

On the sustainability of current account deficits: Evidence from four ASEAN countries

Ahmad Zubaidi Baharumshah^{*}

Evan Lau^{**}

Stilianos Fountas^{***}

Working Paper No. 62

June 2002

Department of Economics
National University of Ireland, Galway

<http://www.nuigalway.ie/ecn/>

^{*} Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia

^{**} Department of Economics, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia

^{***} Corresponding Author. Department of Economics, National University of Ireland, Galway, Galway,

Abstract

This paper examines the sustainability of the current account imbalance for four ASEAN countries (Indonesia, Malaysia, the Philippines and Thailand) over the 1961-1999 period. To this end, we utilize the intertemporal budget constraint (IBC) model to explain the behavior of the current account in these countries. The analysis is based on various unit root and cointegration procedures including those allowing for a structural break to deal with the major shortcomings of previous studies. The empirical results indicate clearly that for all countries, except Malaysia, current account deficits were not on the long-run steady state in the pre-crisis (1961-1997) era. This leads us to conclude that the current accounts of these countries were unsustainable and did not move towards external account equilibrium. Moreover, the persistent current account deficits might serve as a leading indicator of financial crises. In contrast, we find strong comovement between inflows and outflows in Indonesia, the Philippines and Thailand in the period including the post-crisis years, while Malaysia was on an unsustainable path. This is because macroeconomic performance of most of the ASEAN countries has changed dramatically since the onset of the Asian crisis in mid-1997. The evidence suggests that action to prevent large appreciations should have been taken prior to the 1997 crisis.

JEL classification: F30, F32

Keywords: current account deficits, sustainability, intertemporal budget constraint, ASEAN

1. Introduction

The current account is an important barometer to both policymakers and investors as it represents an indicator of a country's economic performance. Temporary current account deficits present fewer problems as the imbalances represent the natural outcome of reallocating capital to the country that the factor of production tends to receive the highest possible returns (Hakkio, 1995). However, large and persistent current account deficits tend to pose more difficult problems on the economy and necessitate a policy response. Specifically, they tend to increase domestic relative to foreign interest rates, while simultaneously imposing an excessive burden on future generations as the accumulation of larger debt will imply increasing interest payments, and thus a lower standard of living. The deficits provide a signal of macroeconomic imbalance, calling for a devaluation and/or tighter macroeconomic policies. Large external imbalances are often assumed to play an important role in the propagation of currency crises. For example, the currency crises in Chile and Mexico (early 1980s), the UK and Nordic countries (late 1980s), Mexico and Argentina (mid 1990s), and more recently in East Asian countries (late 1990s) are often associated with large and persistent current account deficits. Kaminsky et al (1998) and Edwards (2001) provide empirical evidence that large current account deficits increase the probability of a country experiencing a currency crisis. However, country experience indicates that large external imbalances do not necessarily imply a forthcoming crisis (Milesi-Ferretti and Razin, 1996). Kaminsky et al (1998) also survey 28 papers that use a total of 105 explanatory variables in predicting currency crises. Their survey implies that there is not a single best indicator of future crises¹.

The recent Asian financial crisis serves as a reminder that doing nothing to correct the imbalances can be dangerous because these imbalances may eventually lead to an exchange rate collapse. External imbalances will not be financed by foreign investors forever. At some point, they will have to adjust back to the payment balance. Large external imbalances can increase the vulnerability to exogenous shocks including market sentiment. This is relevant for an economy that is increasingly becoming interconnected in the world financial markets, where changes in sentiment can have destabilizing effects

¹ A number of theoretical models predict that large current account deficits can lead to a financial/currency crisis. For example, first-generation models of currency crises introduced by Krugman (1979) show that a depletion of international reserves (due for example

on the financial as well as real sector of the economy. The main purpose of this paper is to assess empirically the issue of sustainability of current account imbalances in the Association of South East Asia Nations (ASEAN) countries, an issue that has not received much attention in the literature. Specifically, this paper attempts to answer the following questions: (1) Was the Asian crisis that was fueled by strong capital inflows predictable? (2) How has the recent crisis affected the sustainability of external imbalances of the crisis-affected countries? We pursue these questions through the application of a number of techniques of modern econometric time-series analysis. They include the Kwiatkowski, Phillips, Schmidt and Shin (1992) (abbreviated as KPSS) approach for the determination of the order of integration of the variables in the model; the Johansen and Juselius (1990) (hereafter refer as Johansen) cointegration methodology; the Gregory and Hansen (1996) procedures for the examination of the comovements between inflows (exports) and outflows (imports); and finally, the Stock and Watson (1993) dynamic OLS (DOLS) approach for the estimation of cointegrating vectors.

In the present study, we draw some lessons from the developing economies of the ASEAN - Indonesia, Malaysia, the Philippines, and Thailand². This set of countries represents an interesting case for several reasons: First, they were severely affected by the 1997 Asian financial crisis and experienced current account imbalances dating as far back as late 1980s (Thailand even much earlier). The deterioration in the current account took place when the economy was growing rapidly, except perhaps for the Philippines. Second, the high-performance Asian economies of Indonesia, Malaysia and Thailand have been the world largest capital importers in the 1990s. In fact, the massive foreign capital inflows led to the widening of current account deficits. In contrast with the case of other developing economies (e.g. Latin America), the accumulated current account deficits in ASEAN were largely invested rather than used to finance consumption³, and therefore, they were not particularly dangerous (Bruno, 1995). The deterioration in trade and current account balances reflected strong import (mainly capital goods) growth in

² The choice of these ASEAN countries is primarily based on the availability of data.

³ Earlier studies by Folkerts-Landau and Ito (1995) and Park and Song (1996) have examined the effect of various types of capital inflows on the developing economies. The general finding is that capital flows pose few problems if they are long-term and induced by growth prospects (in the form of direct investment) as they are likely to be invested in physical assets rather than consumed. In contrast, capital inflows in the form of portfolio investment can pose some difficult problems in the capital-receiving country, as they tend to be more temporary. Indeed, they argued that the Mexican crisis of 1994 and the apparent stability of the Asian economies in the pre-crisis period has been attributed to the differences in the type of capital inflows in the two regions. However, the Asian crisis questions the conventional wisdom expressed in these papers. It demonstrates that the type of capital inflows is not a crucial factor.

ASEAN and was closely related to the surge of FDI inflows into these countries. The external imbalances in the 1990s were due primarily to private saving-investment decisions as all countries maintained small budget deficits. Third, all these countries have a history of several episodes of current account imbalances that coincide with some common events, but the extent of the deficit varies across countries. The first episode was due to the events surrounding the oil shocks and its aftermath. The second relates to the commodity crisis in the mid 1980s and more recently in the 1990s due to the surge of foreign capital inflows from Japan, the US, and the newly industrialized countries.

This paper differs from most of earlier work in at least two important ways: First, we consider the possibility of a structural break in the cointegrating relationship between exports and imports using the Gregory and Hansen (1996) procedure. Second, we test for the sustainability of current account imbalances for a set of ASEAN economies in the period leading to the financial crisis and extend our analysis to include data from the post-crisis era, which ends in 1999. The major findings of this study are: First, our results confirm that Indonesia, the Philippines and Thailand all maintained unsustainable external imbalances in the pre-crisis era. This finding suggests that imports and exports do not share a stable long-run relationship prior to 1997. We view this evidence as supporting the conventional wisdom that the current account deficit may be used as a predictor of currency crisis. However, there is no evidence to indicate that Malaysia's current account deficit was on an unsustainable path prior to the crisis. Second, we found exactly the opposite results when the analysis is extended to include data in post-crisis period. While countries like Indonesia, the Philippines, and Thailand maintained a long run relation between inflows and outflows, Malaysia's policy of pegging the ringgit to the US dollar at RM 3.80/US dollar has yielded an unsustainable path after the exchange rate collapse. The results for the full period 1961-1999 should be considered as tentative as the post-crisis period includes only two years and the cointegration tests employed could be sensitive to outliers. Finally, the empirical results demonstrate that several economic events in the region have altered the long-run relationship between inflows and outflows in the external account.

