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Exchange Rate Regimes and Policies in Asia

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RÉSUMÉ

Les régimes de change dans les pays d'Asie ne sont pas clairement définis. Officiellement, seul Hong Kong rattache sa monnaie au dollar américain, tandis que la plupart des autres pays ont adopté des régimes de « flottement administré », c'est-à-dire de taux de change flexible avec de fréquentes interventions officielles. Les régimes officiels sont donc souvent imprécis, et ils peuvent recouvrir plusieurs types de politiques *de facto*. Cet article s'attache à distinguer les régimes de change effectifs des régimes de change officiels déclarés au FMI. Il fait apparaître une discordance entre blocs commerciaux, blocs financiers et blocs monétaires en Asie. Les flux commerciaux sont de plus en plus intensifs entre les pays d'Asie autres que le Japon. Les flux de capitaux sont particulièrement dynamiques entre le Japon (et plus récemment les NPI) et les pays de l'ASEAN. Enfin, bien que le yen soit de plus en plus utilisé dans le libellé des dettes, et dans une moindre mesure, dans le libellé des transactions commerciales, il n'existe pas en Asie de bloc monétaire au sens d'une stabilité des taux de change vis-à-vis du yen.

L'analyse économétrique des taux de change nominaux et réels de 11 monnaies asiatiques (9 dans le cas de l'analyse réelle) vis-à-vis du dollar américain, du DM et du yen, sur des périodes allant de janvier 1974 à mai 1995, permet de démontrer l'inexistence d'un bloc yen.

Le lien entre la volatilité nominale de court terme et les fluctuations réelles de long terme dépend de la manière dont les variations du taux nominal corrigent les écarts cumulés d'inflation. Le rattachement nominal d'une monnaie à une ancre internationale provoque une appréciation réelle si ces écarts d'inflation ne sont pas compensés par des dévaluations nominales. Cependant, dans l'esprit des autorités monétaires, l'ancrage nominal doit permettre de faire converger le taux d'inflation national vers le taux étranger. A long terme, les ancrages nominaux et réels doivent donc être compatibles. A court terme, ils sont compatibles si le taux de change nominal n'est pas dévalué trop fréquemment, ou s'il est dévalué avec une grande régularité. Pour résumer, l'ancrage réel se rapporte à la stabilité de long terme du taux de change réel, tandis que l'ancrage nominal fait référence à la stabilité du taux de change nominal en niveau ou en variations pendant de plus courtes périodes.

L'analyse nominale porte sur la période 1974-1995, divisée en quatre sous-périodes qui coïncident avec les principaux épisodes du taux de change yen/dollar. Tout au long de la période, le dollar a continué à dominer les régimes de change des pays d'Asie. Le rôle du yen n'a pas augmenté au cours des dernières années: depuis mai 1990, tous les pays sauf le Bhoutan, la Chine, l'Inde et, dans une moindre mesure, les Philippines ont ancré leurs monnaies soit sur le dollar, soit sur un panier dans lequel le dollar est dominant. En outre, sur la période 1974-1993, le Pakistan, le Sri Lanka et Singapour semblent avoir ancré leurs monnaies au dollar en termes réels, alors qu'aucun pays n'a (même partiellement) stabilisé sa parité réelle vis-à-vis du yen.

Quelques statistiques sur les échanges commerciaux et financiers permettent d'expliquer ces résultats, dans le cadre d'un modèle simple d'ancrage optimal. On explique l'absence de bloc yen par la discordance entre, d'une part, la distribution des échanges par pays, et d'autre part, la distribution de la dette extérieure par devises. On montre que le développement des échanges entre les pays asiatiques autres que le Japon pourrait rééquilibrer les stratégies de change en direction d'une plus grande stabilité vis-à-vis du yen, ou inciter les pays d'Asie à adopter des régimes de change plus flexibles.

SUMMARY

The exchange rate regimes in Asian countries are not straightforward. Officially, only Hong Kong pegs its currency to the USD, whereas the exchange rate regimes of most countries are « managed floats », i.e. flexible exchange rates with frequent, official interventions. Thus, the official regimes are rather vague, and they include a wide range of *de facto* policies. This paper tries to disentangle the *de facto* exchange rate regimes from the official regimes which are reported by the IMF. Its main finding is that there is a mismatch between trade blocs, capital blocs and currency blocs in Asia. Trade flows are increasingly intensive between Asian countries other than Japan. Capital flows are specially dynamic between Japan (and, more recently, the NICs) and the ASEAN countries. Finally, there is no currency bloc in Asia in the sense of a stability of exchange rates *vis-à-vis* the yen, although there is an increasing use of the yen for denominating the debt and, to a lesser extent, for denominating trade transactions.

The absence of a yen bloc is evidenced through the econometric analysis of nominal and real exchange rates of 11 Asian currencies (9 for the real analysis) against the USD, the DM and the yen, over the 1974:01-1995:05 period.

The link between the short-run, nominal volatility and the long-run, real fluctuations depends on the drift of the nominal exchange rate compared to cumulated inflation differentials. Pegging a currency to an international anchor in nominal terms leads to a real appreciation if cumulated differentials are not compensated for by nominal devaluations. But in pegging their nominal rate, monetary authorities wish that the domestic inflation will converge towards the foreign rate. Hence, nominal and real pegs should be consistent in the long run. In the short run, the two pegs are consistent if the nominal exchange rate is not devalued too frequently, or if it is devalued with great regularity. In brief, a real peg is related to some long-run stability in the real exchange rate, while a nominal peg is connected to some stability in the nominal exchange rate over short periods.

For the nominal analysis, the 1974-1995 period was divided into four sub-periods matching the main turning points of the yen/USD exchange rate. All over the period, the USD stayed prominent in the exchange rate regimes of Asian countries. Recent years did not see a growing weight of the yen in the exchange rate policies: since 1990:05, all countries but Bhutan, China, India and, to a lesser extent, Philippines, have pegged their currencies either to the USD, either to a basket where the USD is prominent. In addition, over 1974-1993, Pakistan, Sri Lanka and Singapore pegged their currencies to the USD in real terms [1], while no country weighed the yen in its implicit, real basket peg.

A simple optimisation model is developed to rationalise these findings on the basis of a few statistics on regional flows of trade and capital. The absence of a yen bloc is explained by a mismatch between (i) the country-distribution of trade, and (ii) the currency-distribution of the external debt. It shows that the development of trade between Asian countries other than Japan may rebalance the exchange rate strategies in favour of more stability against the yen, or push Asian countries towards more flexible regimes.

[1] In the case of Singapore, there was a trend in the exchange rate against the USD.

