

SHOULD THE SOUTHEAST ASIAN COUNTRIES FORM A CURRENCY UNION?

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This paper examines some of the factors related to the formation of a currency union in Southeast Asia. The main part of the paper presents the results of our examination of the correlation of shocks for the Southeast Asian countries using a structural vector autoregression. The shocks are identified using restrictions on the long-run coefficient matrix as suggested by Blanchard and Quah (1989). The correlations of shocks for the EU and NAFTA countries are used for comparison. The Southeast Asian countries are shown to have more strongly correlated shocks than the EU countries. Compared with the NAFTA countries, external shocks are more closely correlated for the ASEAN countries, but the supply and demand shocks are less correlated. Indonesia, Singapore, and Malaysia, in particular, exhibit a high degree of correlation of shocks. Other criteria for monetary union, such as intra-regional trade, openness of the economy, and similarity of monetary policy are also examined.

I. INTRODUCTION

THERE has been a great deal of interest in the formation of a currency union since the countries of the European Union (EU) decided to introduce a single currency for Europe. Most of the research has examined the suitability of the European countries for such a union (Bayoumi and Eichengreen 1993; Funke 1997). This paper aims to examine some factors relating to the feasibility of the formation of a currency union encompassing five Southeast Asian countries—Indonesia, Malaysia, the Philippines, Singapore, and Thailand.

A currency union is usually defined as an area throughout which a single currency circulates. Currently, the countries in Southeast Asia are all members of a regional grouping called the Association of Southeast Asian Nations (ASEAN). In January 1992, the members of ASEAN agreed to establish an outward-looking and market-based ASEAN Free Trade Area. The final goal is the creation of a regional

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market with low effective tariffs (0–5 per cent) and no nontariff barriers, through the Common Effective Preferential Tariff (CEPT) scheme. The creation of the free trade area in ASEAN could help set the stage for the creation of a currency union among the member countries. This is because a currency union eliminates exchange rate fluctuations among the countries involved and the transaction costs associated with them. This tends to promote increased trade and investment among the countries in the union. In fact, one of the main aims of the introduction of the euro was to enhance the gains from the creation of a single European market (Emerson et al. 1992). Another benefit of currency unions suggested by Agénor (1994) and Giavazzi and Pagano (1988) is that they can enhance an inflation-prone country's credibility in fighting inflation.

Against these benefits of currency unions must be set the loss of monetary policy as an independent policy instrument. Countries that join a currency union lose their individual currencies and along with it the ability to use the exchange rate as a buffer against domestic and foreign disturbances. Economic shocks will affect each member of the currency union differently. However, each member of the currency union no longer has the ability to take an individual policy response to economic shocks.

The main part of this paper examines the correlation of economic shocks across the ASEAN countries, to determine if they are positively correlated. Mundell (1961) argues that a region with highly correlated shocks would form an optimum currency area because the entire region would be able to use a common monetary policy to respond to economic shocks to the region. Hence, if shocks to the ASEAN countries are highly correlated, this would provide evidence in support of forming a currency union.

In order to identify the economic shocks affecting the ASEAN countries, I will use estimates from a three-variable vector autoregression model for each of the ASEAN countries. The long-run restriction identification scheme suggested by Blanchard and Quah (1989) will be used to identify the three shocks in the model—external shocks, domestic supply shocks, and domestic demand shocks. The correlations of these shocks are then calculated for the ASEAN countries. I will also estimate the correlations of these shocks for the EU and North America Free Trade Agreement (NAFTA) countries using the same identification scheme as a basis of comparison. On average, my conclusion is that the ASEAN countries' external shocks are more highly correlated than those of the EU and NAFTA countries. The domestic demand and domestic supply shocks of the ASEAN countries are more highly correlated than those of the EU countries but less so than the NAFTA countries. In particular, Indonesia, Malaysia, and Singapore exhibit high degrees of correlations of external shocks, supply shocks, and demand shocks. I also estimate the size of the shocks using the associated impulse response functions. I find that the sizes of the shocks to the ASEAN countries are roughly similar to those of the EU countries and lower than those of the NAFTA countries.

In the next section, I briefly review theories relating to optimum currency areas and the criteria for joining currency unions. This is followed by a brief review of the features of the Southeast Asian countries. Section IV examines the correlations of shocks to the ASEAN economies relative to those of the European and North American economies. Section V examines some other criteria for a currency union and evaluates how well the ASEAN countries meet them. The final section presents some concluding remarks.

II. THEORIES OF OPTIMUM CURRENCY AREAS

Mundell (1961) provides the first theoretical framework for optimum currency area. In his analysis, he assumes that wages and prices are sticky in the short run. This means that changes in real exchange rates have to be achieved through the use of nominal exchange rates. Mundell then proceeds to weigh the costs and benefits of a group of countries coming together to form a currency union. The cost of forming a currency union is the loss of the nominal exchange rate as an economic instrument for macroeconomic adjustment. The countries in a currency union also lose the ability to carry out independent monetary policy. The benefits of joining a currency union are exchange rate stability leading to lower transaction costs, and increased trade and investment.¹ Mundell argues that countries that experience positively correlated shocks are more suitable candidates for a monetary union. If economic shocks are positively correlated across the members, union-wide policies can be used to correct any imbalances. Hence, the loss of the nominal exchange rate and monetary policy as policy instruments are of lesser consequence.