The remainder of the paper is organized as follows. Section 2 provides an overview of the four ASEAN economies and their current account patterns for the 1961-1999 period. In

determination is presented. Section 4 provides the methodology as well as the data utilized in the analysis. Section 5 contains the results of the cointegration procedures both without and with the consideration of structural breaks. Finally, section VI concludes the paper and provides some policy lessons.

2. Overview of ASEAN Economies

The ASEAN successfully transformed themselves from the inward-oriented strategies toward outward-oriented strategies during the 1960s. For the outward-oriented strategies to succeed, the endogenous economic preconditions must be present. For the ASEAN economies, the single most important real internal factor for their economic success has been their relatively high level of saving and investment. Most of the countries have recorded domestic savings of more than 30% of the GDP (except for the Philippines). In addition, the ASEAN committed a high proportion of their GDP to domestic investment ranging from 20% (Philippines) to as high as 44% (Malaysia). The recession in the 1980s prompted these countries to undertake major structural adjustments and expand their manufacturing exports. The technology transfers from the more developed to the less developed ASEAN countries also led to rapid economic growth. It is important to note here that investment activities took place mainly in the export-oriented industries whereas the non-export sector benefited from foreign investments through dynamic spillover effects from the export sector. These countries like others in ASEAN, initiated several reforms in the financial sector at almost the same period.

Foreign capital started to flow into ASEAN developing countries at accelerating rates in the 1990s after a large drop during the 1980s. International investors were attracted to these countries because of their sound macroeconomic fundamentals. These economies had small fiscal deficits, stable exchange rates, high savings rates, and highly-regarded work force. Other domestic factors that could have contributed to the surge of foreign capital include the widespread liberalization of financial markets and the credit-worthiness of these countries. A decade or so of rapid economic growth has made these economies an attractive region to international investors. Several authors have also documented that external factors jointly played a significant role in explaining the causes

of the recent capital inflows into the ASEAN countries. These include a low world interest rate and recessions in the major industrial countries. In addition, largely the strong yen against the US dollar has propelled Japanese investment in the region. Since the value of ASEAN currencies was more or less tied to a basket of currencies, primarily to the US dollar, Japanese companies could use them as a low-cost substitute for American manufacturing base.

Borrowers found that they could lower their financing costs by borrowing in yen or dollar rather than local currency. In the peak year of 1996, net private capital inflows reached as high as 12 percent of GDP. Foreign commercial banks provided the bulk of private external credit to these countries⁴. The combination of high saving rates and large capital inflows produced an investment boom in these countries. Foreign capital not only filled the saving-investment gap, but also facilitated the transfer of technology, first to the exports sector and later, via spillovers, to the non-export sectors of the economy. The saving-investment imbalance caused the current account to move to deficit. This gap needed to be financed by international debt and the accumulation of these debts made the financing of the current-account imbalances increasingly more difficult as the ability of these countries to sustain and repay their deficits was in doubt.

During the same period, several external events adversely affected the competitive position of ASEAN countries whose currency was pegged to the US dollar. Early in 1994, China devalued its currency by 35%. Additionally, the dollar began to appreciate globally after mid-1995, as the yen weakened. Together these events produced overcapacity problems in the East Asian region. When Thailand was forced to devalue, the pressure spread contagiously to Indonesia, Malaysia, the Philippines, and South Korea. The pegged exchange regimes, the banking sectors, and other highly leveraged borrowers all collapsed at about the same time⁵.

Figures 1-4 chart the current account deficits of the four ASEAN countries: Indonesia, Malaysia, the Philippines, and Thailand. There are at least two noteworthy points derived

⁴ In the peak year of 1996, about \$90 billion flowed into Indonesia, Malaysia, the Philippines, South Korea and Thailand alone. Foreign commercial banks provided the bulk of the private external credit to these countries- \$8 billion out of total new external credit of \$76 billion.

⁵ For a more detailed account of the 1997 Asian financial crisis, see Radelet and Sachs (1998 a,b) and Corsetti *et al.* (1999).

from these graphs. First, the plots give a visual impression of the differences over the sample period between the movements of the current account deficits in Indonesia, Malaysia and the Philippines on the one hand, and Thailand, on the other hand. In particular, the accumulation of the deficits in Thailand started in 1967 with no prospect of a deficit correction. In contrast, the saving-investment imbalance in other ASEAN countries started in the 1980s (Malaysia in late 1989). A second noticeable feature about the external imbalances in all these countries is that the deficits began to improve in 1997 following a sharp drop in ASEAN currencies due to a sudden reversal of capital (mainly portfolio) flows. It appears that the sharp depreciation in the value of the ASEAN currencies against the US dollar and the yen (to a lesser extent the yen in 1997) caused the swing from current account deficit to current account surplus in the post-crisis period.

3. Theoretical Model

We adopt the theoretical model from Hakkio and Rush (1991a) and Husted (1992) and use the data of ASEAN countries to test for the sustainability of current account imbalances. Briefly, the intertemporal approach to current account balances looks at the long-run relationship between exports and imports. The usefulness of this model (or its variation) in explaining the behavior of current accounts in US and other developed nations has already been explored by numerous authors (e.g. Wicken and Uctum, 1993; Cashin and McDermott, 1998; Fountas and Wu, 1999; Irandoust and Boo Sjoo, 2000 and Wu *et al.*, 2001). Less emphasis has been placed on testing current account sustainability using data from developing countries (see for example, Milesi-Ferretti and Razin, 1996 a, b; Reisen, 1998; Yan, 1999 and Apergis *et al.*, 2000)⁶. To the best of our knowledge, there are no other studies focusing on the ASEAN developing countries, except for the work by Yan (1999). However, the modeling strategy adopted in the present study differs from most of the earlier studies in a number of ways. In addition, we extend the analysis to include the data from the recent Asian financial crisis. The purpose is to evaluate the ability of current account imbalances to predict the Asian crisis.

⁶ Methodologically, the issues considered in this paper are analogous to the problem of satisfying the government's intertemporal budget constraint (IBC) used in the literature that can be employed after suitable modification. See for example, Hamilton and Flavin (1986), Trehan and Walsh (1991), Makrydakis *et al.* (1999), Martin (2000) and Green *et al.* (2001).

The model starts with the budget constraint of an individual who is able to borrow and lend freely in the international market. The current-period budget constraint of this representative household is:

$$C_0 = Y_0 + B_0 - I_0 - (1+ir_0) B_{-1} \quad (1)$$

where C_0 denotes current consumption; Y_0 is output; I_0 is investment; ir_0 is the world interest rate; B_0 is international borrowing, which could be positive or negative; and $(1+ir_0)B_{-1}$ is the initial debt of the representative household, corresponding to the country's external debt.

Since equation (1) must hold for every time period, the period-by-period budget constraints can be added up to form the economy's intertemporal budget constraint expressed as:

$$B_0 = \sum_{t=1}^{\infty} \delta_t TB_t + \lim_{n \rightarrow \infty} \delta_n B_n \quad (2)$$

where $TB_t = EX_t - MM_t = Y_t - C_t - I_t$ represents the trade balance in period t (income minus absorption), $EX_t =$ exports, $MM_t =$ imports, $\delta_t = \prod_{s=1}^t \beta_s$ where $\beta_s = 1/(1+ir_s)$, and δ_t is the discount factor. The crucial element in equation (2) is the last term $\lim \delta_n B_n$, where the limit is taken as $n \rightarrow \infty$. When this limit term equals zero, the amount that a country borrows (lends) in international markets is equal to the present value of the future trade surpluses (deficits). If B_0 is positive, then the country is 'bubble-financing' its external debt and in the case B_0 is negative and the limit term is non-zero, the country is making Pareto-inferior decisions: welfare could be raised by lending less (Husted, 1992).

