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Exchange Rate Management and Trade Balance in Selected East Asian Countries

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Exchange rate management has become a hot topic in academic circles examining the merits of fixed versus floating regimes. The 1997-98 Asian crisis has refocused attention on the exchange rate management of East Asian countries. Most views expressed are critical of the pre-crisis US dollar peg regime, citing it as one cause of the crisis.

This article evaluates the pre-crisis US dollar peg regime in the selected East Asian countries by examining its negative effect on trade balance through currency appreciation. The main findings of the study are as follows: First, a significantly large appreciation of real effective exchange rates was found in the selected East Asian countries under the pre-crisis US dollar peg regime. Second, a regression analysis verified the correlation between real effective exchange rates and trade balances. Third, a simulation analysis showed that the appreciation of real effective exchange rates had a clearly negative effect on trade balances. The strategic implication of our findings is how important the stabilizing of the real effective exchange rate is in exchange rate management.

1. Introduction

Exchange rate management is a crucial component of macroeconomic policy. Since the postwar period, there has been a long-term debate over the merits of fixed versus floating exchange rates. The 1997-98 Asian crises have refocused attention on exchange rate management of East Asian countries. Most views expressed are critical of the pre-crisis US dollar peg regime, citing it as a cause of the crisis. It is said that this regime caused the appreciation of real effective exchange rates (REER) and the subsequent loss of competitiveness.

This article evaluates the pre-crisis US dollar peg regime in the selected East Asian countries by examining its negative effect on trade balance through currency appreciation. Specifically, the two main questions are these: whether the dollar peg system did, in fact, cause appreciation of REER in the pre-crisis East Asian countries, and, if it did, how badly the appreciation of REER affected trade balance in those countries. The strategic implication of our findings is how important the stabilizing of REER is in exchange rate management.

The rest of the paper is organized as follows. Section 2 reviews previous studies and assessments of the pre-crisis regimes in the East Asian countries. Section 3 describes empirical studies,

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including regression and simulation analyses, carried out to clarify the relationships among the US dollar peg regimes, REER and trade balance. Section 4 presents some concluding remarks.

2. Previous Studies and Assessments of the Pre-crisis Regime

In this section, we briefly review the previous studies and assessments of the pre-crisis exchange rate regimes in the East Asian countries. First, we review the analyses of the pre-crisis de facto exchange rate regime: the dollar peg regime. Second, we show the general assessments of the pre-crisis dollar peg regime from the viewpoint of its effect on trade balance before the Asian crisis. Third, we focus on recent studies of the pre-crisis trend of the REER and of the relationship between the REER and trade balance.

2.1 De Facto Exchange Rate Regime

The IMF classification of exchange rate arrangements did not necessarily reflect actual exchange rate management, since it was based on member countries' formally announced regimes. For example, the pre-crisis exchange rate arrangements of Indonesia, Korea, and Malaysia were classified as "Managed Float," for the Philippines it was "Independent Float," and for Thailand the classification was "Pegged to Currency Composite," although all of them appeared to have adopted dollar peg regimes.

Frankel and Wei (1994) and Kawai (1997) presented their own analysis of the de facto exchange rate regimes. Frankel and Wei (1994) estimated the weights placed on major foreign currencies in their exchange rate policy during the period between 1979 and 1992, while Kawai (1997) estimated them during the period between 1990 and 1996, using the same method as Frankel and Wei. According to their estimations, for example, the weight on the US dollar is 0.91 (Frankel and Wei (1994)) and 0.789 (Kawai (1997)) for Thailand. The weight on the US dollar is nearly equal to one for Indonesia, Korea, and Philippines (Table 1). Thus, the estimation indicates that these countries have adopted the de facto US dollar-pegged-rate system. Researchers and policymakers seem to be in agreement over this analysis.

2.2 Assessments of the US Dollar Peg Regime

We next review the assessments of the pre-crisis dollar peg system in connection with trade

Table 1. Weights on the Dollar and the Yen in Exchange Rate Policies of the Asian Countries

	Frankel and Wei (1994) Estimated period: 1979-92		Kawai (1997) Estimated period: 1990-96	
	Dollar	Yen	Dollar	Yen
Hong Kong	0.92	-0.00	1.002	-0.002
Indonesia	0.95	0.16	0.966	0.014
Korea	0.96	-0.10	0.941	0.088
Malaysia	0.78	0.07	0.589	0.044
Philippines	1.07	-0.01	1.087	-0.094
Singapore	0.75	0.13	0.420	0.021
Thailand	0.91	0.05	0.789	0.104

balance before the Asian crisis. Most views are critical of the system because of its tendency to cause appreciation of real exchange rates with the subsequent loss of competitiveness, which was one cause of the Asian crisis.

