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How Integrated Were Foreign Exchange Markets in the Asia-Pacific Region in the Past?: Evidence from the Parallel Market

Rukmani Gounder
Massey University

Kunal Sen
University of East Anglia

Abstract

The East Asian currency crisis of 1997-98 has led to considerable interest on the interlinkages between foreign exchange markets in the Asian region. Implicit in the literature is the assumption that the currency crisis can be linked to close integration of the goods and capital markets of the Asian economies both with each other and with the advanced market economies in recent years. In this paper, we find evidence of strong interlinkages between the parallel exchange rates of five East Asian countries: Hong Kong, Indonesia, Malaysia, The Philippines and Thailand in the 1970s and early 1980s, a period when it was generally believed that there may not have been as strong an interlinkage between these economies in terms of international trade or finance as we observe in the 1990s. Thus, interlinkages between exchange rate markets in the Asian region are not a recent phenomenon and may not necessarily be linked to the capital and commodity market liberalisation undertaken by the Asian economies in recent years.

• **JEL Classifications:** F31, F36, N25

• **Key Words:** Exchange Rates, Parallel Markets, Contagion Effects, Economic Integration, Asia

*Corresponding address: Rukmani Gounder, Department of Applied and International Economics, Massey University, Private Bag 11222, Palmerston North, New Zealand, Tel: +64-6-3505969, Fax: +64-6-3505660, E-mail: R.Gounder@massey.ac.nz, Kunal Sen, School of Development Studies, University of East Anglia, United Kingdom, Tel: +44-1603-593376, Fax: +44-1603-451999, E-mail: k.sen@uea.ac.uk

I. Introduction

In late 1997 and early 1998, several countries in East and South-East Asia observed precipitous falls in their exchange rates, following the collapse of the Thai baht's peg in July 1997. It is widely believed that the rapid spread of the currency and stock market crisis from one country in the region to another has been due to *contagion effects*, where the occurrence of currency crisis in one country increases the probability of a similar crisis in another country (Eichengreen *et al*. 1996, Fratzcsher 1998, Baig and Goldfajn 1999, Kaminsky and Reinhart 1999). Underlying the phenomenon of contagion is the observation that removal of the barriers to short-term capital flows and international trade in the Asia-Pacific region has contributed to increasingly integrated foreign exchange markets, particularly among the Asia-Pacific economies (Gerlach and Smets 1994, Corsetti, Pesenti and Roubini 1998). An implication of a greater integration amongst foreign exchange markets is the stronger co-movement between these markets, with shocks to one market being transmitted rapidly to other markets in the region.

Implicit in much of the analysis of contagion effects as a cause of the 1997 Asian currency crisis is the assumption that the speed and severity of the transmission of shocks from one currency market to another could be in great part linked to close integration of the goods and capital markets of the Asian economies both with each other and with the advanced market economies in recent years. In this paper, we ask the question: how integrated were Asian foreign exchange markets with each other in the past ? We find evidence of strong interlinkages between these markets in the 1970s and early 1980s, a period when it was generally believed that there may not have been as strong an interlinkage between these economies in terms of international trade or finance as we observe in the 1990s. Thus, interlinkages between exchange rate markets are not a recent phenomenon and may not necessarily be linked to the capital and commodity market liberalisation undertaken by the Asian economies in recent years.

In the past, when most of the economies in this region had fixed exchange rate regimes, with significant foreign exchange controls on the current and capital accounts, it would be difficult to expect co-movements in official exchange rates of the severity that one has observed in the East Asia region in 1997 and 1998. However, because of the stringent foreign exchange controls, there existed extensive black markets in foreign exchange in almost all the countries in this

region.[1] Officially, a country's currency is pegged to Special Drawing Rights (SDR). Since SDR-dollar fluctuation is limited, this narrows the fluctuation between the country's currency and the dollar. However, since black market exchange rates are market determined, the band of fluctuations is much wider. Thus, contagion effects, if they were present at all, would be reflected in the exchange rates prevailing in parallel markets. In this paper, we examine the black market exchange rates of five East Asian countries: Hong Kong, Indonesia, Malaysia, The Philippines and Thailand for the period 1970 to 1985 to find evidence of contagion effects in currency markets.

To test for the inter-linkages between parallel exchange rate markets, we estimate a Vector Error Correction Model (VECM) for the black market exchange rates of Hong Kong, Indonesia, Malaysia, The Philippines and Thailand using monthly data on domestic currency per SDR unit from January 1970 to December 1985. The period of the study is determined in part by the availability of the data and in part by the fact that during 1970-1985 period, several of the sample countries had strict controls on foreign currency transactions, so the black market exchange rate acted in effect as the shadow price of foreign exchange in these countries. In estimating the VECM for each country, we pay particular attention to the possibility of non-stationary of the data and cointegration among the exchange rates. We then estimate the impulse response functions and variance error decompositions for these five countries exchange rates. This allows us to examine the responses of exchange rates in other economies to a shock in the exchange rate for one economy. Clearly, the greater is the magnitude and speed of response, the stronger is the presence of inter-linkages in these currency markets. The use of domestic currency per SDR unit exchange rates instead of the more conventional US dollar exchange rates controls for the possibility that spurious correlation between the exchange rates of the five countries may be induced by simultaneous movements in the currencies due to changes in the value of the dollar.

The rest of the paper is divided into five sections. Section II provides a brief overview of the exchange rate arrangements of Hong Kong, Indonesia, Malaysia, The Philippines and Thailand. Sections III describes the data and the econometric methodology used in this study. The results are presented in Section IV. The paper finds strong evidence of inter-linkages in the parallel market for exchange rates.

[1]Black market exchange rate is unofficial, usually illegal, price of particular currency, mostly in terms of US dollar value. It reflects unrestricted supply and demand, and therefore, represents true or real worth of monetary unit (Cowitt, 1991, p.7).

Exchange rates in these markets are inter-linked with shocks to one market that exert a strong influence on the exchange rates of the other markets. Section V provides the conclusion.