Assuming that the world interest rate is stationary with unconditional mean ir , equation (1) may be expressed as⁷:

$$Z_t + (1 + ir)B_{t-1} = EX_t + B_t \quad (3)$$

where $Z_t = MM_t + (ir_t - ir)B_{t-1}$. Solving equation (3) by forward substitution, Hakkio and Rush (1991a) and Husted (1992) obtain the following relationship:

$$MM_t + ir_t B_{t-1} = EX_t + \sum_{j=0}^{\infty} \phi^{j-1} [\Delta EX_{t+j} - \Delta Z_{t+j}] + \lim_{j \rightarrow \infty} \phi^{t+j} B_{t+j} \quad (4)$$

where $\phi = 1/(1 + ir)$ and Δ denotes the first difference operator. The left-hand side of (4) represents spending on imports as well as interest payments (receipts) on net foreign debt (assets). Subtracting EX_t from both sides of equation (4) and multiplying the result by (-1), we observe that the left-hand side of equation (4) represents the current account of an economy. Furthermore, by assuming the limit term that appears in equation (4) to equal zero and adding the residual term to equation (4), we obtain the following regression model:

$$EX_t = \alpha + \beta MM_t^* + e_t \quad (5)$$

where $MM_t^* = (MM_t + ir_t B_{t-1})$ measures imports of goods and services plus net unilateral transfers. The necessary condition (weak form) for the economy to satisfy its intertemporal budget constraint is the existence of a stationary error structure, that is, e_t in equation (5) should be an $I(0)$ process. On the other hand, failure to detect comovements between exports (inflows) and imports (outflows) would indicate the economy is not functioning properly and fails to satisfy its budget constraint, and therefore, is expected to default on its debt (Hakkio and Rush, 1991a). Hence, such a finding provides evidence against the sustainability of the current account balance.

The necessary and sufficient condition (strong form) for the intertemporal budget constraint model is the existence of a vector (α, β) such that e_t is a stationary process and $(\alpha, \beta) = (0, 1)$. In other words, if exports and imports are cointegrated with cointegrating vector $b = (1 \ -1)$, then the economy is said to satisfy its strong form of the intertemporal budget constraint in the long run. Such a relationship would imply that the two series would never drift too far apart. Equation (5) above provides a useful framework for testing the sustainability of current account deficits (or surpluses).

4. Econometric Methodology and Data

4.1 Unit Root Tests

Prior to modeling time series data, the order of the integration of the series had to be determined⁸. The classical unit root tests, namely, the Augmented Dickey-Fuller (ADF) test (see Dickey and Fuller, 1981; Said and Dickey, 1984) and the Phillips and Perron (1988) test provide convenient procedures to determine the univariate properties of time series data. Both of these tests are based on the null hypothesis that a unit root exists in the time series. The ADF procedure requires homoscedastic and uncorrelated errors in the underlying structure. The Phillips and Perron (PP) nonparametric test generalizes the ADF procedure allowing for less restrictive assumptions and hence, eliminating any nuisance parameters. A major criticism of the ADF and PP tests is that they cannot distinguish between a unit root and a near unit root stationary process, and as a result these tests may suffer from a lack of power (Campbell and Perron, 1991 and DeJong *et al.*, 1992). This prompted us to use the mean stationary test developed by Kwiatkowski *et al.* (1992) to justify the $I(1)$ specification in the analysis. The KPSS semi-parametric procedure tests for level (η_{μ}) or trend stationarity (η_{τ}) against the alternative of a unit root. Hence, by combining the classical principles with the KPSS test, it is more likely that more conclusive evidence can be drawn with regard to the order of integration of the series under investigation, given our small sample size.

4.2 Multivariate Cointegration Test

The Johansen multivariate procedure poses several advantages over the residual-based Engle-Granger two-step approach in testing for a long-run relationship among economic variables. Phillips (1991) has documented the desirability of this technique in terms of symmetry, unbiasedness and efficiency. Furthermore, it is well known that the Johansen procedure does not suffer from a normalization problem and is robust to departures from normality (Gonzalo, 1994). The determination of the number of cointegrating vectors is

⁸ Although this step is a necessary condition to testing for cointegration, it is noteworthy to point out here that the Johansen procedure also allows series that are integrated of mixed orders up to $I(1)$. In other words, variables that are stationary in levels $I(0)$ and first differences $I(1)$ can be accommodated by the Johansen procedure. This point is also highlighted in some of the recent literature (see

based on the use of two likelihood ratio (LR) test statistics: the trace test and the maximum eigenvalue test⁹.

The importance of applying a degree-of-freedom correction for the Johansen procedure in small samples is well known. The correction factor is necessary to reduce the excessive tendency of the test to falsely reject the null hypothesis of no cointegration often associated with data of a relatively short span. The importance of this correction factor in small samples is documented in Reimers (1992) and Cheung and Lai (1993)¹⁰. Cheung and Lai (1993) provide the correction factor for small sample sizes of the Johansen likelihood ratio test while Reinsel and Ahn (1988) suggest an adjustment to the estimated trace and maximum eigenvalue statistics. In the analysis that follows, we rely on the latter suggestion to deal with the small-sample size¹¹.

4.3 The Gregory and Hansen Cointegration Method

The Johansen approach has its limitations especially when dealing with a long data span as the data generating process may be affected by major economic events. It is over long periods that we would expect shifts in industrial structure, productivity growth, etc. to alter the equilibrium relationship. Several studies have shown the sensitivity of the outcome of the Johansen tests to structural breaks. To examine further the robustness of our results to structural breaks, we apply the Gregory and Hansen (1996)¹² cointegration tests that account for an endogenously-determined break. In brief, the approach is similar to the Engle-Granger two-step procedure, except that dummy variables (D_{it}) are included in the cointegrating regression to account for a shift in the long-run relationship. Gregory and Hansen (1996) consider four different models corresponding to the four different assumptions made concerning the nature of the shifts in the cointegrating vector. Models 2, 3 and 4 in Gregory and Hansen, are as follows:

⁹ Readers may refer to Johansen and Juselius (1990) for a complete discussion on the procedure. Critical values for both the trace and maximum eigenvalue tests are tabulated in Osterwald-Lenum (1992).

¹⁰ Under the Johansen procedure, the trace statistics are more robust to both skewness and excess kurtosis in innovations than the eigenvalue statistics in testing of cointegration (Cheung and Lai, 1993). It is also important to point out here that the power of these tests tends to be low when the cointegration relationship is close to the nonstationary boundary (see Johansen, 1991). Thus, it seems reasonable to allow for type-1 error probability higher than the standard 5 percent level.

¹¹ The degree-of-freedom correction suggested is to multiply the test statistic by $(T-pk)/T$, where T is the sample size, p is the number of variables, and k is the lag length of the VAR model.

¹² We follow Gregory and Hansen (1996) to compute the ADF statistics for each breakpoint in the interval, 0.15T to 0.85T (where T is the number of observations). We will choose the breakpoint associated with the smallest value as that point at which the structural break occurred.

