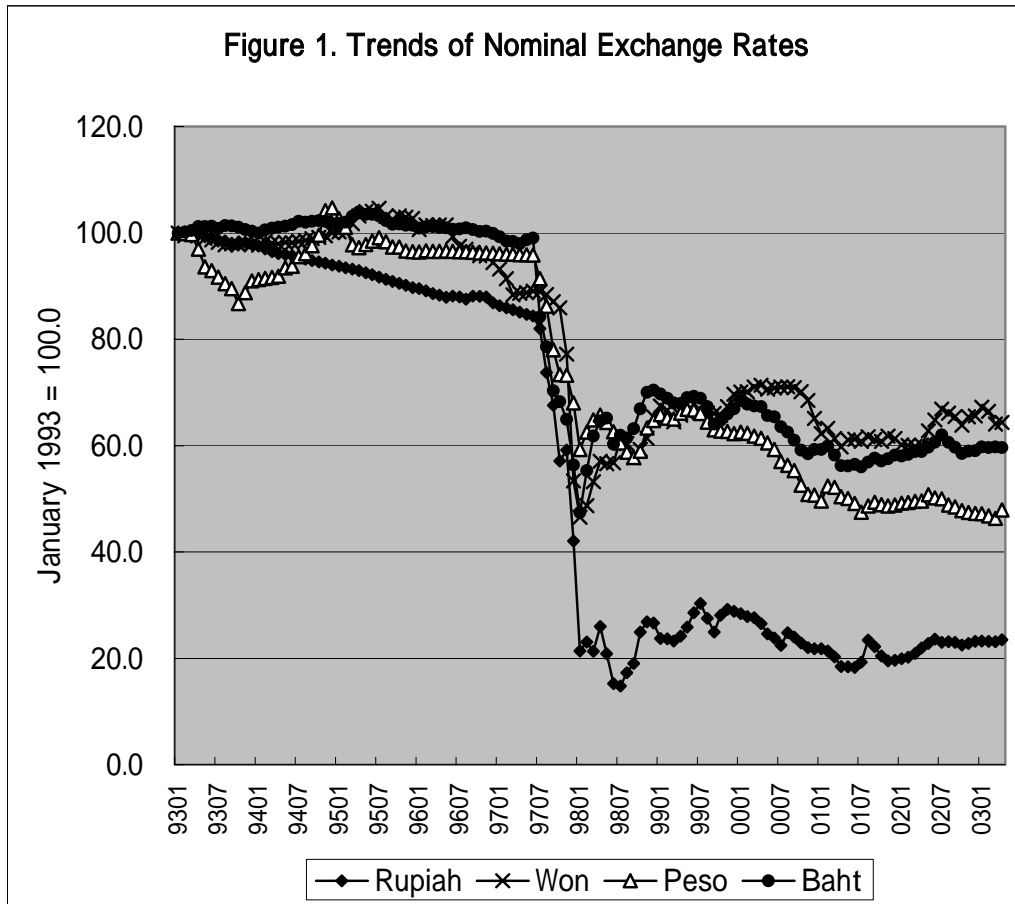
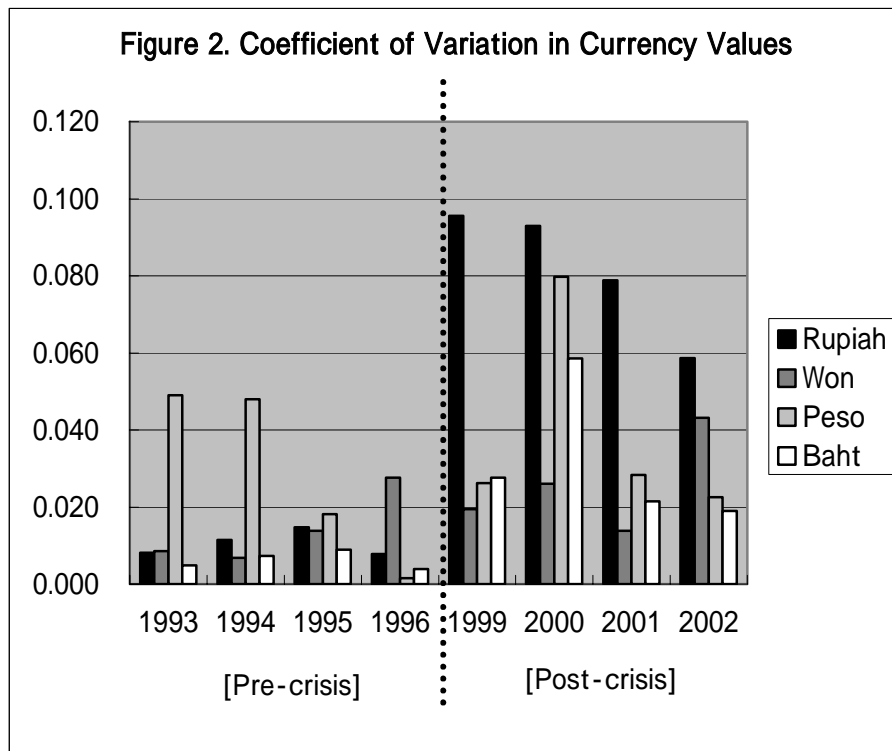