McKinnon (1963) argues that economies with large tradable sectors are better suited for currency unions because the loss of the exchange rate as an independent policy instrument is a smaller concern for these economies. This is because for open economies, the use of the exchange rate to correct imbalances is less effective than domestic policy. In McKinnon's model, the exchange rate is used to maintain the external balance and the price of non-tradable goods is assumed to be stable in domestic currency terms. If the economy faces a negative export demand shock, the economy will have to shift production away from the non-tradable sector to the tradable sector in order to maintain its external balance. Since the domestic price of non-tradable goods is assumed to be fixed, the adjustment will have to be carried out by devaluing the currency. However, the devaluation is likely to create upward pressures on the price level in the economy, which will offset some of the benefits of the devaluation. The larger the tradable sector, the stronger will be the pressure

¹ De Grauwe (1994) and Tavlas (1993) provide a survey of the costs and benefits of joining a currency union. Mundell (1997) provides a listing of criteria for countries deciding to join a currency union.

on prices, hence lessening the effectiveness of the devaluation. Thus, for an economy with a large tradable sector, the loss of the use of the nominal exchange rate as a policy instrument is of less concern.

Economies that have a large volume of mutual trade also obtain greater welfare gains from a currency union through the reduction of transaction costs and exchange rate uncertainties. The reduction in transaction costs comes from eliminating the cost of exchanging one currency into the other. In addition, in a world with risk-averse individuals, a common currency area can generate welfare gains by reducing uncertainties about exchange rate changes (De Grauwe 1994). Both these benefits are directly related to the amount of trade the countries in the proposed currency area conduct with one another. Hence, regions with large amounts of inter-regional trade reap greater benefits from forming a currency union.

III. THE SOUTHEAST ASIAN ECONOMIES

Malaysia, Indonesia, the Philippines, Singapore, and Thailand formed the Association of South East Asian Nations (ASEAN) in 1967.² Brunei joined later in 1984, followed by Vietnam (1995), Laos (1997), and Myanmar (1997). The original founding document for ASEAN, the Bangkok Declaration, emphasizes the promotion of economic progress and social and cultural development in the region. However, in the early years ASEAN seemed to focus primarily on establishing regional security and political stability in the region. One of the aims of ASEAN was to prevent a repetition of the “confrontation” between Malaysia and Indonesia in the early 1960s (Blomqvist 1997; Rieger 1989).

However, now that relative stability and peace has been achieved in the region, ASEAN may be able to turn its focus from regional security toward economic co-operation. An important step in this direction was taken in 1992, when the ASEAN countries agreed to form the ASEAN Free Trade Area (AFTA).³ The aim of AFTA is to lower tariffs for intra-ASEAN trade in manufactured goods to a maximum of 5 per cent by the year 2008. An accelerated tariff reduction schedule for fifteen broad industrial product groupings was also agreed upon. In 1994, the original timetable for AFTA was shortened from fifteen to ten years, setting the goal for ASEAN to become a free trade area by 2003. In addition, steps have been taken to improve monetary cooperation among the member countries. In 1996, the ASEAN countries, together with Japan and Hong Kong, created a network of repurchase agreements to provide mutual support in the foreign exchange market.

In this paper, I will focus on the original five members of ASEAN, i.e., Malaysia, Indonesia, the Philippines, Singapore, and Thailand. Table I presents some eco-

² Recent surveys of ASEAN can be found in Hill (1994) and Tan (1996).

³ For further details on AFTA, see Low (1996) and Lee (1994).

TABLE I
SUMMARY STATISTICS FOR THE ASEAN ECONOMIES, 1995

	GNP per Capita (U.S.\$)	GNP per Capita (PPP)	Population (Millions)	Surface Area (1,000 km ²)
Indonesia	980	3,800	193.3	1,905
Malaysia	3,890	9,020	20.1	330
Philippines	1,050	2,850	68.6	300
Singapore	26,730	22,770	3.0	1
Thailand	2,740	7,540	58.2	513

Source: World Bank, *World Development Indicators, 1997* (Washington, D.C., 1997).

nomic indicators for these five countries. What is immediately striking is the large difference in income levels among them. In 1995, Singapore's per capita GDP is more than twenty-six times that of Indonesia measured in U.S. dollar terms. However, the disparity in income levels is reduced if GDP is measured using purchasing power parity (PPP); the ratio of Singapore's income to the Philippines' drops to about eight. For comparison, the ratio of per capita income between the richest nation in the EU, Denmark, and the poorest, Greece, is about two. There are also large differences in both land area and population size among the ASEAN countries.

Their populations also have very diverse religious and cultural backgrounds. Indonesia and Malaysia are both predominantly Muslim countries, while Buddhism is the dominant religion in Singapore and Thailand, and Roman Catholicism is the main religion in the Philippines. The populations of the various ASEAN countries are also drawn from many different ethnic groups. This has led Kim (1994) to suggest that the diversity of culture, history, religion, language, types of government, and levels of development could form a serious obstacle to closer integration among the Asian countries.

IV. DO ASEAN COUNTRIES EXPERIENCE POSITIVELY CORRELATED SHOCKS?

Mundell (1961) suggests that the correlation of shocks is one criterion for a country deciding to join a currency union. He argues that countries facing positively correlated economic shocks will be better suited for a currency union because it allows the use of union-wide policies to correct imbalances. When forming a currency union, each country loses monetary policy as a policy instrument. Hence, if shocks are uncorrelated, the countries will not be able to use monetary policy to facilitate adjustment to them. However, if the shocks are positively correlated, a union-wide policy can be used to facilitate adjustment. I will attempt to measure the correlation of shocks among the Southeast Asian countries using the structural vector

autoregression (SVAR) method suggested by Blanchard and Quah (1989). I will then estimate the correlation of shocks for EU and NAFTA countries using the same method and identification scheme, as a basis for comparison.