Exchange Rate Regimes and Policies in Asia

Agnès Bénassy-Quéré[2]

I. INTRODUCTION

The exchange rate policies of Asian countries have become a great concern in recent years, especially because the large depreciation of the USD did not eliminate the trade deficit of the United-States *vis-à-vis* Asia, which amounted USD 61bn against Japan and USD 53bn against other Asian countries in 1994 [3]. The recent evolution of Asian exchange rates raises several questions. First, the Balassa effect would have predicted an appreciation in the real, effective exchange rate of the most advanced Asian countries [4]. Second, several developing countries in Asia are increasingly indebted in yen, and the appreciation of the yen has raised the burden of the external debt in such countries which have asked for some form of restructuring [5]. Finally, Asian countries have accumulated external reserves which now add up to one third of the world official reserves [6]. This accumulation of official reserves allows Asian central banks to intervene in the world foreign exchange markets, while Asian countries also stay major suppliers of international speculative assets.

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[3] Source: CHELEM-CEPII and DOTS (IMF).

[4] During the catching-up process, the productivity of the traded-goods sector increases more rapidly than that of the non-traded goods sector. If wages increase at the same speed in both sectors, prices will grow more rapidly in the non-traded goods sector than in the traded-goods sector. Given that the law of one price holds only in the traded goods sector, the real exchange rate of the whole economy appreciates. This effect was introduced by Balassa (1964). It seems that it did not take place in Asia (see Benaroya and Janci, 1996).

[5] See *Financial Times*, 01/17/1995.

[6] See IMF *Annual Report*, 1995.

The three points mentioned above suggest that some Asian countries may follow an exchange rate strategy, and that this strategy may be modified with the rising, yen-denominated debt burden. This paper studies the exchange rate policies of Asian countries and tries to rationalise these policies.

The emergence of a monetary bloc in Asia is often considered a natural process due to the increasing, real integration in the region (through trade and direct investment). According to the literature on optimal currency areas (Mundell, 1961; McKinnon, 1963), the incentive to maintain fixed exchange rates rises with the bilateral intensity of trade, with the mobility of the production factors (workers and capital) and with the proportion of common shocks. But a monetary bloc cannot be reduced to a zone with stable exchange rates, since this stability may come from the domination of a foreign currency over the region. During the Bretton-Woods area, for instance, Europe did not form a monetary bloc: the Bretton Woods system as a whole formed a monetary bloc. The European monetary bloc emerged progressively in the 1970s, and more seriously in the 1980s, as a successful attempt to stabilise intra-European exchange rates without any reference to a foreign currency. Such a story did not take place in Asia where no regional, monetary arrangement has been introduced for the moment [7]. The fact that some bilateral exchange rates may be relatively stable in Asia does not imply the existence of a monetary bloc, except if the zone of stable exchange rates includes the Japanese yen, which is the major potential competitor of the USD in the region. Here, the exchange rate policies of 11 Asian countries are analysed with reference to the major international currencies which may be chosen as monetary anchors in the region [8].

The exchange rate regimes in Asian countries are not straightforward. Officially, only Hong Kong pegs its currency to the USD, whereas the exchange rate regimes of most countries are « managed floats », i.e. flexible exchange rates with frequent, official interventions (Table 1). Thus, the official regimes are rather vague, and they include a wide range of *de facto* policies.

Table 1: exchange rate regimes at end-1994

Hong Kong	Peg to the USD	Indonesia	Managed float with USD ref.
Korea	Managed float.	Malaysia	Managed float.
Singapore	Managed float.	Philippines	Free float.
Taiwan	Not IMF member.	Thailand	Peg to a basket.
Bhutan	Peg to the Indian rupee	Pakistan	Managed float.
China	Managed float.	Sri-Lanka	Managed float.
India	Free float.		

Source: IMF, *Exchange Arrangements and Exchange Restrictions*, 1995.

[7] Central bankers have recently started to exchange some information and some financial support, but these experiments remain rather modest. See *Financial Times*, 11/21/1995.

[8] Thus, our study is complementary to that of Levasseur and Serranito (1996) who analyse the convergence of exchange rate policies in Asia, but do not study the (foreign) origin of this convergence.

How is it possible to disentangle the *de facto* exchange rate regimes from the official regimes which are reported by the IMF ? Two approaches may be taken. The first one looks at official reserves as well as interest rate management, and tries to derive the preferences of the government. This approach was used by Popper and Lowell (1994) on the case of the United-States, Canada, Australia and Japan. Studying official interventions assumes that interventions matter for the evolution of exchange rates, which has been questioned [9]. The analysis of the interest rate management does not lead to clear-cut conclusions either, given the fragility of estimates for the reaction function of the monetary authorities.

The second approach looks at the results of the exchange rate policies, i.e. at the variations of exchange rates. This approach was initiated by Frankel and Wei (1992, 1993) and Frankel (1993) who found some evidence of an increasing influence of the yen in the nominal exchange rate policy of some Asian countries since the early 1980s [10]. Basically, this method looks at the results of exchange rate policies, instead of studying the instruments (official reserves, monetary policy). The main problem is that the stability of the exchange rate can be obtained without any will from the monetary authorities, if most shocks are common shocks.

The link between the short-run, nominal volatility and the long-run, real fluctuations depends on the drift of the nominal exchange rate compared to cumulated inflation differentials. Pegging a currency to an international anchor in nominal terms leads to a real appreciation if cumulated differentials are not compensated for by nominal devaluations. But in pegging their nominal rate, monetary authorities wish that the domestic inflation will converge towards the foreign rate. Hence, nominal and real pegs should be consistent in the long run. In the short run, the two pegs are consistent if the nominal exchange rate is not devalued too frequently, or if it is devalued with great regularity. In brief, a real peg is related to some long-run stability in the real exchange rate, while a nominal peg is connected to some stability in the nominal exchange rate over short periods. Section 2 studies both types of pegs through measures of the volatility and econometric analysis, for a range of 11 Asian currencies over the 1974-1995 period [11]. Section 3 studies the rationale for exchange rate regimes in Asia. A simple optimisation model is proposed to rationalise the choice of a foreign anchor. A quick look at some statistics on trade and capital flows in Asia provides some orders of magnitude which are introduced as parameters in the model. Concluding remarks are given in Section 4.

[9] On the basis of daily data, Weber (1995) shows that most interventions are sterilised and have no lasting effect on the exchange rates.

[10] Haldane and Hall (1991) also used this method in order to investigate the sterling's transition from a dollar peg (in the mid-1970s) to a DM peg (in the late 1980s).

[11] The methodology differs from Frankel and Wei (1993) and Frankel (1993) in that both nominal and real pegs are analysed. Moreover, the nominal and the real pegs are defined so as to be consistent. Finally, near three years (1992:09-1995:05) are added to the sample, and lagged adjustements are allowed.

II. *de facto* EXCHANGE RATE REGIMES IN ASIA

Suppose that the monetary authorities of an inflationary country follow an implicit, foreign peg in real as well as in nominal terms. The short-run evolution of the real exchange rate depends on the type of the nominal peg. In case of a constant, nominal peg, the real exchange rate appreciates progressively, and then it is suddenly devalued. In the case of a crawling peg, the real exchange rate stays constant or appreciates slightly in the short run. In all cases, the real peg is characterised by the stability of the real exchange rate in the long run, while the nominal peg is defined either by a stability in the level of the nominal exchange rate or by a regularity of its variations in the short run. Hence, the methodology must differ when dealing with nominal pegs and with real pegs.

