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PROF. DR. AHMAD ZUBAIDI BAHARUMSHAH

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THE ECONOMICS OF EXCHANGE RATES IN THE EAST ASIAN COUNTRIES

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ABSTRACT

The recent theoretical and empirical research in international macroeconomics has reestablished the hypothesis of purchasing power parity (PPP) as a long run relationship. This paper highlights some of the difficulties that economists had over the past two decades in validating the PPP doctrines. The emphasis is on the exchange rates of the emerging markets of the East Asian economies. This paper argues that with careful application of the nonstationarity time series method, this simple exchange rate model is successful empirically. A review of the literature shows that academicians are continually discovering new empirical facts about the relationship between exchange rate and its fundamental variables as techniques that properly capture the dynamic data generating processes of the macroeconomic variables (exchange rates, current account interest rates, inflation, etc.) are developed. In this paper, the statistical results from the monetary model and its variants are examined to show whether these structural models can replicate the salient features of the exchange rate behavior in the emerging market economies. The focus is on what is predictable and why earlier attempts to model exchange rates failed to produce good forecasts. There is now a growing evidence to suggest that linear models are not always the optimal forecast for the exchange rates.

The bulk of the literature on the exchange rates of the East Asian economies suggests the following: (i) Economic policies including the fixing of the currency to the dollar adopted by the East Asian countries, affected the economic progress of these countries; (ii) The selected monetary approach to exchange rate determination easily passes a number of in-sample tests and outperforms the simple random walk model in a forecasting exercise; (iii) Managing the external balance is important and soaring current account deficit is at odds with fixed peg exchange rates; (iv) Exchange rate emerged as an important policy tool in the East Asian trade; (v) Good macroeconomic policies are necessary but not sufficient for the sustainability of a good fixed peg if there are structural weakness in the financial or corporate sectors of the economies; and (vi) Both equilibrium PPP rates and the current account deficit provided some indicator of the future currency crisis.

INTRODUCTION

Exchange rate has been one of the most important areas of economic research over the past two decades or so, and the amount of area covered on this subject is vast. Important new developments have appeared in areas as diverse as the behavior of exchange rates within the target zone such as the exchange rate mechanism of the European Monetary System (EMS); the theory of optimal course of financial integration by countries previously divorced from the international circuit of capital; explanations for why real exchange rates wander away for long periods from purchasing power parity, thereby disturbing real economic activity; how misinformed speculation and speculative bubbles cause floating exchange rates to be unstable and largely unpredictable. And more recently, one of the key questions surrounding the financial crises in the 1990's is whether the currency crises could have been predicted (see e.g. Kaminsky and Reinhart, 1999 and Berg et al., 2000). Thus, the only hope is to give a selective survey of the literature in this field relating to the East Asian countries.

Any debate about exchange rate policy is bound to be influenced by the view on what influences real exchange rate in the long run, and the cost of adjusting towards that long run if nominal rates are fixed. Discussions about equilibrium real exchange rate usually begin with purchasing power parity (PPP): the proposition that the real exchange rate is constant and independent of movement in other macroeconomic factors (money supply, interest rate, income and inflation rate). In the discussion on PPP a distinction between the short run (less than 3 years, say), the medium run (3-20 years) and the long run is helpful. Although much has been written and debated about the behavior of exchange rates, few puzzles in international economics are as perplexing as the behavior of exchange rates. The literature has documented several facts. First, since the early 1970s the exchange rates for the industrial countries have been very volatile, particularly in comparison with the volatility of other macroeconomic variables such as inflation, money growth rates, or interest rates. Second, change in nominal and real exchange rates are highly correlated and have roughly the same volatility. Third, movement in real exchange rates are highly persistent. That is the PPP puzzle.

Several scholars have noted that exchange rates are unpredictable. Indeed, Mussa (1979) states that the natural logarithm of the spot exchange rate follows approximately a random walk. The article by Meese and Rogoff (1983) provided the empirical evidence supporting the view expressed by Mussa. Their study compares time series and standard models on the basis of out-of-sample forecasting accuracy. Similarly, Meese (1990) has argued that this result is due to the fact that economists do not yet understand the short-to-medium run movement in exchange rates. Many studies undertaken after that failed to outperform a random walk in terms of forecasting accuracy. One of the interesting directions for this research is to explore whether other macroeconomic variables might form part of the cointegrating vector involving exchange rate (as in Baharumshah *et al.*, 2002a). These models have been shown to fare better over the long term horizon while success at explaining short-term movements remains elusive.

This paper looks at the literature on the exchange rate economics over the last two decades, and in the interest of brevity, the survey is a review on empirical facts on the behavior of

exchange rates and how exchange rate affects the East Asian economies. Most of the studies are empirical, tackling the exchange rate issues from the frontier of macroeconomic theory and econometric methods. The remainder of the paper is organized as follows. The article begins with a brief review on the East Asian economies. It shows how the economic policies (including exchange rate) adopted by these East Asian countries affect the economic progress of these countries. Next, a review on the exchange rate economics is presented. The focus is on what is predictable and why earlier attempts to model exchange rates failed to produce good forecasts. To this end, the monetary approach to exchange rate determination and its variant are considered. The purpose is to examine whether the structural models can replicate the salient features of the exchange rate behavior in the emerging markets in the post-Bretton Woods era.

Academicians are continually discovering new empirical facts about the relationship between exchange rate and its fundamental variables as new approaches to econometrics methods are developed. A brief discussion on non-linear approach to exchange rate modeling is presented. Results on the on-going research could explain why earlier attempts to fit the East Asian currency values failed to produce satisfactory results. In the concluding section, we draw some broad conclusions on the host subject.

AN OVERVIEW OF THE ASIAN ECONOMIES

The East Asian economies, namely South Korea, Taiwan, Singapore, Malaysia, Thailand, Indonesia and the Philippines appear to have shared a common success and failure episode. Malaysia, Singapore, Thailand and Taiwan all maintained inflation rates below 3 percent when the economy was growing at a rapid rate for more than a decade. They recorded high growth rates and at the same time kept inflation rates at moderate levels. But when the problems developed in Asia in 1997, it resulted in the largest financial bailouts in history. The financial turmoil developed from what one can view as a moderate adjustment into a financial panic and deep recession. It was the least anticipated financial crisis that hit the most rapid growing economies in the world. East Asia plunged from being a region that exhibited the highest average rate of growth of real gross domestic product (GDP) of all the regions in the world economy to a region where several countries registered negative growth in GDP per capita in 1998: Hong Kong, South Korea, Singapore, Indonesia, Malaysia, Philippines and Thailand. The currency and banking crises have not only been disastrous for the neighboring countries in the region, but put the global financial system under stress. In this sense, the crisis is far more widespread than previous crises: the debt crisis of the 1980s and the Mexican financial crisis of 1994-1995¹.

These countries and in particular the ASEAN-5 (Singapore, Malaysia, Thailand, Indonesia, and the Philippines) had successfully transformed themselves from being inward-oriented (import substitution industrialization), inspired by the "infant industry" argument to being

¹ The Asian financial crisis has significantly affected countries in East Asia (Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand), Latin America (Argentina, Brazil, Chile, Columbia, Mexico, Peru and Venezuela), Russia, and South Africa.

outward-oriented (export oriented industrialization) in the late 1960s-early 1970s. The shift to an outward-oriented strategy overcame the diminishing dynamics of inward-oriented strategy. Besides, several exogenous factors such as, currency overvaluation; the rising labor costs in Japan and other Tiger economies; the voluntary export restraints on textile exports from developing countries by the MFA (Multi fiber Agreement), also contributed to the spectacular growth performance of these countries². Most of these countries (except for Singapore) moved from agricultural economy to manufactured goods and as a result, the export share of the agricultural sector declined. As the economy move towards development and industrialization, export share of the agricultural products diminished and has been replaced by manufactured goods. For instance, the electronic and textile sector accounted for about 60 percent of Malaysia's exports in the 1990s. The export expansion strategy also transformed Thailand from the rice economy of Asia into an important exporter of labor-intensive manufactured products.

Several of the East Asian countries have experienced phenomenal economic growth. This trend was initiated by Japan, and then followed by the four dragons, namely South Korea, Taiwan, Hong Kong and Singapore. Soon the ASEAN economies of Malaysia, Thailand, Indonesia and the Philippines followed their footsteps³. The average annual growth of these countries was well above the world average and more important these Asian economies have managed to sustain such growth rates for a long period⁴. The World Bank (1993), for example, termed eight of these countries as high-performing Asian economies (HPAEs), namely, Japan, The 'Four Tigers' (Hong Kong, The Republic of Korea, Singapore and Taiwan) and the three newly industrialized economies (NIEs) of Indonesia, Malaysia and Thailand. In the 1970s the Philippines had experienced growth rates in excess of 5 percent but have not sustained them for more than a decade.

The success of some of these economies in achieving such growth rates has enabled some to catch up with the developing countries. East Asia emerged as one of the fastest-growing economic areas in the world and became the Japanese's largest trading partner after the US and the largest market for the US products. For most of the Asian economies, the single most important real internal economic factor for their economic success has been their relatively high level of saving and investment rates. This group of countries recorded domestic savings of more than 30% of the Gross Domestic Product (GDP) compared to less than 15% in the sub-Saharan African countries (20% for Latin America). Besides that, all these countries committed a high proportion of their GDP to domestic investment ranging from 20% (Philippines) to as high as 44% (Malaysia). The technology transfers

² One reason why reliance on inward-looking trade and industrial policies have had limited success in less developed countries (LDCs) is because of the small size of the domestic economy which prevents the economy from achieving economies of scale. This factor plus the lack of competitive pressure to improve operating efficiency and product quality, dooms them to remain 'infants who never grow up'.

³ Indonesia had per capita income levels that were among the lowest in the world in the 1970s. In little more than a decade, however, Indonesia moved into the group of lower-middle income group.

⁴ The five Asian economies hardest hit by the recent financial crisis (Thailand, Indonesia, Malaysia, South Korea and The Philippines) had growth rates averaging nearly 7 percent, more than double that of OECD countries over the 1970-95 period.

from the more developed to the less developed countries also led to a rapid growth of investment in the region. It is important to note here that investment activities took place mainly in the export-oriented industries. Hence, the export sector emerged as the engine of growth for all of these countries (export-led growth hypothesis). But what the 1997-98 crises demonstrate is that a high saving rate alone cannot fully ensure success against the consequences of weak financial systems or unsustainable exchange rate policies.

Foreign capital started to flow into the region at accelerating rates in the 1990s after a large drop during the 1980s⁵. International investors were attracted to these countries because of their credible macroeconomics policy. The major Asian economies had low rates of inflation, modest fiscal deficits and government debt as a ratio to GDP, stable exchange rates, high savings rates, and highly regarded work force. Other domestic factors that have made these countries attractive to foreign investors include the widespread liberalization of financial markets, and the credit-worthiness of these countries.

