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Abstract

Exchange rate management has been a hot topic in policy maker and academic circles. 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. It is said that this regime caused the appreciation of real effective exchange rates (REERs) and the subsequent loss of competitiveness. This article examines the trend of the REER and its impact on the trade balance during the pre-crisis and post-crisis periods in selected ASEAN countries. The main findings of the study are as follows. First, we found that the REER shows a clear trend of appreciation during the pre-crisis period, whereas it reveals a rather stable movement during the post-crisis period. Second, a Johansen multivariate co-integration analysis verified the existence of a stable long-run correlation between the REER and the trade balance. Third, a simulation analysis showed that the pre-crisis trend of the REER had a clearly negative impact on the trade balance, whereas the post-crisis trend of the REER had a more or less neutral effect on it.

1. Introduction

Exchange rate management has been a hot topic in policy maker and academic circles. The 1997–98 Asian crisis has refocused attention on the exchange rate management of East Asian countries. The crisis has needed 'third generation' analysis, which puts crisis in the financial system at center-stage. Then, debate raged about whether this third-generation crisis was a problem of panic and collapse, resulting from a shift from a 'good' equilibrium to a 'bad' one (Radelet and Sachs 1998), or, instead, a problem resulting from a worsening of fundamentals (Krugman 1998). Corbett, Irwin and Vines (1999) argued that a panic-and-collapse account of the Asian crisis needed to be underpinned by a story which explains the Asian vulnerabilities to crisis: vulnerability in the financial system due to under-regulating and over-guaranteeing, and vulnerability in the financial system due to the pegged exchange rate regime. Stiglitz (1998) also stated that a de facto dollar peg in East Asia shaped the incentives that led to the build up of vulnerability, especially in the form of short-term, dollar-denominated debt.

Focusing on the assessment of the pre-crisis dollar peg system in connection with the trade balance, most views expressed are critical of the system, by stating that the regime deteriorated trade balance with the appreciation of real exchange rate. For example, Ito (2001) points out three types of problems 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 in the real effective exchange rate—the trade-weighted, inflation-adjusted exchange rate. Kawai (2002) also puts forward, as one of the difficulties 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 flow.

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 the current account deficits and rising real exchange rates, the combination of which provided a vital ingredient to the financial crisis. They attributed the rising real exchange rate to a combination of factors, including higher domestic inflation in relation to the world average, the appreciation of the US dollar, to which these currencies were pegged, the depreciation of the Japanese yen, and the devaluation of the PRC currency in 1994.

This article examines the trend of the real effective exchange rate (REER) and its impact on the trade balance during the pre-crisis and post-crisis periods in selected ASEAN countries. Specifically, the two main questions are these: whether the REER of the sample countries did in fact appreciate under the dollar peg system and have a negative impact on the trade balance in the pre-crisis period, and whether the behavior of the REER has found another path to follow by learning a lesson from the crisis and modified its impact on the trade balance in the post-crisis period.

2. Empirical Study of the Selected ASEAN Countries

We will now proceed to the empirical analysis of the selected ASEAN countries. There are three steps in our analysis. First, we examine the trend of the real effective exchange rate (REER) for the sample countries during the pre-crisis and post-crisis periods. Second, we conduct a Johansen multivariate co-integration analysis to verify the relationship between the REER and the trade balance throughout the pre-crisis and post-crisis periods. Third, based on the analysis given above, we conduct a simulation analysis to examine the impact of the REER on the trade balance for the sample countries during the pre-crisis and post-crisis periods.

We take, as sample countries, the crisis-experienced countries among the ASEAN countries with a similar economic structure: Indonesia, the Philippines, Malaysia, and Thailand. According the ADB (1998), the eroding competitiveness of these four countries in labor-intensive exports triggered the crisis and their currencies depreciated significantly: Since the end of June 1997 through the end of January 1998, the rupiah depreciated by about 80 percent, the baht by about 53 percent, the ringgit by 42 percent, and the peso by about 36 percent.