Bayoumi and Eichengreen (1993) use the SVAR method to determine aggregate demand and supply shocks in the EU. They then compare the correlation of these shocks with those in eight U.S. regions. They find that the correlation of shocks was lower for the European countries than the U.S. regions. Funke (1997) uses the same method to compare the correlations of demand and supply shocks among sixteen European countries with that of eleven “West German” states. He finds that the correlation of shocks was lower for the European countries compared to that of “West German” states. Both of these studies conclude that the EU may not be an optimal currency area based on the criteria of correlation between shocks.

In this paper, I assume there are three types of shocks affecting the economy—domestic demand shocks, domestic supply shocks, and external shocks. I feel that it is important to incorporate the external shock into the model, as the ASEAN economies are small, open economies that are susceptible to external economic shocks. This will allow us to examine how closely correlated the external shocks are in the economies. Since the nominal exchange rate is mainly used for adjustments to external shocks, a positive correlation of external shocks would strengthen the case for a monetary union. I will also use the SVAR model to recover the structural shocks impacting the economy. The SVAR model is used here because we cannot obtain the underlying shocks that affect the economy if we only examine the correlation of output growth or inflation. The observed movements of real GDP growth are a combination of shocks and responses to the underlying shocks. Hence, a low correlation of output growth between two countries could be due to the countries experiencing uncorrelated shocks, or it could be due to different response rates to correlated shocks. Once the correlation of shocks for the ASEAN countries has been estimated, I will compare it with that of the NAFTA countries and the countries in the EU.

A. *Empirical Methodology*

The empirical methodology for this paper is based on the standard aggregate demand and aggregate supply framework with an upward-sloping short-run aggregate supply curve, a downward-sloping aggregate demand curve, and a vertical long-run supply curve. In addition to the demand and supply shocks, I will also assume the presence of external shocks. In this framework, a positive demand shock results in a temporary increase in output and a permanent increase in the price level. However, a positive supply shock causes a permanent increase in the output and a permanent decrease in the price level. The external shocks are results of movements in the global business cycle and are exogenous to the domestic economy. I would like to separate out the effects of domestic shocks and external shocks in

order to examine the importance of external shocks on the economy. The external shock can be thought of as a combination of both external demand shocks and external supply shocks.

Consider the following vector autoregression (VAR) model:

$$A(L)X_t = \mu_t + \eta_t, \tag{1}$$

where $A(L)$ is an autoregressive polynomial lag matrix, X_t is a vector of stationary variables consisting of world real GDP growth, domestic real GDP growth, and inflation, μ_t is a vector of deterministic terms, and η_t is a vector of zero-mean identically distributed innovations such that $E(\eta_t \eta_t') = \Sigma$. Given that X_t is stationary, it can be written as the following Wold moving average representation:

$$X_t - d_t = B(L)\eta_t, \tag{2}$$

where $B(L) = A(L)^{-1}$, $B_0 = I$, and $d_t = A(L)^{-1}\mu_t$. Unfortunately, since the vector of innovations, η_t , is not required to be contemporaneously uncorrelated, it cannot be interpreted as a vector of structural shocks, ε_t . I assume that the innovations can be expressed to be a linear combination of the structural shocks, i.e., $\eta_t = S\varepsilon_t$.

My aim is to identify ε_t in the alternative structural moving average representation:

$$X_t = C_0\varepsilon_t + C_1\varepsilon_{t-1} + C_2\varepsilon_{t-2} + \dots = \sum_{i=0}^{\infty} C_i\varepsilon_{t-i}, \tag{3}$$

or in matrix form,

$$X_t = C(L)\varepsilon_t. \tag{4}$$

Specifically, in this model, we have:

$$\begin{bmatrix} \Delta y_t^* \\ \Delta y_t \\ \Delta p_t \end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix} c_{11i} & c_{12i} & c_{13i} \\ c_{21i} & c_{22i} & c_{23i} \\ c_{31i} & c_{32i} & c_{33i} \end{bmatrix} \begin{bmatrix} \varepsilon_{e,t-i} \\ \varepsilon_{s,t-i} \\ \varepsilon_{d,t-i} \end{bmatrix}, \tag{5}$$

where y_t^* , y_t , and p_t represent the logarithm of world output, domestic output, and prices; c_{11i} represents the element c_{11} in matrix C_i ; and ε_{et} , ε_{st} , and ε_{dt} are the independent external, domestic supply, and domestic demand shocks, respectively.

In order to identify the different shocks from the SVAR, I impose restrictions on the coefficients of the long-run matrix. Domestic demand shocks are assumed to not have any long-run effect on domestic output or world output, while domestic supply shocks are allowed to have long-run effects on domestic output but not world output. All three shocks are allowed to have long-run effects on prices. The short-run dynamics of domestic supply and demand shocks, as well as external shocks, are left unrestricted.