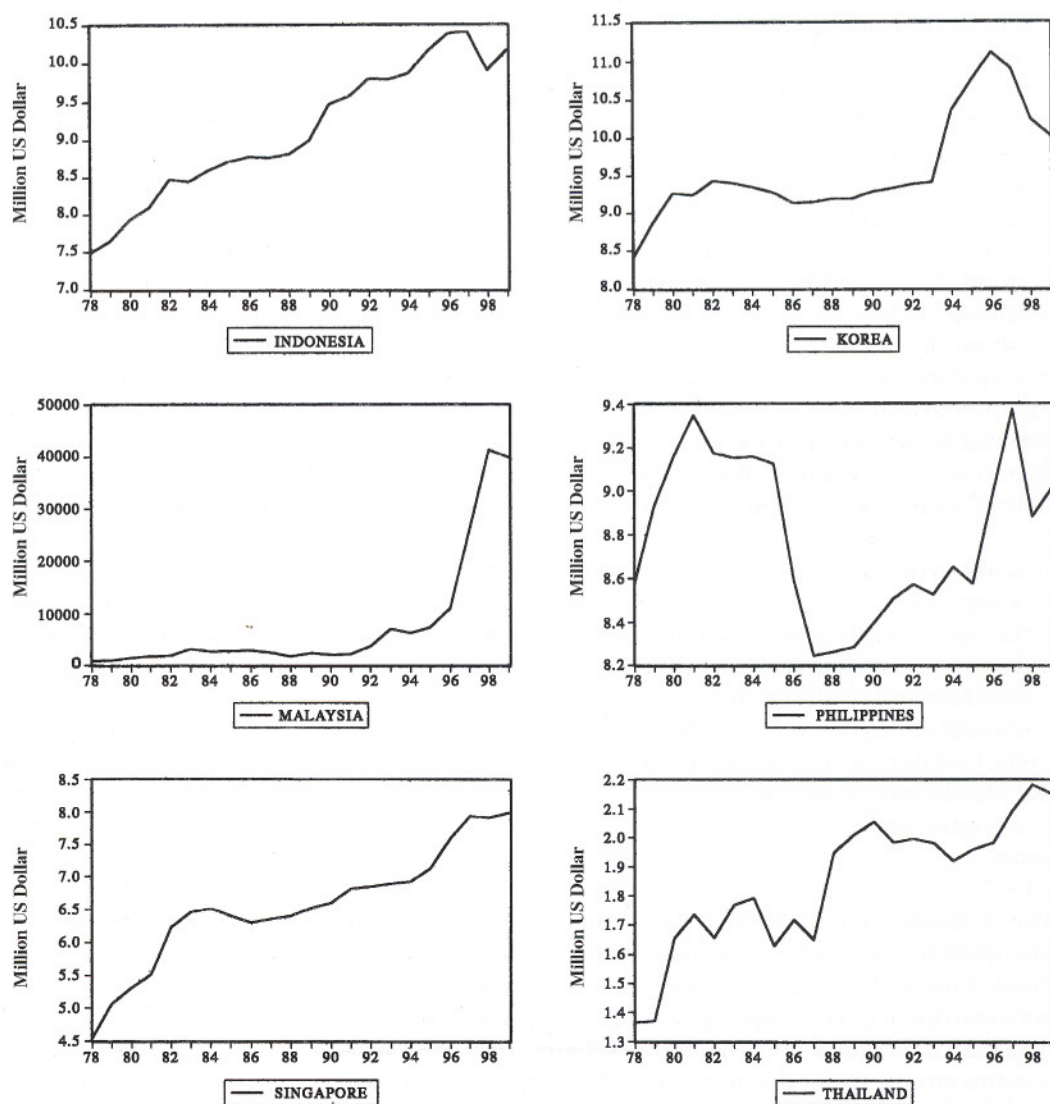
External factors jointly play a significant role in explaining the causes of the recent capital inflows into Asia. These include a low world interest rate and recessions in industrial countries. In addition, the strong yen against the US dollar has largely propelled Japanese investment in the region. Since the value of Asian currencies was more or less tied to a basket of currencies, primarily to the dollar, Japanese companies could use them as a low-cost substitute for American manufacturing base. Many observers attribute the pre-crisis strength and sharp decline in the East Asian currency values in the mid-1997 to the fluctuation in external short-term capital movement, particularly capital inflows presumed to have been initiated by foreign banks. Borrowers found that they could lower their financing costs by borrowing in yen or dollar rather than in local currency. In the peak year of 1996, net private capital inflows reached as high as 12 percent of GDP (See Figure 1). Foreign commercial banks provide the bulk of private external credit to these countries⁶.

The combination of high saving rates and large capital inflows produced investment boom across much of the East Asian countries. Foreign capitals not only filled the saving-investment gap but also facilitated the transfer of technology first to the exports sector and later spilled over to the non-export sectors of the economy. The saving-investment imbalance caused the current account to move in deficits. Indeed, for most part of the 1990s all of these countries recorded large deficits, the only exceptions were Singapore and Taiwan. The saving-investment gap needed to be financed by international debts and

⁵ Indonesia, Malaysia and Thailand are among the 12 percent recipients of foreign investments in the past three decades. China joined this group in 1990.

⁶ In the peak year of 1996, about \$90 billion flowed into South Korea, Indonesia, Thailand, Malaysia and the Philippines alone. Foreign commercial banks provided the bulk of the private external credit to these countries \$8 billion out of the total new external credit of \$76 billion. A recent work by Thanoon and Baharumshah (2002) suggests that foreign capitals (including those of the short-term) may benefit the recipient countries. Thus the challenge is to devise policies and institutions responsive enough to lure investments that have significant impact on growth and, at the same time, to reduce the potential for costly financial crisis.

Figure 1: Short Term Debts (1978 - 1999)



Source: International Financial Statistics (IFS)

as they accumulated, it became increasingly more difficult to finance the current account imbalances; hence, creating doubts on the ability of these countries to sustain and repay their external deficits.

During the same period the external events began to adversely affect the competitive position of Asian countries whose currency was pegged to the US dollar. Early in 1994, China devalued the yuan by 35%. Additionally, the dollar began to be appreciated globally after mid-1995 as the yen weakened. East Asian countries also lost some markets following the establishment of the North America Free Trade Agreement (NAFTA). Together all these events began to produce overcapacity problems in the East Asian countries. When Thailand was forced to devalue in July 1997, the pressure spread contagiously to the Philippines, Malaysia, South Korea, and Indonesia. The market overreacted because the thinking was that if this could happen to Thailand, it was bound to happen to other Asian countries, to varying degrees. The same problems - weak financial and corporate sectors, a large current account deficit and heavy external debt burden existed in all these economies. Pegged exchange regime, the banking sector, and other highly leveraged borrowers all collapsed at about the same time⁷. The financial crisis that hit the region in mid-1997 completely changed the view about the East Asian economies. The crisis reversed the growth miracle and plunged the economies into deep recession. Interestingly like the other currency and banking crises, the Asian economies also experienced crises after the implementation of financial deregulation or liberalization. The article by Kamisky and Reinhart (1996) reported that 70% of banking crises were preceded by deregulation and financial liberalization.

Among the developing regions, East and Southeast Asia in particular have taken the lead in adopting outward-oriented development policies. The Asian development bank's publication "Emerging Asia: Changes and Challenges" (1997) calculate trade openness indexes based on four important aspects of trade policy. Accordingly, a fully closed economy scores zero and a fully open economy scores one. On this set of scale East Asia scores 0.97, Southeast Asia scores 0.73, and South Asia scores 0.06. Reflecting their openness, the growth of the East Asian countries has been strong in recent years. The People's Republic of China, the Newly Industrialized Economies (NIEs) (Hong Kong, Taipei, China and Singapore), and Southeast Asia outpace that in South Asia, and even in the world as a whole in recent years.

The on going financial crisis in Asia, however, has raised some questions about the role of openness in promoting sustainable growth. Several authors have argued that there are many dimensions of openness and for policymaking purposes it is important to distinguish between openness to trade, labor movement, and direct investment on the one hand, and openness of financial flows on the other hand. The case for openness in terms of the former remains strong. As for the openness to financial flows, the case is compelling, yet nuanced. It depends on the strength of the domestic financial system. However, rather than providing a reason for postponing financial integration, this means that reform of domestic financial systems is imperative.

⁷ For more detailed accounts of the 1997 Asian financial crisis, See Radelet and Sachs (1998) and Corsetti et al. (1999).

Liberalization of capital controls sharply increased capital inflows in many countries. This could reverse just as sharply and ignite pressure for depreciation. In this way financial liberalization if poorly implemented may increase the number of bank runs or failures. One very important lesson that has emerged from the problems in the East Asian countries is that capital liberalization must be undertaken with care. The problem in these countries was not that they liberalized their capital account but the sequencing was wrong and that liberalization was partial. It is now known that most of these countries liberalized short-term capital inflow before FDI. What should have been done was the other way round. The financial system must be capable of channeling capital into productive investment.

EXCHANGE-RATE SYSTEM

There is no one exchange-rate system that will be better than another at all times and in all places⁸. At one extreme, a system of pure floating (or flexible) exchange rates can be thought of as an exchange rate band with infinite bounds, while a system of pure fixed (or pegged) rates is a band with zero bounds. In practice, we see few examples of pure floating exchange rates without direct government intervention, or for that matter purely fixed rates with long intervals between realignments. Even the Bretton Woods system of fixed exchange rates, often cited by proponents of fixed rates as a major success story, lasted for only about two decades (some would argue the system lasted barely more than a decade and involved realignments in 1958, 1961 and 1967). The European Monetary System (EMS), which is a form of quasi-fixed exchange rate system, has seen even more frequent realignments.

The main arguments for pegged rates fall under 3 categories:

- Nations with similar economic structures that experience similar exogenous shocks can benefit from a common currency or a fixed rate.
- Pegging the exchange rate provides credibility and perhaps a commitment to monetary policy.
- Floating exchange rate reflects largely non-fundamental noise so floating system creates variability, uncertainty, and over- or under-valuation of currencies. The greater volatility of the rates tends to make a flexible exchange rate option very costly for the smaller emerging market economies.

The main arguments for floating exchange rates also fall into three categories:

- Nations with different economic structures that experience idiosyncratic shocks can benefit from a floating exchange rate

⁸ The choice of an exchange rate regime is an old issue going back to the early 1950s when Friedman (1953) argued in favor of a flexible exchange rate regime. The apparent misalignment of major exchange rates in the last two decades and its relation to the structural characteristics of a particular economy (i.e. trade imbalances, wage price flexibility) forced a reconsideration of what the appropriate exchange rate regime.

Fig. 1.1001

- A pegged exchange rate prevents the use of monetary policy for other (domestic) objectives and that there are alternative or better commitment devices for policy. There is little room for discretionary policy.
- A system of pegged exchange rates creates misalignments, controls on international trade and financial flows, and in the face of speculative attacks, ultimately breaks down in a costly currency crisis. Furthermore, if a country has a fragile banking system and substantial debt denominated in foreign currencies, using exchange rate peg to control inflation can be very dangerous strategy.

According to the IMF classification the East Asian countries can be classified into two broad categories. The first group of countries namely Singapore, Malaysia, Thailand and South Korea is classified to have exchange rates pegged to a basket of currencies or a single currency (the US dollar). The second group of countries (Indonesia and the Philippines) follows a managed float. Does exchange regime matter for macroeconomic performance? The experience since the 1960s suggests that it does. Pegged exchange rates are associated with better inflation performance. The choice of exchange rate regime has implications for economic growth. Pegged rates are associated with higher investment since they foster investment by reducing policy uncertainty and lowering real interest rates. But they can also contribute to slower productivity growth due to distortion in price signals and prevent the efficient allocation of resources across sectors. On net, the empirical evidence seems to suggest that output growth in the developing economies is slightly slower under pegged exchange rates.

PURCHASING POWER PARITY

The professional literature on purchasing power parity (PPP) has a long history. This is one of the earliest, simplest and the most controversial theories of exchange rate determination. The origin can be traced as far back to the 16th century by Spanish scholars of the Salamanca School. However, it was the Swedish scholar Gustav Cassel in the early 1900s that popularized the PPP concept.