All data used throughout the empirical study come from the IFS of the IMF (IMF (2006)). We use the IFS annual data from 1970 to 2004 for the analysis out of data availability considerations; In the IFS data base, quarterly data, which are often used for the analyses on macro-economic variables, are unfortunately unavailable for the real GDP in Indonesia (before 1996), Thailand (before 1992), and Malaysia (before 1987), respectively. This lack of data makes it difficult to analyze the pre-crisis concerned variables.

As for period identification, we divide the sample period into two: the pre-crisis period from 1970 to 1996, and the post-crisis period from 1999 to 2004, excluding the turbulent crisis period of 1997–98. The exclusion of the crisis period may be justified based on the studies mentioned below. Regarding the starting point of the crisis, there seems to be little dispute, because the 1997 crisis clearly began with the Thai baht depreciation on July 2nd of that year. The end point of the crisis is, however, still controversial. In previous studies of McKinnon (2001) and Kawai (2002), the crisis period is considered to end in December 1998. Kawai and Takagi (2001) indicated that, regarding the exchange rate volatility, the value of East Asian currencies began to show a relative stability from November 1998 onward. Baak (2003) identified the end point of the pre-crisis period as June 1997, and the

starting point of the post-crisis period as January 1999, through the Chow test for structural breaks.

2.1   Real Effective Exchange Rate Trend

We start by looking at the REER trend in the sample countries during the pre-crisis and post-crisis periods. The REER is an indicator of a country's international price competitiveness, specifically of a country's prices relative to those of other countries. When the exchange rate is fully adjusted according to that country's prices relative to those of other countries (the country follows purchasing power parity—PPP), a country's REER levels off. The rising REER, therefore, means the deviation from PPP, thereby the loss of international price competitiveness. Some disputes exit on whether or not the crisis-experienced economies really faced a sizable appreciation of the REER during the pre-crisis period. Ohno (1999) argued, for example, that no serious overvaluation was detected in the Asian worst-hit economies during the pre-crisis period. On the other hand, the ADB (1998) reported that the current account deficit of the crisis-experienced countries was caused by their appreciation of the REER. This study, following the report of the ADB (1998), intends to represent not only a sizable appreciation trend of the REER of sample countries, but also its significant impact on trade balance in the later simulation analysis. We here define the REER as follows (taking Indonesia as an example):

$$REER_{Indonesia} = \{WPI_{Indonesia}/ER\ (Rupiah/U.S.\ dollar)\}\ /WEUVI,$$

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

According to Table 1, the REER shows a clear 10~40-percent appreciation trend during the pre-crisis period of 1987–96, whereas it reveals a rather stable movement from 3 percent depreciation to 9 percent appreciation during the post-crisis period of 1999–2004. There seem to be at least two reasons for the difference between the pre-crisis REER trend and the post-crisis one. First, the difference derives from the difference in domestic inflation; during the pre-crisis period, higher domestic inflation induces a greater appreciation of the REER. Table 1 show that the pre-crisis WPI underwent a 130~220-percent hike in 1987–96, whereas the post-crisis WPI underwent a 110~160-percent increase in 1999–2004. Second, the difference in the REER trend is influenced by the difference in the nominal exchange rate trend. It is noteworthy that the Philippines and Thailand experienced a clear depreciation of the nominal exchange rate during the post-crisis period, as shown in Table 1.[1]

Table 1   Indices on Exchange Rates

⟨Pre-crisis Period from 1987 to 1996, 1987 = 100⟩

	REER	WPI	Nominal Exchange Rate
Indonesia	120.5	207.3	70.2
Malaysia	112.6	135.8	100.1
Philippines	142.8	219.8	78.5
Thailand	120.2	142.9	101.5

⟨Post-crisis Period from 1999 to 2004, 1999 = 100⟩

	REER	WPI	Nominal Exchange Rate
Indonesia	108.9	139.9	87.9
Malaysia	104.5	118.0	100.0
Philippines	97.2	157.3	69.8
Thailand	100.1	120.2	94.0

Source: IFS (IMF)

2.2   Analysis of the Trade Balance within a Johansen Co-integration Framework

The second step of our empirical study is to prove the existence of a relationship between the REER and the trade balance. Concerning the relationship between the REER and the trade balance, the movement of the REER, in general, has played a central role in empirical work on trade, where volumes of exports and imports are usually related to changes in the 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.[2] Among these studies, we focus on the ones examining the direct relationship between the REER and the trade balance. Baharumshah (2001) 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 the trade balance and three macro variables: the exchange rate, the domestic income and the foreign income. The model of Rose and Yellen (1989) and Krugman and Baldwin (1987) was applied to his study.

