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Abstract

This paper provides a test of purchasing power parity (PPP) as an explanation for long-term foreign exchange rate movements. It essentially extends the analysis of Cheung and Lai (1993) to the South East Asian nations, Indonesia, the Philippines, Malaysia, South Korea, and Thailand. Consistent with Cheung and Lai, we impose symmetry and proportionality restrictions flowing from the absolute form of purchasing power parity (PPP) as well as applying the less restrictive Johansen test of PPP to data drawn from the period 1972 through 1997. The tests are also run for sub-periods with similar results. Symmetry and proportionality restrictions find little support in the unit root tests though the Johansen tests suggest that the foreign exchange rate and inflation rates are linked in a long run sense. Error correction models are then estimated on the basis of the assumption that the USA inflation rate is exogenous with respect to the selected emerging South East Asian nations. The error correction models vary considerably across the countries though one consistent result is the negative relation between the foreign exchange rate and the error correction parameter and the generally positive relation between the local CPI and the error correction parameter. The impact of the USA CPI on the countries varies considerably, ranging from no impact in the case of Indonesia through to a statistically significant impact on both the foreign exchange rate and local CPI for South Korea.

1. Introduction

Purchasing power parity (PPP) postulates that variation in prices between countries will be matched by exchange rates; that is, nominal exchange rates will reflect differences in inflation rates among economies. Although there is little empirical evidence to support the application of this result of the "law of one price" in the short run (Frenkel, 1981 and Rogoff, 1996) there is evidence of the PPP relation in the "long run". The term long run is used in the literature to indicate that temporary deviations may take place, but over a sufficiently long time horizon, the deviations will be stationary. Despite the relatively large body of literature investigating this theory for developed countries, relatively few researchers have explored the proposition for the economies in the East Asian region. The question of whether or not PPP holds for East Asian countries has importance for policy makers and academics.

The empirical evidence favours the acceptance of PPP theory in the long run. A variety of data sets and statistical techniques are apparent though more recent research focuses on the application of unit root tests and tests of cointegration. Abuaf and Jorion (1990) and Glen (1992, 1998) use long time periods while Frankel and Rose (1996) and Lothian (1997) provide comparisons across a number of countries.[1] This paper follows Cheung and Lai (1993), applying the Johansen test of cointegration to a fairly short time period applied to a number of countries.

This paper investigates the currencies of the countries at the centre of the 1997 crisis, as identified by the International Monetary Fund (1998a, 1998b), over the period 1972-1997. It focuses on whether inflation rates and foreign exchange rate are correlated

[1] For a discussion of the current consensus of researchers see Rogoff (1996).

in a long run sense as predicted by PPP. There are four sections. In section 2 we discuss briefly the relative PPP theory and the literature on developing country exchange rates. Section 3 describes the data. The notion of long run PPP is tested in Section 4. Section 5 provides some conclusions.

2. Discussion

2.1 Purchasing Power Parity

Absolute PPP postulates that the difference between prices in countries will determine the exchange rate. We start with the law of one price, a statement of relative purchasing power, requiring that the exchange rate adjusted price of an asset is the same across countries or:

$$P_t = S_t P_t^* \qquad [1]$$

where $P_{,t}$ is the domestic price index at time t, $P^*_{,t}$ is the foreign price index at time t and S_t is the exchange rate (units of domestic currency per foreign currency unit or the price of the foreign currency). An alternative representation, where continuous compounding is assumed, is:

$$s_t = p_t - p^*_t \qquad [2]$$

where s_t is the natural log of S_t, p_t, is the natural log of P_t and p_t^* is the natural log of P_t^*. A representative basket of goods is generally used to construct price indices. Research tends to focus on the level of prices rather than individual asset prices. This simplification leaves open the question of how price level indices are constructed and whether measures of price levels are actually comparable across countries (Rogoff, 1996). We leave this question to future research.

2.2 Long Run Purchasing Power Parity in Asian Countries

Most of the literature surrounding PPP has examined developed countries. There may be questions as to the generalisation of these results to developing countries, such as those examined in this paper. Given that the focus of this paper is on developing countries, it is pertinent to examine some potential problems.

First, there may be larger deviations of the exchange rate from PPP in developing countries than in developed countries (Tang and Butiong 1994). Developing countries tend to have more government intervention and trade restrictions. The economic structure of developing countries tends to be more diverse and structural changes are more frequent. In sophisticated and highly developed financial markets it would be expected that the exchange rate would better reflect asset markets because of such things as more information being incorporated in prices and the greater difficulty in manipulating prices.