Table 1. Trends of Nominal Exchange Rates

	Rupiah	Won	Peso	Baht
9301	100.0	100.0	100.0	100.0
9401	97.5	97.7	91.2	100.0
9501	93.7	100.2	102.7	101.8
9601	89.5	100.6	96.4	100.9
9701	86.3	93.2	96.1	99.3
9801	21.4	46.5	59.3	47.4
9901	23.7	67.5	65.8	69.7
0001	28.4	70.1	62.5	68.5
0101	21.8	62.3	49.6	59.3
0201	19.9	60.1	49.2	58.0
0301	23.2	67.2	47.2	59.7

Notes: All the indexes on exchange rates are expressed as the U.S. Dollar price of a unit of local currency. Thus, an increase in the index means appreciation of the currency.

Source: IFS (IMF)



Note: All currencies are in terms of units of U.S. Dollar.
Source: IFS (IMF)

Table 2. Coefficient of Variation in Currency Values

		Rupiah	Won	Peso	Baht
Pre-crisis	1993	0.008	0.009	0.049	0.005
	1994	0.011	0.007	0.048	0.007
	1995	0.015	0.014	0.018	0.009
	1996	0.008	0.028	0.002	0.004
Post-crisis	1999	0.096	0.019	0.026	0.028
	2000	0.093	0.026	0.080	0.059
	2001	0.079	0.014	0.028	0.021
	2002	0.059	0.043	0.023	0.019

Note: All currencies are in terms of units of U.S. Dollar.
Source: IFS (IMF)