The assumption that domestic demand shock does not have a permanent impact on output implies the restriction:

$$\sum_{i=0}^{\infty} c_{23i} = 0, \quad (6)$$

I also assume that domestic demand and domestic supply shocks have no long-run effects on world output. World output is assumed to be driven by global factors that are exogenous to those of the domestic variables. This implies the following restrictions:

$$\sum_{i=0}^{\infty} c_{12i} = 0 \quad \text{and} \quad \sum_{i=0}^{\infty} c_{13i} = 0. \quad (7)$$

These three restrictions taken together are sufficient to identify the model. Note that $C(L) = B(L)S$. Identification of the structural shocks, ε_t , and $C(L)$, then depends on choosing a unique S matrix. We can normalize the variance-covariance matrix of the structural shocks such that $E(\varepsilon_t \varepsilon_t') = I$, implying that $\Sigma = SS'$. Further, we note that $C_0 = S$, and $B(1)S = C(1)$. Hence, we have:

$$B(1)\Sigma B(1)' = B(1)SS'B(1)' = C(1)C(1)'. \quad (8)$$

Given the above restrictions, the long-run matrix, $C(1)$, is a lower triangular matrix. This implies that $C(1)$ is simply the unique Choleski lower triangular factor of the matrix $B(1)\Sigma B(1)'$. We can then easily identify S , which uniquely determines ε_t . The structural shocks ε_t can then be calculated as

$$\varepsilon_t = S^{-1}\eta_t. \quad (9)$$

B. Data

I will use annual data for real and nominal GDP from the fifteen members of the EU, the five countries of ASEAN, and the three countries in NAFTA for the period 1970–95 for my estimation. The fifteen members of the EU are Austria, Belgium, Denmark, Spain, Finland, France, the United Kingdom, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Sweden. The five countries in ASEAN are Indonesia, Malaysia, the Philippines, Singapore, and Thailand, while the three countries in NAFTA are Canada, Mexico, and the United States of America. As a proxy for world output, I will use a world real GDP index.

The data for all countries except Germany, Greece, and Luxembourg are compiled from *International Financial Statistics* published by the International Monetary Fund. The world real GDP index is also obtained from the *International Financial Statistics*. The data for Germany are those for a unified Germany and were obtained from national sources through Datastream, while data for Greece and Luxembourg were taken from *World Development Indicators* published by the World Bank.

Before estimating and examining the correlation of shocks, I will first look at the correlations for real GDP growth and inflation⁴ for the various regions. Table II

⁴ Real GDP growth and inflation are calculated as the first difference of the natural logarithms of real GDP and the GDP deflator respectively.

TABLE II
CORRELATION OF REAL GDP GROWTH AND INFLATION FOR ASEAN AND NAFTA

	Indonesia	Malaysia	Philippines	Singapore	Thailand
A. Correlation of Real GDP Growth for ASEAN Countries					
Indonesia	1.000				
Malaysia	0.634*	1.000			
Philippines	0.429*	0.428*	1.000		
Singapore	0.580*	0.772*	0.494*	1.000	
Thailand	0.217	0.457*	0.322	0.311	1.000
B. Correlation of Inflation for ASEAN Countries					
Indonesia	1.000				
Malaysia	0.638*	1.000			
Philippines	0.272	0.308	1.000		
Singapore	0.791*	0.539*	0.165	1.000	
Thailand	0.867*	0.681*	0.152	0.836*	1.000

* Significant at the 5 per cent level.

	Canada	Mexico	USA
C. Correlation of Real GDP Growth for NAFTA Countries			
Canada	1.000		
Mexico	0.256	1.000	
USA	0.780*	0.027	1.000
D. Correlation of Inflation for NAFTA Countries			
Canada	1.000		
Mexico	-0.117	1.000	
USA	0.893*	-0.316	1.000

* Significant at the 5 per cent level.

shows the correlation of output growth and inflation in ASEAN and NAFTA. The output growths of Indonesia, Malaysia, the Philippines, and Singapore are all significantly correlated,⁵ while that of Thailand is only significantly correlated with Malaysia's. Inflation across the ASEAN countries is also significantly correlated, with the exception of the Philippines. This suggests that the ASEAN countries have been pursuing fairly similar monetary policies. Analysis of the correlations suggests that ASEAN may consist of a core of three countries consisting of Indonesia, Malaysia, and Singapore, who all exhibit high correlations for both output growth and inflation.

⁵ The statistic $0.5 \ln [(1+r)/(1-r)]$ is distributed approximately normal with a mean of $0.5 \ln [(1+\rho)/(1-\rho)]$ and a variance of $1/(N-3)$ (Kendall and Stuart 1973, pp. 292-93), where r is the estimated correlation coefficient, ρ is the null value of the correlation coefficient, and N is the number of observations.

TABLE
CORRELATIONS OF REAL GDP GROWTH

	Austria	Belgium	Denmark	Spain	Finland	France	UK
A. Correlation of GDP							
Austria	1.000						
Belgium	0.738*	1.000					
Denmark	0.370	0.346	1.000				
Spain	0.669*	0.749*	0.218	1.000			
Finland	0.287	0.409*	0.187	0.417*	1.000		
France	0.734*	0.830*	0.358	0.743*	0.509*	1.000	
UK	0.224	0.299	0.587*	0.438*	0.509*	0.484*	1.000
Germany	0.498*	0.398	0.289	0.307	-0.319	0.311	0.035
Greece	0.262	0.397	0.384	0.301	0.188	0.442*	0.273
Ireland	0.213	0.24	0.027	0.323	0.270	0.361	0.254
Italy	0.626*	0.796*	0.405*	0.531*	0.451*	0.757*	0.426*
Luxembourg	0.544*	0.705*	0.425*	0.669*	0.352	0.653*	0.536*
Netherlands	0.715*	0.726*	0.407*	0.636*	0.143	0.665*	0.317
Portugal	0.596*	0.516*	0.321	0.431*	0.198	0.546*	0.419*
Sweden	0.175	0.447*	0.224	0.419*	0.783*	0.423*	0.434*
B. Correlation of							
Austria	1.000						
Belgium	0.699*	1.000					
Denmark	0.800*	0.718*	1.000				
Spain	0.561*	0.562*	0.775*	1.000			
Finland	0.773*	0.759*	0.896*	0.676*	1.000		
France	0.721*	0.661*	0.905*	0.848*	0.811*	1.000	
UK	0.518*	0.560*	0.738*	0.714*	0.668*	0.775*	1.000
Germany	0.817*	0.517*	0.552*	0.326	0.513*	0.470*	0.475*
Greece	0.036	0.152	0.142	0.279	0.276	0.320	0.019
Ireland	0.605*	0.562*	0.798*	0.701*	0.628*	0.863*	0.747*
Italy	0.601*	0.545*	0.812*	0.856*	0.795*	0.929*	0.742*
Luxembourg	0.474*	0.294	0.318	0.208	0.508*	0.360	0.053
Netherlands	0.853*	0.716*	0.788*	0.568*	0.722*	0.694*	0.696*
Portugal	0.127	0.232	0.371	0.628*	0.313	0.522*	0.256
Sweden	0.434*	0.511*	0.728*	0.724*	0.641*	0.797*	0.812*