II. An Overview of Exchange Rate Policies in the Sample Countries

Currency areas are geographically defined territories of protective legislation for monetary units. Essentially, for the facilitation of the trade and capital flows, control of the currencies is centralised by the central bank of the country. Collignon (1999) notes that the emergence of regional currency blocs can be explained by the combination of risk-averse private investors maximising their wealth and the public authorities maximising aggregate investment. Thus, by pegging their currency to an anchor, they reduce exchange rate risk within the currency bloc and their effective exchange rate will stimulate private investment due to stability of the currency, a basic requirement to stimulate investment for long run growth.

The notable volatilities of foreign exchange rates in the international markets have increased since the breakdown of the Bretton Wood system in 1973. The Governments undermined the exchange rate adjustments needed as speculative attacks on major currencies became frequent. Over time countries in Asia set their exchange rate regimes from full dollarization to fully flexible for some while other arrangements included currency boards, fixed rates, crawling pegs, floating exchange rate to a reference currency or basket. Essentially, there are two dimensions to exchange rate policy: one, the extent of convertibility, and two, the specific institutional arrangements that determine the day-to-day setting of exchange rate (Dornbusch and Park 1999).

We analyse here briefly the exchange rate policies of the sample countries undertaken in this study for the period 1970-1985.

A. Hong Kong

A system of fixed exchange rate had been adopted in Hong Kong as seen in the 1970. The Hong Kong dollar has had a fixed link to the United States (US) dollar, backed up by an Exchange Fund that acted effectively as a currency board. In an effort to stop and reverse the decline of Hong Kong dollar due to political instability the government announced in October 1983 what is called the linked exchange rate system. Therefore, it has been an unambiguous case of a fixed

exchange rate, and fixed to the US dollar. It resulted into minimal volatility against the US dollar, however, has had significant volatility in terms of both nominal and real effective rates. A further dimension in which Hong Kong differed from the other Asian countries has been the full currency convertibility.

B. Indonesia

The Indonesian exchange rate was unified in December 1970 and later in 1971 a multiple exchange rate structure was created. The rupiah had been pegged to the US dollar before 1978 although its system has been described as one of a managed float. Since 1978 rupiah has been pegged to a basket of the currencies of Indonesia's major trading partners. The rates have been applied to commercial banks' same-day settlement and swap transactions, and exports with the central bank. The market rate of the rupiah against the US dollar has been determined in the interbank foreign exchange market and its level reflected the expected changes in central bank rates. The currency convertibility related to the partial current account convertibility.

C. Malaysia

Initially the Malaysian dollar was linked to Pound Sterling. With the floating of Sterling and the dismantling of the Sterling Area in June 1972, Kuala Lumpur linked the currency to the US dollar, i.e. the ringgit had been linked to the US dollar till 1975 and then to a basket of currencies of Malaysia's major trading partners (particularly the US, Japan, Singapore, Germany, UK and the Netherlands) after 1975. The central bank (i.e. Bank Negara Malaysia) intervened in the interbank foreign exchange market to maintain the ringgit-dollar exchange rate within a target range. Dornbusch and Park (1999) note that it has been widely believed that the bank's target rate has been determined by the movement of an undisclosed multiple-currency basket. The exchange rate system has been seen as a managed floating system and the partial currency convertibility.

D. The Philippines

On February 21, 1970, the Philippine's peso underwent a partial devaluation, as a multiple rate structure with a Mixed Rate was reinstated based on a controlled, floating Official Rate for the US dollar. The Mixed Rate was abolished in May 1970. A system of fixed exchanged rates had been set in the Philippines after that. Till 1983, the Philippine peso was pegged to the US dollar. On 6 June 1984, the

exchange rate system was revised, the Philippines' exchange rate policy can be described as one of floating, interbank trading in foreign exchange was resumed. The effective exchange rate was determined by the market forces under an independent float, but the authorities intervened when necessary to maintain orderly conditions in the exchange rate market. Also the Central Bank intervened in light of their policy objectives in the medium term (IMF 1991). Thus, the exchange rate regime has been regarded as managed float, where the official regimes had been rather vague that included a wide range of policies where the relative volatility of monthly variations of nominal exchange rates against the US dollar was experienced between 1976 and 1985.[2]

E. Thailand

The Thai bhat was officially pegged to the US dollar from 1963 to 1984 that provided exchange rate stability. Since the November 1984 devaluation of the currency, the baht has been linked to a multiple-currency basket, i.e. its value would be determined on the basis of a weighted basket of the currencies of Thailand's major trading partners, the US, Japan and Germany. The basket of currencies was revised to include the US, Japan, Germany, UK, Malaysia, Hong Kong, and Singapore. The shift in the exchange rate regime partly reflected the appreciation of the US dollar in the mid-1980s. The extent of the currency convertibility has been partial for its goods, services and asserts.

Overall, it can be said that the exchange rate practices of the five countries in the sample period were common to a large extent. Most of these countries have had a perfectly fixed exchange rate (Hong Kong) or crawling peg with a heavily dollar-focussed exchange rate system (Indonesia and Thailand). Malaysia and the Philippines, on the other hand, have a heavily managed floating system. The results of the econometric analysis reflect some of the points raised here.

III. Data and the Econometric Methodology

The black market exchange rates for the five countries are obtained from the *World Currency Yearbook* published by the International Currency Analysis Inc. This is the standard source for black market exchange rate data (for example, those studies which compute the black market premium as a measure of openness for

[2]This effect no doubt is clearly seen in Figure 1 for the Philippines exchange rate. This structural break is taken into consideration for the econometric analysis.

different countries obtain the data on black market exchange rates from this source[3]). The data is in monthly form and covers the period 1970 to 1985. The domestic currency - US dollar exchange rates available in the *World Currency Yearbook* are converted into per SDR unit by multiplying these exchange rates with the US dollar-SDR rate (available from the *International Financial Statistics* published by the International Monetary Fund).

