Is ASEAN-5 Suitable for a Regional Currency Agreement?

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Abstract: Many countries have experienced substantial volatility in exchange rates in recent decades, with marked variations across both countries and regions. There is a large literature regarding the hypothesis of income convergence, arising from the diversity in average growth rates and income levels across countries. Recent empirical evidence points toward several convergence clubs, in which per capita incomes have converged for selected groupings of countries and regions. Similarly, convergence of currencies across both countries and regions would support the feasibility of optimum currency areas. The recent Asian financial crisis has increased interest in policy coordination to achieve greater regional exchange rate stability. A regional currency agreement would provide stable intra-regional exchange rates and remain flexibility of the exchange rates against that of non-members. The purpose of the paper is to apply time series tests of convergence, namely the cointegration method, to determine if there is a currency convergence club for the five founding ASEAN member countries (ASEAN-5).

Keywords: ASEAN-5; Cointegration; Currency convergence; Exchange rates

1. INTRODUCTION

Rapid economic growth in several East Asian economies[1] prior to the Asian currency crisis in 1997 brought increased integration to countries in the South-East Asian region, and strengthened its position in the world economy. The Association of Southeast Asian Nations (ASEAN) is the fourth largest trading region in the world, with a market of about 500 million people and a combined gross domestic product (GDP) of US$ 580 billion.[2] ASEAN was established in 1967 to promote economic, social and cultural cooperation, and to safeguard economic and political stability in the region. The agreement in 1992 to create the ASEAN Free Trade Area aimed to increase ASEAN's competitive edge in the global market, eliminate intra-regional trade barriers, encourage greater economic integration among member economies, and attract more direct foreign investments into the region.

After the fall of the Bretton Woods system in the 1970s, several ASEAN countries have gradually switched from fixed exchange rate arrangements to allow their currency values to be determined in foreign exchange markets. Countries tend to experience relatively higher volatility in exchange rates under the floating exchange rate system due to destabilising speculation and money market disturbances. In the East Asian region, the floating of the Thai bhat in 1997 led to the financial meltdown in Thailand, and started a wave of contagion effects, spreading quickly to its neighbouring countries in the region. Of the eight high-performing Asian economies, Indonesia, Malaysia, South Korea and Thailand were badly affected by the currency crisis which, to a lesser extent, also affected countries like Hong Kong, Singapore and Taiwan. This questions the suitability of floating exchange rates for ASEAN countries in a financially integrated world, where funds can be moved instantly between national financial markets. Economists and policymakers agree that the floating exchange rate system is not free of serious problems, but also feel that the

[1] The World Bank [1993] reported that from 1965 to 1990 the eight high-performing Asian economies, namely Japan, Hong Kong, South Korea, Taiwan, Singapore, Malaysia, Thailand and Indonesia, had grown more than twice as fast as the rest of East Asia, roughly three times as fast as Latin America and South Africa, and twenty-five times faster than Sub-Saharan Africa.

[2] These figures are extracted from the ASEAN [2001] statistics for 2000.

fixed exchange rate system cannot be credibly maintained over the long run. What are the options available to developing countries in ASEAN to overcome future speculative currency crises? An interesting proposition is whether ASEAN can benefit from sharing a single currency with its member countries. A regional currency agreement would provide stable intra-regional exchange rates and maintain flexibility of the exchange rates against that of non-members.

Experience in the European Monetary Union informs that monetary union delivers both benefits and costs to its members, depending on the similarities in economic structures. [Krugman and Obstfeld, 2000]. The economic theory of convergence implies that relatively similar economies would make better candidates for monetary integration. If economies diverge in their development levels and macroeconomic conditions, the costs of monetary integration and sustaining integration would be high. This is evidenced from the entry criteria listed in the Maastricht Treaty. Preconditions for nominal convergence involve numerical targets on the convergence of interest rates, inflation, exchange rates, and government debts and deficits. The purpose of such convergence requirements is to reduce the pre-integration levels of divergence among participating countries, so as to alleviate the costs of losing the exchange rate instrument in macroeconomic stabilization after integration.