Ito (2001) picks up three types of problem which the de facto dollar peg gives rise to, two of which are related to competitiveness. First, when inflation at home is higher than in the United States, export sectors lose competitiveness in the long run. Where productivity growth compensates for the inflation differential, the real appreciation of the exchange rate can be absorbed. But, unfortunately, this was not the case for most Asian countries. Second, Asian countries have extensive trade relationships with Japan. For many Asian countries, one-quarter to one-third of their exports and imports are to and from Japan. Even though the exchange rate was fixed to the US dollar, the exchange rate relative to the yen fluctuated greatly. Therefore, the fixed exchange rate relative to the US dollar led to instability of the real effective exchange rate — the trade-weighted, inflation-adjusted exchange rate. Kawai (2002) also puts forward as one of the problems of US dollar-based stabilization, that using the US dollar as the sole anchor is problematic given that the emerging East Asian economies have diverse economic relationships with the United States, Japan, and the European Union through trade, FDI inflows, and other forms of capital flows.

The international organizations also comment on the pre-crisis dollar peg system as follows. The World Bank (1998) stated that in most of the ASEAN countries, the dollar pegged currencies lost competitiveness against the important yen market because the yen depreciated against the US dollar throughout much of 1996. The ADB (1998) explained that the pegged exchange rate contributed to current account deficits and rising real exchange rates, the combination of which provided a vital ingredient of the financial crisis. They attributed the rising real rate to a combination of factors that included higher domestic inflation in relation to the world average; appreciation of the US dollar, to which these currencies were pegged; depreciation of the Japanese yen; and devaluation of the PRC currency in 1994.

2.3. Recent Studies of the REER and its Relationship with Trade Balance

We focus on recent studies of the pre-crisis trend of the REER and on the relationship between the REER and trade balance. In looking at the REER trend, several studies have examined the validity of the purchasing power parity (PPP) hypothesis, which is equivalent to the constancy of the REER.¹ Hataiseree (1995), through co-integration analysis, provided no evidence in support of a long-run equilibrium relationship between bilateral nominal exchange rates for the Thai baht and the currencies of Thailand's major trading partners, thereby rejecting PPP. This implied that considerable care should be taken in assessing the long-run implications for the real exchange rate. Khoon and Mithani (2000) presented an empirical test of PPP applied to the Malaysian ringgit for the pre-crisis period. It detected that real exchange rate follows a random walk, contrary to the expectations of PPP equilibrium.

Looking at the relationship between the REER and trade balance, the movement of REER, in

¹ The relationship between the REER and PPP is shown from their definitions as $REER = ER/PPP$ where ER means nominal exchange rate. If ER follows PPP, therefore, REER keeps constancy.

general, has played a central role in empirical work on trade, where volumes of exports and imports are usually related to changes in REER and to changes in real activity, either at home (for imports) or abroad (for exports). Such equations have proven to be highly successful empirically, and they have consistently been used in policy work and in macroeconomic models.² Among these studies, we focus on the ones examining the direct relationship between the REER and the balance of trade. Although previous studies have attempted to address this important issue, no clear consequences have emerged from the empirical work regarding the effect of exchange rates on the trade balances. While providing a comprehensive summary of previous studies, Baharumshah (2001), in the most recent study of this issue, attempted to identify the major economic factors that influence the bilateral trade balances of Malaysia and Thailand with the US and Japan. He indicated the existence of a stable long-running relationship between trade balance and three macro variables: exchange rate, domestic income and foreign income. His findings showed that the real effective exchange rate is an important variable in the trade balance equation and that devaluation improves the trade balances of both economies in the long-run. The model in Rose and Yellen (1989), and Krugman and Baldwin (1987) was applied to the analysis of the trade balances, and will be described in detail in the following section.

All though there has been plenty of literature on the issue of the REER and its connection with trade as shown above, there seem to be few studies which deal directly with the REER appreciation under the pre-crisis dollar peg system, and its negative impact on trade balance. This article will address this specific issue by applying the analytical framework of trade balance presented by Baharumshah (2001) to our simulation analysis.