In Figure 1, we plot the black market exchange rates of the five countries in our sample, Hong Kong, Indonesia, Malaysia, The Philippines and Thailand. Several of the exchange rates show significant variability during the period under consideration. For two of the five exchange rates, there are significant structural breaks in the series in the period considered (November 1978 in the case of Indonesia and January 1976 in the case of The Philippines).[4]

We use vector error-correction modelling to examine the interactions between the exchange rates. There is a body of literature that supports the use of a VECM, or cointegrating vector autoregressions (VAR), in this situation. The latter is preferable to unrestricted VAR when variables in the VAR are cointegrated. Because the cointegrating vectors bind the long run behaviour of the variables, the VECM is expected to produce results in the impulse response analysis and variance decomposition that more accurately reflect the relationships between the variables than the standard unrestricted VAR.

A. Steps in the Estimation Procedure

Consider a vector autoregressive model of order *p*, or VAR(p):

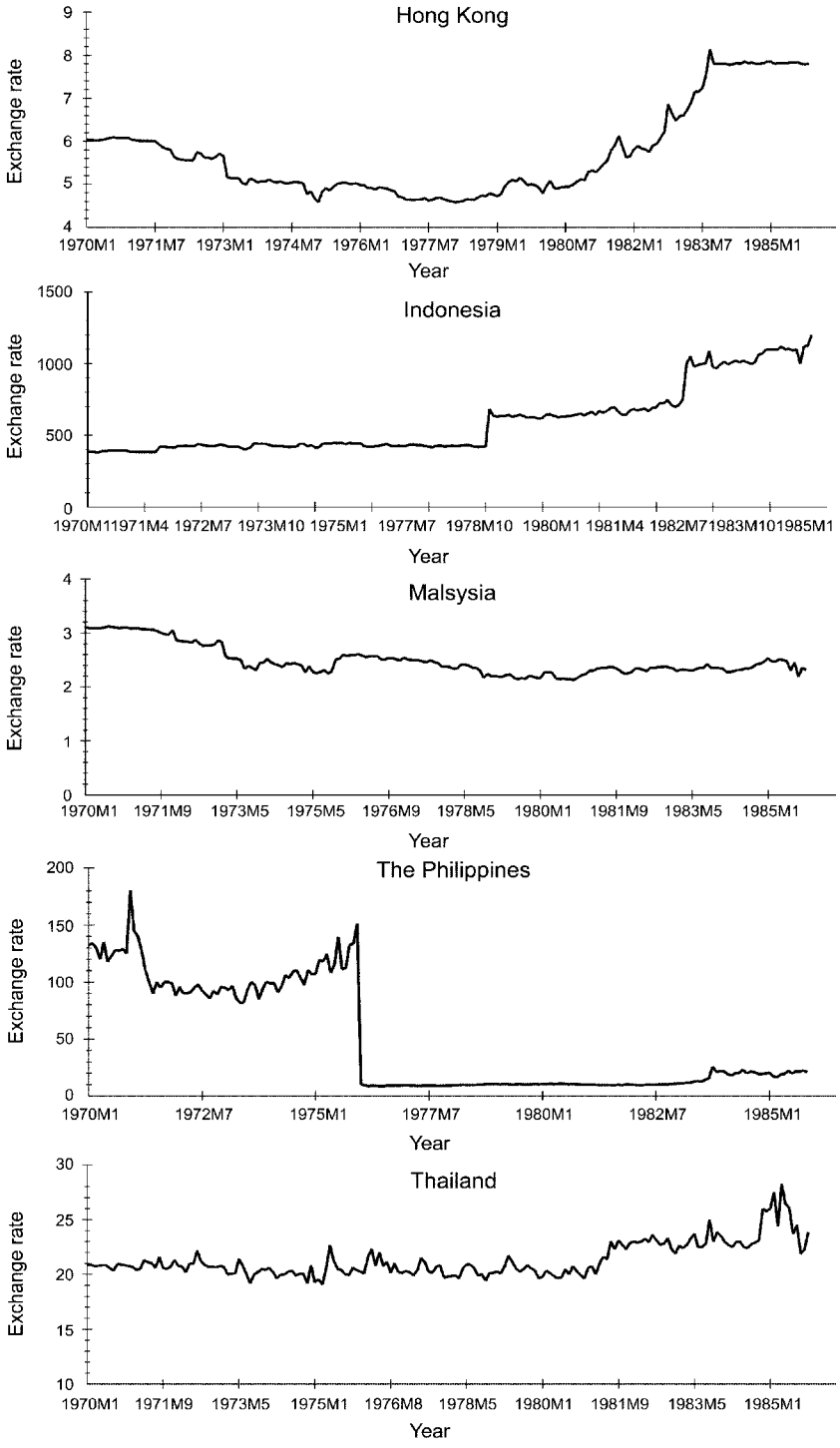
$$Z_t = a_0 + a_1 t + \sum_{i=1}^{p} \Phi_i z_{t-i} + u_t, \; t = 1, 2, \ldots, n \qquad (1)$$

where z_t is a m*1 vector of jointly determined (endogenous) variables, a_0 is a 1*m row vector, t is a linear time trend, Φ_1 through Φ_p are m*m matrices of coefficients to be estimated, and u_t is an m*1 vector of unobserved disturbances assumed to satisfy the usual assumptions of the errors from an Ordinary Least Squares (OLS) regression.

[3]For some recent studies see Harrison (1996) and Sachs and Warner (1995).

[4]The structural breaks in the black market exchange rates of Indonesia and The Philippines in November 1978 and January 1976, respectively, can be linked to the massive devaluations of the official exchange rates of these two countries in these two months, i.e. 50 percent in the case of Indonesia (Hill, 1996) and a substantial depreciation in the case of the Philippines (Ito *et al*., 1996). The large one-off change in the black market exchange rates of these two countries could be linked to changes in the official exchange rates.