By contrast, there are arguments for smaller deviations from PPP for developing countries. These countries experience more volatile price changes and so it is expected that monetary factors overshadow real ones in PPP deviations. In addition, more frequent use of foreign exchange controls in developing countries may have led to less speculation resulting in lower exchange rate volatility.

Tang and Butiong (1994) examined the bilateral exchange rates of eleven developing Asian countries during the period 1973-1990 using an error correction model. They found strong evidence for PPP being a long run constraint for five of the countries.

Their study suggested substantial deviations in countries that had relatively high foreign exchange speculation and capital movements. Bahmani-Oskooee (1993) confirmed PPP for twenty-four developing countries, of twenty-five examined.

Chinn (1998) used PPP to examine whether the Asian currencies were overvalued just prior to the crisis. Hong Kong, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand were examined for the period 1970-1997. Both the consumer price index and the wholesale price index were used. Using the augmented Dickey-Fuller test, Chinn found only four cases to be stationary. Applying the Johansen procedure (Johansen 1988) and using the consumer price index, Chinn (1998) found evidence for PPP in all cases except Indonesia. When Chinn (1998) used the Horvath-Watson procedure (Horvath and Watson 1995), the null hypothesis of no co-integration was strongly rejected. Using the consumer price index, he found a half-life reversion rate of between 3.3 and 10.9 years (excluding the Philippines). When the wholesale price index was used, the half-life reversion rate was between 2 and 8.2 years (if insignificant coefficients are excluded, the half-life reversion changes to 2 to 4 years).[2]

3. Data

3.1 Exchange Rate Data

Bilateral exchange rates between the crisis country currencies and the United States dollar (USD), spanning the fourth quarter of 1971 to the second quarter in 1997 were

[2] Chinn's results indicated that in May 1997, the Malaysian Ringgit was overvalued by 8 percent, the Thai Baht by 7 percent and the Indonesian Rupiah by –5 percent. When the predicted real rate was allowed to move using a linear deterministic trend, the results changed to 17 percent, 13 percent and 30 percent respectively. However, the latter approach resulted in non-stationarity. Finally, Chinn checked for robustness by examining the period 1986 to 1997 and found the estimates did not change significantly.

extracted from the International Monetary Fund's *International Financial Statistics* using Datastream. The exchange rates are end of quarter units of national currency per USD. This variable is a standard choice in the literature (Frankel and Rose 1996; Li 1998).

The descriptive statistics for the quarterly observations of the natural log of the exchange rates and change in the natural log of exchange rates are provided in Table 1. In order to test for PPP it is necessary to identify whether the exchange rate time series are stationary. Both the Augmented Dickey Fuller test (Dickey and Fuller, 1979) and the Phillips Perron test (Phillips and Perron, 1988) are used for this purpose and are applied to both the level and change in level. The null hypothesis for both tests is that the time series is non-stationary. Thus if the hypothesis cannot be rejected for levels but can be rejected for the change in levels then it is generally held that the process contains a unit root, or is non-stationary. In Table 1 both the Phillips Perron tests and Dickey Fuller tests suggest one unit root in the exchange rates for the period. It is assumed on the basis of these results that each of the time series has one unit root.

[Table 1 about here]

3.2 Price Indexes

There are three types of price indexes employed in the literature. Researchers who attach great importance to the role of the non-tradable sector tend to use the relatively narrow commodity, export or import price indexes. Researchers who believe that broader price indexes best capture the price changes in the economy opt for such indexes as the Labour

Cost Index or the Consumer Price Index.[3] Those who believe a heavier weight needs to be placed on the tradable sector may use the Wholesale Price Index.

The narrower indexes are ruled out since they do not incorporate those goods and services at the periphery of being traded. Furthermore, there may be price manipulations by large multinationals that may bias these indices. The Consumer Price Index is employed in this research because it is likely to be the most accurately calculated, given the greater overall emphasis placed on this index.[4]

Datastream was used to extract the required consumer price series from the International Monetary Fund's *International Financial Statistics*. The index values are set at 100 in 1990 for all countries.[5] Again this is a standard choice in the literature (Frankel and Rose 1996; Li 1998).