The PPP hypothesis in its absolute form states that national price levels expressed in a common currency should be equal: $E = P / P^*$, where E is the exchange rate measured as the domestic currency price of a unit of foreign currency and P and P^* are the domestic and foreign price indexes respectively. Equivalently, strict PPP implies that movement in nominal exchange rate should be proportional to the ratio of national price levels or that real exchange rate should be constant. Thus according to the PPP hypothesis, if the US price level rose by 10 per cent and the Malaysian price level rose by 5 percent, the US dollar would depreciate by 5 percent, offsetting the higher inflation in the US and leaving the relative purchasing power of the two currencies unchanged.

The PPP concept follows from the Law of One Price (LOP), which holds that in competitive markets, identical goods will sell for identical prices when valued in the same currency. An arbitrage argument is usually offered to explain why this condition should hold. The LOP relates to an individual product (e.g., gold, plywood, rice, Big-Mac etc.)⁹. A generalization of that law is the absolute version of PPP - the proposition that exchange

rates will equate the nations' overall price level. Typically, one does not have prices of identical goods; rather one observed price indices for a bundle of goods, so direct testing of LOP is not possible. What can be tested empirically is how well PPP holds.

The implication of the existence of long run PPP is that the fundamental (equilibrium) value of the real exchange rate is constant and that the dynamic of the real exchange rate can be described by a transient process that reverts to this fixed mean. Today various versions of PPP are used in a wide range of applications: from choosing the right initial exchange rate for a newly independent country, to forecasting medium- and long-term real exchange rates, to trying to adjust for price differential in international comparisons of income. As a policy tool, PPP may serve as a guide for the monetary authorities when they intervene in the foreign exchange to move the exchange rate toward a level consistent with PPP.

The PPP relationship has been the forefront of modern international finance. This parity condition rests on the assumption of perfect inter-country commodity arbitrage and is the central building block of many theoretical and empirical models of exchange rate determination. Under the generalized float exchange rate system, PPP becomes a theory of exchange rate determination. While few economists take PPP seriously as a short-run proposition, most instinctively believe in some variant of PPP as an anchor for long-run real exchange rates. It has long been argued that deviation from PPP may result in factors like government intervention, trading restrictions, differential speed of adjustment in the currency and goods markets, measurement errors in constructing aggregate price index as well as transportation costs. All these can push the actual exchange rate away from its PPP determined level in the short run. The research in this area has proliferated in recent years and our contributions have been mainly on the less researched bilateral rates of the East Asian currencies (Baharumshah and Ariff, 1997; Tan and Baharumshah, 1999; Liew *et al.*, 2002).

Prior to the recent float, the consensus appeared to support the existence of a fairly stable real exchange rate over a long period of time (e.g. Friedman and Schwartz, 1963). In the mid to late 1970s, several authors failed to provide support for long-run PPP and this therefore, led to the widespread belief that the simple model of exchange rate was of little or no use empirically. Rejecting PPP as a long-run relationship means that real exchange rate follows a random walk. If true, then the implication is that shocks to the real exchange rate never reversed.

More recent literature has arrived at a consensus on a couple of basic facts. First, a number of recent studies have provided fairly persuasive evidence that the real exchange rates (nominal exchange rates adjusted for differences in national price levels) tend towards PPP in the long run. There is sufficient evidence to suggest that the speed of convergence to PPP is extremely slow; deviations for the parity appear to damp out at a rate of roughly

⁹ If the LOP holds for all countries for some products we would characterize this as integrated world market. LOP provides an operational definition of market integration. For the empirical evidence on LOP in the case of Malaysian exports, see Baharumshah *et al.* (1993) and Baharumshah and Habibullah (1997).

15 percent per year. Second, short-run deviations from PPP can be very large and volatile. Indeed, the one-month volatility of real exchange rates (the volatility of deviation from PPP) is of the same order of magnitude as the conditional volatility of nominal rates. Price differential volatility is surprisingly even larger when one confines to relatively homogenous classes of highly traded goods.

Empirical Evidence on PPP

A. Indices for Measuring PPP and the Base currency

The results that came out of a careful study of the major industrialized countries were that consumer price index (CPI) based on real exchange rates tends to reject the PPP hypothesis more often. More favorable results are obtained by using wholesale price index (WPI)-based measures because WPIs have a smaller non-traded goods component compared to CPIs (CPI does not include exported goods). Authors like Goh and Mithani (2000) confirm that the type of price index does matter in testing PPP relation in Malaysia. Building on earlier work, Baharumshah (2002) showed that PPP holds when the Japanese yen was used as numeraire currency, reflecting the evidence that the East Asian economies are forming what is known as the "Yen Bloc". The high volatility of the nominal exchange rate for the US dollar in the 1980s may provide an explanation for the unusually slow speed of adjustment. Several authors have noted that the evidence for PPP is weaker when using dollar rates than when using other exchange rates (e.g. German Mark or Japanese Yen). This dollar/nondollar dichotomy was highlighted in the paper by Baharumshah (2002). The statistical evidence finds less favorable evidence on the US dollar-based rates than the yen-based rates (or DM-based rates). In addition, several authors have also pointed out that the failure of PPP in major industrialized countries (EMS) is due to what is known as the "dollar" phenomena.

B. Tests based on long-horizon data sets

Authors like Frankel (1990) and Cheung and Lai (1994) argued that the reason for the failure to reject the random walk model of real exchange rate was a lack of power (the failure to reject the null of a unit root when it is false - Type II error). They pointed out that if PPP deviations damp sufficiently slowly, then it requires many decades of data for one to be able to reliably reject the existence of a unit root (a random walk component) in real exchange rates. Therefore, they concluded that one must look at longer data sets (say 100 years) to test the validity of the hypothesis. Long horizon studies by Frankel (1869-1984) and Cheung and Lai (1900-1992) among others, have found evidence of mean reversion for real exchange rates. The finding leads many to argue that real exchange rate exhibits mean reverting behavior in the long run. Accordingly, deviation from PPP are temporary, and that over time the real exchange rate will return to its equilibrium or long-run value.

Although the consensus among authors who search for cointegration in samples of more than 100 years in length are mostly favorable to PPP, there are two important caveats to the results based on long-horizon data. First the results from these studies blend exchange rates from two regimes: fixed exchange rate that ended in 1973 and

floating exchange rate data. Real exchange rates tend to be more volatile under floating than fixed exchange rate, implying that the rate of convergence to PPP is not the same before and after floating began in 1973. Secondly, all the exchange rates used are across pairs of countries, which have had high incomes (relative to the rest of the world) throughout the sample period. This raises the question of whether PPP will hold across two countries with differing growth experiences (the Balassa-Samuelson effect). In fact, Froot and Rogoff (1995) found that PPP does not hold for the Argentine peso over more than 70 years of data.

Baharumshah and Ariff (1997), by using improved data and deploying recent statistical technique found that PPP holds in the long run by showing that there exist a long run relationship between nominal exchange rates and prices of traded goods for the ASEAN-5 countries. In other words real exchange rates can be characterized as mean reverting. The span of the data covers the period of the recent float. Furthermore, the results support the notion that price Granger-cause exchange rates and not vice-versa for most of the countries in the sample. Following this article, other authors that used alternative time-series econometrics methods to study the Asian countries and their results appear to be supportive of PPP as a long-run relationship. It is worth noting here that these findings are often currency- and deflator-specific.

C. Panel data

Deviations of PPP appear to have half-lives of approximately 4-5 years. Nevertheless, long samples required for the testing of PPP hypothesis are unavailable for most currencies, particularly the developing economies. With the estimated half-life of 4-5 years it is difficult to find PPP holds with pure time-series approach using data of less than a century. Several authors have questioned the power of the standards unit root and cointegration tests. Evidence has been provided indicating that unit roots tests are not resilient against trend-stationary alternatives; and the classical unit root asymptotic is asserted to be of little practical value. In addition when the time series has a near unit root, it is possible that these tests do not reject the null hypothesis of the unit root. In other words the standard test may have some problem in detecting cointegration (long run relationship) using data in the post-1973 period. These criticisms cast serious doubt on the consensus that seem to emerge during the last decade on the existence of unit root in real exchange rates, i.e., rejecting the mean reversion behavior of exchange rate series¹⁰.

The response of some researchers has been to employ panel unit root and cointegration tests. The panel data approach possesses major advantages over the conventional single time series or cross sectional data sets. First, panel analysis improves the power of unit root tests by increasing the number of observations. Second, the panel approach appeal to researchers because information from cross-sectional units helps to identify the parameters of concern. In the exchange rate literature, a number of authors turned to

¹⁰ The lack of empirical support for PPP hypothesis in the earlier studies may be due to the low power of the relevant tests for unit roots and cointegration.

this panel data technique to test for PPP in the post-Bretton Woods era. Econometric analysis using the panel approach finds strong evidence of mean reversion in real exchange rates. The authors of numerous articles (Pedroni, 1995; Frankel and Rose, 1996; Wu, 1996; Papell, 1997; M. Azali et al., 2001) have taken the view that the panel approach is the best in dealing with data in the post-Bretton Woods era (25 years span). Using only post-1973 data for seven Asian developing countries, M. Azali et al. (2001) found encouraging results for long run PPP for the Asian emerging market economies. In this study the Japanese yen is used as the base country. This allows them to conclude that the financial and goods markets are integrated in the East Asian economies.

Liu and Maddala (1996), Papell (1997), and O'Connell (1998) among others, however, found sufficient evidence to suggest that mean reversion in panels of real exchange rate is sensitive to country grouping and panel size. Moreover, some have also pointed out that the results depend on the choice of the base currency (the US dollar or the German mark). For example, O'Connell (1998) finds little evidence of real exchange rate stationarity after controlling for cross-sectional dependence. Hence, it may be too early to say whether the revisionists' PPP finding will prove robust.

D. Real Disturbance and Deviation from PPP

The PPP theory predicts that, in the long run, the real exchange rate is constant and independent of movements in other macroeconomic factors (money supplies, interest rates, income). Several authors (Gan 1991; Rogoff, 1996; Edwards, 1999; Goh and Mithani, 2000) suggest that the deviation of PPP from its long run equilibrium value is due to certain macroeconomic variables such as technology, government spending on non-tradable goods and productivity differentials and current account. The papers by Gan (1991) and Goh and Mithani (2000) have identified the major source of real disturbance that cause PPP to deviate from its equilibrium value for the East Asian currencies. For the emerging economies, there may be other real disturbances that cause PPP to deviate from its long run value. Future research needs to focus more on the real disturbance that can cause exchange rate to deviate from PPP value in the medium term.

NONLINEARITIES IN EXCHANGE RATES ADJUSTMENTS

Studies that apply linear framework to examine the hypothesis implies a constant speed of adjustment of deviation towards PPP. Recently, the non-linear adjustment of PPP deviation due to the existence of transaction costs has received a great deal of attention in the literature. Accordingly, the theory suggests that prices of identical commodities sold in a spatially separated market may move in a pure random walk as long as this difference does not exceed the transaction cost threshold. One would expect that spatial arbitrage would occur, leading to mean reversion process until the differences falls within the boundaries. Once inside these boundaries economic forces of arbitrage no longer in play, hence the price differential would again be expected to fluctuate randomly.

Using data from the recent float, several authors (Coleman, 1995, Dumas, 1992) showed that the persistent deviation from the parity is due to market frictions and showed that the adjustment towards PPP is nonlinear in fashion. Market frictions in international trade introduce a neutral range or band of inaction within which, deviation from PPP are left uncorrected as they are not large enough for arbitragers to cover transaction costs. It is only deviations outside the neutral range that are arbitrated away by market forces. In this dynamic framework, deviation from PPP follows a nonlinear stochastic process that is mean reverting.