Figure 1. Black Market Exchange Rates



B. Step 1: Testing for Unit Roots

The first step in the VAR modelling is to test for the order of integration of the variables in the VAR. The knowledge of the order of integration of the variables in a regression equation is important for the optimal inference (Phillips 1986). We use the Dickey-Fuller test to determine the order of integration of the exchange rates in our sample. However, as is clear from Figure 1, there is evidence of a structural break in the black market exchange rate for Indonesia and The Philippines. Perron (1989) has shown for a number of macroeconomic variables, that the inclusion of the dummy variable for structural change resulted in the rejection of the null of a unit root, and where the exclusion of that dummy variable resulted in tests that could not reject the null. Perron has extended the Dickey Fuller unit root test by incorporating a dummy variable for the structural change in the regression equation used to test for a unit root and has calculated the critical values for this extended model. We use Perrons test for unit roots in the case of the black market exchange rates for Indonesia and The Philippines.

C. Step 2: Determining the Order of the VAR

We determine the order (that is, optimal lag length) of the VAR model as in (1) by the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC).

D. Step 3: Testing for Cointegration

By the Granger Representation Theorem, an equivalent vector error correction model of the VAR as in equation (1) has the following specification:

$$\Delta z_t = a_0 + a_1 t + \sum_{i=1}^{p-1} T\Delta_i z_{t-1} + \Pi z_{t-p} + u_t \qquad (2)$$

Here, Δ is the difference operator and Π is the long-run parameter matrix with r cointegrating vectors (r can be between 1 and 5, as there are five endogenous variables in the VAR), Π has rank r and can be decomposed as $\Pi = \alpha\beta'$, with α and β both $5\times r$ matrices. The β's are the parameters in the cointegrating relationships and α's are the adjustment coefficients which measure the strength of the cointegrating vectors in the VECM.

The Johansen (1988) and the Johansen and Juselius (1990) cointegration techniques allow us to estimate the long-run relationships between the non-

stationary variables using a maximum likelihood procedure which tests for cointegrating rank r and estimates the parameter β of these cointegrating relationships.

E. Step 4: Estimating Impulse Responses and Variance Decompositions

The impulse response functions measure the time-profile of the effect of the shocks on the future states of the dynamical system represented by the VAR, while forecast error variance decompositions provide a decomposition of the variance of the forecast errors of the variables in the VAR at different horizons. The impulse response functions and the variance decompositions are obtained by using the vector moving average representation of (1) as follows:

$$z_t = \sum_{j=0}^{\infty} A_j u_{t-j} \tag{3}$$

which represents z_t as a linear combination of current and past one-step-ahead forecast errors or "innovations."

The errors in equation (3) may be contemporaneously correlated, i.e. the covariance matrix of the innovations is not diagonal. When the innovations in exchange rates are contemporaneously correlated, a shock in one market may work through the contemporaneous correlation with innovations in other markets. It is customary to transform these correlation coefficients by orthogonalising the innovations in the VAR system according to a pre-specified causal ordering. After the transformation, equation (3) can be expressed as:

$$\sum_{j=0}^{\infty} A_j \varepsilon_{t-j} \tag{4}$$

where $A^*_j = A_j T$, and $\varepsilon_t = T^{-1} u_t$. T is a lower triangular matrix.

The orthogonalised impulse response functions of a unit shock (equal to one standard error) at time t to the ith orthogonalised error on the j^{th} variable at time $t+N$ is given by the j^{th} element of $A_N T e_i$, where e_i is the $m \times 1$ selection vector,

$$\varepsilon_i = (0, 0, \ldots, \underset{\substack{\uparrow \\ i^{th}\ element}}{1}, 0, \ldots, 0)'$$

The transformed innovations, ε_t, are uncorrelated with each other at all lags as

well as contemporaneously. Specifically, the innovations are orthogonalised using a Cholesky decomposition method so that the resulting covariance matrix is diagonal. This essentially amounts to assuming that the first market in a pre-specified ordering has an immediate impact on all other markets in the VAR system. A shock in the second market in the system has an immediate impact on all markets, excluding the first market, and so on. Therefore, the orthogonalised impulse responses are not unique and, in general, depend on the particular ordering of the variables in the VAR. In the special case when the variance-covariance matrix is diagonal, the orthogonalised responses are invariant to the ordering of the VAR.

IV. Results

As is the standard practice in the time-series literature, we transform all the five country data series by the natural logarithmic function. Thus, the transformed series are LMAL for Malaysia, LTHAI for Thailand, LHK for Hong Kong, LINDO for Indonesia and LPHIL for The Philippines. We first present the results of the unit root tests in Table 1. We use the augmented Dickey-Fuller (ADF) test procedure for the black market exchange rates for Malaysia, Thailand and Hong Kong, and the Perron test procedure that includes the possibility of a structural break for Indonesia and The Philippines. Tests for unit roots were performed on the levels variables as well as on the first differences. In each case, the lag-length was chosen for the ADF test according to the AIC. The results are consistent with the hypothesis that the levels variable are all integrated of order 1.

Next, we estimated several unrestricted VARs in levels with different lag-

Table 1. Test Results for Unit Roots

Variable	Levels	First Differences
LHK	0.22(0)	−14.0(0)
LINDO	−0.54*	−13.86(0)
LMAL	−1.39(1)	−12.60(0)
LPHIL	−1.76*	−13.89(0)
LTHAI	−3.31(1)	−18.03(0)

Notes: Variables are as defined in the text. The critical value of the ADF statistic without the linear trend is –2.88, and the critical value of the ADF with a linear trend is –3.44. Figures in parenthesis indicate the number of lags used in the Dickey-Fuller regressions. The number of lags was chosen using the AIC criterion. Results presented in the table are tests for stationarity around a non-zero constant. For LINDO and LPHIL, dummy variables for structural change were introduced in the Dickey-Fuller regressions and critical values obtained from Perron (1989).