The descriptive statistics of the natural log of the price level series are presented in Table 2. Phillips Perron tests suggest the existence of one unit root in all of the CPI time series. Again the Augmented Dickey Fuller test is less consistent. It is likely that the more general nature of the Phillips Perron test is better able to handle the time series than the Dickey Fuller test and so it is assumed that each of the price level time series has one unit root.

[Table 2 here]

[3] Steindel (1997) argues that there are currently no better broad price indexes in the United States than the Consumer Price Index.

[4] Wholesale price indices seem to produce similar results in the literature.

[5] The data series are not seasonally adjusted.

4. Analysis

Section 2.1 detailed the theoretical foundations of PPP. Despite some criticisms of its underlying assumptions when short-term temporary deviations are permitted, it appears reasonable to expect this theory to hold in the long run. If PPP does hold and if prices are accurately measured then the PPP pricing discrepancies will be stationary in some long-term sense. The Phillips Perron and Augmented Dickey Fuller tests provide a univariate test while the Johansen test provides a multivariate alternative where the focus is on how tightly the exchange rates and inflation rates are bound together in a long run sense.

It is important to note that PPP imposes two constraints on the data. The first is proportionality and the second is symmetry. If equation [2] is expressed in regression form then:

$$s_t = \alpha_1 p_t - \alpha_2 p_t^* + d_t \qquad [3]$$

Symmetry requires that $\alpha_1 = \alpha_2$ and proportionality requires that $\alpha_1 = \alpha_2 = 1$. This suggests a univariate test based on the pricing discrepancies, d_t, obtained when imposing both restrictions on the time series or:

$$d_t = s_t - p_t + p_t^* \qquad [4]$$

In virtually all cases both the Phillips Perron and the Augmented Dickey Fuller tests fail to reject the null of non-stationary data thus also failing to support the PPP restrictions of

symmetry and proportionality (see Table 3). This general lack of support for the PPP restrictions was also observed in Cheung and Lai (1993) for the UK, Germany, France, Switzerland and Canada. Imposing the PPP restrictions almost invariably leads to rejection of PPP for developed countries (Cheung and Lai 1993) and a similar result is observed in this study for South East Asian countries.

Cheung and Lai emphasis that the CPI is measured with error. Thus it is possible that the PPP restrictions are rejected because of CPI measurement error. This is important for tests of PPP, which are essentially cointegration tests, because linear combinations of non-stationary variables will generally produce non-stationary variables. The only exception is where the combination is a cointegrating vector[6]. If it is assumed that the measured CPI numbers are linearly related to the true CPI numbers then it can be shown that the PPP symmetry and proportionality restrictions may not be appropriate when testing PPP. Perhaps testing for symmetry and proportionality is a little too optimistic given the reliance on cointegration tests and the problems with CPI index calculation.

The Johansen test provides an alternative to the more restrictive univariate test. This approach can identify whether there is a cointegrating relation between the foreign exchange rate and the two price level indices together. Evidence for PPP is provided where the Johansen test identifies at least one cointegrating vector between the three variables.

[6] From a statistical point of view cointegrating vectors are the exception rather than the rule.

Table 4 provides a summary of the tests for the number of cointegrating vectors for each country, for full and restricted sample and for the two base currencies, USD and AUD. The tests are split into a number of levels with test statistics for r=0, no cointegrating vectors, r=1, one cointegrating vector, and r=2, two cointegrating vectors. First, if there are no cointegrating vectors then none of the hypotheses are rejected and so there is no stationary, linear combination of the variables. Second, if there is one cointegrating vector r=0 is rejected but r=1 cannot be rejected. If there are two cointegrating vectors then r=0 and r=1 are rejected but r=2 cannot be rejected. If r=0, r=1 and r=2 are rejected the time series are stationary. The results in Table 4 suggest that there is one cointegrating vector in all cases. This result is supportive of PPP.

[Table 4 here]

Thus there is evidence of a long run relationship between foreign exchange rate and inflation rates[7] yet the symmetry and the proportionality restrictions are rejected in virtually all cases. Cheung and Lai suggest CPI measurement error could be a cause of this rejection and this may well be the explanation. We leave further discussion of this question to future research.