The articles by Liew *et al.* (2002) and Baharumshah and Liew (2002) focusing on the above mentioned theory and applying an exponentially smooth transition (ESTAR) model to the ASEAN-5 countries, confirm the nonlinear representation of the price adjustment process for all the countries. The advantage of the ESTAR model over its predecessors (e.g. the threshold autoregression - TAR model) is that it allows regime changes to occur smoothly. Hence, the linkage between nominal exchange rates and prices in open economies in the post-Bretton Woods era may be established by allowing nonlinearities in the adjustment to deviation from PPP without resorting to cross-sectional variation in the data upon which the panel framework relies. Results of this study find that the nonlinear model provides strong evidence of mean-reverting behavior for PPP deviation. In this article we argued that our finding demonstrates why the standard linear cointegration test (Johansen and Engle-Granger methodology) fail to detect mean reversion behavior of exchange rates. We view this finding as providing a baseline model for understanding the movement of exchange rates in the developing economy. In addition, the finding suggests that countries that allow exchange rates to adjust more rapidly (i.e. are flexible) to fundamentals are less prone to exposure to currency crisis. Based on the evidence of the ASEAN-5 plus South Korea, we showed that the rupiah with the least flexibility suffered most during the recent crisis while the Singapore dollar was the least affected currency among the six rates.

To sum, more recent works seem to suggest that while the random walk model is a reasonably good approximation to short-run dynamics (less than 3 years, say), real exchange rates show mean reverting tendencies over the medium (3-20 years) to long terms. Three points are noteworthy here: First, the cointegration vectors that emerged sometimes involved coefficients on price term which many would find different from unity. Second, even if real exchange rate is stationary, this is still compatible with the fact that real exchange rate is being influenced by other $I(0)$ variables. Third, there may be statistical problems in distinguishing between $I(0)$ and $I(1)$ process when real exchange rate nonstationarity is swamped by movements in nominal magnitudes.

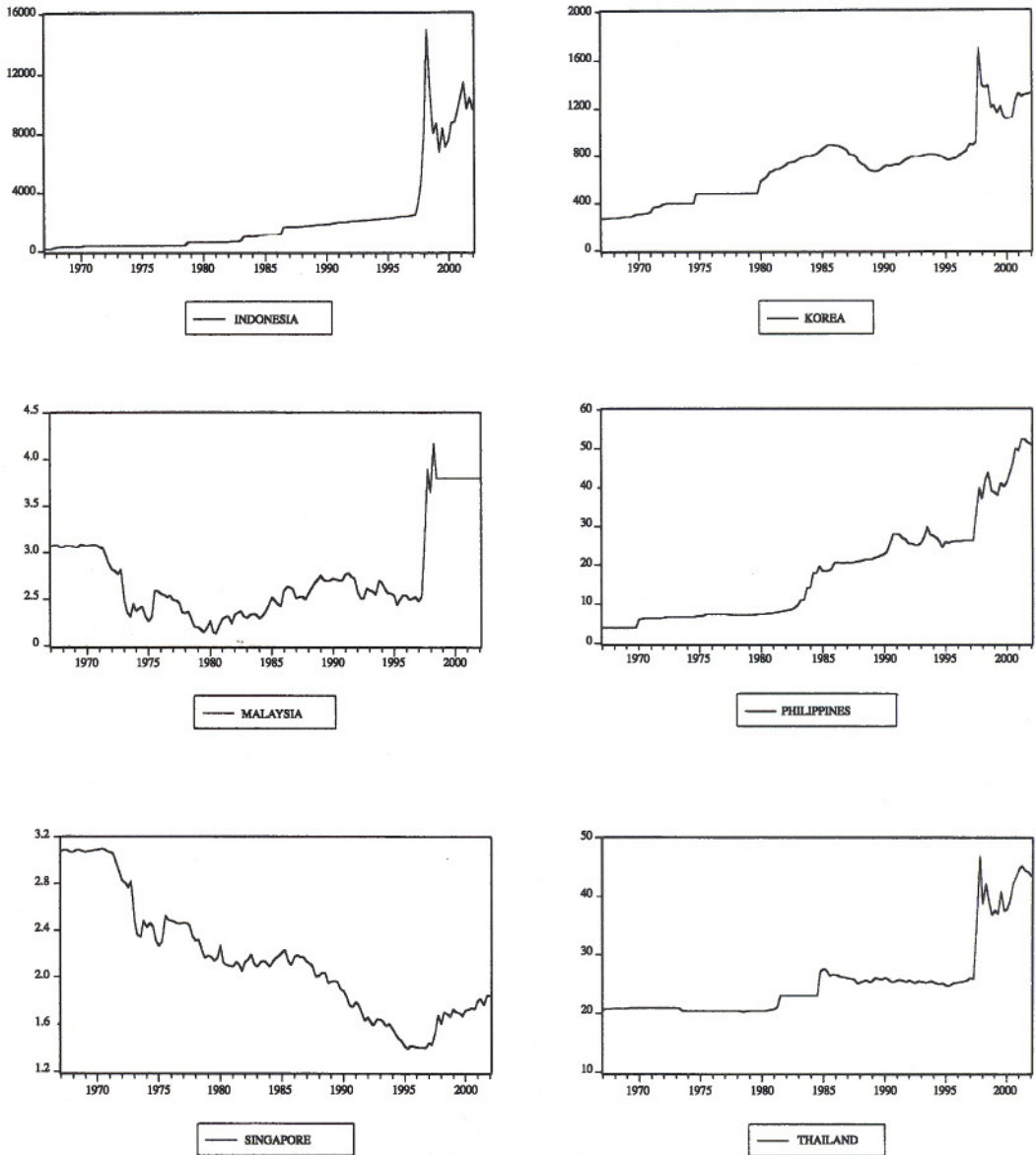
BEFORE THE CURRENCY CRISIS: WERE EAST ASIAN CURRENCIES OVERVALUED?

Before 1997 East Asian countries used a variety of exchange rate systems ranging from a currency board hard peg in Hong Kong to a sliding or crawling peg in Indonesia. Although these pegs were often not openly admitted to or were disguised as currency baskets, the common adherence to the dollar is not difficult to recognize. Figure 2 plots the relative value in US dollar for six of the East Asian currencies from 1967:1 to 2002: 1 at quarterly

frequency. The rupiah rate is ladder-like with large devaluation in 1981, 1983 and 1986. The time plot also indicates that the Thai baht follows the ladder-like function before the currency crash in 1997:2. The exchange rate for the other Asian countries appears to be more flexible. In Malaysia, the ringgit fluctuates narrowly within a small band. The currency moves in a 10% range of 2.7-2.5 ringgit to the US dollar from 1990 until the beginning of 1997, and thereafter it took a sharp rise (depreciation). Unlike the other East Asian currencies, the Singapore dollar appreciates for most part of the sampling period and it was the least affect by the 1997/98 crises. The Hong Kong dollar in nominal term (figure not shown here) was the most stable among the bilateral rates since it is on the currency board.

Real exchange rates (figure not shown) appreciated by more than 25 percent between 1990 and early 1997 in Malaysia, Thailand and The Philippines. In all the five crisis countries, the period of sharp decline ended by February 1998. The period of free fall was longest and deepest in Indonesia, which was the only country to experience a political crisis as well. Even Taiwan and Singapore devalued their currency in what is termed as competitive devaluation. Hong Kong was the only country that was successful against speculative attack and had maintained its parity with the US dollar even during the crisis period. In all the countries, currency values have strengthen since early 1998, except for Malaysia who has chosen to stabilize its currency by imposing control over capital movement and the fixing of the ringgit to the US dollar at RM 3.8/US dollar.

Figure 2: Nominal Exchange Rate in Terms of US Dollar at Quarterly Frequency



Source: International Financial Statistics (IFS)

The dollar peg regime contributed to the relatively stable real exchange rate in East Asian countries until mid-1995, a period characterized as good fix. The stable real exchange rate in the pre-1995 period contributed positively to economic growth by attracting Japanese FDI, notably after 1985. But the yen started to depreciate in April 1995 and, this led to a fall in the competitiveness of East Asia exports to Japan¹¹. For example, Malaysia's export growth was reduced from 25 percent in 1995 to 6 percent in 1996, and similarly export growth in South Korea fell from 17.5 percent to 9 percent over the same period. The decline in the exports to Japan, their major trading partner, increased the current account deficits in these countries¹².

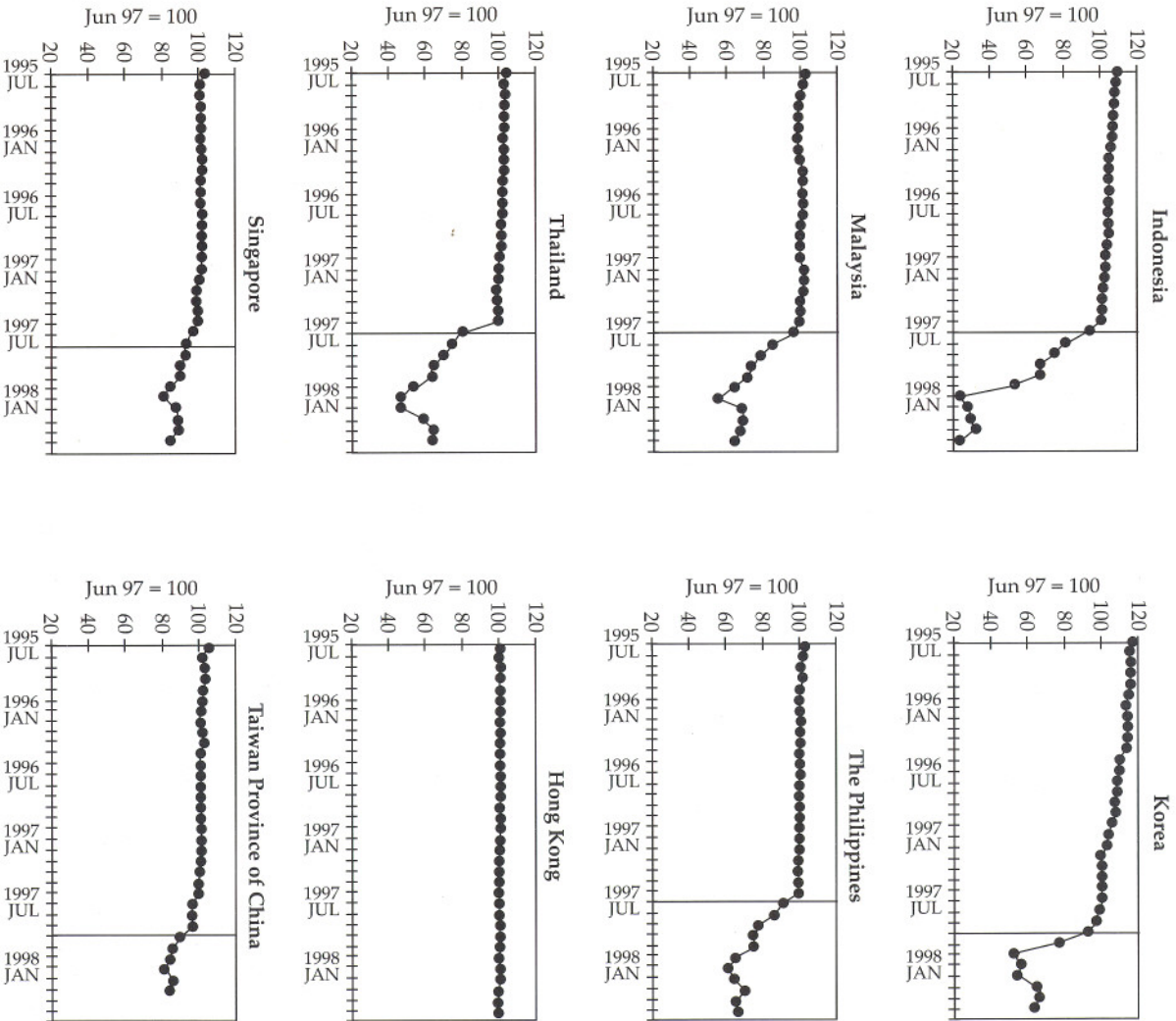
In 1994 China maintained a hard peg (8.3 yuan to the dollar), after a series of devaluations. Malaysia introduced a fixed exchange rate of 3.8 ringgit to the dollar in September 1998. Despite the fact that Japan is the world's second largest industrial economy, the dollar is more widely used in Japanese trade with East Asia than is the yen. Similarly, the US dollar also dominates in the intra-East Asian trade. Although the evidence found in Baharumshah and Goh (2001) and Kwan (2001) about the possibility of the formation of a Yen Bloc, the data compiled by MacKinnon and Schnabi (2002) seem to suggest that Asian importers' and exporters' invoices are largely dominated by the US dollar.