* Significant at the 5 per cent level.

Table II also presents the correlation of output growth for the NAFTA countries. As expected, the figures for the United States and Canada are significant and highly correlated, while that of Mexico is not closely correlated with either country. Inflation is also highly correlated between the United States and Canada, but Mexico's inflation is negatively correlated with those of the two other countries.

Table III shows the correlations of output growth and inflation for the EU nations. There seems to be a core group of countries, consisting of Austria, Belgium, France, Italy, Luxembourg, and Spain, whose output growths are highly correlated

III

AND INFLATION FOR THE EU

Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Portugal	Sweden
Growth for the EU							
1.000							
0.348	1.000						
0.097	0.094	1.000					
0.360	0.216	0.229	1.000				
0.464*	0.176	0.303	0.656*	1.000			
0.529*	0.277	0.293	0.681*	0.687*	1.000		
0.258	0.218	0.222	0.516*	0.483*	0.409*	1.000	
-0.100	0.189	0.168	0.505*	0.356	0.318	-0.138	1.000
.....							
Inflation for the EU							
1.000							
-0.189	1.000						
0.439*	0.058	1.000					
0.339	0.485*	0.730*	1.000				
0.271	0.478*	0.195	0.429*	1.000			
0.760*	-0.186	0.726*	0.567*	0.265	1.000		
-0.171	0.513*	0.289	0.566*	0.081	-0.059	1.000	
0.222	0.216	0.707*	0.789*	0.071	0.535*	0.534*	1.000

both among themselves and with other European countries. Ireland's output growth is not significantly correlated with that of any other members of the EU, while Greece's output growth is correlated only with that of France. Compared to the ASEAN countries, output growth in the EU seems to be only weakly correlated. Inflation rates across the EU are more strongly correlated than output growth. The exceptions here seem to be Greece, Luxembourg, and Portugal, whose inflation rates are much less correlated with the other EU countries.

TABLE IV
MEANS AND MEDIANS OF THE CORRELATIONS OF SHOCKS

	External Shock		Supply Shock		Demand Shock	
	Mean	Median	Mean	Median	Mean	Median
ASEAN	0.693	0.660	0.314	0.190	0.335	0.330
EU	0.651	0.690	0.067	0.022	0.097	0.122
NAFTA	0.269	0.299	0.363	0.355	0.490	0.369

C. Results

Before proceeding with the estimation of the VAR, the time series were tested for unit roots using the Phillips (1987) unit root test and the KPSS unit root test developed by Kwiatkowski et al. (1991) to ensure that the variables are stationary. The null hypothesis of a unit root in the time series was rejected for all the series except for Portuguese inflation. As a result, I removed Portugal from my sample of EU countries. I also tested the data for each individual country for cointegration using the Johansen (1988) test. The variables for the Philippines and Thailand were found to have a single cointegrating vector. For all the other countries, the null of no cointegration could not be rejected.⁶

I then proceeded to estimate vector autoregressions using real GDP growth and inflation for each country in the sample except for the Philippines and Thailand. Due to the presence of cointegrating vectors in the cases of the Philippines and Thailand, a vector error correction model was used instead. A uniform lag of two years was used for all the estimations. The lag length was chosen using the Akaike Information Criterion (AIC). For all the countries, the sample period was from 1971 to 1995.

Table IV summarizes the main results of this paper. It shows the means and medians of the correlations across ASEAN countries compared with those for the EU and NAFTA countries. The ASEAN countries' external shocks on average are more highly correlated than those for the EU and NAFTA countries. Their supply and demand shocks are also more correlated than those of the EU countries. However the NAFTA countries' supply and demand shocks are more highly correlated than those of the ASEAN countries. It would seem, in terms of correlations of shocks, that the ASEAN countries closely match the EU countries.

Tables V, Table VI, and Table VII present detailed individual correlations of the various shocks for the ASEAN, NAFTA, and EU countries, respectively. Looking first at the effect of external shocks, all of the ASEAN countries exhibit a high correlation. This may be due to the fact that most of the countries are small, rela-

⁶ Detailed results of the above tests can be obtained from the author.

TABLE V
CORRELATION OF SHOCKS FOR ASEAN

	Indonesia	Malaysia	Philippines	Singapore	Thailand
A. Correlation of External Shocks for ASEAN Countries					
Indonesia	1.000				
Malaysia	0.679*	1.000			
Philippines	0.628*	0.787*	1.000		
Singapore	0.642*	0.811*	0.747*	1.000	
Thailand	0.626*	0.613*	0.630*	0.769*	1.000
B. Correlation of Demand Shocks for ASEAN Countries					
Indonesia	1.000				
Malaysia	0.682*	1.000			
Philippines	0.191	-0.023	1.000		
Singapore	0.729*	0.593*	0.129	1.000	
Thailand	0.223	0.547*	-0.155	0.437	1.000
C. Correlation of Supply Shocks for ASEAN Countries					
Indonesia	1.000				
Malaysia	0.750*	1.000			
Philippines	0.104	0.126	1.000		
Singapore	0.656*	0.710*	-0.014	1.000	
Thailand	0.123	0.114	0.317	0.254	1.000

* Significant at the 5 per cent level.