2.1. Nominal pegs

Nominal exchange rate policies can be examined first by comparing the volatility of monthly, nominal exchange rate variations against the USD and against the yen (Table 2) [12]. The volatility in the value of Asian currencies is always smaller against the USD than it is against the yen. The implicit link to the dollar was reinforced in recent years in Korea, Indonesia and Thailand, while it became looser for Bhutan, China and India [13].

Table 2: The relative volatility of monthly variations of nominal exchange rates against the USD (as a % of their volatility against the yen).

	1974:01-1978:10	1978:11-1985:02	1985:03-1990:04	1990:05-1995:05
Korea	73.1	49.3	27.0	21.1
Singapore	68.9	60.0	37.6	41.4
Indonesia	0.0	91.3	78.4	8.9
Malaysia	79.5	57.4	33.2	42.3
Philippines	39.3	73.9	28.2	51.7
Thailand	5.3	53.8	26.1	18.8
Bhutan	71.9	48.2	44.4	74.2
China	92.2	74.5	60.3	94.4
India	71.9	48.2	44.4	74.2
Pakistan	0.0	43.2	30.1	35.2
Sri-Lanka	91.7	40.7	39.2	55.5

Source: author's calculations based on IMF data (*International Financial Statistics*, line rf)

[12] The volatility is defined as the standard deviation of the first difference of the logarithmic exchange rate. With this definition, both a constant peg and a crawling peg imply a low volatility. For the choice of the sub-periods, see below.

[13] Taïwan is not included since it is not an IMF member. Several Asian countries (for instance, Vietnam and Myanmar) are missing due to insufficient or uninformative data.

The problem with this analysis is that a relatively low volatility against the USD does not preclude that Asian countries try to stabilise their nominal exchange rates against a *basket* of foreign currencies. Suppose the monetary authorities of country k wish to stabilise their currency against the USD, against European currencies (proxied by the DM) and against the yen, i.e. they try to limit the variations in the nominal exchange rates. They minimise the following loss function:

$$L = a_0\left(a(L)\Delta S_{k,\$} - s_0\right)^2 + a_1\left(b(L)\Delta S_{k,DM} - s_1\right)^2 + a_2\left(c(L)\Delta S_{k,Y} - s_2\right)^2, \quad \text{with} \quad a_0, a_1, a_2 \geq 0 \qquad (2.1)$$

a(L), b(L) and c(L) are lagged polynomials [14]. $\Delta S_{k,i}$ stands for the monthly log-variation of the nominal exchange rate of currency k against i. s_0, s_1, s_2 are the corresponding targets. $\sigma_i = 0$ in case of a fixed peg; $\sigma_i > 0$ in case of a crawling peg. Given that $\Delta S_{k,DM} = \Delta S_{k,\$} - \Delta S_{DM,\$}$ and $\Delta S_{k,Y} = \Delta S_{k,\$} - \Delta S_{Y,\$}$, the optimal exchange rate policy is:

$$\Delta S_{k,\$} = D + A(L)\Delta S_{k,\$} + B(L)\,\Delta S_{DM,\$} + C(L)\,\Delta S_{Y,\$} + u \qquad (2.2)$$

with

$$D = \frac{a_0 a(0) s_0 + a_1 b(0) s_1 + a_2 c(0) s_2}{a_0 a(0)^2 + a_1 b(0)^2 + a_2 c(0)^2}, \qquad A(L) = \frac{a_0 a(0)\left[a(0) - a(L)\right]}{a_0 a(0)^2 + a_1 b(0)^2 + a_2 c(0)^2},$$

$$B(L) = \frac{a_1 b(0) b(L)}{a_0 a(0)^2 + a_1 b(0)^2 + a_2 c(0)^2}, \qquad C(L) = \frac{a_2 c(0) c(L)}{a_0 a(0)^2 + a_1 b(0)^2 + a_2 c(0)^2}$$

The regression is carried out on the monthly average of nominal exchange rates for 11 Asian countries (source: IMF, *International Financial Statistics*). The behaviour of monetary authorities may be influenced by the fluctuations in the USD exchange rate against the yen and the DM. Here, four sub-periods are considered, matching the main turning points of the yen/USD exchange rate:

[14] $a(L) = \sum_{i=0}^{l} a_i\ L^i$, $b(L) = \sum_{i=0}^{l} b_i\ L^i$, $c(L) = \sum_{i=0}^{l} c_i\ L^i$, where L is the lag operator.

1974:01-1978:10: the USD depreciated

1978:11-1985:02: the USD appreciated

1985:03-1990:04: the USD depreciated sharply, and then stabilised

1990:05-1995:05: the USD depreciated.

The nominal peg was defined above by the short-run stability of the nominal exchange rate, as opposed to the real peg which concerns long-term trends. Hence, only three lags are included in the regression of equation 2.2. More lags will be included for the analysis of the real pegs. The econometric results do not suffer from the small number of lags since the lagged variables are rarely significant.

The results are reported in Table 3. B(0) and C(0) represent the short-run coefficients. Levasseur and Serranito (1996) have shown that the monthly variations of the Asian, nominal exchange rates against the USD are stationary over 1976-1994. Our results are consistent with this finding since when they are significant, the « long-run » estimates of A(L) (written A(1)) always differ significantly from 1. When A(1) is significant, the other « long-run » estimates are:

$$\tilde{B}(1) = \frac{B(1)}{1 - A(1)} \quad \text{and} \qquad \tilde{C}(1) = \frac{C(1)}{1 - A(1)}$$

Otherwise, we have $\tilde{B}(1) = B(1)$ and $\tilde{C}(1) = C(1)$. The « long-run » estimates are computed using a Wold decomposition (see Annex 1).

Surprisingly, several Asian countries have been weighing the DM in their implicit basket pegs for a long time. This is especially the case in Bhutan, India and Singapore. Only China, Korea, Indonesia and Philippines never stabilised their exchange rates against the DM, while Thailand has given only a small weight to the DM since 1985 [15].

Conversely, the yen appears quite infrequently in the implicit basket pegs, and this sort of peg is generally short-lived. Only Singapore weighed the yen over a long period (1978:11-1995:05). But the peg concerns only the very short run ($\tilde{C}(1)$ is not significant), and the weight falls over time: C(0) = 0.244 over 1978:11-1985:02, 0.126 over 1985:03-1990:04 and 0.096 over 1990:05-1995:05. Thailand has been weighing the yen since 1985:03, but the weight remains low (not exceeding 0.1). Finally, Pakistan and Philippines cannot be considered as using the yen as a partial anchor over the last sub-period, since C(0) and $\tilde{C}(1)$ are negative.