Table 2. Test for the Order of the VAR

Order	AIC	SBC
6	1724.7	1458.6
5	1725.8	1500.0
4	1743.0	1557.5
3	1752.8	1607.7
2	1762.7	1657.7
1	1765.2*	1700.7*
0	1191.2	1167.0

Notes: a) AIC = Akaike Information Criterion; SBC = Schwartz Bayesian Criterion, b) *denotes maximum value.

lengths for the five variables, LHK, LINDO, LMAL, LPHIL and LTHAI, in order to determine the optimal lag length of the VAR. The results are presented in Table 2. Both the AIC and the SBC indicate that the optimal lag length is 1.

We then use the multivariate cointegration techniques developed by Johansen and Juselius to test for the number of cointegrating vectors in the VAR. As the plots of the exchange rates in Figure 1 do not indicate the presence of linear time trends in the latter, we estimate the VAR with no trend but with a restricted intercept. We also introduce dummies for November 1978 and January 1976 to capture the breaks in the series for Indonesia and The Philippines, respectively, for these months. The Johansen test results are presented in Table 3. Both the trace and the maximum eigenvalue test statistics indicate the number of cointegrating vectors is three.[5]

Table 3. Johansen Tests for Cointegration

H_0: Number of Cointegrating Vectors	Test Statistic	5% Critical Value	Reject H_0 at 5%?
Panel A: Results of Maximum Eigenvalue Tests			
r= 0	222.20	34.40	Yes
r<=1	57.40	28.27	Yes
r<=2	30.35	22.04	Yes
r<=3	13.56	15.87	No
r<= 4	1.56	9.16	No
Panel B: Results of Trace Tests			
r= 0	325.07	75.98	Yes
r<=1	102.87	53.48	Yes
r<=2	45.46	34.87	Yes
r<=3	15.12	20.18	No
r<= 4	1.56	9.16	No

[5]The number of cointegrating vectors simply represents the number of linear combinations of the five non-stationary variables in the VAR

Finally, in order to obtain the impulse response functions and variance decompositions, we estimate the VECM imposing on the cointegrating vectors just-identifying restrictions obtained from the Johansen estimates.[6] Since the orthogonalised impulse responses are sensitive to the order of the variables, we estimate the VECM with the five exchange rates ordered with respect to the closing time of each foreign exchange market, with the most exognous market (that is, the last to close) placed first.[7] Thus, the order used in the VAR is Malaysia, Thailand, Hong Kong, Indonesia and The Philippines. We find, however, that the

Table 4. Variance Decompositions of Exchange Rates

	Percentage of Forecast Variance Explained by Innovations in:					
Country	Months	Malaysia	Thailand	Hong Kong	Indonesia	Philippines
Malaysia	3	91.60	3.17	3.10	0.22	0.17
	6	82.35	8.95	6.79	1.67	0.24
	12	69.02	12.67	11.74	6.32	0.24
	24	55.52	15.64	16.50	12.12	0.22
	36	49.02	17.04	18.78	14.96	0.21
Thailand	3	6.76	77.77	4.59	10.83	0.06
	6	5.29	68.03	9.48	17.15	0.04
	12	5.50	59.26	14.49v	20.72	0.02
	24	6.17	52.95	18.03	22.33	0.01
	36	6.45	51.19	19.43	22.92	0.01
Hong Kong	3	3.07	1.78	93.77	1.26	0.09
	6	3.83	2.11	92.71	1.25	0.10
	12	6.11	2.21	90.69v	0.87	0.13
	24	7.98	2.18	89.14	0.53	0.16
	36	8.67	2.16	88.56	0.43	0.17
Indonesia	3	3.35	14.82	1.66	77.37	0.06
	6	7.96	23.95	1.56	66.49	0.04
	12	14.66	30.63	1.49	53.18	0.04
	24	19.70	35.31	1.45	43.49	0.05
	36	21.60	37.05	1.43	39.86	0.06
Philippines	3	1.06	6.45	12.69	2.50	77.30
	6	2.33	6.31	25.53	2.22	63.61
	12	4.08	5.50	42.00	1.65	46.77
	24	5.81	4.62	57.90	1.09	30.58
	36	6.65	4.20	65.59	0.82	22.74

.[6]By taking into account the presence of three cointegrating relationships between the exchange rates, we incorporate within the VAR estimation the deviations of these exchange rates from the long-run equilibrium relationships specified by the cointegrating vectors.

[7]This is consistent with the approach taken by Eun and Shin (1989) and Janakiramanan and Lamba (1998) for stock market data

covariance matrix of errors is near diagonal; thus, the results are not sensitive to the ordering of the variables in the VAR.

Figures 2 to 6 present the plots of the impulse response functions.[8] It is clear from the figures that shocks to the black market exchange rate of one country has a strong and persistent effect on the black market exchange rate of another country. Thus, a shock to the Thai exchange rate (as in Figure 3) and the exchange rate of Hong Kong (as in Figure 4) has significant positive effects on the exchange rates of Indonesia and The Philippines, respectively.

The variance decompositions present a similar picture of strong inter-linkages between the parallel exchange rate markets of the region. The results are presented in Table 4. Thus, at 36 months, the percentage of the forecast variance of Malaysia's exchange rate explained by innovations in the exchange rates of Hong Kong and Indonesia are 19 per cent and 15 per cent respectively. In the case of Indonesia, 37 per cent of the forecast variance of its exchange rate is explained by innovations in the Thai exchange rate at the end of 36 months. Similarly, In the case of Indonesia, 66 per cent of the forecast variance of its exchange rate is explained by innovations in the exchange rate of Hong Kong at the end of 36 months. The foreign exchange market that seems to be exogenous to developments in the other markets is that of Hong Kong, where at 36 months, 89 per cent of the forecast variance of the exchange rate can be explained by its own innovations. Generally, our results support the hypothesis that the parallel exchange rate markets in the five countries considered here are highly interdependent, though the response of one parallel exchange rate market to the developments in other markets is slow and is only evident at a longer time horizons.