3. Empirical Studies of Selected East Asian countries

We now turn to empirical analyses of the selected East Asian countries. Here we focus, as sample countries, on the hardest-hit countries among the East Asian countries: Indonesia, Korea, the Philippines, Malaysia, and Thailand.

There are three steps in our analyses. First, we examine the trend of real effective exchange rates (REER) for the sample countries during the pre-crisis period, considering its relation to the US dollar peg regime. Second, we conduct a regression analysis to verify the relationship between REER and trade balance during the pre-crisis period. Third, we conduct a simulation analysis of trade balance with the assumption that the sample countries had adopted a policy to stabilize REER instead of the de facto US dollar peg system during the pre-crisis period. We can then examine the negative effect of REER appreciation on trade balances.

All data used throughout the empirical studies come from the IFS of the IMF (IMF 2002). We

² Much of trade theory, including the factor-proportions theory associated with Heckscher and Ohlin, focuses on the underlying reasons for international trade, with relatively limited discussion of the role of exchange rates either in determining or being determined by trade. In contrast to that, exchange rates have played a central role in estimated equations for trade volumes (See Ito, Isard, Symansky, and Bayoumi (1996)). Taguchi (1998) focus on the estimation for trade — exchange rate relationship of selected East Asian countries. Kim and Lee (1996) dealt with the issue on the impact of exchange rate volatility on trade in the Korean case.

use IFS annual data for the regression and simulation analyses considering data availability, the sample period for which is from 1960 to 1996 (For Indonesia, the sample period is from 1971 to 1996 due to a constraint on data). We exclude the period after 1997 because of macroeconomic turbulence during the financial crisis.

3.1 Real Effective Exchange Rate Trends

We start by looking at the REER trends in the sample countries and examining whether the pre-crisis dollar peg system caused appreciation of the REER.

The REER is an indicator of a country's international price competitiveness, specifically of a country's prices relative to those of other countries. Therefore, a country's REER levels off when an exchange rate is fully adjusted according to a country's prices relative to those of other countries (the country follows purchasing power parity). There are, in general, two kinds of REER: One is the prices of one country relative to those of competitors in the world export market, which are obtained by dividing the US dollar value of the price level of a country in question by the US dollar value of the world export unit price index. The other is the weighted average of bilateral real exchange rates with a trading partner wherein the weight is the share of the trade with the trading partner in the country's total trade, the typical example of which is the Morgan Guaranty indexes (JP Morgan (2002)). The former values the role of competitors in third markets, while the latter reflects the relative importance of a country's trading partners. We here use the former indices of REER by taking the role of competitors in third markets into account and calculate it in the following way (taking Indonesia as an example).

$$\text{REER}_{\text{Indonesia}} = \{ \text{WPI}_{\text{Indonesia}} / \text{ER}(\text{Rupiah}/\text{U.S. dollar}) \} / \text{WEUVI}$$

where WPI is wholesale price index on local currency base, ER (Rupiah /U.S. dollar) is actual exchange rate on the U.S. dollar base, and WEUVI is world export unit value index on the U.S. dollar base.

According to Figure 1-1 and Table 2, the REER shows a clear trend of 10-40 percent appreciation during the pre-crisis period of 1987-96. There seem to be at least two reasons for this significantly large appreciation of REER. First, when the sample countries peg their currencies to

Table 2. Indices on Exchange rate in 1996 (1987=100)

	REER	WPI	Nominal Exchange Rate
Indonesia	124.4	207.3	70.2
Korea	114.4	130.9	102.3
Malaysia	113.4	132.7	100.0
Philippines	137.2	204.6	78.5
Thailand	124.0	142.9	101.5
U.S.A.	—	124.1	—
Japan	—	—	133.0
China	—	—	44.8

Source: IFS (IMF)