[15] $\tilde{B}(1)$ is negative for Korea over 1985:03-1990:04, which means that the currency depreciated against the USD when the DM appreciated. This behaviour is the opposite of a DM peg.

It can be argued that the regression of equation 2.2 does not provide good estimates due to multicolinearity problems. In a second step, the DM/USD exchange rate is dropped, and the following regression is carried out:

$$\Delta S_{k,\$} = D + A(L)\Delta S_{k,\$} + C(L)\,\Delta S_{Y,\$} + u \qquad (2.3)$$

The results are reported in Table 4. Not surprisingly, C(0) and $\tilde{C}(1)$ partially catch the previous DM effect. But the yen does not make for the DM, especially over the last sub-period where C(0) and $\tilde{C}(1)$ are not significant for Bhutan, India, Pakistan and Sri Lanka, while B(0) and/or $\tilde{B}(1)$ were significant for the corresponding countries in equation 2.2. Moreover, only Malaysia and, to a certain extent, Korea appear to weigh the yen in equation 2.3 while none of the estimates was significant for these countries in equation 2.2 (but the adjusted R^2 remain low).

Table 4: Estimates of the implicit, nominal basket pegs (equation 2.3).

1974:05-1978:10					1978:11-1985:02				
Country	C(0)	$\tilde{C}(1)$	$\bar{R}^2$	k(1)	Country	C(0)	$\tilde{C}(1)$	$\bar{R}^2$	k(1)
Bhutan	0.096	0.407**	0.283	0	Bhutan	0.203**	0.035	0.248	0
China	0.283	0.435	0.081	0	China	0.371**	0.014	0.472	0
Korea	Constant USD peg 1975:01 to 1979:12				Korea	0.073	0.032	0.245	12
India	0.096	0.407	0.283	0	India	0.179**	0.085	0.345	0
Indonesia	USD peg until 1978:10				Indonesia	0.037	-0.159	0.044	3
Malaysia	0.323**	0.281	0.112	9	Malaysia	0.315	0.229	0.592	0
Pakistan	USD peg until 1981:12				Pakistan	0.153**	0.180	0.363	0
Philippines	0.013	0.189**	0.238	11	Philippines	-0.262	-0.326	-0.035	0
Singapore	0.256**	0.214	0.160	12	Singapore	0.350**	0.346**	0.742	0
Sri Lanka	-0.154	-0.220	0.301	0	Sri Lanka	0.040	-0.115	0.185	0
Thailand	0.015**	0.026**	0.317	3	Thailand	-0.009	0.059	-0.059	0

1985:03-1990:04					1990:05-1995:05				
Country	C(0)	$\tilde{C}(1)$	$\bar{R}^2$	k(1)	Country	C(0)	$\tilde{C}(1)$	$\bar{R}^2$	k(1)
Bhutan	0.198**	0.131	0.283	0	Bhutan	-0.059	0.227	-0.084	0
China	-0.197	-0.063	0.134	0	China	0.272	0.705	-0.086	0
Korea	0.071**	0.653**	0.757	0	Korea	0.050**	0.158	0.224	0
India	0.174**	0.160	0.361	0	India	-0.070	0.292	-0.082	0
Indonesia	0.096	0.100	0.157	0	Indonesia	0.019	-0.005	-0.006	0
Malaysia	0.131**	0.030	0.356	8	Malaysia	0.090*	0.411**	0.256	0
Pakistan	0.127**	0.094	0.278	0	Pakistan	0.024	0.100	0.294	0
Philippines	-0.076*	-0.042	0.019	1	Philippines	-0.095	-0.477	0.146	0
Singapore	0.211**	0.066	0.410	0	Singapore	0.207**	0.170*	0.388	0
Sri Lanka	0.064	0.165**	0.347	0	Sri Lanka	0.107	0.105	0.224	0
Thailand	0.166**	0.109*	0.777	11	Thailand	0.137**	0.115**	0.795	0

* Significantly ≠ 0 at 10%. ** Significantly ≠ 0 at 5%. Source: author's calculations based on IFS data.
(1) highest order of autocorrelation of residuals (k = 0 to 12) at 5% (Breusch-Godfrey test).

The main conclusion that emerges is the absence of a yen bloc. In addition, the yen has not increased its role as a partial, nominal anchor in Asia since 1990. Our results confirm those of Frankel an Wei (1993) who found « no special role for the yen » in Korea, China, Thailand and Singapore, except on the 1988:01-1992:08 where they found a statistically significant, but low coefficient on the yen in Thailand and Singapore. But in contradiction with Frankel (1993) we cannot conclude to an increasing role of the yen in the region [16].

When B and C do not significantly differ from zero, and when the explanatory power of equations 2.2 and 2.3 is low (it is often the case over the last sub-period), the econometric analysis does not allow to say whether Asian countries follow a USD peg, or whether they do not follow any peg. But Table 2 shows that over the last sub-period, the volatility of the nominal exchange rate against the USD is smaller than ½ of its volatility against the yen in Korea, Indonesia, Pakistan and Sri Lanka. It can be concluded that the latter countries follow a USD peg [17]. By contrast, Bhutan, China, India and, to a lesser extent, Philippines, would follow a floating regime [18]. Finally, only Singapore, Thailand and, to a lesser extent, Malaysia, seemed to peg their currencies to a basket of international currencies over the last sub-period, although the weights of the yen and of the DM remained low.

2.2. Real pegs

Because the short-run volatility of prices is much lower than that of nominal exchange rates, the short-run volatility of real exchange rates is generally similar to that of nominal exchange rates. But the long run volatility of both exchange rates differ since the nominal exchange rate can adjust in order to stabilise the real exchange rate. Thus, the analysis of real pegs must rely on the long-run evolution of real exchange rates.

The usual approach to long-run economic relationships is the unit-root and cointegration analysis. In a first step, unit-root tests were carried out over the 1974-1993 period. Real exchange rates are calculated with monthly output prices [19]. Although more reliable, consumer prices are not suited to the problem of measuring external competitiveness, because they include the prices of imported goods and of non-traded goods. Conversely, export prices are not available for most of the countries under review. Output prices are available for all countries but Bhutan and China.

[16] Frankel (1993) uses a purchasing power over local goods (the inverse of the local price level) as the numeraire, while our results are based on nominal exchange rates against the USD. The difference in the results can be due to the choice of a numeraire, to the samples, or to the model specification (Frankel does not include lags in the regressions).

[17] For Indonesia, Pakistan and Sri Lanka, this conclusion is reinforced by the fact that the constant is significant in equations 2.2 and 2.3.

[18] This finding partially fits the official regimes which are a free float for India and Philippines, and a peg to the Indial rupee for Bhutan.

[19] Source: IMF, *International Financial Statistics*, line 63 (wholesale prices).