To concentrate on the relationship between foreign exchange rate, USA inflation rate and local inflation rate, error correction models are estimated and reported in Table 5. This analysis provides some insight into the complex inter-relationships that exist

[7] The data set was increased to include the 1997 Asian Crisis and the tests were rerun and it is found that even the inclusion of the 1997 Asian crisis was not sufficient to lead to rejection of PPP for the chosen sample. Clearly, the observation of a stable long run relationship does not preclude the possibility of short-term disturbances.

between the USA and the individual countries. Perhaps of most interest in the analysis of the long run impact of PPP is the speed of adjustment parameter. In all cases the speed of adjustment parameter is negative. Further, where statistically significant, the speed of adjustment parameter is positive in the local inflation rate equation. These results are consistent with the existence of a long run PPP equilibrium relationship between the exchange rate and inflation rates. The lack of statistical significance for the speed of adjustment parameter in the error correction models for the Philippines contrasts with the Johansen test results where one cointegrating vector is suggested for each of the five countries. This variation in not surprising, given the two step procedure inherent in error correction model estimation.

The short-term impacts vary across the five countries. The USA inflation rate is assumed exogenous and its impact varies across the countries. For example, there is no statistically significant relationship found between the USA inflation rate and either the foreign exchange rate or the local inflation rate for Indonesia. Alternatively, the USA inflation rate is a statistically significant explanatory variable in both the foreign exchange rate equation and the local inflation rate equation for South Korea. The impact on the remaining countries varies, with local inflation rate impact for the Philippines and Thailand and foreign exchange impact for Malaysia. The impact of short-term local inflation rate and the foreign exchange rate vary considerably across the countries.

While it is difficult to draw conclusions about the short-term impacts, the long-term impacts are reasonably consistent across the sample with a tendency for foreign exchange rate to close the gap between the PPP rate and the observed rate in the longer term. This is also apparent, to a lesser extent, for the local inflation rate.

5.0 Summary

The International Monetary Fund (1997; 1998a; 1998b) identified Indonesia, Malaysia, the Philippines, Thailand and South Korea as being at the centre of the Asian currency crisis and provides a comprehensive analysis of the causes. The International Monetary Fund (1997), along with most other research in the area (Corbett and Vines, 1998; Corsetti et al. 1998; McKibbin 1998; Radelet and Sachs 1998; Wyplosz 1998), suggests that a major reason for the crisis was the build-up of international competitiveness pressures, which resulted from the overvaluation of the currencies. However, overvaluation is a relative measure and most researchers do not define it adequately or provide sufficient empirical evidence of it. The prime objective of this paper is to examine the proposition that PPP holds for the period 1972 to 1998.

Although PPP theory has been tested extensively for developed countries, there are few studies that focus solely on East Asian countries. Given the lack of empirical evidence for the countries at the centre of the 1997 crisis, the objective of this paper is to provide further evidence on the impact of PPP in the long run. The sample period was restricted to the post Bretton-Woods era to ensure different world exchange rate environments were not mixed, although the data includes different exchange rate regimes for some of the currencies. A quarterly sample interval was chosen to minimise the short-term noise of exchange rate movements. The USD based foreign exchange rates were chosen for analysis due the United States being a major trading partner of all the crisis countries. The data employed in this study is the standard choice in the literature (Frankel and Rose 1996; Li 1998).

Both univariate and multivariate methods are adopted to explore the hypothesis that PPP theory holds in the long run. In virtually all cases the univariate tests result in rejection of the theoretical PPP restrictions of symmetry and proportionality. It is suggested this result could be driven by CPI measurement problems and so the less restrictive multivariate Johansen test is run to test for the number of cointegrating vectors. One cointegrating vector is observed in virtually all cases. This result is consistent with PPP and it is quite robust as PPP effects are evident in the time series even when the 1997 crash period is included in the study. Error correction models are estimated assuming that the USA inflation rate is exogenous. These results further highlight the importance of PPP as a long run relationship between foreign exchange rate and inflation rates though it is apparent that the short run effects vary considerably across emerging nations chosen for this analysis.