Figure 3. Trends of Real Exchange Rates

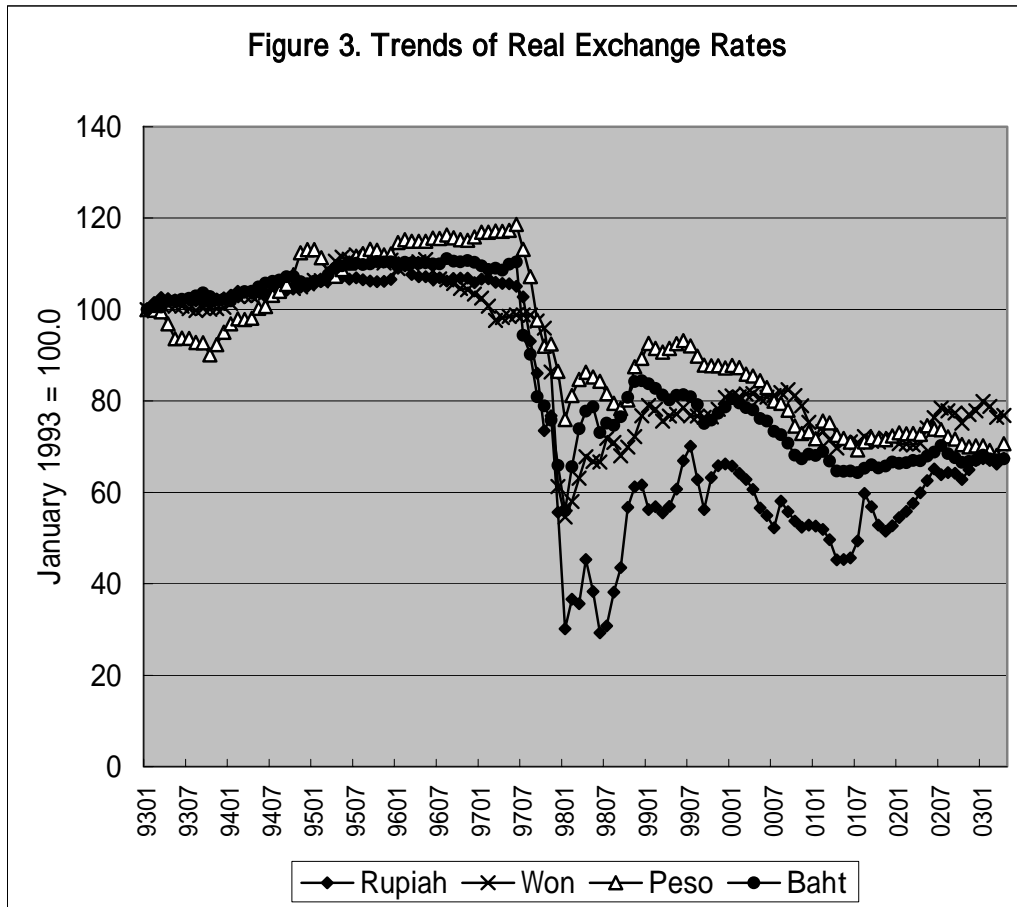


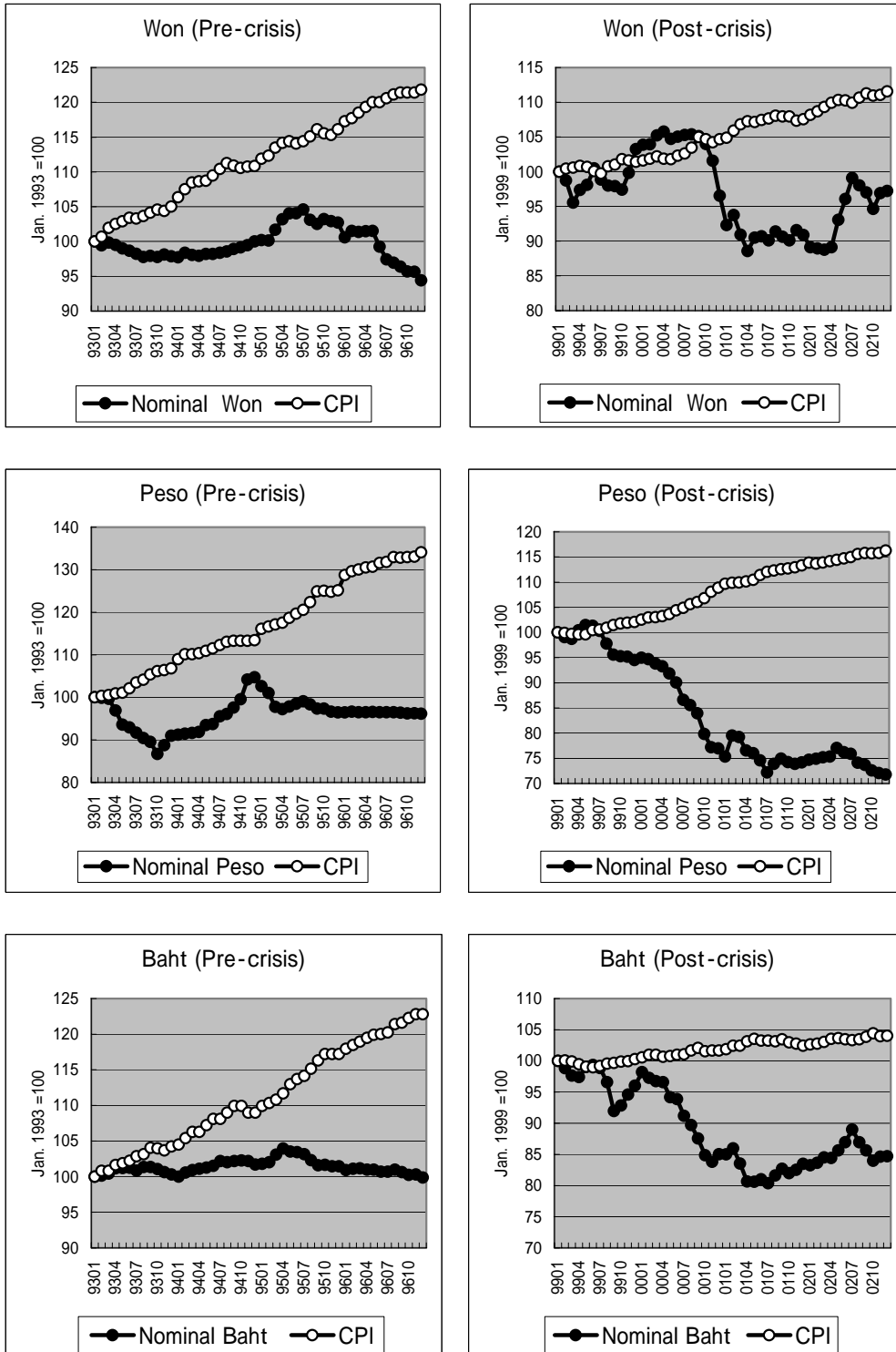
Table 3. Trends of Real Exchange Rates

	Rupiah	Won	Peso	Baht
9301	100.0	100.0	100.0	100.0
9401	103.1	101.4	96.9	101.9
9501	105.5	106.4	113.1	106.2
9601	109.0	108.9	114.6	110.0
9701	106.7	102.5	116.9	109.6
9801	30.2	54.6	76.0	56.0
9901	56.3	79.0	92.6	83.7
0001	65.8	81.1	87.8	80.5
0101	52.7	71.7	71.8	68.0
0201	54.5	70.7	73.0	66.4
0301	67.4	79.9	70.1	68.1

Notes: All the indexes on exchange rates are expressed as the U.S. Dollar price of a unit of local currency. Thus, an increase in the index means appreciation of the currency.

Source: IFS (IMF)

Figure 4. Trends of Nominal Exchange Rates and CPI



Source: IFS(IMF)

Table 4. The Results of Chow's Breakpoint Test on Regression for Currency Values
(Breakpoint: January 1999)

	F-statistic	Probability
Baht	2.610	0.041
Peso	2.736	0.034
Won	3.874	0.006
Rupiah	1.179	0.326

Notes:

- 1) All currencies are in terms of units of Swiss francs.
- 2) The pre-crisis period is from January 1993 to December 1996, and the post-crisis period is from January 1999 to April 2003.

Source: IFS (IMF 2002)

Table 5. The Results of Regressions for Currency Values including Post-crisis Dummy

	USD	JPY	DEM/EURO	(CPI+CPI(-1))/2	Constant	R**2	D.W.
Baht	0.84 ***	0.10	0.07	0.02	-	0.79	1.39
	Dummy -0.15	-0.01	0.45	1.68 **	0.00		
Peso	1.11 ***	-0.05	0.18	0.30	-	0.74	1.63
	Dummy -0.22	0.08	0.47	2.22 **	-0.00		
Won	0.84 ***	0.13 *	0.02	0.24	-	0.81	1.29
	Dummy -0.23 *	0.42 ***	0.12	1.07 *	-0.00		

Notes:

- 1) All currencies are in terms of units of Swiss francs.
- 2) The estimation period is both the pre-crisis one (from January 1993 to December 1996) and the post-crisis one (from January 1999 to April 2003).
- 3) "Dummy" is for the post-crisis period.
- 4) *, **, *** indicate that the coefficient is significant at the 90, 95, and 99 percent levels, respectively.