Most Asian real exchange rates appear to be non-stationary in level, but stationary in first differences, both against the dollar and against the yen (Annex 2). Only in Pakistan and Sri Lanka is the level of the real exchange rate stationary against the dollar: the news affecting both exchange rates do not have any lasting effect. This result can be interpreted as an attempt by the monetary authorities to compensate the news in order to control the evolution of the real exchange rate in the long run. Conversely, the only case of stationarity against the yen is that of Philippines. But the real exchange rate of the Philippinian peso against the USD is stationary too. Thus, it is not possible to conclude on the unit root analysis for Philippines. For all other currencies, the real exchange rate both against the dollar and against the yen is I(1), which does not allow to conclude either.

In a second step, cointegration analysis was carried out for I(1) currencies. The test consists in looking for a linear combination of the k/USD and the yen/USD exchange rates which may be stationary over 1974-1993 [20]. In fact, no cointegration relationship was found (see Annex 2).

In brief, the unit-root analysis does not allow to conclude about the real pegging behaviour of Asian currencies, except for Pakistan and Sri Lanka which appear to be USD-peggers. The cointegration analysis shows that Asian currencies do not follow the yen in real terms in the long run. But the test is rather restrictive since it requires that the residuals of the regression be stationary, which will not be the case if some variables are omitted.

A less-demanding test of real exchange rate policy consists in regressing equation 2.4 in order to measure the long-run impact of DM/$ and yen/$ variations on each real exchange rate against the dollar:

$$\Delta E_{k,\$} = F + G(L)\Delta E_{k,\$} + H(L)\Delta E_{DM,\$} + J(L)\Delta E_{Y,\$} + e \qquad (2.4)$$

where $E_{k,i}$ is the logarithm of the real exchange rate of k against i, and L is the lag operator [21]. Equation 2.4 can be derived from the minimisation of a loss function similar to 2.1. Additional lags (totalising 12 lags) are included here since monetary authorities generally adjust the nominal exchange rate with a lag when inflation differentials accumulate if they also have a nominal anchor (in this case, adjusting the nominal exchange rate in response to inflation is costly). This leads to short-run fluctuations in the real exchange rate that do not preclude the existence of a real anchor.

[20] The yen/USD exchange rate is also stationary in first difference, which allows to test for cointegration.

[21] The exchange rates are first-differenciated because only their first differences are stationary. In the case of Philippines, the real exchange rate is stationary both against the USD and against the yen. Thus, the following regression is carried out: $E_{k,\$} = F + G(L)E_{k,\$} + J(L)E_{k,Y} + e$. The long-run estimate $\tilde{J}(1)$ does not significantly differ from 0 at 5%, which means that Philippines does not weigh the yen in their implicit basket pegs. This can be shown by re-arranging the above equation as: $E_{k,\$} = F + (G(L) - J(L))E_{k,\$} + J(L)E_{Y,\$} + e$.

Following this analysis, only long-run estimates are of interest. Like in the nominal case, they are estimated using a Wold decomposition (Annex 1).

The regressions are carried out over the 1974-1993 period, with seasonal dummies. The sum of the auto-regressive coefficients (G(1)) is always significantly different from one, which is consistent with I(1) or I(0) real exchange rates and allows to interpret $\tilde{H}(1) = \frac{H(1)}{1-G(1)}$ and $\tilde{J}(1) = \frac{J(1)}{1-G(1)}$. The two latter coefficients do not significantly differ from zero, except in Thailand where the adjusted R^2 is very low (Table 5). Other Asian countries do not give weight to real fluctuations of the DM/$ or yen/$ rates in their implicit basket peg. This can be interpreted as a peg to the USD (with an appreciation trend) in Singapore where the constant is highly significant and the adjusted R^2 not very low. For other countries, the results can be interpreted either as a peg to the USD or to no peg at all.

Table 5: Estimates of the implicit, real basket pegs (equation 2.4).

Country	F	G(1)	$\tilde{H}(1)$	$\tilde{J}(1)$	$\overline{R}^2$	k [(1)]
India	0.004	0.105	0.287	0.064	0.145	0
Indonesia	-0.010	-0.221	-0.127	-0.278	0.139	0
Korea	0.007**	0.256	0.088	0.148	0.101	0
Singapore	-0.007**	0.265	0,188	-0.027	0.375	0
Thailand	0.000	0.103	0.372**	-0.088	0.098	0
Philippines [(2)]	4.828**	0.901**	-	-0.040	0.960	3

* Significantly ≠ 0 at 10%. ** Significantly ≠ 0 at 5%.
[(1)] highest order of autocorrelation of residuals (k = 0 to 12) at 5% (Breusch-Godfrey test).
[(2)] see footnote 21.

In sum, Pakistan, Sri Lanka, and to a lesser extent, Singapore seem to peg the dollar in real terms. Other countries follow a USD real peg or no real peg at all. The results concerning nominal anchors differ according to the sub-periods considered. But over the last sub-period, only Thailand, Singapore and, to a certain extent, Malaysia, weighed the yen in their implicit basket pegs. In the three cases, however, the USD remained prominent.

III. RATIONALE FOR EXCHANGE RATE POLICIES IN ASIA

This section studies the rationale for the very modest role played by the yen as a regional anchor. For convenience, NICs (New Industrialised Countries) refers to the group comprising Hong Kong, South Korea, Taiwan and Singapore; and the ASEAN (Association of South Eastern Asian Nations) is held as the group which includes Indonesia, Malaysia, Philippines and Thailand.

This section begins with the choice of an exchange rate regime in Asia (Section 3.1). Then, it turns to the choice between the dollar and the yen as foreign anchors (Section 3.2). A simple optimisation model is proposed in Section 3.3 in order to rationalise the stylised facts presented in the previous section.

3.1 Choosing an exchange rate regime in Asia

The choice of an exchange rate regime in developing (or transition) countries can be viewed as a trade-off between the « real target approach » and the « nominal anchor approach » (see Corden, 1993). In theory, both approaches exclude each other. According to the former, nominal exchange rate fluctuations can have an impact on the real exchange rate, in the Keynesian tradition. Conversely, the nominal anchor approach stipulates that a nominal exchange rate policy can help reducing inflation without any lasting effect on real variables, in the monetarist tradition. In practice, countries which peg their nominal exchange rate wish that their inflation rate will converge towards the inflation in the anchor country. In the mid-time, they allow for a real appreciation that helps reducing inflation at the expense of external competitiveness. Discretionary or pre-announced devaluations help reconciling the nominal objective with the real target during the disinflation process.

The NICs and the ASEAN countries have followed an export-oriented development strategy. India and China have turned to this strategy in recent years. This strategy is based on the external in order to promote exports and attract foreign direct investment. In recent years, NICs' current accounts (except that of Korea) have turned to surpluses, while ASEAN countries were running deficits (Table 6). Following the balance of payment cycle theory, the NICs may progressively allow for a real appreciation of their currencies, while the ASEAN countries would keep an objective of external competitiveness until they accumulate a positive net external position.

Table 6: Some macroeconomic indicators in selected Asian countries.