Although there has been plenty of literature on the issue of the REER and its connection with trade, there seem to be few studies which deal directly with the relationship between the REER and the trade balance during the pre-crisis and post-crisis periods in the crisis-experienced countries among the ASEAN countries. Here, we address this specific issue by applying the analytical framework for trade balance presented by Baharumshah (2001) to our analysis. The equation form is as follows:

$$ln(TB) = \alpha ln(REER) + \beta ln(YR) + \gamma ln(WYR) + u,$$
$$\alpha < 0, \quad \beta > 0 \text{ or } < 0, \quad \gamma > 0,$$

where ln is the natural logarithm, and u is assumed to be a white-noise process. TB, the trade balance, is expressed by the ratio of the export value to the import value. (For Indonesia, the oil export value is excluded.) $REER$, the real effective exchange rate, is defined in the previous section, 2.1. The coefficient of $REER$, α is expected to be negative if the Marshall-Lerner condition holds, that is, if the REER has a meaningful impact on the trade balance. For YR, the domestic real income, we use the GDP in real terms. The sign of β can be either positive or negative, depending on whether YR represents the level of domestic demand or the supply volume of the exportables. For WYR, the foreign real income, we use the industrial production of industrial countries. The sign of γ is expected to be positive, because the WYR is seen as the foreign demand for the country's export.

In the present context, if the four series, $TB, REER, YR, WYR$, are integrated of the same order, we can proceed to the co-integration test. We relied on two asymptotically equivalent procedures for detecting the unit roots: the Augmented Dickey-Fuller (ADF) and the Phillip and Perron (PP) tests. The unit-root tests for the series in the first differences confirm our expectation that all series are non-stationary on their level but stationary in their first differences, thereby testing for co-integration is feasible.

We adopted the Johansen-Juselius multivariate co-integration technique to test for co-integration (see Johansen and Juselius (1990)). This method sets out a maximum likelihood procedure for the estimation and determination of the presence of co-integrating vectors in a Vector Autoregressive (VAR) system. It is well known that the results of the Johansen-Juselius procedure are sensitive to lag length. Based on the Akaike information criterion, the Schwarz information criterion and the Hannan-Quinn information criterion, a lag length of $k=1$ is feasible in most cases. The Johansen-Juselius method suggested two statistics to determine the number of co-integrating vectors: the trace and maximum eigenvalue tests. Table 2 lists the results of both tests for the co-integration among the variables of the equations for the sample period. It is evident that, in all cases, the null hypothesis of no co-integration is rejected by either statistic of the tests at the 95-percent critical value. We conclude from this that, in all cases, there is at least one stochastic trend shared by these four variables in the long run.

For Indonesia, the Philippines and Thailand, we found only one significant co-integrating vector. Thus, we did not have the problem of identifying the equation that represents the trade balance. For Malaysia, four significant vectors were identified by the co-integration analysis. In this case, we chose the vector corresponding to the largest eigenvalue. In Table 3, we present the coefficients estimated by normalizing on the trade balance in order to

Table 2   Testing for Cointegration
(Trend assumption: Linear deterministic trend)