V. Conclusion

In recent years, currencies in the East Asian region have shown strong evidence of spillover effects with shocks to one currency being rapidly transmitted to other currencies in the region. As yet, it is unclear what causes these spillover effects and "observers have come to different conclusions as to whether the observed contagion effects are evidence of irrational investor behaviour or more conventional fundamental causes" (IMF 1998, p. 71). In this paper, we asked the question: how recent is the phenomenon of interdependence of currency markets in this region ?

[8]The plots show the effect of a one standard deviation shock to each exchange rate on all five exchange rates over 36 month horizon.

Figure 2. Time-path of Impulse Responses to One Standard Deviation Shock to the Malaysian Black Market Exchange Rate

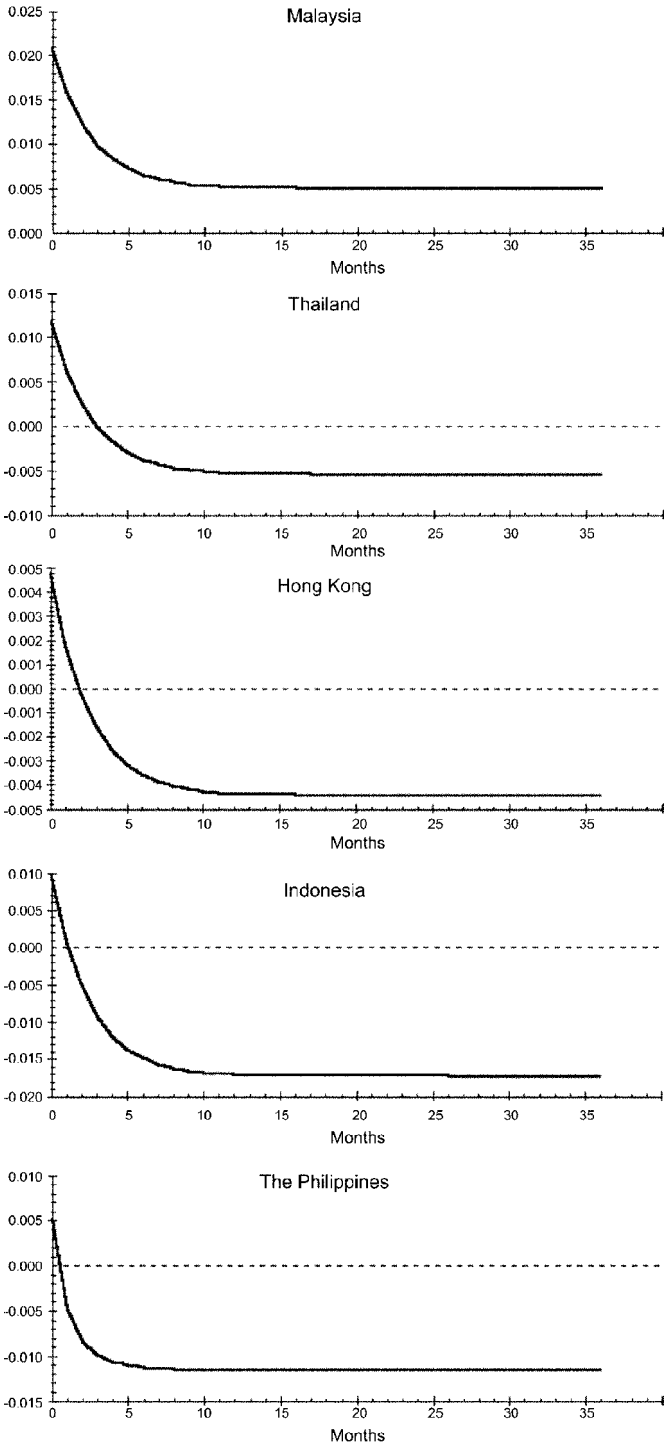


Figure 3. Time-path of Impulse Responses to One Standard Deviation Shock to the Thai Black Market Exchange Rate