Figure 3 compares movement in nominal exchange rates before and after the start of the financial crisis for the East Asian countries. Notice that all experienced declines in nominal currency values to the order of about 40%, except for Singapore, Hong Kong and Taiwan. It is evident from these figures the experience of the most-affected countries was different from that of the non-crisis countries (Hong Kong, Singapore and Taiwan). To investigate the degree of misalignments of the East Asian currencies against the US dollar and the Japanese yen at the time before the Asian financial crisis, the ESTAR models reported in Liew *et al.* (2002) are utilized to generate the equilibrium exchange rates. The models were estimated using the sample period that ended in 1996:4, to avoid some of the statistical problems associated with the crisis. The calculated equilibrium rates are then used to evaluate whether the East Asian currencies were overvalued. Figure 4 displays the implied deviations from equilibrium rates using US dollar as the base currency.

¹¹ Between 1991 and 1995, the US dollar had followed a downward nominal trend relative to the Japanese yen and the German mark, reaching a low of 80 yen per dollar in spring 1995. After spring 1995, the dollar started to appreciate rapidly: the yen/dollar rate appreciates 56% between 1995 and 1997.

¹² Following the depreciation of the yen/dollar rate, the Japanese authorities followed a low interest rate policy to boost the depressed economy. This increased the interest rate differential between Japan and the East Asian countries and marks the inflows of short-term inter-bank borrowing. When the bubble burst, all these investments turned into non-performing loans.

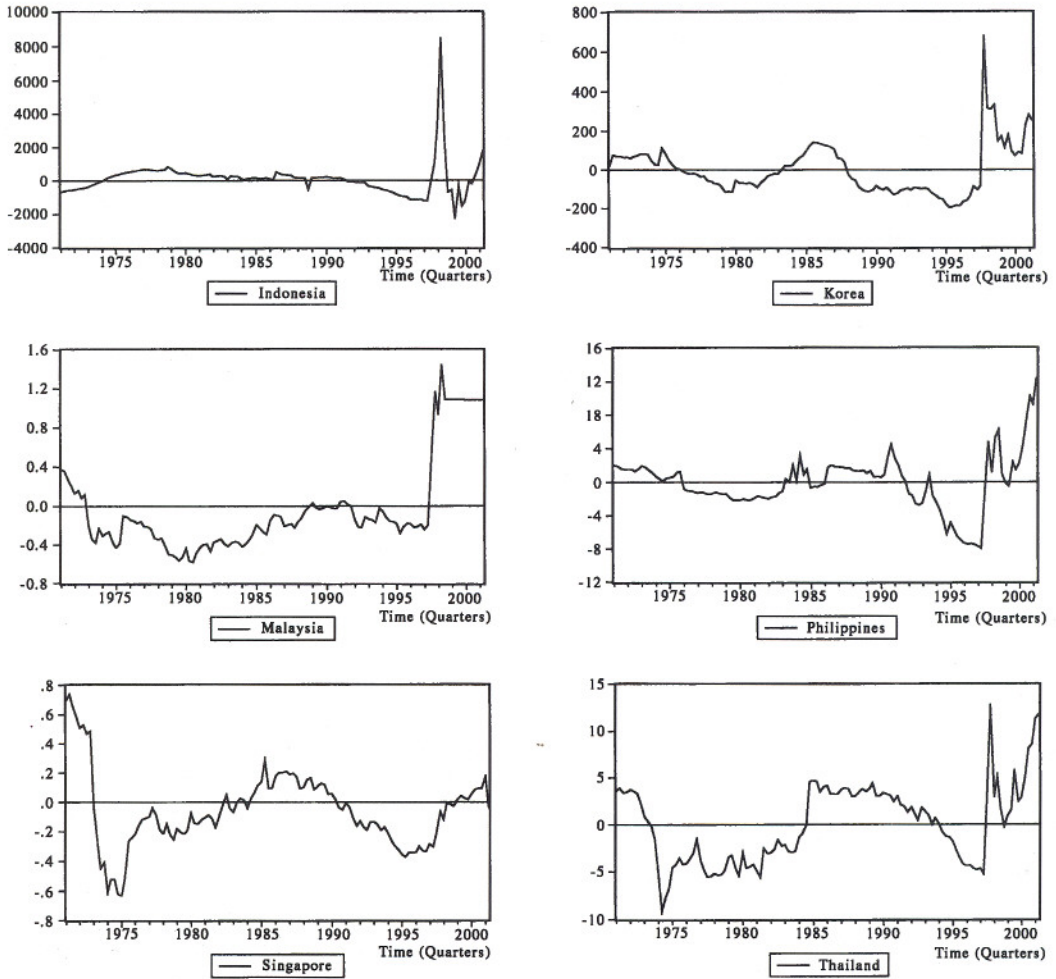
Figure 3: Nominal Exchange Rate versus the US Dollar at Monthly Frequency 1995 - 2000



Each point represents a value, at the end of a month, of $100 \times S_{6/97}/S_t$, where S_t is the number of local currency units per U.S. dollar at date t . Vertical lines represents crisis dates determined by the first month in which a large depreciation occurred.

Source: IFS.

Figure 4: Deviations of Exchange Rates from PPP Equilibrium (US Base)



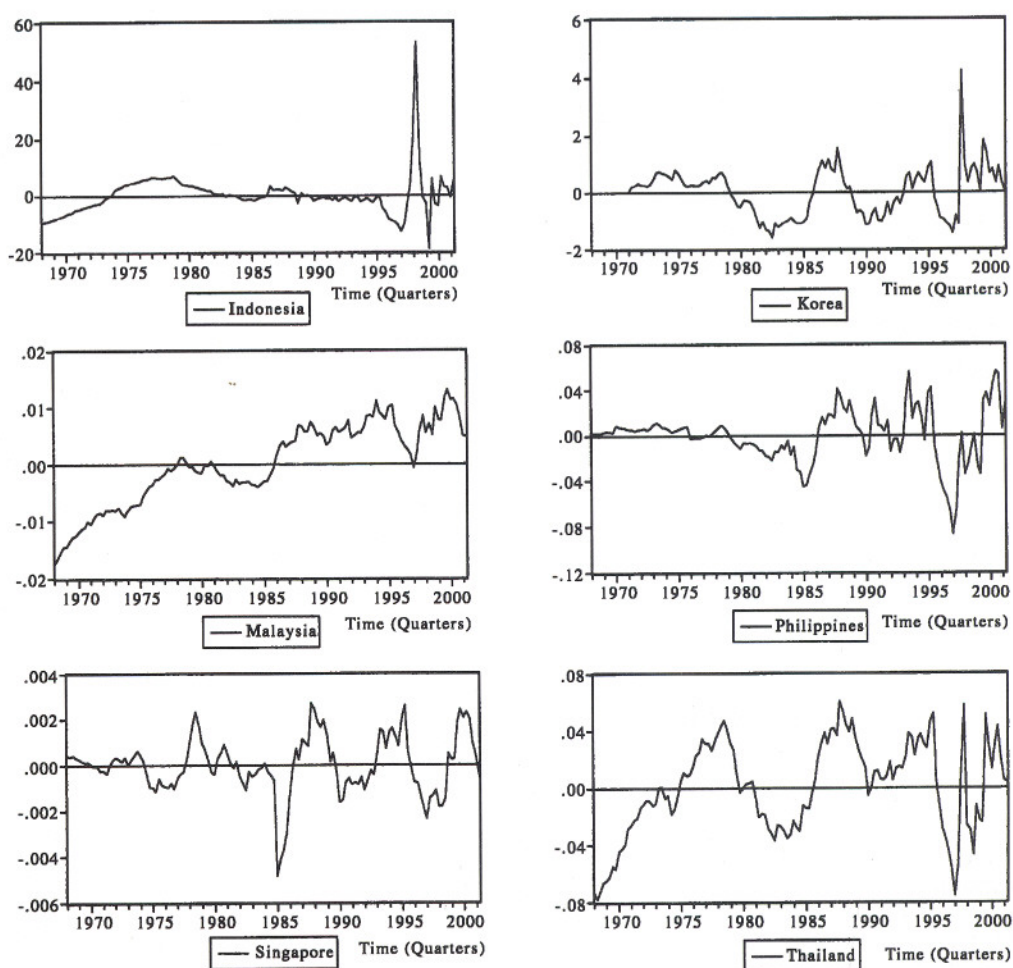
Note: Deviation = observed rate - equilibrium rate predicted by PPP

Source: Baharumshah and Liew (2002)

A negative (positive) value indicates overvaluation (undervaluation). The Philippine peso, Thailand's baht and the Korean won were all substantially overvalued in quarters leading up to the crisis against the US dollar. The fitted values do not replicate the actual value for the most part of the mid and late 1990s (just before the crash), suggesting that during these periods the currencies do not follow the PPP rates. The devaluation for the US rates in the region was persistent. Hence, the peso, the won and the bath suffered the currency crash during the East Asian financial crisis that started in 1997:2. The result indicates that the Singapore dollar was overvalued but to a lesser extent. The Singapore dollar suffered only

a small depreciation in its currency value during the currency crash. This is because the economy was in net credit (positive current account). The degree of misalignments based on the yen rates is also estimated using the approach outlined above. The results also suggest that all the East Asian currencies but Malaysian ringgit were overvalued vis-a-vis the yen for several quarters (in 1995/96) before the currency crisis. Interestingly, Figure 5 shows that for the early part of the 1990s, the Asian currencies were undervalued, except for the Indonesian rupiah. Hence, the econometric approach seems to detect overvaluation in the regional currencies and suggest that overvaluation may be used as an early warning system for a currency crisis. This finding adds to the literature that finds exchange rate is leading and reliable crisis indicator.

Figure 5: Deviations of Exchange Rates from PPP Equilibrium (Yen Base)



Note: Deviation = observed rate - equilibrium rate predicted by PPP

Source: Liew *et al.* (2002)

HOW WELL DOES STRUCTURAL MODEL FIT THE EAST ASIAN DATA?