	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic
Indonesia				
ln(TB)	None	0.472520	50.989526*	22.387521
ln(REER)	At most 1	0.346841	28.602005	14.907688
ln(YR)	At most 2	0.248422	13.694318	9.995320
ln(WYR)	At most 3	0.100293	3.698997	3.698997
Malaysia				
ln(TB)	None	0.489009	53.817114*	23.499098
ln(REER)	At most 1	0.339891	30.318016*	14.537256
ln(YR)	At most 2	0.283392	15.780760*	11.662901
ln(WYR)	At most 3	0.110996	4.117859*	4.117859*
Philippines				
ln(TB)	None	0.503265	52.971939*	24.489480
ln(REER)	At most 1	0.461241	28.482458	21.647063*
ln(YR)	At most 2	0.153461	6.835396	5.830964
ln(WYR)	At most 3	0.028290	1.004432	1.004432
Thailand				
ln(TB)	None	0.647133	62.891598*	36.458258*
ln(REER)	At most 1	0.326813	26.433340	13.850625
ln(YR)	At most 2	0.220478	12.582715	8.717588
ln(WYR)	At most 3	0.104553	3.865127*	3.865127*

Notes: * denotes rejection of the hypothesis at the 0.05 level
Source: IFS(IMF)

interpret them as the long-run effect of the variables on the trade balance. In all cases except Indonesia, the negative signs and magnitudes of the exchange-rate variable suggest that depreciation leads to an improvement of the trade balance in the long run. The vector of the foreign income yields the wrong sign, i.e. the sign that appears to be inconsistent with theory, in all cases except the Philippines. Having established the long-run relationship between the REER and the trade balance, we turned to the error-correction model; The error-correction term was constructed and included in the estimation of the Vector Error Correction Model (VECM) (see Appendix). As a short-run effect, we could not find any significant coefficients for the variables, some of which even have the wrong sign, except for the case of the Philippines.

Based on these observations, we could at least verify a meaningful long-run correlation between the REER and the trade balance during the sample period in Malaysia, the Philippines and Thailand. As for the reasons why Indonesia does not show a significant long-run relationship between the REER and the trade balance, we speculate that Indonesian exports, a large share of which are raw materials (even if crude oil is excluded), may have been highly influenced by the movement of world commodity prices.

2.3   Impact of the REER on the Trade Balance

We finally turn to the simulation analysis to examine the impact of the actual trend of the REER on the trade balance for sample countries during the pre-crisis and post-crisis periods. We used the equation in Table 3, which

Table 3   Estimated Cointegrated Vectors

	ln(TB)	ln(REER)	ln(YR)	ln(WYR)	Constant
Indonesia	1.00	0.46 [1.56]	−0.07 [−0.23]	−0.81 [−0.91]	−2.68
Malaysia	1.00	−1.14** [−2.75]	1.56*** [4.73]	−5.22*** [−4.72]	17.40
Philippines	1.00	−0.99** [−2.23]	−2.12*** [−3.04]	2.37** [2.40]	−1.01
Thailand	1.00	−1.57*** [−4.34]	1.10*** [6.43]	−4.68*** [−7.68]	18.94

Notes:
1) [　] shows t-values.
2) *, **, *** indicate that the coefficient is significant at the 90, 95, and 99 percent level.
Source: IFS(IMF)

Table 4   The Effect of REER Appreciation on Trade Balance

〈Pre-crisis Period〉

	Actual Trade Balance (Export/Import)			The Effect of REER appreciation (1987–1996)
	1987	1996	1987–1996	
Malaysia	1.42	1.00	−0.42	−0.14
Philippines	0.79	0.60	−0.19	−0.35
Thailand	0.90	0.77	−0.13	−0.29

〈Post-crisis Period〉

	Actual Trade Balance (Export/Import)			The Effect of REER appreciation (1999–2004)
	1999	2004	1999–2004	
Malaysia	1.29	1.19	−0.10	−0.05
Philippines	1.13	0.94	−0.19	0.03
Thailand	1.16	1.02	−0.14	0.00

Source: IFS (IMF)

we identified as the one representing the long-run relationship between the REER and the trade balance within the Johansen multivariate co-integration framework. The impact of the actual trend of the REER on the trade balance can be calculated in such a way that only the actual *ln*(*REER*) is substituted for the trade balance equation in Table 3 under the assumption that there are no changes in other variables, *ln*(*YR*) and *ln*(*WYR*). Here, we excluded Indonesia from the analysis because we could not verify any long-term relationship between its REER and its trade balance within the Johansen framework.