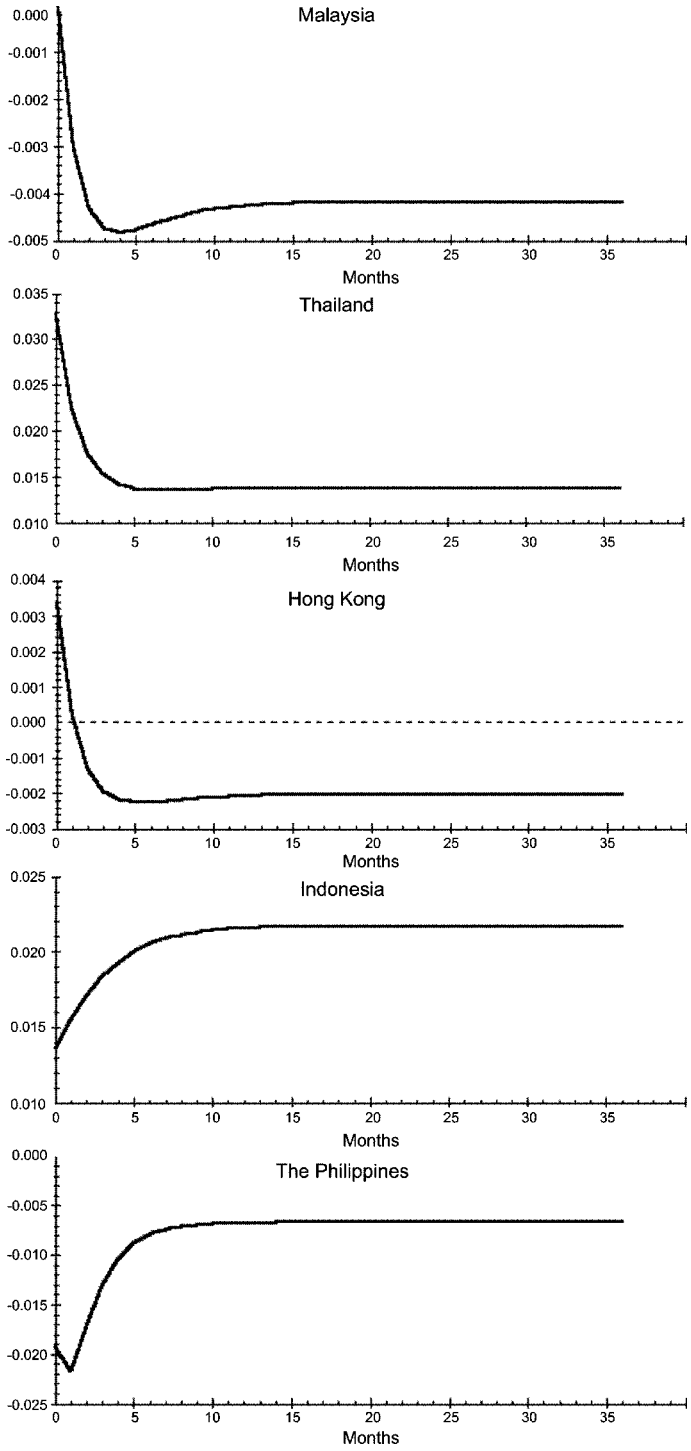


Figure 4. Time-path of Impulse Responses to One Standard Deviation Shock to the Hong Kong Black Market Exchange Rate

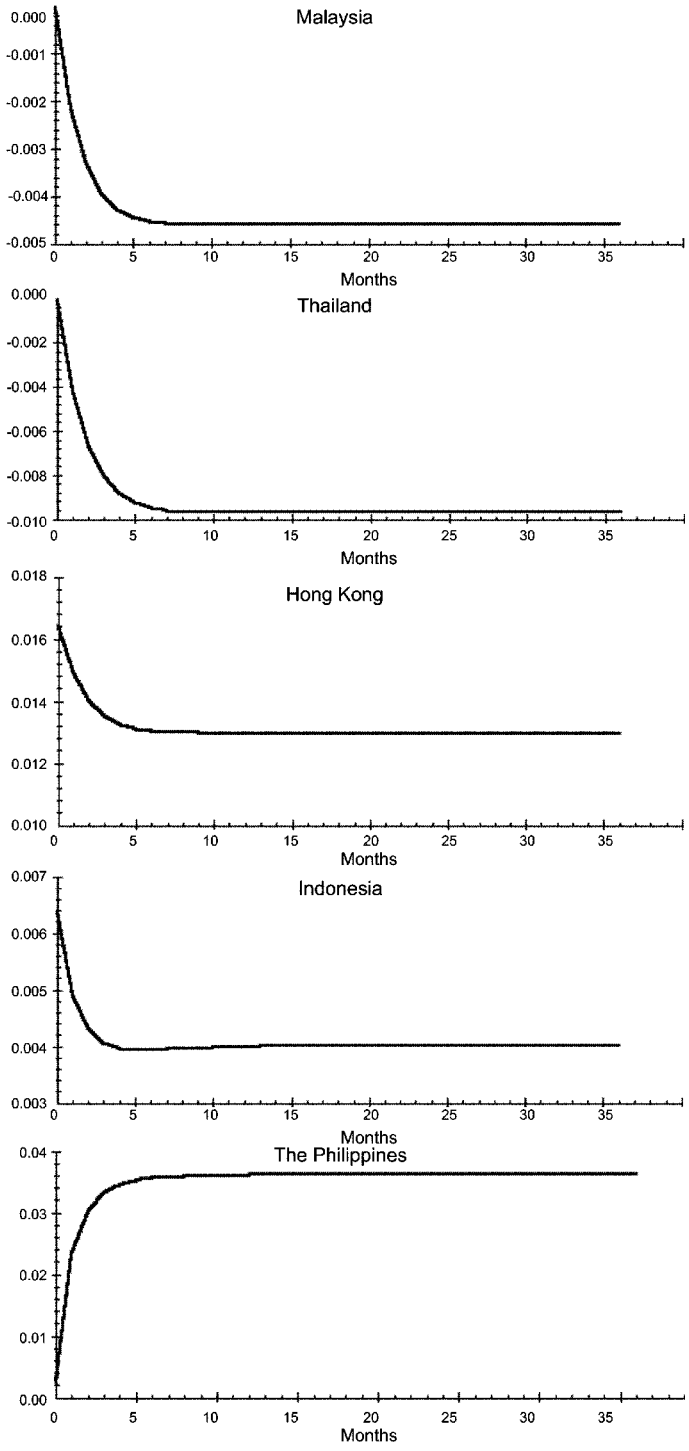


Figure 5. Time-path of Impulse Responses to One Standard Deviation Shock to the Indonesian Black Market Exchange Rate