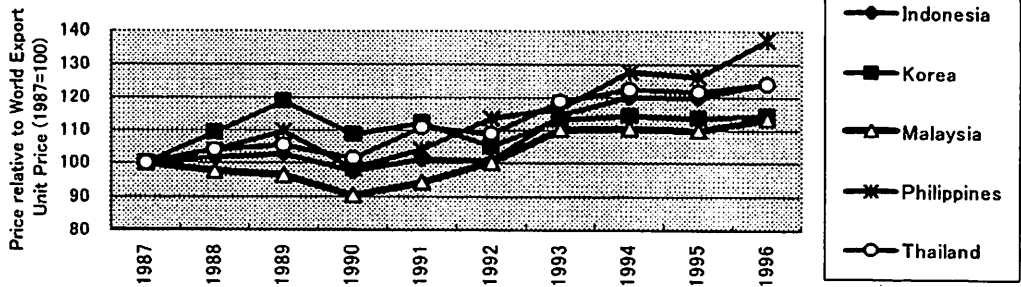


Figure 1-1. The Trend of REER

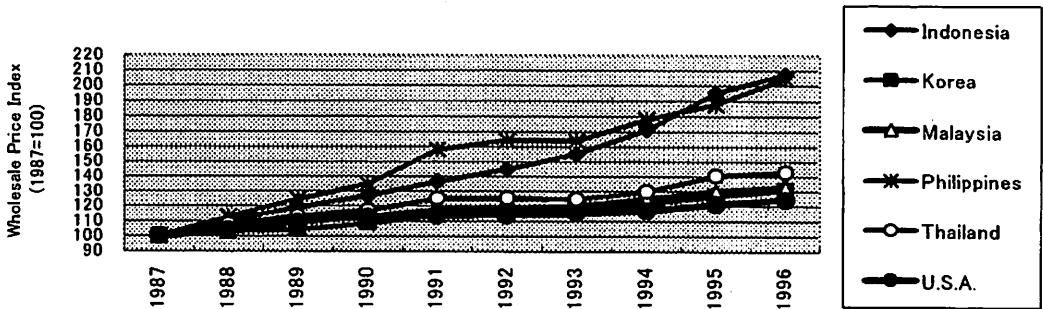


Figure 1-2. The Trend of WPI

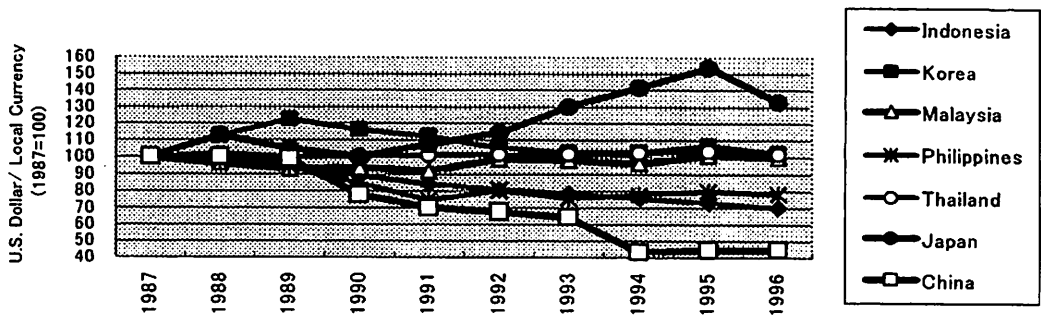


Figure 1-3. The Trend of Nominal Exchange Rate

the US dollar in nominal terms, their higher domestic inflation than that of the US definitely creates appreciation of their currencies in real terms. Figure 1-2 describes higher trends of wholesale prices in the sample countries than that of the US. These inflation differentials under the US dollar peg regime may have entailed appreciation of REER. Second, the devaluation of the Chinese yuan in 1994 and the rapid depreciation of the Japanese yen in 1996, shown in Figure 1-3, may have caused appreciation of REER in the sample countries. The sample countries' pegging to the single currency of the US dollar makes their currencies appreciate when there is devaluation or depreciation in the third countries. Thus, we identified the appreciation of REER of the pre-crisis East Asian countries accompanied inherently by their dollar peg regime.

3.2. Regression Analysis of Trade Balance

The second step of our empirical studies is to conduct a regression analysis to prove the relationship between the REER and the trade balance during the pre-crisis period.