Model 2: Level Shift (C)

$$RXY_t = \mu_1 + \mu_2 D_{t\tau} + \delta^T RMY_t + e_t \quad t=1, \dots, n \quad (6)$$

Model 3: Level Shift with Trend (C/T)

$$RXY_t = \mu_1 + \mu_2 D_{t\tau} + \psi t + \delta^T RMY_t + e_t \quad t=1, \dots, n \quad (7)$$

Model 4: Regime Shift (C/S)

$$RXY_t = \mu_1 + \mu_2 D_{t\tau} + \delta_1^T RMY_t + \delta_2^T RMY_t D_{t\tau} + e_t \quad t=1, \dots, n \quad (8)$$

and

$$D_{t\tau} = \begin{cases} 0 & \text{if } t \leq [n\tau], \\ 1 & \text{if } t > [n\tau], \end{cases}$$

where μ_1 represents the intercept before the shift, μ_2 represents the change in the intercept at time of the shift, and t is a time trend. The unknown parameter $\tau \in (0, 1)$ denotes the (relative) timing of the change point and $[]$ denotes integer part. The parameter δ_1^T denotes the cointegrating slope coefficients before the regime shift while δ_2^T denotes the change in the slope coefficients (model 4). The dummy variable, $(D_{t\tau})$ is a sequence of zeros prior to the break point and ones thereafter. Specifically, for each τ , estimation of the above models (depending upon the alternative hypothesis) by OLS, yields the residuals $\hat{e}_{t\tau}$. The breakpoint is identified as the one where the test statistic is maximized in absolute value. The advantage of the Gregory and Hansen procedure is that it determines the break point endogenously from the data set rather than on the basis of *a priori* information. Hence, the problem of data mining can be avoided by employing this procedure.

Annual frequency data spanning from 1961 to 1999 are utilized in the present analysis, hence providing a total of 39 observations¹³. The sample period includes the 1997 Asian financial crisis. The length of this sample period makes it likely that a major economic

¹³ One may argue that 39 years of data may not provide enough long-run information for the purpose of examining the sustainability of the current account balance using the Johansen procedure. This is typically the case in developing countries where a small number of annual observations are available for analysis. This issue has been a matter of debate in the literature. Indeed, as we show later, even with 39 years of data, we are able to find a unique cointegrating relationship between imports and exports in half of the countries under investigation. Moreover, as Hakkio and Rush (1991b) and Campbell and Perron (1991) pointed out the ability to detect cointegration is a function of the total sample length and not a function of data frequency. To deal with the relatively small sample size, we chose to use the small sample version of the Johansen procedure suggested by Bai and Li (2002) and Cheung and Lai (2003) among others.

shock has occurred. To address the potential issue of structural breaks due to the currency crisis, the analysis is conducted for two periods. First, the analysis is performed using the entire sample period that ends in 1999. The second sample considered begins in 1961 and ends in 1997, the year the crisis hit the region. This strategy allows revealing any potential differences in the results between the two sample periods, which might allow us to conclude whether the crisis could have been predicted on the basis of the results of the current account sustainability test¹⁴. All data are gathered from several issues of *International Financial Statistics* published by the International Monetary Fund (IMF). Real exports (RXY) include exports of goods and services, while real imports (RMY) include imports of goods and services plus net transfer payments and net interest payments (Husted, 1992). Both exports and imports are measured in real terms as a percentage of real GDP. The consumer price index (CPI) is used as a proxy for the national price level. All the variables are expressed in terms of domestic currency.

5. Empirical Results

We first perform unit root tests in order to determine the univariate properties of the data employed in the analysis. The results are presented in Table 1. It is evident from the table that the calculated ADF statistics are less than their critical values in all cases, suggesting that the variables are not level stationary. Similarly, based on the PP test, the null hypothesis of nonstationarity cannot be rejected in favor of the alternative in all cases; an exception is RXY and RMY in Thailand. Table 1 also shows that the ADF and PP statistics for the two variables (ΔRXY and ΔRMY) imply first-difference stationarity in all countries. To confirm these results we also conduct the KPSS tests. The KPSS test, as indicated by the η_μ and η_τ statistics, strongly rejects the $I(0)$ null at the 95% confidence level. The results are consistent with the argument that most of the macroeconomic aggregates are difference stationary processes (Nelson and Plosser, 1982).¹⁵

¹⁴ We adopt this strategy because the Gregory-Hansen approach is not suitable in detecting a structural break near the end of the sample period.

¹⁵ We also test for a unit root during the period 1961-1997. Overwhelmingly, the evidence also supports the $I(1)$ properties of all the series.

5.1 Johansen Cointegration Analysis

Having established that all variables are integrated of the same order, we proceed with the Johansen multivariate cointegration tests which allow us to test for long-run current account balance sustainability. If inflows (RXY) were determined by other factors than those associated with outflows (RMY), then their omission should prevent us from finding evidence of cointegration. On the other hand, evidence of cointegration would imply that RMY could adequately capture permanent innovations along with RXY. To implement this procedure, an appropriate lag length in the VAR system must be determined. The purpose is to allow dynamics and eliminate serial correlation in the model. The Akaike's information criterion (AIC) is used to determine the optimal lag length. The AIC criterion yields a VAR (2) for Malaysia and the Philippines, and a VAR (1) for Indonesia and Thailand. Despite the relatively short lag length chosen, the residuals of each equation in the system do not exhibit serial correlation or ARCH effects, thus satisfying the standard specification criteria for residuals.

Table 2 presents the Johansen cointegration test results for the full sample period (1961-1999). The purpose is to determine whether the crisis has had any effect on the external balance of the ASEAN countries. We find that despite the sharp depreciation of the ASEAN currencies, only for the case of Thailand and Indonesia do the trace and maximum eigenvalue statistics (unadjusted and adjusted) reject the null hypothesis of no cointegration. We also perform the cointegration test using the period prior to the financial crisis (1961-1997) and report the results in Table 3. The null hypothesis of no cointegrating vector ($r=0$) is rejected at conventional significance levels solely for Malaysia (according to the trace statistic only). However, both the maximal eigenvalue and trace statistics (unadjusted and adjusted) for Thailand, Indonesia, and the Philippines are insignificant even at the 10 percent level. The absence of cointegration between the two variables system (RXY, RMY) in these three cases implies that there has been no relationship between inflows and outflows in the current account for the sample period that ends in 1997¹⁶. The inability to reject the no-cointegration null in the majority of cases examined above might be due to the existence of structural breaks that bias the test

¹⁶ This finding highlights the sensitivity of the Johansen procedure to the sampling period as documented in Gonzalo (1994) and

results in favour of accepting the null. This leads us to pursue further testing using an alternative procedure that can accommodate potential structural breaks in the data.

5.2 Structural Break

In order to allow for possible changes in the cointegrating vector over the estimation period, we apply the Gregory and Hansen (1996) procedure. The results of the Gregory and Hansen cointegration tests based on the full sample period (1961-99) are summarized in Table 4 (Panel A). The first model (mean model) reveals that cointegration is present with a break for Indonesia (1975) and Philippines (1975), implying that the data support cointegration with a change in intercept only for two of the ASEAN countries under investigation. The second model (slope model) shows that cointegration is present with a break for the Philippines (1973) and Thailand (1975). Finally, the third model that takes into consideration the simultaneous presence of both a mean break and a slope break (regime shift) exhibits empirical support for cointegration with a break only for the case of the Philippines (1985). Taken together, the Gregory-Hansen tests support a cointegrating relationship between the two variables with a possible shift in mean and/or slope in all countries, except Malaysia.

The analysis is also carried out for the pre-crisis period. The results of the tests are given in Table 4 (panel B). A striking feature of these results is that a cointegrating relationship between inflows and outflows is only found for Malaysia. For the remaining ASEAN countries the results reveal that the countries were on an unsustainable path.