The purchasing power parity theory based on the law of one price does not perform well in explaining actual exchange rates movements. Empirical evidence suggests a positive relationship between countries' price levels and their real income per capita, when measured in terms of a single currency [Krugman and Obstfeld, 2000]. Possible explanations for difference in overall price levels between rich and poor countries are trade barriers and differences in endowments of capital and labour and productivity. There is a large literature on testing the income convergence hypothesis, arising from the diversity in average growth rates and income levels across countries, and found several convergence clubs, in which real per capita incomes have converged for selected groupings of countries and regions. Empirically, similar time series tests of convergence can be applied to determine if there is a currency convergence club in South-East Asia. This paper focuses on the five founding members of ASEAN, namely Indonesia, Malaysia, the Philippines, Thailand and Singapore (hereafter referred to as ASEAN-5), as the other members, except for Brunei Darussalam, joined ASEAN after the mid-90s. Convergence of real exchange rates is tested using time series data to determine the suitability of a monetary integration in ASEAN-5.

The plan of the paper is as follows. Section 2 outlines the time series methods used to test the existence of a currency convergence club. Section 3 examines the time series data and selected indicators for ASEAN-5. Section 4 presents the test results for ASEAN-5. Some concluding remarks are given in Section 5.

2. METHODOLOGY

In this paper, two different time series methods are used to test if there is evidence of convergence in real exchange rates for the ASEAN-5 countries. The first method applies a simple statistical test for currency trends, while the second method applies unit root tests and cointegration analysis to the real exchange rate series.

2.1 Test for Converging Trend

In a time series framework, a simple statistical test for converging or diverging trends of an exchange rate series, as proposed by Verspagen [1994], can be written as follows:

$$W_{i,t} = y_{i,t} - y_t^*, \qquad (1)$$

where $y_{i,t}$ is the logarithm of the real exchange rate for country i at time t and y_t^* is the logarithm of average real exchange rate for n countries in the sample ($y_t^* = \left(\sum_{i=1}^{s} y_{i,t}\right) / n$). It is assumed that, for each time period, W_i changes according to the following process:

$$W_{i,t+1} = \Psi W_{i,t} + \eta_{i,t}. \qquad (2)$$

If $\Psi > 1$, the currency in country i diverges from the sample group; if $\Psi < 1$, convergence of the currency occurs.

2.2 Cointegration Method

A stochastic definition of income convergence requires per capita income disparities across countries to follow a stationary process. This definition is applied to test for convergence in currencies across countries. Bernard and Durlauf [1995] have proposed a time series test for convergence and common trends. The notion of convergence in multivariate exchange rates can be defined such that the long-term forecasts of real exchange rates for all countries, $i = 1, \ldots\ldots, n$, are equal at a fixed time t:

$$\lim_{k\to\infty} E(y_{1,t+k} - y_{i,t+k} | I_t) = 0, \quad \forall i > 1, \qquad (3)$$

where I_t is the information set at time t. Applying the concepts of unit roots and cointegration, the convergence test determines whether $y_{1,t+k} - y_{i,t+k}$ in equation (3) is a zero mean stationary process in a cointegration framework. Convergence in exchange rates for two countries, p and q, implies that the exchange rates are cointegrated, with cointegrating vector [1, -1].

Empirically, testing for convergence and common trends in a cointegration framework requires the individual exchange rate series to be integrated of order one. The following augmented Dickey-Fuller [1981] (ADF) test is used to determine the order of integration for real exchange rates of the ASEAN-5 countries:

$$\Delta y_{i,t} = a_{0i} + a_{1i}t + \beta_i y_{i,t-1} + \sum_{j=1}^{p} \delta_{ji} \Delta y_{i,t-j} + \varepsilon_{i,t} \qquad (4)$$

where $\Delta y_{i,t}$ approximates the growth rate of real exchange rate, t is the deterministic trend, p is the order of the autoregressive process, and $\Delta y_{i,t-j}$ is included to accommodate (possible) serial correlation in the errors.

The rank of the cointegrating matrix in a multivariate framework can be estimated using the following VAR representation [Johansen, 1991]:

$$\Delta Y_t = \Gamma(L)\Delta Y_t + \Pi Y_{t-k} + \mu + \varepsilon_t, \qquad (5)$$

where Y_t is a 5 x 1 vector of the logarithms of real exchange rates for the ASEAN-5 countries, Π represents the long-run relationships of the cointegrating vectors, $\Gamma(L)$ is a polynomial of order $k-1$ to capture the short-run dynamics of the system, and ε_t are independent Gaussian errors with zero mean and covariance matrix Ω. The reduced rank ($0 \le \text{rank}(\Pi) = r < n$) of the long-run impact matrix is formulated as follows:

$$\Pi = \alpha\beta', \qquad (6)$$

where β is the 5 x r matrix of cointegrating vectors and α is the 5 x r matrix of adjustment coefficients.