What drives the exchange rate? The monetary model assumes that exchange rate is determined by the fundamental variables: money supplies, interest rates, trade balance, and output levels¹³. Most economies believe that exchange rate is influenced by these fundamental factors. The monetary model, which is based on the PPP hypothesis, predicts that exchange rate is determined by relative money market equilibrium between two countries. It is widely used by journalists to analyze the movements of exchange rate. The model or some variant is popular because it provides intuitive relationships between the fundamentals and it is based on strong macroeconomic reasoning. For instance, if the money supply increases in Malaysia relative to the US (Japan), then the model predicts that the ringgit will depreciate against the US dollar (Japanese yen). Similarly, a hike in the domestic interest rates encouraged foreign capital inflows, and put pressure on the ringgit, as demonstrated during the pre-crisis era in East Asia. So what is important for the analyst is to assess the monetary policy in the two countries. As a tool, the model provides a benchmark for nominal exchange rate between two currencies. Thus it provides a clear criterion for determining whether a currency is significantly overvalued or undervalued.

What is not well known outside the academia is that exchange rates do not seem to be affected by economic fundamentals in the short-run. Being able to predict money supplies, central bank policies, or other supposed influences does not help forecast exchange rate in the short-term. Economists have found instead the best forecast of exchange rate, at least in the short run, is whatever it happens to be on that particular day (random walk hypothesis). This naïve strategy of using today's exchange rate as a forecast works at least as well as the monetary model. And for many years after the publication of the seminal paper by Meese and Rogoff (1983), economists have failed in their attempt to overturn this finding.

Numerous attempts have been made to model the exchange rate of the industrialized countries, namely the US dollar, German mark, British pound and Japanese yen. A major puzzle of the empirical exchange rate literature is the poor performance of various structural exchange rate models. Empirical research on exchange rates found little evidence in support of the hypothesis that the simple monetary model or other variants can explain the movement of exchange rates. Their results were disappointing to economists because it could mean that theoretical models were not useful in forecasting the movement of economic variables. These failures have been documented in literature surveys by

¹³ Authors like Lane (1999) pointed out the PPP is itself may not be an optimal model of the long run nominal exchange rate for the following reasons. First, the long run real exchange rate may not be constant, for instance, a fast growing economy may experience a long run appreciation of its real exchange rate owing to differential productivity growth in the traded and non-traded sectors. Second, inflation rates may contain both long run and short run components. Inflation can vary from its long run value owing to business cycle factors, temporary 'mistakes' or policies that shift inflation from the present to the future. In this case, the PPP practice of identifying the long run nominal exchange rate with current inflation differential may be misleading. Finally, if the long run inflation rate is important in determining the long run rate of change in nominal exchange rate, this begs the question of what determines the long run inflation rate.

MacDonald and Taylor (1992, 1994) and Frankel and Rose (1994) who pointed out problems with endogeneity and simultaneity, single equation approaches, complicated dynamics, and other forms of misspecification.

Reviewing the literature on this subject reveals several important factors for the poor performance of the simple monetary model or its variants: First, papers that utilized the Johansen multivariate technique and adjust for finite samples inference problems by applying the degree-of-freedom correction factor for small sample as suggested by Cheung and Lai (1993) and Reinsel and Ahn (1988) reported results that are mostly favorable to the monetary model (e.g., MacDonald and Taylor, 1994; Baharumshah *et al.*, 2002a). To avoid size distortion in small samples appropriate adjustments are called for to avoid incorrect statistical inference. Other authors used the Monte Carlo approach to generate the standard errors of the model rather than relying on the standard tests, also produced unsatisfactory results.

Second, monetary models that include the equity market or augment the model with various measures of current accounts yield better empirical results (e.g. Cushman *et al.*, 1996; Baharumshah and Masih, 2002). For instance, a recent paper by Baharumshah and Masih (2002) using data for Malaysia-Japan and Singapore-Japan exchange rates that cover the span of 30 years, came to the following conclusions: First, the data supported the existence of a long-run relationship among exchange rates, interest rate differential, income differential and current account. This finding is consistent with the monetary approach to exchange rate determination. Nevertheless, it also shows that the poor performance (noncointegrability) arose because of the omission of an important causing variable - current account.

Third, the monetary model yields much superior predictions than the random walk model over the medium term horizon, not to mention the in-sample forecasts. Indeed we argued that previous attempts to model the bilateral exchange rate have been unsuccessful due to inadequate modeling strategy adopted by analysts. A structural model that is well specified can produce sensible results and much superior in and out of sample forecasts. In fact we have shown that ignoring the current account and stock market yield results that are less optimal for most of the Asian countries (Baharumshah *et al.*, 2002b). This in line with the consensus that poor performance of structural models is due to one or more variables with large variance is omitted from the model. Third, the current account carries a negative sign and is statistically significant at conventional significance levels, suggesting that current account deficits depreciate the Malaysian ringgit-yen and Singapore dollar-yen rates. Therefore, our finding reveals the importance of managing current account balances. Specifically, foreign capital inflows (savings) may have consequences on the sustainability of pegging exchange rates. Fourth, interest rate (money supply) appears to be an effective tool to stabilize the Singapore dollar (Malaysian ringgit).

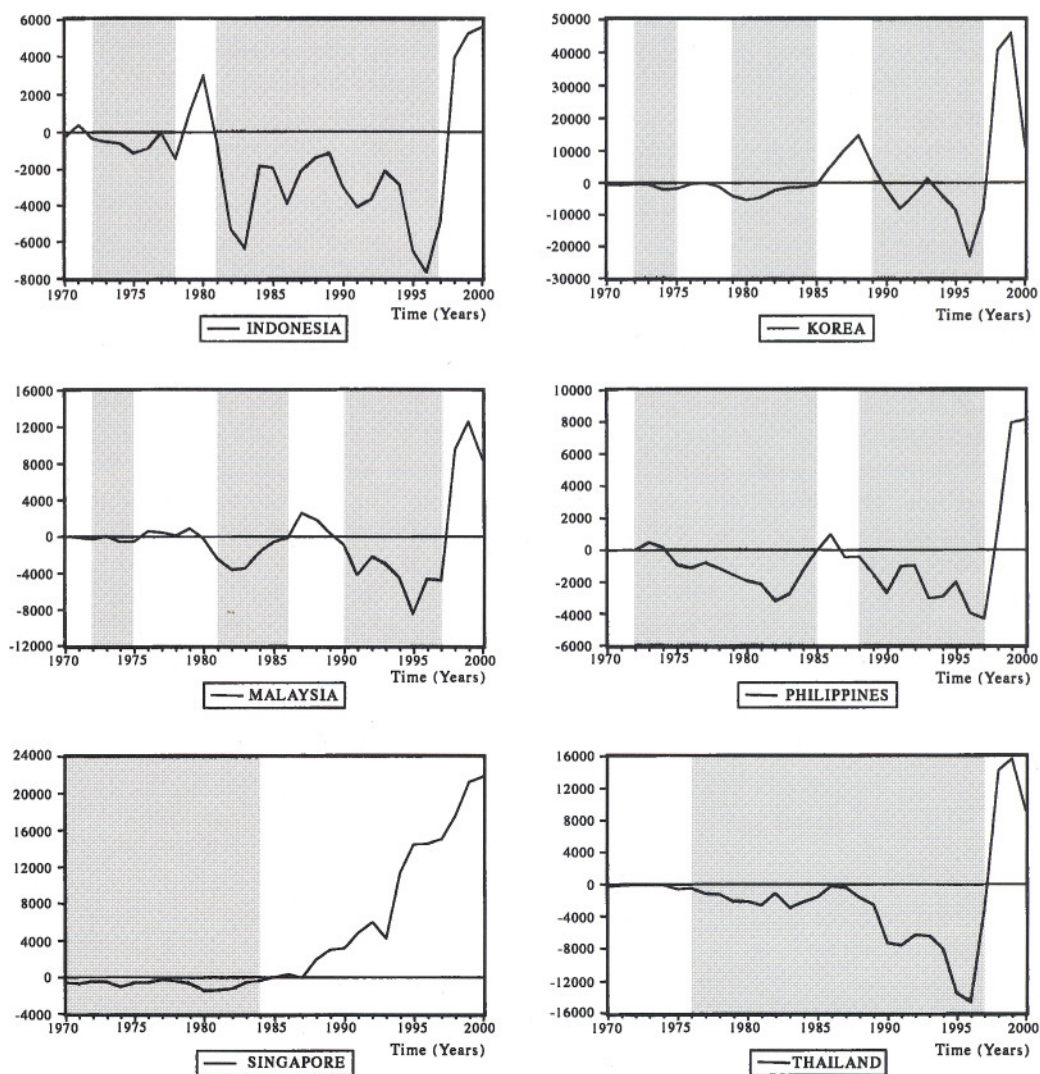
Finally, researchers employing the panel data approach for the G-7 countries have also produced encouraging results in estimating the monetary model. To my best knowledge, the approach has not been applied to the Asian economies. The panel cointegration approach in multivariate setting provides an ideal framework for reexamining the application of the standard monetary model.

CURRENT ACCOUNT BALANCES AND THE EAST ASIAN CURRENCY CRISES

Crises are inevitable. As long as there are financial markets, there will be boom and bust. However, the vulnerability of crises can be limited if they are predictable. Some progress has been made in this area and we will discuss this later. The recent financial crisis demonstrates that the crisis could have been avoided if the current account had been properly managed. The current account had been persistently in deficit in the five hardest hit countries (South Korea, Malaysia, Thailand, Indonesia and the Philippines) in the region since the early 1990s and they were far higher than in the late 1980s (see Figure 6). Two notable features of these Asian countries' current accounts have been: between 1985 and 1989, current account deficit averaged just 0.3 percent of GDP in the five countries. In fact, Malaysia and South Korea recorded a surplus of 4.3 and 2.4 percent of GDP, respectively. The largest deficit was in Indonesia (2.4 percent of GDP). By contrast, between 1990-1996, current account deficits averaged 4.0 percent of GDP in all the five countries. In 1996 the deficit ratios for Thailand and Malaysia moved to a historically high 8.0 and 8.6 percent of GDP, respectively. Another noticeable aspect of the figures is that the deficits moved to large surpluses in the post crisis period following the large appreciation of the Asian currencies, suggesting that devaluation improves the current account deficits of the countries affected by the financial turmoil.

The current account is an important barometer to both policymakers and investors as it indicates a nation's economic performance. The time path of current account measures changes in national indebtedness. The current account reflects a mixture of investment and savings decisions of the government and private agents as well as the lending decisions of foreign investors. Therefore, the behavior of the current account embodies the decisions of private agents, the public sector and foreign investors. Economists have interpreted the

Figure 6: East Asian Current Account (Million US Dollar)



Note: The shaded area indicates the deficit

Source: Lau *et al.* (2002)

sustainability of current account deficit in many different ways. Under the least restrictive but popular interpretation the current account deficit is sustainable if the country is solvent in the sense that its present value intertemporal budget is satisfied. This implies that the country must be able to generate sufficient trade surplus in the future to service its debt. A more restrictive interpretation of sustainability is found in Frankel and Razin (1996, p. 512) where they defined an unsustainable path as one which would eventually require a "drastic" policy shift which would lead to either a large recession, (which can be regarded as politically infeasible), or a "crisis" such as an exchange rate collapse or an inability to service external obligations. In other words, a country's current account deficit is unsustainable when (by its own forces) it triggers a sharp hike in domestic interest rates, a rapid depreciation of the domestic currency, or some other abrupt domestic or global disruptions.