	CPI inflation % in 1995 (1)	Current account % GDP, 1995 (1)	Export/GDP ratio, % in 1993 (2)	Net external debt, % of GNP 1993 (3)	Long-term debt service, % of GDP, 1993 (3)
Hong Kong	9.0	n.a.	26.1	n.a.	n.a.
Korea	4.5	-2.0	24.9	14.4	2.5
Taiwan	3.7	1.6	38.6	n.a.	n.a.
Singapore	1.7	18.3	84.3	n.a.	n.a.
Indonesia	9.4	-3.7	25.7	65.9	8.6
Malaysia	3.4	-8.5	71.4	37.8	6.1
Philippines	8.1	-3.3	21.7	63.7	8.3
Thailand	5.8	-7.1	27.3	37.6	6.5
Bhutan	8.0	n.a.	n.a.	36.4	2.8
China	14.8	2.3	19.1	21.4	2.2
India	10.2	-1.5	8.8	37.3	3.2
Pakistan	12.3	-3.8	12.8	49.7	6.1
Sri Lanka	7.7	n.a.	n.a.	65.5	3.6

Sources: (1) IMF, *World Economic Outlook*, may 1996.
(2) CEPII-CHELEM data base, 1995.
(3) World Bank, *World Debt Tables*, 1994-95.

However, the current account is not just a question of external competitiveness, when there is an external debt denominated in foreign currencies: a depreciation in real terms improves the trade account if the Marshall-Lerner condition is verified, but the external debt is revalued. The net effect on the current account is uncertain. This argument

applies especially to Indonesia and Philippines where the external debt represents over 60% of their GNP. With a 10% debt service/GDP ratio, a 10% depreciation against the currency of denomination induces a rise in the debt service ratio by 1 percentage point [22]. On the other hand, a depreciation of the currency raises external competitiveness. With an export/GNP ratio of 25%, the net effect of a depreciation on the current account is positive if the sum of the price elasticities of exports and imports exceeds 1.4 (instead of 1 if there is no external debt). Thus, the net effect of a currency depreciation on the balance of payments is ambiguous in a highly indebted country [23].

3.2 Choosing a foreign anchor

Assuming that Asian countries wish to stabilise their real exchange rates, they still have to choose between various foreign anchors. Following the above analysis, the choice of a foreign anchor depends on the country and currency breakdown of trade and capital flows.

a. Trade flows

The breakdown of Asian external trade by country is detailed in Annex 3 for 1973 and 1993.

For the NICs, the US market is not as important as it used to be, while Asian markets are developing. On the import side, Asian countries, including Japan, are larger suppliers than the US, even though the latter represents 20-21% of imports in Korea and Taiwan.

The US remains an important market *for the ASEAN countries* (especially for Philippines), but an increasing share of exports is directed to the NICs. On the import side, the US is a small partner compared to Japan and to the NICs.

Lastly, the external trade of India and Pakistan is EC-oriented. Chinese exports are diversified, while its imports come mainly from Asia.

Kwan (1994) makes a clear distinction between the NICs, which mainly compete between each other in the US market, and ASEAN countries, which have Japan as their main partner for imports. The analysis here shows that this distinction, while quite impressive in 1973, is now vanishing due to two trends: (i) intra-NICs trade is developing

[22] In theory, indebted countries should be indifferent to the currency of denomination of their debt if the uncovered interest parity (UIP) holds, because any change in the exchange rate would be compensated by an interest differential. In fact, asset holders are risk-adverse, and the UIP does not hold. In practice, exchange rates are much more volatile than interest rates, and the cost of the external debt is more dependent on valuation effects than on interest rates differentials.

[23] In theory, the trade balance is influenced by the real exchange rate while re-evaluation effects are due to variations in the nominal exchange rate. But a developing country considers the world inflation as exogenous. The evolution of its real exchange rate basically depends on that of its nominal exchange rate compared to domestic inflation. While the external debt is influenced by the nominal exchange rate, the nominal GDP depends on domestic inflation. Hence, the debt ratio rises when the real exchange rate depreciates.

at the expense of exports to the US and to Japan, and (ii) NICs have also become major suppliers for ASEAN countries, at the expense of Japan [24].

It has become a conventional wisdom to say that, unlike Europe, Asia is not a trade bloc. Maswood (1994) argues that such a bloc should include Japan. Yet Japan's trade intensity index declined between 1980 and 1991 for East Asia, while it increased for the United States [25]: the rising share of the Asian countries in total Japanese exports was more than explained by the dynamism of Asian countries as importing countries. In a similar way, Frankel and Wei (1993) and Frankel (1993) estimate a gravitational model of trade. They test whether trade bloc dummies are significant in explaining trade flows, even when the distance or the openness are included in the regressions. They conclude that unlike Europe and the Western Hemisphere, Pacific and East Asian blocs seem to have weakened in the 1980s. The expansion of trade in these two blocs was simply in line with their economic development, their geographic proximity and their opening trend. But it is not important here to know whether intra-Asia trade expansion was due or not to a specific trade bloc effect. The important thing is that (i) there is a trade dynamism between non-Japan, Asian countries, (ii) the role of Asia as a trading partner is growing for Japan, and (iii) the role of Japan as a trading partner is declining for most of the other Asian countries.

b. Capital flows

Capital flows between Asian countries are well described in Kwan (1994). Traditionally, Japan was running a trade deficit with the ASEAN countries because of large oil imports from Indonesia and Malaysia. But in recent years, the large flow of direct investment from Japan to the ASEAN countries has stimulated Japanese exports of investment goods. The trade deficit turned into surplus in 1992. The Asian NICs also provide foreign investment to the ASEAN countries (Taiwan is running a surplus *vis-à-vis* the ASEAN countries).

There is a long tradition of trade surpluses of Japan *vis-à-vis* the Asian NICs, and this surplus has increased in recent years. As a whole, in 1994, the surplus of Japan *vis-à-vis* Asia was of $63 bn while its surplus *vis-à-vis* the US was of $61 bn [26]. But Japanese investment in ASEAN countries is being caught up by the NICs, which are increasingly investing in the region. In fact, every stage of the balance of payment cycle is represented in Asia. Thus, there are good grounds for further development of capital flows between Asian countries.

The role of Japan as a direct investor in Asia has been widely documented. In 1994, the stock of direct investment of Japan in Asia was $51 bn, while that of the US

[24] Singapore is the only NIC whose exports to the US have expanded faster than its total exports, while Malaysia is the only ASEAN country whose imports from Japan have expanded faster than its total imports.

[25] The trade intensity index is defined as the ratio of the reporting country exports to total world exports, divided by the ratio of the target country imports to total world imports. Thus, the bilateral trade is corrected for the share of each partner in the world trade.

[26] Source: CEPII-CHELEM data base.

amounted only to $46 bn [27]. However, Japanese direct investments to the NICs have been decreasing since 1989, while those to ASEAN countries have increased steadily since 1986 (see MITI, 1994). The NICs have also begun to invest massively in ASEAN countries, and the stock of direct investment amounted to $88 bn in 1994 (see Footnote [27]).