Applying the Johansen maximum likelihood estimation method, convergence in multivariate currencies, as defined in equation (3), would require $r = n - 1$ (or four) cointegrating vectors for five ASEAN countries of the form [1, -1] (i.e. one common long-run trend for the individual exchange rate series in Y_t). The Johansen procedure permits hypothesis testing of the cointegrating relations and their adjustment coefficients, using the likelihood ratio test which follows a chi-squared distribution. This method is necessary to determine whether the r cointegrating vectors are of the form [1, -1], which requires a unit restriction imposed on all the coefficients of the r cointegrating vectors.

3. DATA

Testing for exchange rate convergence among the ASEAN-5 countries in a time series framework requires comparative data for these countries over an extended period. As most countries traditionally pegged their currencies against the US dollar, each currency for ASEAN-5 is expressed in US dollars. Monthly nominal exchange rates of US$ per national currency for each country in ASEAN-5 are extracted from the International Financial Statistics [IMF, 2001] over the period 1986(1) to 2000(8). Real exchange rates of US$ per national currency are derived by multiplying the nominal exchange rates with the relative consumer price index[3] of the national currency to the US$. Due to vast differences in the values of each ASEAN-5 currency, the real exchange rates used are US$ per 1,000 rupiah, 1 ringgit, 10 peso, 1 S$ and 10 bhat, for Indonesia, Malaysia, the Philippines, Singapore and Thailand, respectively.

Figure 1 depicts the logarithm of real exchange rates for ASEAN-5 over the period 1986(1)-2000(8). It is evident from Figure 1 that the exchange rates for ASEAN-5 are fairly stable, apart from the recent Asian financial crisis, which caused a substantial weakening in each ASEAN-5 currency against the US$. Among the ASEAN-5 currencies, the Indoneisan rupiah suffered the largest drop in value, particularly for 1997(12)-1998(10), as a result of political instability. The Malaysian government also chose to fix its exchange rate at ringgit 3.80 per US$ in October 1998.

Apart from the convergence of exchange rates, the feasibility of an optimum currency area for ASEAN-5 also requires convergence in development levels and macroeconomic conditions. Table 1 provides recent ASEAN-5 indicators for inflation rates (average period, %), current account balance (% of GDP), fiscal balance

[3] The consumer price indices for each ASEAN-5 country and the USA have been converted to a common base year.