It is natural for a country to experience deficit in current account. Temporary current account deficits pose fewer problems as the imbalances represent the natural outcome of reallocating capital to the country where the factor of production tends to receive the highest possible returns. In other words, temporary current account deficits reflect reallocation of capital to the country where capital is most productive. However, large and persistent current account deficits tend to pose more difficult problems on the economy and present a policy problem. Specifically, 'too large' deficits tend to increase domestic interest rates relative to their foreign rates, while simultaneously, they impose an excessive burden on future generations, and thus lower the standard of living. The deficits provide a signal of macroeconomic imbalances, which calls for a devaluation and/or tighter macroeconomic policies. A deficit over an extended period of time is often assumed to play an important role in the propagation of the currency crisis. Policy makers and commentators are concerned about the soaring current account. The conventional wisdom is that a current account above 5% of GDP flashes a red light, particularly if the deficit is financed by short-term debts or foreign reserves. Economists are more concerned about the sustainability rather than the size of the current account.

The currencies crises in Chile and Mexico (early 1980s), in the UK and Nordic countries (late 1980s), in Mexico and Argentina (mid-1990) and more recently in Asian countries (late 1990s) should alert policymakers on the problem of large and persistent current account deficits. Indeed, the recent Asian financial crisis demonstrates the importance of managing the current account and that doing nothing to correct the imbalances can be dangerous because the economy may be using the deficit to finance risky investments. The financial meltdown is due to a combination of panic on the part of international investors, policy mistakes at the onset of the crisis by governments, and poorly designed international rescue programs. Together these factors turn a moderate financial crisis into a larger financial crisis.

In line with the high level of capital inflows, current account deficits were growing increasingly large across the Asian region in the early 1990s, and were far higher than they were in the late 1980s. Between 1985 and 1989, current account deficits averaged just 0.3 percent of GDP in South Korea (4.3), Indonesia (-2.5), Malaysia (2.4), Thailand (-2.0) and the Philippines (-0.5). In fact, South Korea and Malaysia had current account surplus. The largest deficit was recorded in Indonesia at 2.5 percent of GDP, which resulted primarily

from the fall in oil prices in the mid-1980s. By contrast, between 1990-96, current account deficit averaged 4.0 percent of GDP, and more important, in most countries the current account deficits were rising (except perhaps for Indonesia). In 1996 the current account deficits in Malaysia (-5.3), Thailand (-8.0), South Korea (-4.8) and the Philippines (-4.3) were all greater than 4.2 percent of GDP, a figure that many observers believe to be the threshold for current account unsustainability. It is worth mentioning here that Indonesia and South Korea, with smaller deficits, have arguably been the hardest hit countries, while Malaysia's deficits were much larger in 1995 (8.6) than it was in 1996 (5.3) or early 1997. In this sense the 5% threshold level is not always a good predictor of the sustainability of the current account.

Looking at the data on the five countries hardest hit by the financial crisis in the years preceding the 1997/98 crises, we observed the following:

- The sizes of the deficit relative to GDP were increasing.
- Savings and investment data suggested that the deficit were often the consequences of investment and credit booms.
- Significant real appreciation had led to loss of competitiveness. All countries maintained strongly pegged to the US dollar.
- The weak financial system was unable to cope with large capital inflows—hot money.
- The current account imbalance was due largely to trade imbalance. A large and persistent trade imbalance indicates a structural competitiveness problem but the size of exports as a share of GDP (openness) was large, implying that the current account was sustainable.

Are the current account deficits of the Asian countries too large? A recent paper (Lau et al., 2002) summarized findings on the sustainability of the current account deficits in East Asian economies. In this work, we conducted an in-depth empirical investigation on the issue of sustainability of current account imbalances in the ASEAN countries. More precisely, we attempted to answer these two important questions; (1) Was the Asian crisis fueled by strong capital inflows predictable? (2) How has the crisis affected the external imbalances of the crisis-affected countries?

We pursued these questions by taking the issue of modern time series econometric such as the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) (1992) for the determination of the order of integration of the variables in the model. The Johansen (1988), Johansen and Juselius (1990) procedure and Stock and Watson (1993) dynamic OLS (DOLS) approach are adopted to estimates the cointegrating vectors. We adopted the theoretic and empirical work of Hakkio and Rush (1991) and Husted (1992) and used the quarterly frequency data from four Asian countries to test for the sustainability of external imbalances. Briefly, the theoretical model is based on the intertemporal solvency condition to current account balances that focuses on the long-run paths of exports and imports. Several recent papers have successfully examined the intertemporal solvency using this model (or its variation)

to investigate the current accounts of industrialized countries (e.g. Fountas and Wu, 1999 and Wu *et al.*, 2001).

The econometric analysis on the East Asian economies led to the following conclusions: first, we find strong evidence of a violation of the intertemporal balance model prior to the Asian crisis (the only exception is Malaysia). Despite substantial deterioration in Malaysia's current account deficits during the early 1990s, its current account movement over the sample period as a whole had been consistent with external solvency condition with no indication of running a default. The failure of imports and exports to exhibit any stable long-run relationship suggests that the ASEAN countries were adopting a strategy of borrowing from the rest of the world. Hence, the policies installed prior to the crisis (including the pegged exchange rate system) violate the expected intertemporal budget constraint. An important policy lesson that can be drawn from this study is that no action to correct the widening of current account deficits may lead to a financial crisis. Problems left un-addressed does not go away by themselves-they only get worse. Unsustainable current account deficits which draws down the country's foreign reserves and lines of credit need to be corrected by allowing exchange to decline and by tightening monetary and fiscal policy.

Second, currency crises show themselves in a variety of ways. However, the sustainability of current account deficit can be used as a signal for predicting its arrival. The overspending of the private sector, inefficient investment, or overvaluation of the currency will explicitly incarnate in the imbalance of the current account. The persistent insolvency of the external debt will sabotage the ability to pay and the willingness to lend for the crisis-ridden country. Therefore, the evidence presented in Lau *et al.* (2002) is enough to show that the East Asian crisis is predictable. The external accounts may be used to predict future crises.

Fourth, there is also evidence to suggest that a crisis-affected country (e.g. Malaysia) maintained a sustainable current account. Now, if we believed that the crisis that started in Thailand contagiously spread to the other East Asian countries-the contagious hypothesis-then it is not sufficient to examine the sustainability of current account and used it as a signal to predict future crisis. The empirical results reveal that it may also be important to look at the stationarity of the neighboring countries' current account as well to predict future crises. After all, problems causing financial crises are not always homegrown. In fact many attribute the recent crisis to the volatility of capital inflows (or "hot money") partly due to the interest differentials between the industrialized countries.

Finally, we observed that in the post-crisis era the sharp depreciation of the ASEAN currencies led to an immediate improvement in current account imbalances (surplus). Our results illustrate that with the exception of Malaysia, the current account balance of all others are on a sustainable path. They satisfy the necessary as well as the sufficient conditions for a sustainable external balance. This decisive evidence led us to conclude that a large depreciation should have taken place prior to 1997 when the stationarity of the current account deficit was rejected by the data. In addition, the large surplus recorded in Malaysia's account in more recent years is indeed unsustainable. Fixing the ringgit to the US dollar has to a certain extent promoted exports but at the same time adversely affected imports of capital goods. Recently, several authors have shown that the past performance

of East Asia had depended heavily on imports of capital and intermediate goods (see for example Baharumshah and Rashid, 1999). Any policy actions that adversely affect the imports of these goods will also have implications on the nation's economic progress.

EXCHANGE RATE AND BALANCE OF TRADE

It is not uncommon to find in the macroeconomic literature arguments for and against devaluation. A large body of studies going back to the early 1980s has utilized different methodologies to address this important issue in the last two decades. Nevertheless, the empirical results from all these studies are inconclusive. No clear consequences have emerged from the empirical work regarding the effect of exchange rates on trade balance¹⁴. They have varied by studies, by sample and by data source. In a series of papers, we examined the effect of changes in exchange rate on trade balance. The objective was to identify the macroeconomic variables that influenced the trade balance and the focus is on two ASEAN economies: Malaysia and Thailand. Both are on the threshold of becoming newly industrialized economies (NIEs). The reasons for choosing these economies are: First, Malaysia and Thailand have enjoyed high growth rates during the period of this study period, with phenomenal expansions in trade and capital inflows. Second, the substantial change in exchange rate and trade balance experienced in the recent years by these two countries offers an excellent opportunity for the question whether exchange rate changes by themselves have a significant and direct impact on trade flows. The large size of the deficits in the 1990s is a major concern to the policy makers in these countries.

The analysis is based on the vector error correction model (VECM) variance decomposition and impulse response function (IRFs). In general, the results of this study support the traditional view that devaluation under the right circumstances can affect the real variables and the structure of the economy. This finding corroborates the empirical work reported by Himarios (1989) and Bahmani-Oskooee (1985) for a different set of countries and sample periods but does not support the results found in Rose and Yellen (1989) and Rose (1991).

Some important results were obtained in this paper on the role of real effective exchange rates on bilateral trade. First, the results indicate that the depreciation of the ASEAN currencies caused trade balances to improve (i.e. trade surplus increased) with the US and Japan. This occurred because devaluation of the ringgit (baht) implied increased competitiveness of Malaysian (Thailand) goods with foreign goods and an improvement of trade balance. Several authors have maintained this optimistic view but the empirical evidence is at best mixed. This paper finds strong support of the optimistic view and it is based on the pure time series cointegration approach.

Second, our results do not rule out the existence of short-term and medium-term relationships between exchange rate and trade balance. Clearly the results point to a long-

¹⁴ For some conflicting results regarding the responsiveness of trade balance to exchange rate, see Gylfason and Risager (1984), Miles (1979), Marquez (1990) and Brada *et al.* (1997).

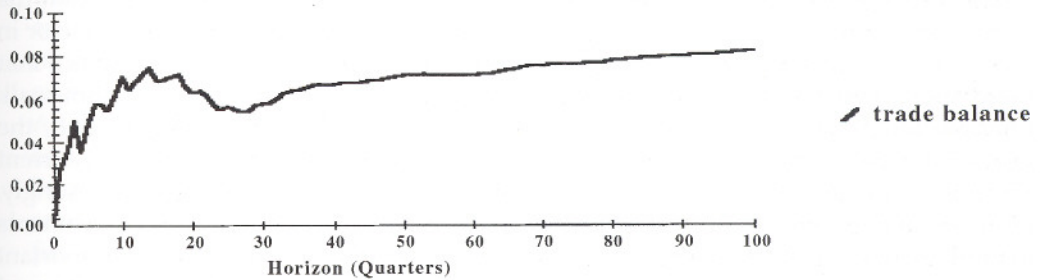
term relationship between the two variables. Thus, exchange rate certainly cannot be ruled out as irrelevant in the ASEAN economies. This point is reinforced when looking at the trade statistics of these economies before and after the financial crisis. This could be one plausible explanation among others as to why trade balances in ASEAN countries have been improving following large depreciation of their currencies. Thus, to cope with the issue of trade deficits, both countries may have to devalue their currencies with the major trading partners. Third, we find strong evidence to suggest that the causal relationship between trade balance and exchange rates run from exchange rate to trade balance. From the policy perspective, this indicates that exchange rate might be used by policy makers to manage their trade balance or current account. The null of no-Granger causality that trade balance has not signaled subsequent change in exchange rate has not been rejected further strengthening our argument on the appropriate policy response to ASEAN trade deficits. This finding contradicts the supply-siders view that devaluation is not a useful instrument for adjusting trade balance.

The evidence based on these two NIEs tends to suggest that real domestic income growth is also important in explaining trade deficit. Our finding seems to confirm the results reported earlier by Miles (1979), Bahmani-Oskooee (1985) and Himarios (1989), among others. The level of economic activity is important for these two ASEAN countries in managing their aggregate trade balance. Our results show that any income reducing policy may help to reduce the trade deficit with the US but not with Japan in the case of Malaysia. In addition, the two ASEAN countries' trade balance is likely to be closely related with the slow down of the US and Japanese economies.