In summary, the cointegration test results of Tables 2, 3 and 4 lead to the following conclusions: First, the results of the Gregory and Hansen tests are identical with those of the Johansen test, the only difference being that in the full-sample period, the Gregory and Hansen tests imply cointegration in one more country, namely, the Philippines. Second, the additional evidence for cointegration obtained from the use of the Gregory and Hansen tests is not surprising given the bias towards the null arising from cointegration tests that disregard potential structural breaks, such as the Johansen test. Third, the evidence for unsustainable current account deficits in the pre-1997 period in 3 of the 4 countries supports the view that these deficits can be considered as predictors of the recent Asian currency crisis. Moreover, the large depreciations after 1997 as these

countries floated their currencies led to a partial correction in these external imbalances¹⁷. According to our results, this interpretation does not apply for Malaysia, where the return to a fixed exchange rate regime following the once-off depreciation in 1997 did not allow the country's current account balance to return to its sustainable path that existed prior to the crisis.

All the break points detected by the Gregory and Hansen test coincide with major international events that also affected the ASEAN countries. The most prominent structural shifts for most of the data coincide with two major events: first, the aftermath of the oil price shocks that occurred in 1973-1975¹⁸; and, second the collapse of commodity prices that coincided with the commodity crisis of 1985.

5.3 Estimation of Long run Equilibria

The Johansen procedure may be used to extract the long-run parameters of the model. We have decided to apply a more robust method proposed by Stock and Watson (1993)¹⁹ that also corrects for possible simultaneity bias among the regressors. The method involves estimation of the long-run equilibrium relationship using the dynamic OLS (DOLS) method. The procedure advocated is similar to estimators proposed by Phillips and Hansen (1990) and Phillips and Loretan (1991) but it is much more convenient to implement and estimate the model. Moreover, DOLS is often preferred due to its favorable performance in small samples as well. The DOLS estimation results appear in Table 5. The most important aspect of the results is that in all cases, except Malaysia, the null hypothesis $\beta=1$ is strongly rejected at conventional significance levels. This is inconsistent with the strong form of the theory. For Malaysia, the empirical evidence based on the 1961-1997 period points to the fact that the current account deficits in the years preceding the crisis are indeed sustainable (strong form of sustainability). The cointegration and DOLS results indicate evidence of intertemporal budget constraint (weak form of sustainability) for Indonesia, the Philippines, and Thailand. Hence, the

¹⁷ These results support the weak form of current account sustainability. The strong form of sustainability would require that the slope coefficient in the long-run equilibrium relationship between inflows and outflows is equal to one.

¹⁸ This may also coincide with the change of the monetary system that took place in 1973. Some countries maintained a rigid exchange rate regime well past the collapse of Bretton Woods.

¹⁹ They offer a parametric approach for estimating long-run equilibria in systems that involve variables integrated of different orders but still cointegrated. The possibility of simultaneity bias and small-sample bias among the regressors is dealt with the inclusion of lagged and lead values of the first difference in the regressors. Moreover, Monte Carlo results show that the DOLS estimator has the lowest root mean square error (RMSE) and, therefore, performs well in finite samples relative to other asymptotically efficient

overall results indicate that inflows and outflows in these three countries tend to form a cointegrating relationship (weak form of sustainability). The strong form of the sustainability hypothesis is rejected by the data, even after allowing for the post-crisis period.

The estimated model that appears in Table 5 seems to be robust to various departures from the standard regression assumptions in terms of residual correlation, autoregressive conditional heteroskedasticity (ARCH), misspecification of functional form, non-normality, or heteroskedasticity of residuals, except for one case. For the Philippines, the Jarque-Bera test implies a rejection of the null hypothesis of normality. Furthermore, the application of the CUSUM (cumulative sum) and CUSUM squares test allows the examination of the parameter stability of the model. Briefly, if the plot of the CUSUM or CUSUM squares sample path moves outside the critical region (at the 5 percent significant level), the null hypothesis of stability overtime of the intercept and slope parameters is rejected (assuming the model is correctly specified)²⁰. In this study we only reported the CUSUM squares values, as it is known to be more powerful than the CUSUM test. The plots of the CUSUM squares in Figures 5-8 reveal the null hypothesis of parameter stability cannot be rejected at the 5 percent level of significance.

6. Conclusions and Policy Lessons

A country may be able to sustain current account deficits arising from high levels of national consumption or investment by borrowing from abroad in the short run. However, when the deficits persist for a long period, then a nation's ability to service its external obligations will be questioned. The primary purpose of this study is to examine the sustainability of current account imbalances in four ASEAN countries using the methodology of vector time series econometrics and allowing for structural breaks.

²⁰ The CUSUMSQ statistic has a beta distribution with mean $(t-k)/(T-K)$. For a more complete elaboration on the test, see Harvey (1990). The test is based on the test statistic $S_t = \frac{\sum_{i=k+1}^t w_i^2}{\sum_{i=k+1}^n w_i^2}$, where $t = k+1, k+2, \dots, n$, s is the standard error of the regression

fitted to all i sample period, and w_i^2 is the squared recursive residuals. The mean value given the expected value of this test statistic under the null hypothesis of parameter stability is $E(s_t) = (t-k)/(T-k)$ which goes from zero at $t=k$ to unity at $t=T$.

Our analysis leads to the following important conclusions. First, we find strong evidence supporting the violation of the intertemporal balance model prior to the Asian crisis in all countries, with the exception of Malaysia. The failure of imports and exports to exhibit any stable long-run relationship perhaps suggests that the ASEAN countries were adopting a strategy of excessive borrowing from the rest of the world. The economic policies implemented prior to the crisis (including the peg exchange rate system) contributed to the violation of the intertemporal international budget constraint. An important lesson that can be drawn from this finding is that lack of action to correct persistent current account deficits may lead to a financial crisis. In other words, external-account imbalances may be used as an indicator (or warning signal) of a forthcoming crisis. There is also evidence to suggest that one crisis-affected country, i.e., Malaysia, maintained a sustainable current account. This is contrary to what was observed in the other ASEAN countries. This anomaly may be attributed to the macroeconomic structural differences existing between Malaysia and the other ASEAN-member countries. Our first result has also important implications for the role of the contagion hypothesis in explaining financial crises: It implies that one needs to examine the stationarity of neighboring countries' current account deficits, as well, in order to predict future crises, as exemplified by the recent Asian crisis.

Second, in the post-crisis era it was observed that large currency depreciations as well as adjustment in other macroeconomic variables in ASEAN led to an immediate improvement in current account imbalances (surplus). Our results illustrate, with the exception of Malaysia, all other ASEAN are on a sustainable path (in the weak sense explained above) in the post-crisis period. The decisive evidence leads us to conclude that actions to prevent large appreciations of ASEAN currencies should have taken place prior to 1997 when current account deficits were unsustainable. In addition, the large surplus recorded in Malaysia after 1997 can be attributed to the fixing of the ringgit to the US dollar, a policy that has to a certain extent promoted exports, but at the same time adversely affected imports. Several authors have shown that Malaysia's past performance has depended heavily on imports of capital and intermediate goods (see [Baharumshah and Rashid, 1999](#)). Any policy actions that adversely affect the imports of these goods will also have implications for the nation's economic progress.

Finally, our analysis highlights the significance of modeling structural breaks that correspond to major economic events. We demonstrate that the results based on the procedures accounting for structural breaks are more favorable on the long-run relation between exports and imports. Several authors of recent studies ([Wu *et al.*, 1996](#); [Apergis *et al.*, 2000](#); [Martin, 2000](#)) have also raised this point that derives from the low power of standard cointegration tests in the presence of structural breaks.