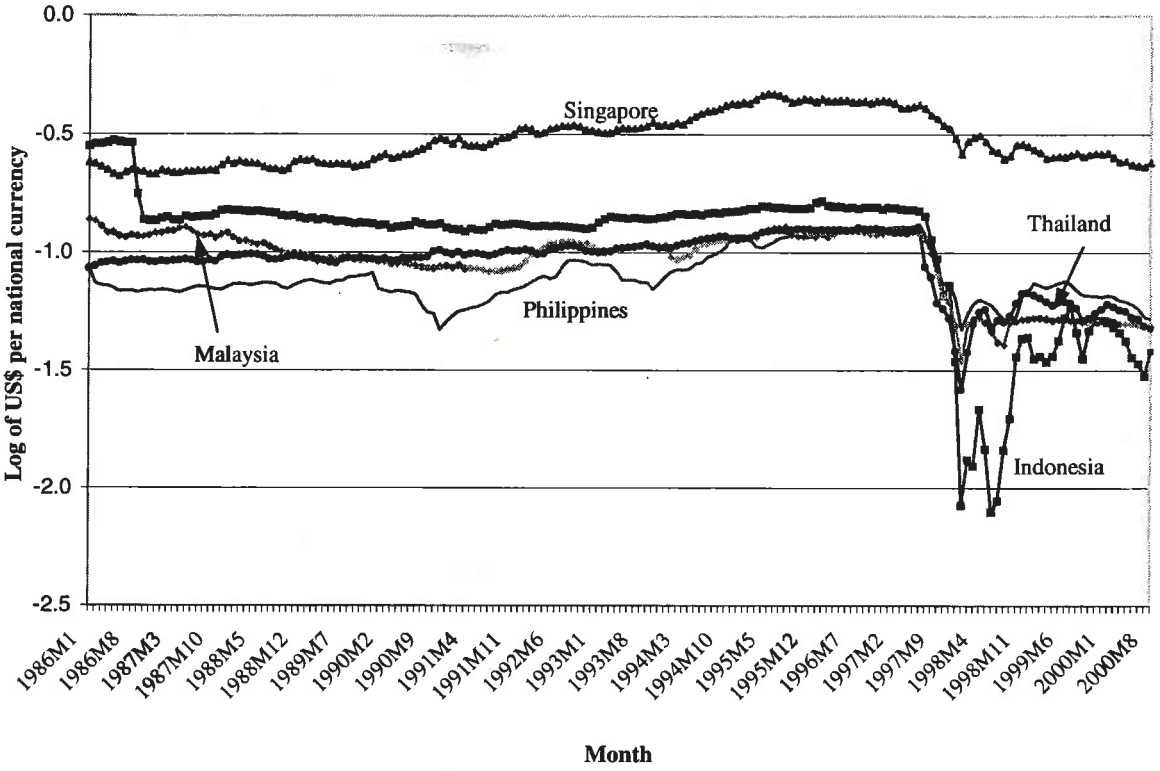

Figure 1. Logarithm of Real Exchange Rates for ASEAN-5, 1986(1)-2000(8).

Table 1. Selected ASEAN-5 Indicators for 1996 and 2000.

Country	Inflation Rate (average period, %)		Current A/c Balance (% of GDP)		Fiscal Balance (% of GDP)		Money (M2) Growth (End of period, %)[a]		Interest Rates (3-month time deposit, % p.a.)[b]	
	1996	2000	1996	2000	1996	2000	1996	2000	1996	2000
Indonesia	7.94	3.77	-2.27	5.02	1.4	-4.5	29.6	15.6	16.43	12.0
Malaysia	3.48	1.56	-5.92	9.18	0.7	-5.8	21.2	5.2	7.21	3.5
Philippines	9.10	4.40	-5.28	12.43	0.3	-4.1	15.8	4.6	11.50	12.2
Singapore	1.38	1.35	18.98	23.63	6.9	3.5	9.8	-2.0	3.41	1.7
Thailand	5.85	1.56	-2.06	7.55	0.9	-2.0	12.6	3.7	9.25[c]	3.0

Source: ASEAN [2001].

Notes: [a] For Malaysia and the Philippines, the figures are growth rates of M3.

[b] Interest rates for Indonesia and the Philippines are based on one-month time deposit and short-term deposit rate, respectively.

[c] The figure represents an average of 8.75% and 9.75%.

(% of GDP), money (M2) growth rate (year-on-year, end of period, %), and interest rates (3-month time deposit, % per annum). Comparing the figures for 1996 and 2000, there has been substantial convergence in inflation rates, current account balances and fiscal balances among some of the ASEAN-5 members after the financial crisis. However, Singapore is definitely performing well above its neighbouring countries in both the current account balance and fiscal balance, and had the lowest interest rates, inflation rates and money growth in 2000. Thus, it may be useful to test currency convergence for just ASEAN-4 (excluding Singapore).

4. EMPIRICAL RESULTS

The paper applies time series tests of the convergence hypothesis to monthly real exchange rates in natural logarithms (LER) for ASEAN-5 for 1986(1)-2000(8). Using the simple statistical test of Verspagen [1994] for converging or diverging trends of the LER series (see equations (1) and (2)), estimation results for ASEAN-5 are reported in Table 2. Among the ASEAN-5 countries, Singapore is the only diverging country, whereas the remaining four countries converge towards the mean LER level. When Singapore is excluded from the group, the test results indicate that all countries are converging to the average LER in ASEAN-4.

Table 2. Test Results for ASEAN-5 and ASEAN-4, 1986(2)-2000(8).

ASEAN-5	ASEAN-5($\hat{\Psi}$)	ASEAN-4($\hat{\Psi}$)
Indonesia	0.96104	0.95421
	(0.0203)	(0.0200)
Malaysia	0.99240	0.89486
	(0.0110)	(0.0338)
Philippines	0.99054	0.97902
	(0.0082)	(0.0135)
Singapore	1.0032*	–
	(0.0037)	
Thailand	0.98229	0.91535
	(0.0104)	(0.0239)

Notes: * indicates that the LER of the country diverges from the sample group.
Standard errors are given in parentheses.