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Table 1
Natural Log of Bilateral Exchange Rates – Descriptive Statistics (N = 103)

Country		Mean	Std. Dev	Skewness	Kurtosis	PP(4)	ADF 4 lags
Indonesia	Levels	6.89	0.67	-0.09	-1.65*	-2.19	-1.91
	Change	0.02	0.06	5.60*	30.74*	-10.25*	-4.61*
Malaysia	Levels	0.91	0.07	-0.15	-0.66	-3.2	3.71*
	Change	0	0.03	-0.02	4.62*	-8.95*	-5.18*
Philippines	Levels	2.61	0.58	-0.07	-1.85*	-1.37	-1.64
	Change	0.01	0.05	2.92*	12.75*	-10.22*	-3.59*
South Korea	Levels	6.47	0.27	-0.67*	-1.04*	-1.62	-1.92
	Change	0.01	0.03	3.73*	20.97*	-8.43*	-3.56*
Thailand	Levels	3.15	0.1	-0.17	-1.70*	-1.93	-1.86
	Change	0	0.02	5.66*	42.19*	-9.32*	-4.73*

Note: Foreign exchange rates are USD rates and statistics for both levels and change in levels are reported. ADF(4) = Augmented Dickey Fuller test with 4 lag terms, including intercept and trend. PP(4) = Phillips Perron test with 4 lag terms, including intercept and trend. Lag choice appears to have little impact on the reported results. The 5% critical value for the unit root tests is –3.41.

Table 2
Natural Log of Consumer Price Indices – Descriptive Statistics (N = 103)

Country		Mean	Std. Dev	Skewness	Kurtosis	PP(4)	ADF (4)
Indonesia	Levels	4.03	0.79	-0.58*	-0.55	-3.11	-4.24*
	Change	0.03	0.03	2.47*	9.02*	-7.85*	-2.71
Malaysia	Levels	4.41	0.3	-0.52*	-0.6	-2.47	-4.07*
	Change	0.01	0.01	1.75*	4.89*	-5.97*	-4.25*
Philippines	Levels	3.84	0.95	-0.16	-1.32*	-1.74	-2.26
	Change	0.03	0.03	1.90*	6.67*	-6.16*	-5.37*
South Korea	Levels	4.1	0.69	-0.70*	-0.72	-1.15	-2.35
	Change	0.02	0.02	1.64*	3.30*	-5.75*	-3.49*
Thailand	Levels	4.27	0.46	-0.60*	-0.68	-2.11	-3.04
	Change	0.02	0.02	1.79*	3.96*	-5.35*	-3.68*
USA	Levels	4.26	0.42	-0.54*	-1.00*	-0.32	-1.85
	Change	0.01	0.01	0.93*	0.33	-4.61*	-3.26

Note: Levels and change in levels of the local inflation rates and the USA inflation rate. ADF(4) = Augmented Dickey Fuller test with 4 lag terms, including intercept and trend. PP(4) = Phillips Perron test with 4 lag terms, including intercept and trend. Lag choice appears to have little impact on the reported results. The 5% critical value for the unit root tests is –3.41.

Table 3
Quarterly PPP Divergence – Descriptive Statistics and Unit Root Tests (N = 103)

Country	Mean	Std. Dev	Skewness	Kurtosis	PP(4)	ADF (4)
Indonesia	7.13	0.37	-0.38	-1.31*	-2.73	-2.79
Malaysia	0.76	0.16	-0.18	-1.13*	-2.71	-3.48*
Philippines	3.04	0.13	0.19	-1.35*	-1.76	-1.71
South Korea	6.63	0.11	0.55*	-0.55	-1.86	-2.06
Thailand	3.14	0.1	-0.06	-1.33*	-2.2	-2.48

Note: Quarterly PPP divergence ($dt = s - p + p^*$) where s, p, p* are the continuously compounding return on the exchange rate, local inflation rate and base inflation rate (USD or AUD) respectively. This provides a measure of the level of PPP mis-pricing observed in the data. ADF(4) = Augmented Dickey Fuller test with 4 lag terms, including intercept and trend. PP(4) = Phillips Perron test with 4 lag terms, including intercept and trend. Lag choice appears to have little impact on the reported results. The 5% critical value for the unit root tests is –3.41.

Table 4
Quarterly PPP – Johansen Test (Trace Statistics) for Number of Cointegrating Vectors

Country	r = 0	r = 1	r = 2	Lags	LM(1)	LM(4)
Indonesia	95.71*	14.8	3.67	4	8.26	5.25
Malaysia	62.73*	13.14	6.1	5	23.53*	17.00
Philippines	54.22*	18.27	7.33	4	5.24	6.98
South Korea	42.34*	19.33	6.5	6	13.19	9.85
Thailand	42.54*	12.21	3.32	4	10.50	6.65

* Trace statistic is significant at the 5% level. The model chosen for testing is a VAR with the specified number of lags. The number of lags was chosen with reference to information statistics including the Schwartz Criterion as well the level of serial correlation evident in the residuals. An intercept is included in both the VAR and the cointegrating vector with critical values at the 5% level of significance of 42.20, 25.47 and 12.39. The tests are read as follows: no rejections is consistent with no cointegrating vectors (no stationary combinations are identified); reject r=0 but not r=1 suggests there is one cointegrating vector; reject r=0 and r=1 but not r=2 suggests that there are two cointegrating vectors and; reject r=0, r=1 and r=2 suggests there are three cointegrating vectors and the series are stationary. LM(1) and LM(4) are multivariate tests for serial correlation at lag 1 and lag 4 respectively.