The role of banks located in Japan is shown in Table 7. The share of Japan as a creditor is always much larger than that of the United States, except in Thailand. Pakistan is a second exception, with credits coming mainly from Europe. Finally, the yen is already the major currency for long-run debts in the ASEAN countries (Table 8).

Table 7: International bank liabilities by creditor country, at end-1994 (% of total external bank debt)

	United States	Japan		United States	Japan
South Korea	9.7	30.9	Indonesia	7.2	53.7
Taiwan	12.1	25.7	Malaysia	10.2	43.3
China	2.3	34.5	Philippines	14.7	39.3
India	8.1	28.7	Thailand	61.0	6.2
Pakistan	6.0	7.8			

Source: BIS, *Ventilation par Echéance, Secteur et Nationalité des Prêts Bancaires Internationaux*, juillet 1995.

Table 8: Currency composition of the long-term debt in selected Asian countries in 1993

	US dollar	Yen	Multiple currency		US dollar	Yen	Multiple currency
China	54.2	21.0	20.6	Indonesia	13.2	40.7	30.6
India	55.0	12.8	14.6	Malaysia	25.1	37.5	21.8
Pakistan	34.5	14.2	32.4	Philippines	30.2	38.3	25.3
Sri Lanka	36.4	27.4	18.1	Thailand	21.8	52.1	18.6

Source: The World Bank, *World Debt Tables*, 1994-95.

To summarise, three stylised facts emerge from the above analysis of the Asian economies:

- First, there is an intra-regional trade dynamism among Asian countries other than Japan. Asia as a whole has also become a major partner for Japan, although the reverse is not true: the role of Japan as a trade partner has diminished for Asian countries since 1973.

- Secondly, Japan is the main foreign investor in Asia, although Asia is not the main destination for Japanese direct investments. The NICs play an increasing role in financing the ASEAN countries.

[27] Source: CEPII calculations based on *World Investment Report*, *Survey of Current Business* and MITI data. In fact, Asia is not the main destination of Japanese direct investments (on this point, see De Laubier, 1995).

- Finally, the yen already plays a major role in the external debt of Asian countries. This feature is likely to be important for the exchange rate policy in countries which have a large debt/GNP ratio, i.e. in Indonesia and Philippines.

Given the increasing weight of the yen-denominated debt, and the development of intra-regional flows of trade and capital, there should be a rising incentive for Asian countries to use the yen instead of the US dollar as a foreign anchor. But the key point is that Japan is not the centre of their trade strategies. Each Asian country faces numerous, small Asian partners, and a single, very large, American partner. Their trade strategy will likely continue to be defined in relation to this large partner, unless some form of monetary coordination emerges in Asia [28]. The next section provides a simple model in order to infer the optimal foreign anchor for an Asian currency.

3.3. A simple model simple model for the choice of a foreign anchor

a. The small country case

Suppose the public authorities of a small, Asian country wish to minimise the squared discrepancies between the external account b and a target $\bar{b}$ (both as percentages of the nominal GDP) [29]:

$$Min\ \Omega = \frac{1}{2}(b - \bar{b})^2 \qquad (3.1)$$

For simplicity, we assume that the monetary authorities optimise over a single period. The external account considered here is the sum of the trade balance and of the debt service (interests + principal repayments). Thus, the external account represents the needs for additional foreign financings:

$$b = hd\ e - s\ \ f + b_0 \qquad (3.2)$$

e represents the logarithm of the real, effective exchange rate corresponding to the country distribution of external trade [30]. *f* is the logarithm of the real, effective exchange rate corresponding to the currency breakdown of the external debt. η is the export/GDP ratio, δ is the sum of the price elasticities of exports less one ($\delta > 0$ if the

[28] Monetary coordination may be initiated by another country than Japan. In November 1995, for instance, the Governor of the Australian central bank proposed the creation of an institution for regional coordination. However, Japan may recognise the needs for regional coordination. For this purpose, it could use the existing EMEAP (Executive Meeting of East Asia and Pacific Central Banks), which broadly covers non-American members of the APEC and was created by the Bank of Japan in 1991.

[29] The squared formulation keeps the model tractable. The symetry in the loss function is unrealistic since a country will generally prefer a positive current account. Nevertheless, this is not a big problem for developing countries in Asia where the current account is generally negative (see Table 6). Thus, the program generally consists in minimising the deficit.

[30] The trade balance can be extended so as to include direct investment which responds to exchange rate variations in a similar way to trade flows.

Marshall-Lerner condition is satisfied), σ is the debt service/GDP ratio, and b_0 covers omitted variables.

The effective exchange rates can be defined as follows:

$$\begin{cases} e = e_{\$} s_{\$} + e_Y s_Y & (3.3) \\ f = j_{\$} s_{\$} + j_Y s_Y & (3.4) \end{cases}$$

where s_i is the logarithm of the real, bilateral exchange rate against currency i (i=$,Y), ε_i is the weight of currency i-country as a trade partner and j_i is the weight of currency i in the denomination of the external debt. At this stage, we assume $e_{\$} + e_Y = 1$ and $j_{\$} + j_Y = 1$ [31]

With $s_{Y\$}$ standing for the real exchange rate of the yen against the dollar, the minimisation of the loss function leads to the optimal reaction to yen/USD fluctuations:

$$\frac{\partial s_{\$}}{\partial s_{Y\$}} = \frac{hde_Y - s j_Y}{hd - s} \qquad (3.5)$$

- With no external debt (σ=0), the above solution simply becomes $\frac{\partial s_{\$}}{\partial s_{Y\$}} = e_Y$: when the yen appreciates by 1% against the USD, the currency of the small, Asian country appreciates by e_Y% against the USD, so that its effective exchange rate *e* stays constant.

- If the currency breakdown of the external debt fits the country distribution of trade ($j_Y = e_Y$), we also have $\frac{\partial s_{\$}}{\partial s_{Y\$}} = e_Y$, because keeping *e* constant leads to a constant *f* too. In the special case where $e_Y = 1$ (100% of trade is done with Japan), pegging the yen becomes optimal [32].

- If $s \approx hd$, the optimal exchange rate policy is undetermined since an exchange rate variation has no net effect on the external account.

It was shown in Section 3.2 that in Asia, we have $hd > s$ and $e_Y < j_Y$. The following orders of magnitude can be derived for ASEAN countries like Philippines or Thailand:

[31] More specifically, all trade flows with countries outside Japan are supposed to be with the US, and the external debt that is not denominated in yen is assumed denominated in US dollar. The former assumption is relaxed in the two-country framework.

[32] In Asia, we have $e_Y << 1$, but for Central and Eastern European Countries, the European Union sometimes represents more than 80% of external trade. If the role of the forthcoming Euro for debt-denomination was to reach 80% too, there would be some good grounds for a peg to the Euro.