Table 1: Unit Root Test Results

Country and Series	Test Statistics					
	t_{μ}	t_{τ}	$Z(t_{\mu})$	$Z(t_{\tau})$	η_{μ}	η_{τ}
A: Level						
Indonesia						
RXY	-1.501(1)	-2.161(1)	-1.502(3)	-2.461(3)	1.058(2)**	0.243(2)**
RMY	-2.211(1)	-2.890(1)	-2.208(5)	-3.186(3)	1.020(2)**	0.203(2)**
Malaysia						
RXY	-1.569(1)	-0.736(1)	-1.504(3)	-1.175(3)	0.838(3)**	0.244(3)**
RMY	-0.042(1)	-2.049(1)	-0.355(3)	-2.721(3)	1.100(2)**	0.261(2)**
Philippines						
RXY	-1.384(1)	-0.466(1)	1.151(3)	0.890(3)	1.139(2)**	0.260(2)**
RMY	-0.080(1)	-1.795(1)	-0.214(3)	-1.915(3)	1.104(2)**	0.226(2)**
Thailand						
RXY	-0.199(1)	-1.843(1)	-0.497(3)	-3.758(3)**	1.161(1)**	0.380(1)**
RMY	-1.074(1)	-2.746(1)	-1.675(3)	-4.903(3)***	1.684(1)**	0.244(1)**
B: First Difference						
Indonesia						
Δ (RXY)	-5.547(1)***	-5.532(1)***	-8.284(3)***	-8.223(3)***	0.106(2)	0.077(2)
Δ (RMY)	-5.856(1)***	-5.926(1)***	-9.668(5)***	-10.149(5)***	0.115(2)	0.059(2)
Malaysia						
Δ (RXY)	-4.806(1)***	-6.144(1)***	-8.585(3)***	-11.117(3)***	0.511(3)	0.061(3)
Δ (RMY)	-4.132(1)***	-4.336(1)***	-9.563(3)***	-10.197(3)***	0.177(2)	0.041(2)
Philippines						
Δ (RXY)	-4.739(1)***	-5.521(1)***	-7.200(3)***	-8.228(3)***	0.287(2)	0.087(2)
Δ (RMY)	-4.803(1)***	-5.038(1)***	6.463(3)***	-6.718(3)***	0.124(2)	0.057(2)
Thailand						
Δ (RXY)	-5.699(1)***	-6.474(1)***	-13.600(3)***	-15.789(3)***	0.180(1)	0.029(1)
Δ (RMY)	-4.317(1)***	-4.144(1)***	-12.341(3)***	-12.149(3)***	0.046(1)	0.040(1)

Note: The t , $Z(t)$ and η statistics refer to the ADF, PP, and KPSS tests, respectively. The subscripts μ and τ indicate the models that allow for a drift term and both a drift and a deterministic trend, respectively. The following notation applies: RXY = Exports measured in real terms as a percentage of real GDP, RMY = Imports measured in real terms as a percentage of real GDP. Asterisks (***), (**), and (*) show significance at 1 %, 5% and 10% levels, respectively. Figures in parentheses indicate the lag length. The critical values are obtained from [MacKinnon \(1991\)](#) for the ADF and the PP tests and from [Kwiatkowski et al. \(1992\)](#) for the KPSS test. Both the ADF and PP tests examine the null hypothesis of a unit root against the stationarity alternative. KPSS tests the stationarity null hypothesis against the alternative hypothesis of a unit root.

Table 2: Cointegration Test Results (1961-1999)

A: Indonesia							
Null	Alternative	k=1 r=1					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	16.108*	15.282*	14.880	19.439*	18.442*	17.860
r ≤ 1	r = 2	3.302	3.133	8.070	3.302	3.133	8.070
B: Malaysia							
Null	Alternative	k=2 r=0					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	10.446	9.374	15.870	12.626	11.331	20.180
r ≤ 1	r = 2	2.179	1.955	9.160	2.179	1.955	9.160
C: Philippines							
Null	Alternative	k=2 r=0					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	12.373	11.104	15.870	15.624	14.022	20.180
r ≤ 1	r = 2	3.251	2.918	9.160	3.251	2.918	9.160
D: Thailand							
Null	Alternative	k=1 r=1					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	25.446*	24.141*	19.220	30.819*	29.239*	25.770
r ≤ 1	r = 2	5.373	5.097	12.390	5.373	5.097	12.390

Note: Asterisk (*) denotes statistical significance at 5%. k is the lag length in the VAR and r is the number of cointegrating vectors. The unadjusted statistics (λ -max and trace) are the normal Johansen tests while the adjusted (λ -max and trace) are the small-sample adjustments of the Johansen test statistics discussed earlier in the text.

Table 3: Cointegration Test Results (1961-1997)

A: Indonesia							
Null	Alternative	k=1 r=0					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	15.702	14.897	19.220	21.633	20.523	25.770
r <= 1	r = 2	5.931	5.626	12.390	5.931	5.626	12.390

B: Malaysia							
Null	Alternative	k=2 r=1					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	15.110	13.380	15.870	23.990*	21.240*	20.180
r <= 1	r = 2	8.880	7.866	9.160	8.880	7.866	9.160

C: Philippines							
Null	Alternative	k=2 r=0					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	10.024	8.940	14.880	14.609	13.029	17.860
r <= 1	r = 2	4.587	4.091	8.070	4.587	4.091	8.070

D: Thailand							
Null	Alternative	k=1 r=0					
		λ_{max}			Trace		
		Unadjusted	Adjusted	95% C.V.	Unadjusted	Adjusted	95% C.V.
r = 0	r = 1	14.491	13.748	19.220	18.956	17.983	25.770
r <= 1	r = 2	4.465	4.236	12.390	4.465	4.236	12.390

Note: Asterisk (*) denotes statistical significance at 5%. k is the lag length in the VAR and r is the number of cointegrating vectors. The unadjusted statistics (λ -max and trace) are the normal Johansen tests while the adjusted (λ -max and trace) are the small-sample adjustments of the Johansen test statistics discussed earlier in the text.

Table 4: Gregory-Hansen Cointegration Tests

Country	C	C/T	C/S
A: Period: 1961-1999			
Indonesia	-5.190** (1975)	-4.172 (1975)	-3.182 (1975)
Malaysia	-2.079 (1986)	-2.492 (1986)	-2.607 (1986)
Philippines	-13.430** (1975)	-25.467** (1973)	5.669** (1985)
Thailand	-0.199 (1985)	-31.348** (1975)	-0.113 (1973)
B: Period: 1961-1997			
Indonesia	-3.118 (1973)	-3.408 (1975)	-4.074 (1977)
Malaysia	-7.453** (1985)	-26.004** (1975)	-5.320* (1973)
Philippines	-3.099 (1982)	-3.179 (1982)	-2.995 (1982)
Thailand	-2.553 (1978)	-3.455 (1985)	-4.538 (1985)

Note: All the critical values are obtained from Table 1 (p.109) of Gregory and Hansen (1996). Asterisks (**) and (*) denote statistical significance at the 5% and 10% levels, respectively.

Table 5: Dynamic OLS Estimation (DOLS)

Country	β	$H_0: \beta = 1$	AR(2)	ARCH (1)	RESET(1)	J-B	White
Indonesia (1961-1999)	0.381	3.748*	1.862	1.426	1.717	2.609	1.162
Malaysia (1961-1997)	0.969	0.222	0.850	0.932	0.865	4.086	1.321
Philippines (1961-1999)	0.224	10.828**	0.999	1.025	0.100	10.110*	0.781
Thailand (1961-1999)	0.888	4.936**	0.599	1.283	0.741	0.558	1.108

Note: The distributional properties of diagnostics are: LM (2) is a test of 2nd order serial correlation. ARCH (m) is an m-order test for autoregressive conditional heteroskedasticity. Ramsey's RESET (Regression Specification Test) test uses the square of the fitted values. J-B (Jarque-Bera) is the test of the normality of the residuals. The White general heteroscedasticity test is based on the regression of squared residuals on squared fitted values. Asterisks (*) and (**) denote significance at 10 percent and 5 percent level, respectively. For Malaysia, the analysis is conducted using data from 1961-1997 since no cointegrating vector was found in the full sample period. The break point selected for the DOLS estimation is based on the Gregory and Hansen results from Table 4. The break points for Indonesia and Thailand are chosen on the basis of models C and C/T, respectively. The break points for Malaysia and the Philippines are chosen on the basis of model C/S.