Table 5
Error Correction Model with Exogenous US CPI

Country	Dependent Variable	Lags in VAR	FX F stat.	Local CPI F stat.	Speed of Adj't (t stat.)	Exogenous USA CPI F stat.	DW Statistic	R^2
Indonesia	FX	4	1.15	0.16	-0.1015 (-2.69**)	0.53	2.01	0.12
	Local CPI	4	1.74	3.59*	0.0307 (2.28**)	0.78	1.51	0.29
Malaysia	FX	5	4.43*	3.30*	-0.1328 (-2.35**)	4.04*	1.68	0.37
	Local CPI	5	1.44	7.34*	0.0023 (0.12)	1.28	1.91	0.48
Philippines	FX	4	7.47*	0.36	-0.0322 (-0.78)	0.05	1.98	0.30
	Local CPI	4	8.26*	11.97*	0.0308 (1.55)	2.99*	1.98	0.62
South Korea	FX	6	0.83	6.19*	-0.0825 (-2.46**)	2.62*	2.09	0.44
	Local CPI	6	0.95	0.79	-0.0139 (-0.74)	5.02*	2.02	0.62
Thailand	FX	4	1.64	1.83	-0.1012 (-1.79*)	0.97	1.96	0.12
	Local CPI	4	1.17	9.72*	-0.0374 (-1.21)	6.23*	1.95	0.54

Note:
* = 10% level of significance, ** = 5% level of significance. There are two equations in the vector error correction model for each country. The dependent variable identifies the equation within the VECM, foreign exchange (FX) or Local CPI (LCPI). The USA CPI (USACPI) is assumed exogenous. The VECM is of the form:

$$\Delta FX_t = \sum_{i=1}^{n-1} b_{1i}\Delta FX_{t-i} + \sum_{i=1}^{n-1} c_{1i}\Delta LCPI_{t-i} + ECT_{t-n} + a_1 + \sum_{i=1}^{n-1} d_{1i}\Delta USACPI_{t-i} + e_{1t}$$

$$\Delta LCPI_t = \sum_{i=1}^{n-1} b_{21i}\Delta FX_{t-i} + \sum_{i=1}^{n-1} c_{2i}\Delta LCPI_{t-i} + ECT_{t-n} + a_2 + \sum_{i=1}^{n-1} d_{2i}\Delta USACPI_{t-i} + e_{2t}$$

Where the number of lags in the VAR is n, Δ is the change in variable and ECT is the error correction term which consists of the residuals from a regression of the FX rate on the inflation rates or:

$$ECT_{t-n} = FX_{t-n} - f - jLCPI_{t-n} + gUSACPI_{t-n}$$

Granger Causality F-statistics for the foreign exchange coefficients, Local CPI coefficients and USA CPI coefficients, speed of Adj't (Speed of Adjustment) coefficients and associated t-statistics, Durbin Watson statistic and R square are reported for each of the two equations within each VECM.

Table 6
Exchange Rate Regimes 1980-1997

Regime	Indonesia	Malaysia	Philippines	South Korea	Thailand
September 1980	other	peg to composite basket	other	other	peg to composite basket
September 1985	man. float	peg to composite basket	indep. float	man. float	peg to composite basket
September 1990	man. float	peg to composite basket	indep. float	man. float	peg to composite basket
September 1996	man. float	man. float	indep. float	man. float	peg to composite basket
June 1997	man. float	man. float	indep. float	man. float	indep. float

Source: *International Financial Statistics* (International Monetary Fund, Washington D.C.), various years. We have used the IMF characterisation of country exchange rate regimes as managed, independently floating, and pegged. The term "other" is used in 1980 where either the rate was independent or where it did not fall into the standard categories. Similar details were not available from this source for 1975 or 1970.