　　Table 4 shows the results of the calculation above. The main observations are as follows. During the pre-crisis period from 1987 to 1996, the cumulative negative impact of the REER on the trade balance in the three sample countries amounted to 0.14−0.35 points of the export-import ratio. During the same period, the three countries' trade balances deteriorated by 0.13−0.42 points of the export-import ratio. It can be said, therefore, that, during the pre-crisis period, the negative impact of the REER on the trade balance was large enough to be the main cause of the deterioration of the trade balance. In contrast, during the post-crisis period from 1999 to 2004, the

Appendix   Vector Error Correction Model

	Constant	D(ln(TB)₋₁)	D(ln(REER)₋₁)	D(ln(YR)₋₁)	D(ln(WYR)₋₁)	ECT
Indonesia D(ln(TB))	−0.026 [−0.48]	0.159 [0.81]	−0.018 [−0.08]	0.062 [0.07]	1.651 [1.71]	−0.794*** [−3.91]
Malaysia D(ln(TB))	0.081** [2.17]	0.100 [0.53]	0.387 [1.33]	−0.869 [−1.54]	−1.027 [−1.53]	−0.136 [−1.15]
Philippines D(ln(TB))	0.012 [0.38]	−0.170 [−0.91]	−0.577** [−2.35]	−1.314* [−1.95]	1.769** [2.31]	−0.284*** [−3.98]
Thailand D(ln(TB))	0.044 [1.00]	−0.124 [−0.53]	−0.664 [−1.35]	−0.295 [−0.47]	−0.583 [−0.79]	−0.292* [−1.71]

Notes:
1) [ ] shows t-values.
2) *, **, *** indicate that the coefficient is significant at the 90, 95, and 99 percent level.
Source: IFS(IMF)

cumulative impact of the REER on the trade balance was restricted to a small range, from −0.05 to 0.03 percent points, of the export-import ratio, while the three countries' trade balance deteriorated by 0.10–0.19 points. During the post-crisis period, the trend of the REER seems to have had a more or less neutral effect on the trade balance.

3. Concluding Remarks

In this study, we set out to examine, using empirical methods, the trend of the real effective exchange rate (REER) and its impact on the trade balance during the pre-crisis and post-crisis periods in selected ASEAN countries. Specifically, the two main questions were these: whether the REER of the sample countries did in fact appreciate under the dollar peg system and exert a negative impact on the trade balance in the pre-crisis period, and whether the behavior of the REER has found another path to follow by learning a lesson from the crisis and modifying its impact on the trade balance in the post-crisis period.

The main findings of the study were as follows. First, we found that the REER shows a clear trend of appreciation during the pre-crisis period, whereas it reveals a rather stable movement during the post-crisis period. Second, a Johansen multivariate co-integration analysis verified the existence of a stable long-run correlation between the REER and the trade balance in Malaysia, the Philippines and Thailand. Third, a simulation analysis for those countries showed that the pre-crisis trend of the REER had a clearly negative impact on the trade balance, whereas the post-crisis trend of the REER had a more or less neutral effect on it. The strategic implication of our findings is that the stabilizing of the REER is important in exchange rate management.

One of the remaining issues is the methodological improvement by obtaining sufficient data for estimation. There seems to be two possible alternatives: to obtain quarterly data for the real GDP from other data sources than the IFS, or to conduct panel unit root tests and co-integration tests by constructing a table of annual data from four sample economies for 1970 to 2004.

Notes
1. The sample countries' pegging to the US dollar also makes their currencies appreciate when there is devaluation or depreciation in the third countries (the devaluation of the Chinese yuan in 1994 and the rapid depreciation of the Japanese yen in 1996).

2 . Exchange rates have played a central role in estimated equations for trade volumes (see Ito, Isard, Symansky, and Bayoumi (1996), Taguchi (1998), Kim and Lee (1996)).

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