TABLE VI
CORRELATION OF SHOCKS FOR NAFTA

	Canada	Mexico	USA
A. Correlation of External Shocks for NAFTA Countries			
Canada	1.000		
Mexico	0.104	1.000	
USA	0.299	0.403	1.000
B. Correlation of Demand Shocks for NAFTA Countries			
Canada	1.000		
Mexico	0.422	1.000	
USA	0.694*	0.355	1.000
C. Correlation of Supply Shocks for NAFTA Countries			
Canada	1.000		
Mexico	0.157	1.000	
USA	0.369	0.564*	1.000

* Significant at the 5 per cent level.

TABLE
CORRELATION OF

	Austria	Belgium	Denmark	Spain	Finland	France
A. Correlation of External						
Austria	1.000					
Belgium	0.648*	1.000				
Denmark	0.778*	0.723*	1.000			
Spain	0.822*	0.663*	0.943*	1.000		
Finland	0.433*	0.749*	0.482*	0.467*	1.000	
France	0.853*	0.441*	0.639*	0.742*	0.350	1.000
UK	0.861*	0.445*	0.739*	0.762*	0.349	0.723*
Germany	0.751*	0.532*	0.727*	0.803*	0.564*	0.861*
Greece	0.540*	0.272	0.425*	0.633*	0.415*	0.668*
Ireland	0.726*	0.500*	0.693*	0.809*	0.487*	0.748*
Italy	0.576*	0.147	0.358	0.446*	0.327	0.691*
Luxembourg	0.848*	0.489*	0.690*	0.738*	0.533*	0.881*
Netherlands	0.798*	0.595*	0.780*	0.825*	0.366	0.856*
Sweden	0.742*	0.442*	0.749*	0.808*	0.302	0.704*
B. Correlation of Demand						
Austria	1.000					
Belgium	0.148	1.000				
Denmark	0.423*	0.129	1.000			
Spain	0.437*	0.609*	0.260	1.000		
Finland	0.184	0.313	0.190	0.081	1.000	
France	-0.200	-0.288	-0.167	-0.506*	0.350	1.000
UK	-0.224	0.207	-0.112	0.067	-0.288	0.228
Germany	0.415*	-0.080	-0.070	0.232	0.281	0.119
Greece	0.253	-0.032	-0.169	0.232	-0.318	-0.194
Ireland	-0.114	-0.363	0.184	-0.398	-0.288	0.129
Italy	-0.168	-0.308	-0.034	-0.396	0.198	0.609*
Luxembourg	0.510*	0.221	0.203	0.270	0.428	0.232
Netherlands	-0.148	0.040	0.222	-0.014	-0.192	-0.076
Sweden	-0.034	-0.069	0.184	0.031	-0.083	0.294
C. Correlation of Supply						
Austria	1.000					
Belgium	0.625*	1.000				
Denmark	-0.066	-0.128	1.000			
Spain	-0.089	-0.057	-0.437*	1.000		
Finland	-0.023	-0.058	0.294	0.022	1.000	
France	0.346	0.386	0.229	-0.315	0.162	1.000
UK	-0.127	-0.094	0.313	-0.032	0.204	0.271
Germany	0.309	0.017	-0.069	0.043	-0.569*	-0.163
Greece	-0.128	0.020	0.013	-0.222	-0.097	0.111
Ireland	0.092	0.266	0.073	-0.311	0.141	0.029
Italy	0.487*	0.561*	-0.234	-0.093	-0.264	0.531*
Luxembourg	0.097	0.291	0.178	-0.242	0.062	0.189
Netherlands	0.460*	0.400	0.020	0.002	-0.040	0.215
Sweden	-0.209	-0.090	0.273	0.059	0.550*	0.297

* Significant at the 5 per cent level.

VII

SHOCKS FOR THE EU

	UK	Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Sweden
Shocks for the EU								
	1.000							
	0.703*	1.000						
	0.408	0.708*	1.000					
	0.750*	0.828*	0.757*	1.000				
	0.681*	0.613*	0.546*	0.627*	1.000			
	0.742*	0.802*	0.669*	0.746*	0.765*	1.000		
	0.661*	0.767*	0.552*	0.782*	0.536*	0.791*	1.000	
	0.655*	0.726*	0.646*	0.649*	0.528*	0.704*	0.675*	1.000

Shocks for the EU

	1.000							
	-0.289	1.000						
	0.034	0.518*	1.000					
	0.174	-0.401	-0.333	1.000				
	0.433	-0.039	-0.208	0.293	1.000			
	0.024	0.631*	0.326	-0.192	-0.051	1.000		
	0.207	-0.356	0.157	0.387	0.255	-0.103	1.000	
	0.292	0.159	-0.088	0.236	0.294	0.122	0.162	1.000

Shocks for the EU

	1.000							
	-0.231	1.000						
	-0.200	0.139	1.000					
	0.032	-0.112	-0.508*	1.000				
	-0.239	0.036	0.124	-0.128	1.000			
	0.238	0.057	-0.098	0.412*	-0.009	1.000		
	-0.086	-0.013	-0.177	0.275	0.197	0.343	1.000	
	0.186	-0.539*	-0.069	0.019	0.008	0.414*	0.135	1.000