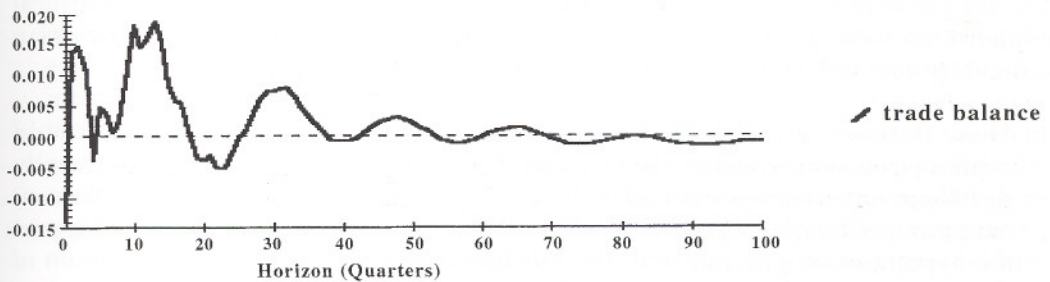
The J-curve is the term most commonly used by economists to describe the short-run response of trade to devaluation. Accordingly, the J-curve phenomena predict that the trade balance may deteriorate at first, and improvement comes after the passage of some time. Does the J-curve exist for the two economies? The debate on whether the J-curve exists is still an unresolved issue in the literature (for example, Rose and Yellen, 1989; Moffett, 1989). A number of studies based on developed and developing countries are contradictory. In a recent study, we found in some cases that adjustment to devaluation is rather rapid, implying no evidence of the J-curve effect. Indeed, the time profiles of the generalized impulse functions (GIRFs) show that for Malaysia-US trade improvement in trade balance occurred in the quarter, in which devaluation took place, and the bulk of the effect was felt in the subsequent quarters. In addition, Figure 7a shows that shocks due to exchange rate have persistent and permanent effect on Malaysia's trade balance. On the other hand in the Msia/JP model, the GIRFs in Figure 7b displays a cyclical pattern and finally gradually tending towards 0. This of course does not follow the J-curve pattern. The impulse response functions for Thailand trade with the US and Japan are plotted in Figures 7c and 7d. We conclude that the J-curve pattern does not fit the data reasonably well. These findings as well as others are documented in Baharumshah (2001)

Figure 7: J-curve for Malaysia and Thailand

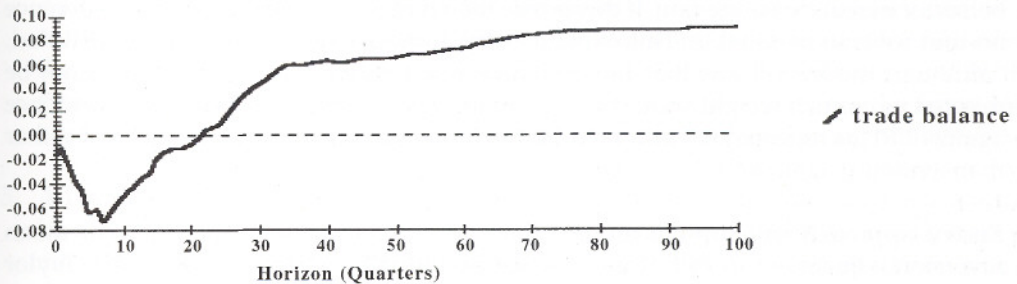
a: J-Curve effect for Msia/US model



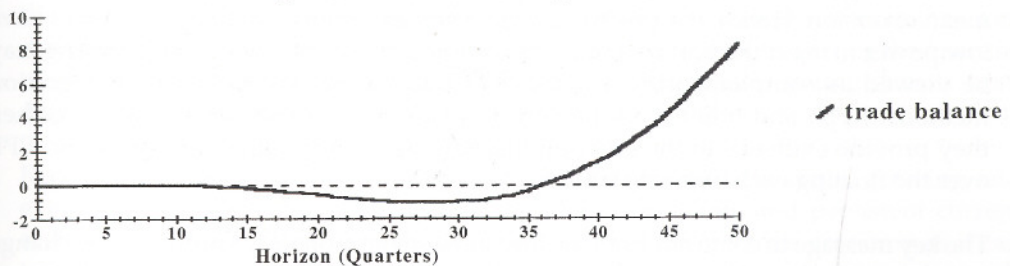
b: J-Curve effect for Msia/JP model



c: J-Curve effect for Thai/US model



d: J-Curve effect for Thai/JP model



Source: Baharumshah (2001)

CONCLUDING REMARKS

This paper provides a systematic analysis on the key issues in the exchange rate market in East Asia. In terms of the empirical evidence, the bulk of the literature suggest that the economic model might not be useful in explaining the history of the exchange rate or in forecasting its value over the next month or so. Indeed, there is sufficient evidence that these short-term forecasts will probably be outperformed by the naïve random walk forecast: tomorrow's exchange rate will be what it is today. On the other hand, the relationship between exchange rate and its fundamentals (money supply, income, current account interest and inflation rates) has a predictable pattern in the long run. Interestingly, more economists are finding that currencies react, as theory would predict to movements in fundamental variables. Having said that, it is worth mentioning here that it is important for the policy-makers to understand the relationship between exchange rate and macroeconomic variables. A proper understanding of the issues is expected to result in a less noisy system and consequently a better formulation of economic policy. The statistical evidence on the existing literature on the exchange rate dynamics of the East Asian economies allows the following conclusions:

1. There is now a growing evidence to suggest that although PPP does not hold continuously, it does hold as a long-run phenomenon. Several works that used recently developed time-series econometric methods (e.g. the Johansen, KPSS and Stock-Watson) have produced a growing body of evidence that contradicts earlier findings and support the hypothesis of long-run PPP. The literature has provided some interpretation of these results. The low power of the standard unit root tests against persistent alternatives in small samples is a likely explanation. Related to this is the very slow mean-reversion behavior in real exchange rate. If this is true then it requires more data for the inference on unit roots to be reliable. This explains why authors like Hakkio (1986) concluded, "although the hypothesis that the exchange rate follows a random walk cannot be rejected, not much weight should be put on this conclusion". Therefore, the evidence against PPP as reported in earlier studies is due to poor power of unit root test rather than evidence against PPP.
2. Recent approach has applied models that allow for the effects of nonlinear mean reversion adjustment to PPP. The evidence provided by Michael et al. (1997), Taylor and Sarno (1998), Baharumshah and Liew (2002) and Liew *et al.* (2002) among others showed that real exchange rate in the post-Bretton Woods period exhibit nonlinear mean reversion. Hence, if a process is in fact nonlinear, univariate ADF test will have low power to reject the unit root null hypothesis that says PPP holds. This finding may be viewed as complementing a number of other approaches: panel cointegration methods, KPSS and other more powerful univariate unit root tests. Taken together, they provide evidence to the growing literature that yield support for long-run PPP over the floating exchange rate system.
3. The key message to come out from the literature on the monetary approach to exchange rate determination is that econometric method used, and also model specification, can have crucial bearing on the findings of significant and sensible long-run relationship between exchange rate and the fundamental variables. Recent application of the model

indicates that monetary model can tract and replicates the salient feature of exchange rate behavior and the model has two principal findings. First, we found that if the equity (stock) market is omitted in the model, the model performed poorly. In most of the East Asian countries the empirical results suggest that stock prices affect exchange rate and not vice versa. Second, the model we proposed outperformed the simple random walk at short forecasting horizon. We found that the fundamental-based exchange rate model passed the acid test of beating the simple random walk model. All in all, these findings can be interpreted as indicating fundamental variables have an important and significant bearing on the movements of the exchange rates in the long run setting. The fact that stock markets affect exchange rates and not vice versa seems to support that some form of capital control is necessary for maintaining a "good fix" exchange rate system.

4. Research into the determinants of exchange rate movements in the emerging market economies has produced some surprising results. The results shown in Baharumshah *et al.* (2002a) and Baharumshah and Masih (2002) map out the relationship between exchange rate and the fundamental variables. It appears that besides money supply, interest rate, and income level, current account balances and stock prices matter over the long-horizon. In fact the evidence suggests that the model performs poorly if current account and/or equity prices are excluded from the standard monetary model. The emerging findings that the data do support some form of the long-run relationships suggested by economic theory indicates that progress might be made by concentrating on the long-run determinants of exchange rates. Macroeconomic fundamental are clearly important in setting the parameters within which the exchange rate moves in the short term, but they do not appear to tell the complete story. What we learned from the Asian financial crisis is that good macroeconomic policies are necessary but not a sufficient condition to ensure the stability of an exchange rate regime. One reason for the vulnerability of countries with sound macroeconomic policies is found in the structural weakness of the financial and corporate sectors, which is an important characteristic of many developing and transition economies (including Malaysia).
5. All in all, exchange rate is a strongly exogenous variable in the trade balance equation. In other words, it is the initial receptor of exogenous shock to the system of macroeconomic variables commonly used in trade balance studies. From policy perspective, this finding indicates that exchange rate is an important policy instrument for the East Asian countries in managing the external balances. This is consistent with the role of exchange rate in Asian trade – intra and inter. The stable exchange rate drives the export sector and exports lead to strong economic growth. During the financial meltdown we observed that the trade balance (current account) swung sharply from deficits to large surpluses.
6. Recent episodes of currency crises have been associated with large, growing and eventually unsustainable current account imbalances. Large and persistent current account deficits are likely to have significant adverse effect on the economy as it can trigger financial crisis. The affected countries in the currency crisis started out with substantial current account deficits as a fraction of GDP. As the crises proceeded these deficits were sharply reduced and swing into large surpluses in the post crisis era. The

lesson that can be learned from the experience in Asia is that the problem with soaring of current account deficits does not go away by themselves-they normally get worse. Soaring current accounts were at odds with the requirement of a fixed peg. Most of the East Asian countries have to abandon the peg and move to floating rates during the crisis period. We also learned from the Asian crisis that good macroeconomic policies are necessary but not sufficient condition to secure the sustainability of the exchange rate regime. The East Asian countries should have taken policy action before 1997 to allow for the necessary adjustment of shocks. We also found that there was strong evidence of overvaluation of the East Asian currencies in years prior to the 1997 financial crises. It turns out that for many of these countries overvaluation coincides with the deterioration of their external accounts.

Finally, recent international financial crises have eroded the credibility of unilateral fixed exchange. Fixed exchange rate regime adopted by the Asian countries is open to speculative crises. The Asian financial crisis clearly demonstrates this point. The banking and currency crisis in the 1990s suggests that few countries can maintain fixed rates when things go wrong. To have a good fix in addition to pursuing good macroeconomic policies, it needs to have a healthy banking system and a strong reserve system. The crisis resulted in the abandonment of the de facto exchange rate pegs against the dollar. Some policy makers (not all) are considering the possibility of moving toward a common currency like the EMU. A regional currency arrangement would enable these governments to foster intra-regional trade and capital mobility. It will provide the members with flexibility with regards to three major global currencies, the dollar, euro and yen. This is particularly important for ASEAN, with its relatively diversified partners, which provide no obvious currency against which to peg. For small(er) countries the adoption of a common currency less vulnerable to speculative attacks under conditions of high capital mobility. There are a number of factors, however, that work against a common currency union in ASEAN. This group of countries has differences in standards of living and economic maturity and hence may complicate further economic integration. Of course all these issues need further research.

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