Figure 1: Percentage of Indonesia Current Account to GDP ratio (1961-1999)

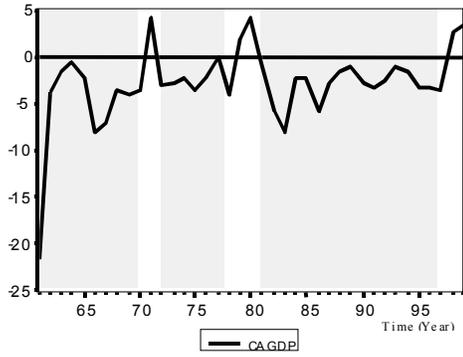


Figure 2: Percentage of Malaysia Current Account to GDP Ratio (1961-1999)

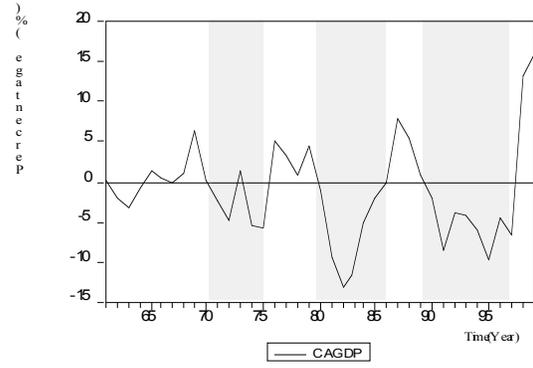


Figure 3: Percentage of Philippines Current Account to GDP ratio (1961-1999)

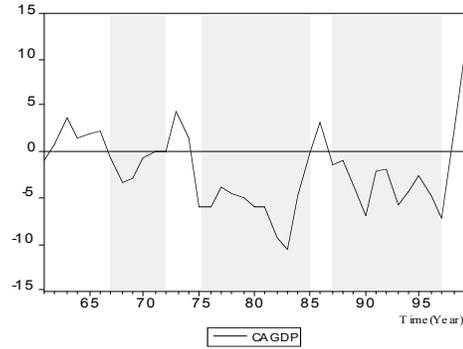


Figure 4: Percentage of Thailand Current Account to GDP Ratio (1961-1999)

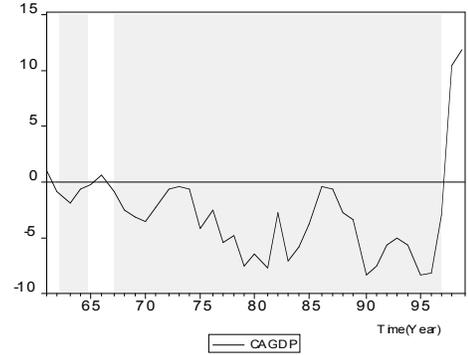


Figure 5: Indonesia CUSUM squares

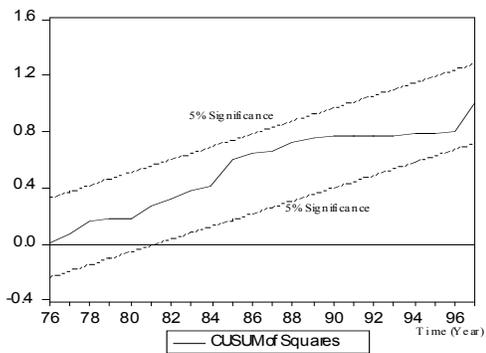


Figure 6: Malaysia CUSUM Squares

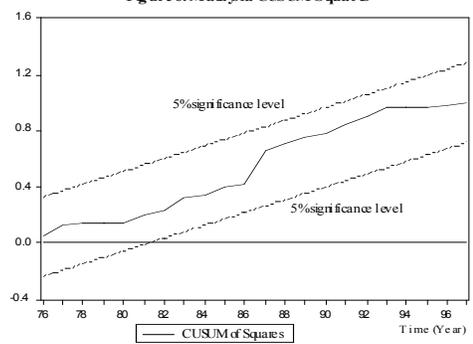


Figure 7: Philippines CUSUM squares

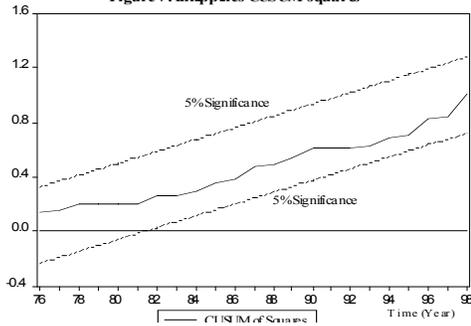
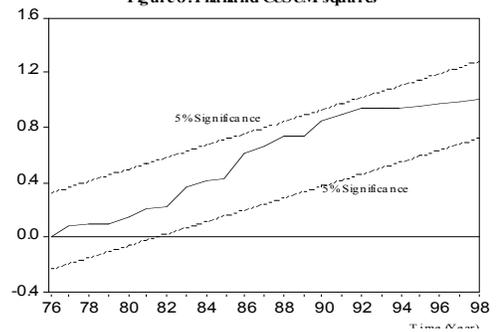


Figure 8: Thailand CUSUM squares



REFERENCES

Apergis, N., K.P. Katrakilidis and N.M. Tabakis. 2000. Current Account Deficit Sustainability, *Applied Economics Letters*, 7: 599-603.

Baharumshah, A.Z. and S. Rashid. 1999. Exports, Imports and Economic Growth in Malaysia: Empirical Evidence Based on Multivariate Time Series, *Asian Economic Journal*, 13: 389-406.

Campbell, J.Y. and P. Perron. 1991. Pitfalls and Opportunities: What Macroeconomists Should Know About Unit Roots. in O.J. Blanchard and S. Fischer, (eds.), *National Bureau of Economic Research Macroeconomics Annual*. Cambridge: MIT Press, pp. 144-201.

Cashin, P. and C.J. Mcdermott. 1998. Are Australia's Current Account Deficits Excessive?, *The Economic Record*, 74: 346-361.

Cheung, Y-W., and K-S. Lai. 1993. Finite-sample Sizes of Johansen's Likelihood Ratio Tests for Cointegration, *Oxford Bulletin of Economics and Statistics*, 55: 313-328.

Claessans, S., M.P. Dooley and A. Warner. 1995. Capital Flight: A response to Difference Risks, *IMF Staff Papers*, 35: 422-436.

Corsetti, G., P. Pesenti and N. Roubini. 1999. What Caused the Asian Currency and Financial Crisis?, *Japan and World Economy*, 11: 305-373.

DeJong, D. N., J.C. Nankervis, N.E. Savin and C.H. Whiteman. 1992. Integration versus Trend Stationarity in Time Series, *Econometrica*, 60: 423-433.

Diamandis, P. F., D.A. Georgoutsos and G.P. Kouretas. 2000. The Monetary Model in the Presence of $I(2)$ Components: Long-run Relationships, Short-run Dynamics and Forecasting of the Greek Drachma, *Journal of International Money and Finance*, 19: 917-941.

Dickey, D.A. and W.A. Fuller. 1981. Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root, *Econometrica*, 49: 1057-1072.