Source: IFS (IMF 2002)

Table 6. The Results of Granger Causality Test on Bilateral Currency Values
F-statistic (Probability)

Cause / Caused		Baht	Peso	Won	Rupiah
Baht	pre-crisis	-	1.639 (0.207)	0.449 (0.642)	0.084 (0.919)
	post-crisis	-	0.506 (0.606)	0.436 (0.649)	0.461 (0.633)
Peso	pre-crisis	0.124 (0.884)	-	0.349 (0.707)	0.180 (0.836)
	post-crisis	2.847 (0.068)	-	3.330 (0.044)	0.056 (0.946)
Won	pre-crisis	0.013 (0.988)	1.156 (0.325)	-	0.051 (0.950)
	post-crisis	0.067 (0.935)	2.321 (0.109)	-	0.435 (0.650)
Rupiah	pre-crisis	0.036 (0.964)	1.288 (0.287)	0.291 (0.749)	-
	post-crisis	1.515 (0.230)	1.199 (0.311)	0.030 (0.971)	-

Notes:

- 1) All currencies are in terms of units of Swiss francs.
- 2) The pre-crisis period is from January 1993 to December 1996, and the post-crisis period is from January 1999 to April 2003.
- 3) The lag length is two months.

Source: IFS (IMF 2002)

Appendix Unit Root Tests on Data for Regression in Table 4 and Table 5

Variables	ADF Statistic		PP Statistic	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
Pre-crisis (Jan.1993-Dec.1996)				
log(Baht)	-5.63 ***	-5.99 ***	-5.42 ***	-5.63 ***
log(Peso)	-5.43 ***	-5.81 ***	-4.68 ***	-4.89 ***
log(Won)	-6.17 ***	-6.37 ***	-5.64 ***	-5.76 ***
log(Rupiah)	-5.65 ***	-6.05 ***	-5.38 ***	-5.62 ***
log(USD)	-5.50 ***	-5.92 ***	-5.23 ***	-5.48 ***
log(JPY)	-4.54 ***	-4.42 ***	-5.59 ***	-5.49 ***
log(DEM)	-3.96 ***	-5.03 ***	-4.88 ***	-5.71 ***
log((CPI+CPI(-1))/2) Thailand	-5.16 ***	-5.09 ***	-3.92 ***	-3.86 **
log((CPI+CPI(-1))/2) Philippines	-6.83 ***	-6.86 ***	-3.92 ***	-3.91 **
log((CPI+CPI(-1))/2) Korea	-7.00 ***	-7.07 ***	-3.62 ***	-3.60 **
log((CPI+CPI(-1))/2) Indonesia	-4.88 ***	-4.91 ***	-4.31 ***	-4.24 **
Post-crisis (Jan.1999-Apr.2003)				
log(Baht)	-4.63 ***	-5.11 ***	-4.62 ***	-4.82 ***
log(Peso)	-4.26 ***	-4.49 ***	-5.07 ***	-5.24 ***
log(Won)	-4.61 ***	-5.09 ***	-5.32 ***	-5.64 ***
log(Rupiah)	-6.39 ***	-6.44 ***	-5.59 ***	-5.56 **
log(USD)	-4.10 ***	-5.02 ***	-5.18 ***	-5.82 ***
log(JPY)	-4.48 ***	-5.39 ***	-5.70 ***	-6.36 ***
log(EURO)	-3.23 **	-3.27 *	-6.29 ***	-6.32 ***
log((CPI+CPI(-1))/2) Thailand	-5.79 ***	-5.86 ***	-4.46 ***	-4.42 ***
log((CPI+CPI(-1))/2) Philippines	-4.51 ***	-4.70 ***	-3.53 **	-3.62 ***
log((CPI+CPI(-1))/2) Korea	-6.55 ***	-6.89 ***	-3.94 ***	-4.02 **
log((CPI+CPI(-1))/2) Indonesia	-5.41 ***	-5.73 ***	-3.00 **	-2.98

Notes:

1) The lag truncation is one quarter in the ADF test, and three quarters in the PP test.

2) ***, **, and * indicate rejection of the null of nonstationarity at the 1 percent, 5 percent, and 10 percent significance levels with critical values taken from Davidson and MacKinnon (1993).

Source: IFS(IMF)