We here follow the analytical framework of trade balance equation presented by Baharumshah (2001). We choose to work with the framework not only for its simplicity but also because of its ability to capture the net effects of the REER on the trade balance for the simulation analysis in the next section. The estimating model is derived from foreign and domestic supply and demand for imports and exports³, and the final equation form is shown as follows.

$$\Delta \ln(TB) = \alpha_1 \Delta \ln(REER) + \alpha_2 \Delta \ln(REER_{-1}) + \beta \Delta \ln(YR) + \gamma \Delta \ln(WYR) + u$$

$$\alpha_1 < 0, \alpha_2 < 0, \beta > 0 \text{ or } < 0, \gamma > 0,$$

where \ln shows natural logarithm, and u is assumed to be a white-noise process. TB , the trade balance, is expressed by the ratio of export value to import value (In Indonesia, oil export value is excluded). Using the ratio enables us to do without price index to express trade balance in real terms and to avoid the scale problem of time-series increase of value. $REER$, the real effective exchange rate, is the one defined in the previous section of 3.1. The reason for using both variables of $REER$ and $REER-1$ is that it is possible to take a certain time to improve trade balance because of the J-curve effect. Of particular importance are the signs and magnitude of the coefficient of $REER$, α_1 and α_2 . They are expected to be negative if the Marshall-Lerner condition holds, that is, if the $REER$ has meaningful impacts on trade balance. For YR , the domestic real income, we use GDP in real terms. The sign of β is ambiguous, depending on whether YR represents the level of domestic demands or the supply volume of exportables. For WYR , foreign real income, we use industrial production of industrial countries. The sign of γ is expected to be positive because WYR is seen as the foreign demand for the country's export. The regression model is multivariate ordinary least squares for each country.

We first test the stationarity of all the data series for the regression by using the unit root tests of the Augmented Dickey-Fuller (ADF) test and the Philips-Perron (PP) test (for test methodology, see Matsuura and McKenzie 2001). Due to a failure to reject the null of a unit root for each level data, we specify the function above in the first-differenced data. The Table 3 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.

Table 3 reports the results of the regressions. We observed as follows: The coefficients of $REER$ are significantly negative in Korea and Philippines, and that of $REER-1$ is significantly negative in Thailand. The coefficients of YR are negative except for Korea, but only significant in Philippines. The coefficients of WYR are positive in all the sample countries, but significant in Indonesia, Korea and Philippines. From these observations, we could at least verify the meaningful correlation between $REER$ and trade balance during the pre-crisis period in Korea, Philippines and

³ For details in theoretical background, see Baharumshah (2001).

Table 3. The Results of Regression on Trade Balance Functions

	Indonesia	Korea	Malaysia	Philippines	Thailand
$\Delta \ln(\text{REER})$	-0.41	-0.90***	0.20	-0.33**	-0.47
$\Delta \ln(\text{REER}_{-1})$	-0.07	0.11	0.27	-0.23	-0.64*
$\Delta \ln(\text{YR})$	-0.98	0.02	-0.28	-1.51***	-0.38
$\Delta \ln(\text{WYR})$	4.11***	1.35*	0.79	1.74***	0.48
Adj R ²	0.40	0.27	0.04	0.32	0.14
D.W.	1.98	1.37	2.04	2.65	2.48
Sample	1973-1996	1962-1996	1962-1996	1962-1996	1962-1996

Notes:

1) The specified Trade Balance Function is:

$$\Delta \ln(\text{TB}) = \alpha_1 \Delta \ln(\text{REER}) + \alpha_2 \Delta \ln(\text{REER}_{-1}) + \beta \Delta \ln(\text{YR}) + \gamma \Delta \ln(\text{WYR})$$

TB: Trade Balance (Export/Import)

REER: Real Effective Exchange Rate

YR: Real GDP

WYR: Industrial Production (Industrial Countries)

2) *, **, *** indicate that the coefficient is significant at the 90, 95, and 99 percent level.