Edwards, S. 2001. Does the current account matter?, National Bureau of Economic Research (NBER), Working Paper No. 8275.

Folkerts-Landau, D., and T. Ito. 1995. *International Capital Markets: Developments, Prospects, and Policy Issues*, International Monetary Fund, Washington, DC.

Fountas, S. and J-L. Wu. 1999. Are the U.S. Current Account Deficits Really Sustainable?, *International Economic Journal*, 13: 51-58.

Green, C.J., M.J. Holmes and T. Kowalski. 2001. Poland: A Successful Transition to Budget Sustainability?, *Emerging Market Review*, 2: 160-182.

Gregory, A.W. and B.E. Hansen. 1996. Residual-Based Tests for Cointegration in Models

- Gonzalo, J. 1994. Five Alternative Methods of Estimating Long Run Equilibrium Relationships, *Journal of Econometrics*, 60: 203-233.
- Hakkio, C.S. 1995. The U.S. Current Account: The Other Deficit, *Economic Review*, Federal Reserve Bank of Kansas City, Third Quarter, 11-24.
- Hakkio, C.S. and M. Rush. 1991a. Is the Budget Deficit 'Too Large'?, *Economic Inquiry*, 29: 429-425.
- Hakkio, C.S. and M. Rush. 1991b. Cointegration: How Short Is the Long Run?, *Journal of International Money and Finance*, 10: 571-581.
- Hamilton, J.D and M.A. Falvin. 1986. On the Limitations of Government Borrowing: A Framework for Empirical Testing, *American Economic Review*, 76: 808-819.
- Harvey, A. 1990. *The Econometric Analysis of Time Series*. Second Edition. Cambridge: MIT Press.
- Horne, J. 1991. Criteria of External Sustainability, *European Economic Review*, 35: 1559-1574.
- Husted, S. 1992. The Emerging U.S. Current Account Deficit in the 1980s: A Cointegration Analysis, *The Review of Economic and Statistics*, 74: 159-166.
- Irاندoust, M. and S. Boo. 2000. The Behavior of the Current Account in Response to Unobservable and Observable Shocks, *International Economic Journal*, 14: 41-57.
- Johansen, S. 1991. The power function of the likelihood ratio test for cointegration. In J. Gruber, ed., *Econometric Decision Models: New Methods of Modelling and Application*, New York: Springer Verlag, pp. 323-35.
- Johansen, S. and K. Juselius. 1990. Maximum Likelihood Estimated and Inference on Cointegration with Application to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, 52: 169-210.
- Kaminsky, G., S. Lizondo and C. Reinhart. 1998, Leading indicators of currency crises, *IMF Staff Papers*, 45: 1-48.
- Krugman, P. 1979. A model of balance-of-payments crises, *Journal of Money, Credit and Banking*, 11: 311-325.
- Kwiatkowski, D., P.C.B. Phillips, P. Schmidt and Y. Shin. 1992. Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root. How Sure Are We that Economic Time Series Have a Unit Root?, *Journal of Econometrics*, 54: 159-178.
- MacKinnon, J.G. 1991. Critical Value for Cointegration Tests. In R.F. Engle and C.W.J. Granger, eds., *Long-Run Economic Relationships: Reading in Cointegration*, Oxford: Oxford University Press.

Makrydakis, S., E. Tzavalis and A. Balfoussias., 1999, Policy Regime Changes and the Long-Run Sustainability of Fiscal Policy: An Application to Greece, *Economic Modelling*, 16: 71-86.

Martin, G.M. 2000. US Deficit Sustainability: A New Approach Based on Multiple Endogenous Breaks, *Journal of Applied Econometrics*, 15: 83-105.

Milesi-Ferretti, G.M. and A. Razin. 1996a. Sustainability of Persistent Current Account Deficits, National Bureau of Economic Research (NBER), Working Paper No. 5467.

Milesi-Ferretti, G.M. and A. Razin. 1996b. Current Account Sustainability: Selected East Asian and Latin American Experiences, National Bureau of Economic Research (NBER), Working Paper No. 5791.

Monetary Authority of Singapore. 1997. Current Account Deficits in the ASEAN-3. Is there Cause for Concern?, *Occasional paper*, No 1.

Nelson, C.R. and C.I. Plosser. 1982. Trends and Random Walks in Macroeconomic Time Series, *Journal of Monetary Economics*, 10: 139-162.

Osterwald-Lenum, M. 1992. A Note with Quantiles of the Asymptotic Distribution of Maximum Likelihood Cointegration Rank Test Statistic, *Oxford Bulletin of Economics and Statistics*, 54: 461-472.

Park, Y.C. and C. Song. 1996. Managing Foreign Capital Flows: The Experiences of Korea, Thailand, Malaysia and Indonesia, Working Paper No. 163, The Jerome Levy Economics Institute, Bard College.

Phillips, P.C.B. 1991, Optimal Inference in Cointegrated Systems, *Econometrica*, 59: 283-306.

Phillips, P.C.B. and B.E. Hansen. 1990. Statistical Inference in Instrumental Variables Regression with $I(1)$ Processes, *Review of Economic Studies*, 57: 99-125.

Phillips, P.C.B. and M. Loretan. 1991. Estimating Long run Equilibria, *Review of Economic Studies*, 58: 407-436.

Phillips, P.C.B. and P. Perron. 1988. Testing for a Unit Root in Time Series Regression, *Biometrika*, 75: 335-346.

Radelat, S. and J.D. Sachs. 1998a. The East Asian Financial Crisis: Diagnosis, Remedies, Prospects, *Brookings Papers on Economic Activity*, 1: 1-90.

Radelat, S. and J.D. Sachs. 1998b. The Onset of the East Asian Financial Crisis, National Bureau Economic Research (NBER) Working Paper No. 6680.

Reimers, H.E. 1992. Comparison of Tests for Multivariate Cointegration, *Statistical Papers*, 33: 335-359.

- Reinsel, G.C. and S.K. Ahn. 1988. Asymptotic Distribution of the Likelihood Ratio Test for Cointegration in the Nonstationary Vector Autoregressive Model, Working Paper, University of Wisconsin-Madison.
- Reisen, H. 1998. Sustainable and Excessive Current Account Deficits, OECD Development Centre, Technical Paper, No. 132.
- Said, E.S. and D.A. Dickey. 1984. Testing for Unit Roots in Autoregressive-Moving Average Models of Unknown Order, *Biometrika*, 71: 599-607.
- Stock, J.H. and M.W. Watson. 1993. A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems, *Econometrica*, 61: 783-820.
- Trehan, B. and C.E. Walsh. 1991. Testing Intertemporal Budget Constraints: Theory and Applications to U.S. Federal Budget and Current Account Deficits, *Journal of Money, Credit, and Banking*, 23: 206-223.
- Wickens M.R. and M. Uctum. 1993. The Sustainability of Current Account Deficits: A Test of the U.S. Intertemporal Budget Constraint, *Journal of Economic Dynamics and Control*, 17: 423-441
- Wu, J-L. 2000. Mean Reversion of the Current Account: Evidence from Panel Data Unit-Root Test, *Economic Letters*, 66: 215-222.
- Wu, J-L., S. Fountas and S-L. Chen. 1996. Testing for the Sustainability of the Current Account Deficit in Two Industrial Countries, *Economics Letters*, 52: 193-198.
- Wu, J-L., S-L. Chen and H-Y. Lee. 2001. Are Current Account Deficits Sustainable? Evidence from Panel Cointegration, *Economic Letters*, 72: 219-224.
- Yan, H-D. 1999. Intertemporal Current Account Balance and the East Asian Currency Crisis, *International Advances in Economic Research*, 5: 277-288.