TABLE VIII
SIZE OF SHOCKS

	Long-Run Effect of				
	External Shock on		Supply Shock on		Demand Shock on Price
	Output	Price	Output	Price	
ASEAN	0.059	0.033	0.139	0.202	0.187
EU	0.057	0.168	0.089	0.333	0.299
NAFTA	0.080	0.173	0.137	0.728	0.400

tively open⁷ and possess export-oriented economies. Similarly, with few exceptions the external shocks across the EU countries are also highly correlated. This fits nicely with the fact that the EU countries are all relatively open. In contrast, the NAFTA countries show little correlation for external shocks. This should not come as a surprise as the U.S. and Mexican economies are relatively closed, while that of Canada is more open.

Next, I will discuss correlations of demand shocks. Among the ASEAN countries, Indonesia, Malaysia, and Singapore exhibit highly correlated demand shocks. Those across Malaysia, Singapore, and Thailand are also found to be significantly correlated, albeit to a lesser extent. Moving onto NAFTA, demand shocks are found to be strongly correlated between Canada and the United States. In the EU, there do not seem to be many countries for whom demand shocks are significantly correlated. For Austria, Germany, Greece, and Luxembourg they are closely correlated, but for the other countries in the EU seem to be much less so. When interpreting demand shocks, it is important to note that monetary policy can affect the degree of correlations. If a group of countries follow similar monetary policies, we would expect the demand shocks for those countries to be correlated. Hence as the EU countries move toward the formation of a currency union, we can expect their demand shocks to become more highly correlated.

Finally, I will examine supply shocks. In ASEAN, shocks are highly correlated for Indonesia, Malaysia, and Singapore. Among the NAFTA countries, those between the United States and Mexico are significantly correlated. Those across the EU seem to be relatively idiosyncratic, without any clear patterns.

The above results indicate that there is a core group of three ASEAN countries—Malaysia, Indonesia, and Singapore—that seem most suited for a currency union from the standpoint of having relatively highly correlated shocks. The external, supply, and demand shocks for these countries are all significantly correlated. The sizes of the correlation coefficients for the external, demand, and supply shocks in these three countries are higher than those of the EU countries. This suggests that in

⁷ See Table X for an indicator of openness of the economy.

terms of correlations of shocks, the ASEAN countries are just as suitable for the formation of a currency union as the EU countries.

Goto and Hamada (1993) come to a similar conclusion using a different empirical methodology. They attempt to estimate the degree of synchronization of real and monetary disturbances among a group of Asian countries.⁸ Using principal component analysis, they find that real shocks (obtained as residuals from an estimated investment function) are more synchronized in the Asian countries than in Europe. They also find that monetary shocks (obtained as residuals from the estimated money demand function) are as synchronized in Asia as in Europe. This result provides further support for the possibility of a monetary union in East Asia.

In addition to the correlation of shocks, the size of the shocks itself is important in determining whether a country is suitable for entering into a currency union. The larger the size of the shocks, the greater will be their effects on the economy. Hence, the larger the shocks, the more important an independent monetary policy will be. The influence of shocks on economies can be inferred from the VAR impulse response functions, which trace out the effects of a unit shock on output and prices. In the case of external and supply shocks, I will use the absolute value of the long-run output effect and price effect as an indicator of the size of shocks. Since I have restricted demand shocks to having no long-run effects on output, I will only use the long-run effects of demand shocks on prices as an indicator of the size of the shocks. The average values of the magnitudes of shocks are presented in Table VIII. The NAFTA countries seem to have the largest shocks, while those for the ASEAN and EU countries are roughly comparable. Hence, in terms of the sizes of shocks, the ASEAN countries are as suitable for a currency union as the EU countries.

V. OTHER CRITERIA FOR A CURRENCY UNION

Economies with large intra-regional trade volumes will benefit more from the formation of a currency union, due to savings on transaction costs and the elimination of exchange rate uncertainties. Table IX shows the share of exports going to countries within the same region. Among the ASEAN countries, the share of intra-regional trade has been relatively stable, at around 20 per cent. This is lower than the share of intra-regional trade within the EU or the NAFTA countries. Traditionally, the ASEAN countries have focused on Japan, Europe, and the United States as markets for their exports (Jovanovic 1998). However, in the 1990s there has been a trend toward a growing share of ASEAN intra-regional trade. The share of intra-regional trade in ASEAN is also likely to increase with the formation of AFTA. At the moment, however, the benefits of a currency union are likely to be limited for the ASEAN countries because of the low level of intra-regional trade.

⁸ The Republic of Korea, Singapore, Taiwan, Indonesia, Malaysia, the Philippines, and Thailand.

TABLE IX
SHARE OF INTRA-REGIONAL TRADE AS A PERCENTAGE OF TOTAL EXPORTS

	1970	1980	1985	1990	1994
ASEAN	21.1	16.9	18.4	18.7	21.2
EU	59.5	61.0	59.3	66.0	61.7
NAFTA	36.0	33.6	43.9	41.4	47.6

Source: United Nations Conference on Trade and Development, *Handbook of International Trade and Development Statistics, 1995* (New York, 1997).