Appendix The Unit Root Tests on Date for regression

Variables	ADF Statistic		PP Statistic	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept
Indonesia (1973-1996)				
$\Delta \ln(\text{TB})$	-4.39***	-4.27**	-4.96***	-4.82***
$\Delta \ln(\text{REER})$	-3.89***	-3.80**	-3.75***	-3.65**
$\Delta \ln(\text{YR})$	-3.28**	-3.17	-3.41**	-3.26*
$\Delta \ln(\text{WYR})$	-5.00***	-4.91***	-4.45***	-4.27**
Korea (1962-1996)				
$\Delta \ln(\text{TB})$	-4.24***	-5.84***	-4.23***	-4.81***
$\Delta \ln(\text{REER})$	-6.50***	-6.79***	-10.00***	-9.79***
$\Delta \ln(\text{YR})$	-4.56***	-4.59***	-5.34***	-5.26***
$\Delta \ln(\text{WYR})$	-4.35***	-5.55***	-4.29***	-5.02***
Malaysia (1962-1996)				
$\Delta \ln(\text{TB})$	-5.18***	-5.15***	-5.95***	-5.87***
$\Delta \ln(\text{REER})$	-4.10***	-4.14**	-3.91***	-3.80**
$\Delta \ln(\text{YR})$	-3.92***	-4.07**	-5.45***	-5.53***
$\Delta \ln(\text{WYR})$	-4.35***	-5.55***	-4.29***	-5.02***
Philippines (1962-1996)				
$\Delta \ln(\text{TB})$	-6.52***	-6.45***	-7.56***	-7.50***
$\Delta \ln(\text{REER})$	-6.05***	-6.15***	-7.19***	-7.92***
$\Delta \ln(\text{YR})$	-3.32**	-3.53*	-3.02**	-3.07
$\Delta \ln(\text{WYR})$	-4.35***	-5.55***	-4.29***	-5.02***
Thailand (1962-1996)				
$\Delta \ln(\text{TB})$	-4.26***	-4.21**	-6.75***	-6.79***
$\Delta \ln(\text{REER})$	-4.90***	-4.97***	-4.79***	-4.74***
$\Delta \ln(\text{YR})$	-3.38**	-3.33*	-3.85***	-3.74**
$\Delta \ln(\text{WYR})$	-4.35***	-5.55***	-4.29***	-5.02***

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)

Thailand. As reasons why Indonesia and Malaysia do not show a significant relationship between REER and trade balance, we speculate that Indonesian exports, recording a large share of raw materials (even if crude oil is excluded) may have been highly influenced by the movements of world commodity prices, and that Malaysian exports, consisting largely of machinery components for the Asian industrial production network, may not have been so sensitive to price mechanisms.

3.3. Simulation Analysis of Trade Balance

We finally turn to a simulation analysis to examine how and to what extent the sample countries would have changed their trade balance trend if they had adopted a policy to stabilize their REER instead of the de facto US dollar peg system during the pre-crisis period. We here exclude Indonesia and Malaysia from the simulation analysis because we could not verify the relationship between its REER and trade balance in the regression analysis of the previous section.

We proceed to the simulation analysis in the following way. First, we materialize the policy to stabilize the REER in such a way that the REER levels off from 1987 to 1996. Second, we simulated the trade balance by replacing only the actual REER with the leveled-off REER in the regression equation estimated in the previous section of 3.2. We here assume that the coefficients on the explaining variable in the regression equation are unchanged even if the monetary authorities change their exchange rate management. Third, we compare the simulated trade balance with the one estimated under the actual REER appreciation, and then calculate the gap for both values. The gap really shows the extent to which the sample countries would have improved their trade balance trend if they had adopted a policy to stabilize their REER instead of the de facto US dollar peg system during the pre-crisis period. This can also be understood as the negative effect of the pre-crisis REER appreciation under the dollar peg regime on trade balance.