Before testing for convergence based on the method of Bernard and Durlauf [1995], it is essential to determine the order of integration for each of the exchange rate series. ADF tests are used to test for the presence of unit roots in the logarithms of real exchange rates for ASEAN-5. For monthly data, an initial lag length of twelve is used for the ADF test. If the t-statistic for the largest lag is insignificant, the lag length is reduced successively until a significant lag length is obtained. Although detailed results are not reported to save space, the ADF t-statistics do not reject the null hypothesis of a unit root for the five LER series, implying that each is non-stationary. Upon taking first differences of the series, which indicate stationarity of the transformed series, the test results indicate that all five LER series are integrated of order one. Thus, the Johansen maximum likelihood method can be used to test for the presence of cointegrating vectors or common trends.

Based on the definition in Bernard and Durlauf [1995], the five LER series are tested for convergence between each country of ASEAN-5. The Akaike Information Criterion is used to determine the order of the VAR model, with the test statistics and choice criteria indicating a VAR model of order eleven. If the LER for two countries are cointegrated, the restriction [1, -1] is imposed on the cointegrating vector. Using unrestricted intercepts and no trends in the VAR, Table 3 reports the trace and maximal eigenvalue statistics of the stochastic matrix to determine the number of cointegrating vectors (r).

Table 3. Maximal Eigenvalue and Trace Statistics for the VAR(11) Model, 1986(12)-2000(8).

Country	Maximal Eigenvalue H_0: r=0, H_a: r=1	Trace H_0: r=0, H_a: r≥1
Singapore		
Indonesia	9.3173	9.3279
Malaysia	7.8777	8.6386
Philippines	4.4763	4.4812
Thailand	5.7363	6.6208
Malaysia		
Indonesia	13.6899*	14.3797*
Philippines	3.8471	4.8442
Thailand	7.9605	8.7670
Thailand		
Indonesia	18.5630*	19.4184*
Philippines	2.9703	3.5959
Indonesia		
Philippines	4.9284	5.0161

Note: * denotes significance at the 5% level.

Both the trace and maximal eigenvalue statistics reject the existence of a long-run cointegrating relationship between Singapore and each ASEAN-4 country. In the case of Malaysia, both test statistics indicate that a long-run cointegrating relationship exists with Indonesia. In addition, the test statistics also reject the null hypothesis of no cointegrationg relationship between Thailand and Indonesia. Overall, there are two cointegrating vectors for each pair of ASEAN-5 countries from the possible ten cointegrating vectors.

Of the two cointegrating vectors, one cointegrating vector (namely, for Malaysia and Indonesia, with $\chi^2(1) = 4.787$ and probability value = 0.029) rejects the null hypothesis of a unit restriction. The likelihood ratio test of a unit restriction for the other cointegrating vector, namely Thailand and Indonesia (with $\chi^2(1) = 1.634$ and probability value = 0.201), does not reject at the 5% significance level. These results imply only single currency convergence between Thailand and Indonesia.

For the two groups of countries, namely ASEAN-5 and ASEAN-4, tests for the presence of a common long-run trend for individual LER series in each group are also undertaken. The maximal eigenvalue and trace statistics suggest the presence of at least one cointegrating vector for ASEAN-5 at the 10% and 5% levels of significance, respectively, which indicate non-convergence of the currencies for ASEAN-5. Similarly, the maximal eigenvalue and trace statistics also suggest the presence of at least one and two cointegrating vectors, respectively, for ASEAN-4 at the 5% level, which do not support convergence of the currencies for ASEAN-4.

5. CONCLUSION

This paper examined the suitability of a regional currency agreement among ASEAN-5 member countries to overcome future speculative currency crises. Two time series methods were used to test for convergence of currencies for the ASEAN-5 countries. The test results did not find evidence of convergence within ASEAN-5. This result is largely attributed to the inclusion of Singapore, which grew faster than the other members and also performed better in all key economic indicators. When Singapore was excluded from the group, there was evidence of the existence of a currency convergence club for the ASEAN-4 countries using the statistical test for converging trend. However, convergence in currencies for ASEAN-4 was not supported using the cointegration method, except for convergence in a pair of ASEAN-4 currencies, namely the Indonesian rupiah and Thai bhat.

It is important to emphasise that the time series methods available to test the convergence hypothesis are limited to testing the time series properties of currency differences, without considering the factors that determine exchange rate movements. Apart from convergence for each ASEAN-5 currency, the experience of the European Monetary Union emphasises the importance of similarities in economic structures among participating members, and also convergence in the levels of interest rates, inflation rates, and government debts and deficits. Thus, further research would be valuable on existing time series methods for testing the convergence hypothesis and a consideration of other relevant variables that determine exchange rate movements.

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