TABLE X
TRADE SHARE AS PER CENT OF GDP

		(%)			
	1980	1996	1980	1996	
Indonesia	54	51	Greece	39	43
Malaysia	113	183	Ireland	108	134
Philippines	52	94	Italy	47	51
Singapore	440	356	Mexico	24	38
Thailand	54	83	Netherlands	103	100
Austria	74	78	Norway	80	72
Belgium	127	140	Portugal	63	74
Canada	55	73	Spain	34	47
Denmark	66	63	United Kingdom	52	58
Finland	67	68	United States	21	24
France	44	45			

Source: World Bank, *World Development Report, 1998/99* (Washington, D.C., 1999).

In addition, McKinnon (1963) argues that the more open the economy the less useful the nominal exchange rate is as a tool of adjustment. Table X presents the share of trade to GDP for the ASEAN countries and several European and North American countries. The ASEAN countries all have much larger tradable sectors than the European and NAFTA countries. The very high share of trade to GDP for Singapore is due to its role as a trading and distribution center for the Southeast Asian region. The high shares of trade for the other ASEAN countries are due to the export-led growth strategy they have followed.

An immediate result of monetary integration is the loss of monetary policy as a policy instrument. The adjustment to a single monetary policy for a region is easier if the countries in the region have been pursuing relatively similar monetary policies. As an indicator for monetary policy, I will use nominal interest rates and inflation rates. Table XI and Table XII show nominal interest rates and inflation across the ASEAN countries. We can see that Malaysia and Singapore have followed rela-

TABLE XI
NOMINAL INTEREST RATES ACROSS ASEAN COUNTRIES

	1980	1985	1990	1995
Indonesia	12.87	10.33	13.97	13.64
Malaysia	4.86	7.57	6.19	5.78
Philippines	12.14	26.72	23.67	11.76
Singapore	10.98	5.38	6.61	2.56
Thailand	14.66	13.48	12.87	10.96

Source: IMF (1998).

Note: Interest rates are the annual average money market rates, except for the Philippines, where it refers to the annual average Treasury Bill rate, as money market rates are not available.

TABLE XII
INFLATION RATES ACROSS ASEAN COUNTRIES

	1980	1985	1990	1995
Indonesia	18.1	4.7	7.8	9.4
Malaysia	6.7	0.3	2.6	4.1
Philippines	18.4	24.8	14.2	8.1
Singapore	8.6	0.5	3.5	1.7
Thailand	19.8	2.4	5.9	5.7

Source: IMF (1997).

Note: Inflation rates are the annual average of the monthly inflation rate as measured by consumer prices.

tively similar monetary policies recording both low inflation and interest rates. In the past, Indonesia, the Philippines, and Thailand have had higher rates of inflation than Malaysia and Singapore. However, in recent years there has been a trend toward lower interest rates and inflation in these countries, bringing them closer to the levels of Malaysia and Singapore.

Another way of looking at whether the ASEAN countries have a consensus on monetary policy is to look at the correlation of their interest and inflation rates. Table XIII and Table XIV show the correlation of nominal interest rates and inflation rates across the ASEAN countries. The correlations of nominal interest rates have generally been low. Singapore and Thailand have the highest correlation, at 0.8, but all the others are below 0.5. However, inflation rates are more closely correlated. Malaysia, Thailand, Singapore, and Indonesia all have relatively highly correlated rates. The odd country out is the Philippines, which has low correlations with all the other ASEAN countries. The low correlation of nominal interest rates across the ASEAN countries means that it may be difficult to form a currency union that will result in a common interest rate for the whole region.

TABLE XIII
CORRELATION OF NOMINAL INTEREST RATES ACROSS ASEAN COUNTRIES, 1980–95

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.00				
Malaysia	0.09	1.00			
Philippines	0.17	0.41	1.00		
Singapore	0.39	0.06	0.06	1.00	
Thailand	0.46	0.24	0.24	0.80	1.00

Source: IMF (1998).

Note: Interest rates are the annual average money market rates, except for the Philippines, where it refers to the annual average Treasury Bill rate, as money market rates are not available.

TABLE XIV
CORRELATION OF INFLATION RATES ACROSS ASEAN COUNTRIES, 1980–95

	Indonesia	Malaysia	Philippines	Singapore	Thailand
Indonesia	1.00				
Malaysia	0.58	1.00			
Philippines	0.12	0.05	1.00		
Singapore	0.61	0.80	0.18	1.00	
Thailand	0.71	0.65	-0.04	0.83	1.00

Source: IMF (1997).

Note: Inflation rates are the annual average of the monthly inflation rate as measured by consumer prices.

VI. CONCLUSIONS

I have examined several economic criteria for a currency union in order to evaluate the feasibility of the formation of such a union in Southeast Asia. The pattern of shocks across Southeast Asia suggests that Singapore, Malaysia, and Indonesia would be good partners for a currency union. These three countries experience highly correlated supply, demand, and external shocks compared with the EU and NAFTA. In addition, the average correlations of shocks across the ASEAN countries are also higher than those of the EU countries. In terms of the magnitude of shocks, the effects on the ASEAN countries are comparable to those of the EU countries but smaller than those for the NAFTA countries. Overall, it would seem that in terms of correlations of economic shocks, the ASEAN countries are good candidates for a monetary union.

In addition, the ASEAN countries have large tradable sectors, which should make the transition to a currency union easier. However, the share of intra-regional trade among them has remained relatively low compared with the EU and NAFTA coun-

tries. That said, the ASEAN countries did experience an increase in intra-regional trade in the 1990s, and the formation of AFTA is likely to further stimulate intra-regional trade. In terms of a consensus on monetary policy, there seems to be some diversity in the ASEAN countries' inflation and interest rate policies. Malaysia and Singapore have maintained relatively low inflation and interest rates, while they have been higher for the other ASEAN countries. However, in recent years the gap between these countries has narrowed.

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