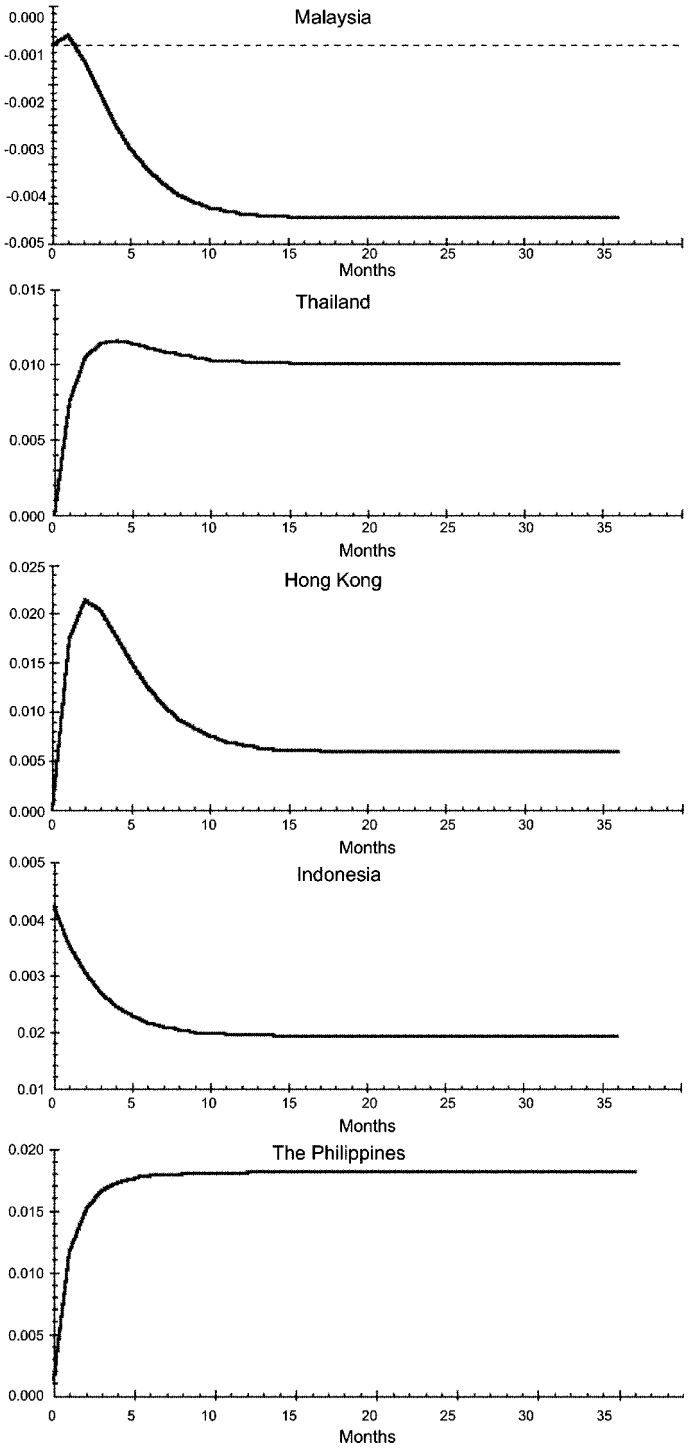
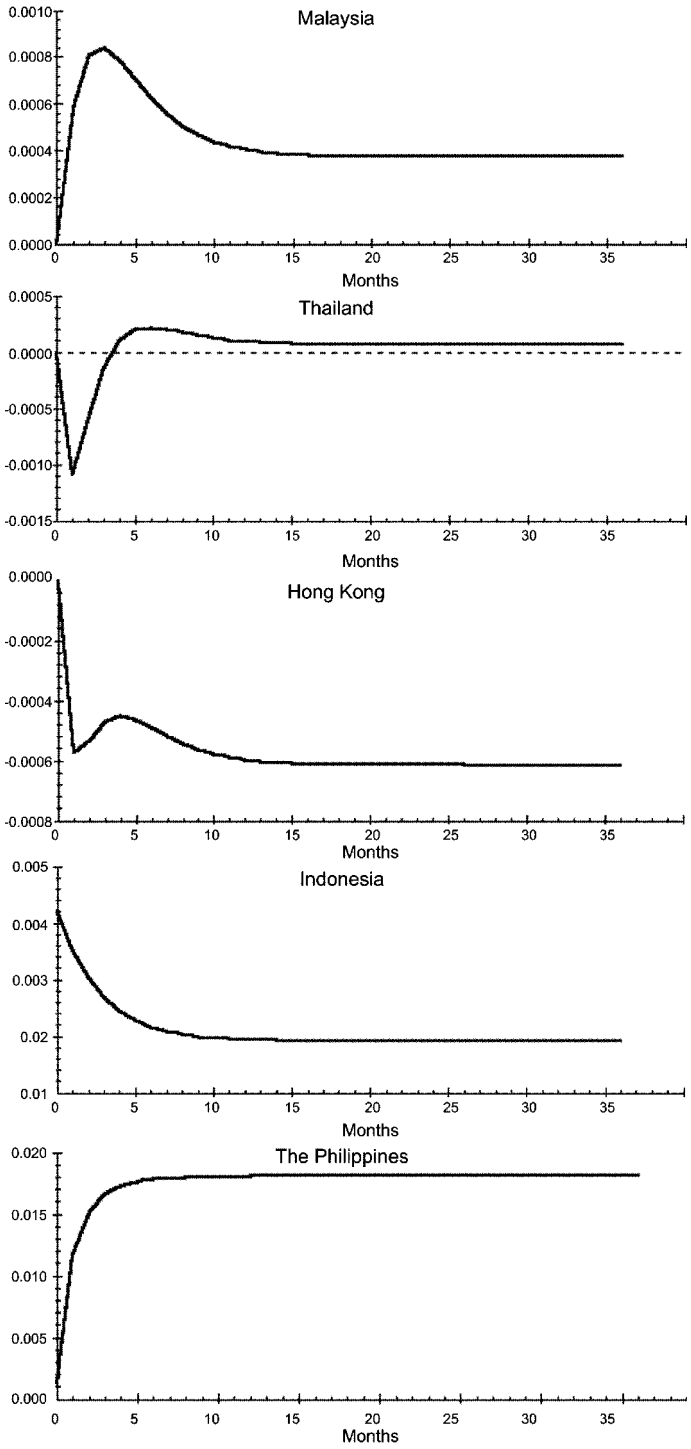


Figure 6. Time-path of Impulse Responses to One Standard Deviation Shock to The Philippines Black Market Exchange Rate



We examined the parallel exchange rates of five East Asian economies - Hong Kong, Indonesia, Malaysia, The Philippines and Thailand to test for inter-linkages in the 1970-1985 period, a period when most of these economies had either a fixed or pegged exchange rates and there were severe controls on short-term capital. We found evidence of strong inter-linkages between the parallel exchange rate markets of these economies. The presence of such inter-linkages between the parallel exchange rate markets of these economies during the 1970s and early 1980s suggest that there may already have been a large volume of cross-border flows in goods and assets in the five economies during this period, predating the significant liberalisation of goods and capital markets in several of these economies in the late 1980s and 1990s.

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