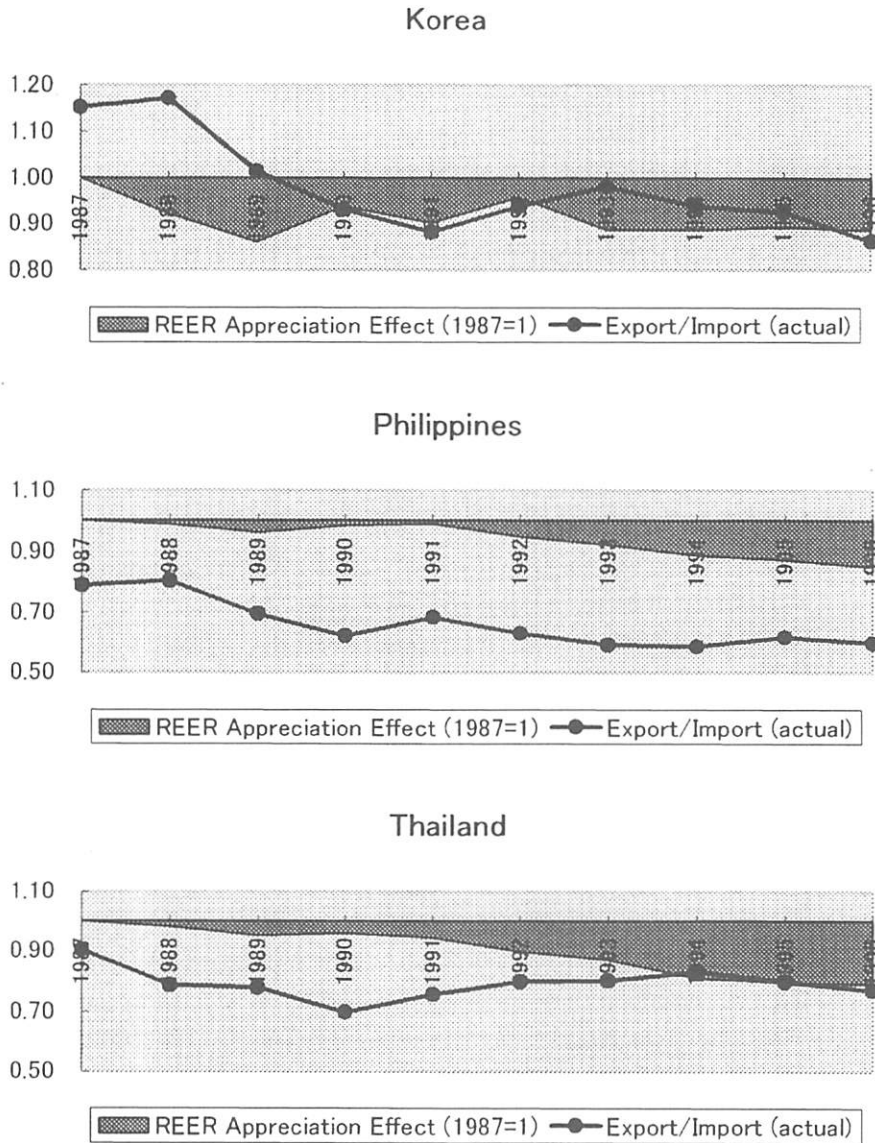
Figure 2 and Table 4 report the results of the calculation above. The main observations are as follows. The cumulative negative impact of the REER appreciation on trade balance from 1987 until 1996 in three sample countries amounts to 0.1-0.2 points of the export-import ratio. During the same period, three countries' trade balances had deteriorated by 0.1-0.3 points of the export-import ratio. We can therefore conclude that the negative effect of the REER appreciation on external balance was large enough to be considered as one of the causes of the currency crisis since 1997.

The simulation analysis above clearly shows the importance of stabilizing the REER in exchange rate management as a policy implication. The US dollar peg system, as analyzed in Section 3.1, had inherently caused the REER appreciation. Then, the question is: what kinds of

Table 4. The Effect of REER Appreciation on Trade Balance

	Actual Trade Balance (Export/Import)			The Effect of REER Appreciation (1987-1996)
	1987	1996	1987-1996	
Korea	1.15	0.86	-0.29	-0.11
Philippines	0.79	0.60	-0.19	-0.15
Thailand	0.90	0.77	-0.13	-0.21

Source: IFS (IMF)



Source: IFS (IMF)

Figure 2. The Effect of REER Appreciation on External Balance

alternative system for exchange rate management can achieve a stable REER. When we consider that both inflation differentials and the depreciation of third countries under the dollar peg regime are key factors for currency appreciation, both the inflation slide and basket pegging in exchange rate management seem to be inevitable for the REER stabilization.

4. Concluding Remarks

In this study we set out to examine, using empirical studies (Section 3), the negative effect of

the pre-crisis US dollar peg regime on trade balance through currency appreciation in selected East Asian countries.

First, we found a significantly large appreciation of real effective exchange rate in the pre-crisis East Asian sample countries with de facto dollar peg regimes. Second, we verified the correlation between real effective exchange rate and trade balance by regression analysis. Third, the simulation results indicated that the appreciation of real effective exchange rate had a clearly negative effect on trade balance. Therefore, our studies imply the importance of stabilizing real effective exchange rate in exchange rate management.

Other analytical issues remain. First, we may improve the simulation method by considering the "general impact" of the changes of exchange rate policies on macroeconomic variables. This paper considers only the "partial impact" on trade balance. Change of exchange rate management, however, may simultaneously influence such domestic economic variables as GDP and coefficients on the REER. Second, the post-crisis trends of the REER and trade balance are an important frontier to be studied. The post-crisis period is, up to now, a little too short to provide sufficient data for sophisticated analyses. We will, therefore, need to keep track of upcoming trends in the relevant economic indices and policies.

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