$h = 0.25; e_Y = 0.2; s = 0.08; j_Y = 0.4$

Finally, the price elasticities of external trade have been estimated by Mimosa (1996) for the NICs, implying $\delta = 1.4$ [33]. With these figures, the optimal exchange rate policy is: $\frac{\partial s_\$}{\partial s_{Y\$}} = 0.14$. When the yen appreciates by 1% against the USD, the currency of the small country should appreciate by 0.14% against the USD in order to keep the external account constant. This small weight attributed to the yen in the optimal basket peg comes from the fact that (i) exchange rate fluctuations have a greater impact on the external account through trade flows than through the valorisation of the external debt service ($hd > s$); (ii) Japan plays a smaller role as a trade partner than the yen does as a creditor currency ($e_Y < j_Y$).

This result fits quite well the policies evidenced in Section 2. However, the small country framework hides the fact that a large part of the external trade of each Asian country is done with Asian partners.

b. The two-country case

Suppose now that there are two, identical, ASEAN countries, called A and B, which carry out some trade between each other and compete on the same foreign markets (the US and Japan). The bilateral trade between both countries represents $(1-e_\$ - e_Y) = (1-e)\%$ of the total trade of each country. Their currencies are not used for debt-denomination. The effective exchange rates of currency A must be re-defined as:

$$\begin{cases} e_A = e_\$ s_{A\$} + e_Y s_{AY} + (1-e) s_{AB} & (3.8) \\ f_A = j_\$ s_{A\$} + j_Y s_{AY} & (3.9) \end{cases}$$

where s_{Aj} stands for the exchange rate of currency A against currency j (j=$,Y,B). Similar relations prevail for currency B. Like in the small country case, each country minimises the squared discrepancy of its external account from a target. If country A takes for given the exchange rate policy of its partner, its optimal exchange rate policy does not change compared to the small country case (equation 3.5). But if it knows that country B will follow the same exchange rate policy, then its reactions to yen/$ fluctuations are modified:

$$\frac{\partial s_\$}{\partial s_{Y\$}} = \frac{hde_Y - s j_Y}{hde - s} \qquad (3.8)$$

[33] The estimates of the price-elasticities are 1.9 for exports and 0.5 for imports. δ is the sum of the elasticities less one. This estimate is applied to ASEAN countries due to the lack of estimates for the latters.

Now, when currency A depreciates against the USD, the effect on the trade account is reduced because currency B also depreciates. Thus, the optimal policy is rebalanced in favour of the yen. With $\varepsilon = 0.5$ [34], the optimal exchange rate policy is $\frac{\partial s_{\$}}{\partial s_{Y\$}} = 0.4$: when the yen appreciates by 1% against the dollar, the optimal policy now is to appreciate the currency against the dollar by 0.4%. But the solution of the optimisation problem becomes unstable for small values of ε. With $\varepsilon = 0.2$, we have $hde - s \approx 0$: the variations in the exchange rate have little impact on the external account since the valuation effects make for the competitiveness effects. In this case, there may be no optimal basket peg, i.e. the floating regime may be optimal [35].

Of course, this very simple model does not cover the whole rationale for the exchange rate policies in Asia. More specifically, this model does not describe trade-off made by the monetary authorities between various objectives. Here, pegging the currency to the optimal basket allows to reach the single objective. An interesting extension would be to introduce a second objective in the model. For instance, the monetary authorities may wish a real appreciation in order to reduce the inflation rate. Then, targeting the external account would have a cost in terms of the second objective. Such an enriched model would probably show that Asian countries may be better off in coordinating their exchange rate policies, because such a coordination would eliminate ineffective exchange rate fluctuations.

[34] As shown in Annex 3, approximately 50% of ASEAN countries' exports are directed to countries other than Japan or the US.

[35] The share of bilateral trade between A and B under-estimates the extent of the competition between both countries, because it does not consider competition on third markets. Considering the whole competition between both countries would lower ε.

ANNEXES

Annex 1: computing long-run estimates

The long-run estimates are computed using the Wold lag formula, which makes it possible to test with a Student t for the significance of the sum of the coefficients estimated for the lags of each explanatory variable. Consider equation 2.2:

$$\Delta S_{k,\$} = D + A(L)\Delta S_{k,\$} + B(L)\Delta S_{DM,\$} + C(L)\Delta S_{Y,\$} + e \qquad (2.2)$$

This relation can be re-written as:

$$\Delta S_{k,\$}(t) = D + A(1)\Delta S_{k,\$}(t-1) + \sum_{i=1}^{11} A_i^* \Delta^2 S_{k,\$}(t-i) + B(1)\Delta S_{DM,\$}(t) + \sum_{i=0}^{11} B_i^* \Delta^2 S_{DM,\$}(t-i)$$
$$+ C(1)\Delta S_{Y,\$}(t) + \sum_{i=0}^{11} C_i^* \Delta^2 S_{Y,\$}(t-i) + e$$

with $A_i^* = -\sum_{l=i+1}^{12} a_l$, $B_i^* = -\sum_{l=i+1}^{12} b_l$, $C_i^* = -\sum_{l=k+1}^{12} c_l$.

The same methodology is applied to the estimation of the implicit real basket pegs.

Annex 2: Unit root and cointegration analysis 1973-1993

Unit Roots

Three regressions are carried out:

(1) $$\Delta E_{i,j}(t) = \rho E_{i,j}(t-1) + \sum_{h=1}^{p} \gamma_h \Delta E_{i,j}(t-h) + u_t$$

(2) $$\Delta E_{i,j}(t) = c + \rho E_{i,j}(t-1) + \sum_{h=1}^{p} \gamma_h \Delta E_{i,j}(t-h) + v_t$$

(3) $$\Delta E_{i,j}(t) = c + \beta t + \rho E_{i,j}(t-1) + \sum_{h=1}^{p} \gamma_h \Delta E_{i,j}(t-h) + w_t$$

where p stands for the last significant lag ($p \leq 12$) which is chosen by an optimising procedure; c is a constant and u_t, v_t, w_t are the residuals. We test whether ρ differs significantly from zero using the augmented Dickey-Fuller test. If it does, than $E_{i,j}$ is stationary (I(0)), i.e. it tends in the long run to return to its past level (equation 1), to a constant (equation 2), or to an exogenous trend (equation 3). In all three cases, currency i can be said to use j as a real anchor.

Country	Real exchange rate /USD			Real exchange rate /DM			Real exchange rate /yen		
	Equation	Lags p	Concl.*	Equation	Lags p	Concl.*	Equation	Lags p	Concl.*
India	3	0	I(1)	3	9	I(1)	2	12	I(1)**
Indonesia	3	3	I(1)	3	0	I(1)	3	9	I(1)
Korea	3	6	I(1)	3	0	I(1)	3	12	I(1)
Pakistan	3	2	I(0)	3	1	I(1)	3	5	I(1)
Philippines	3	10	I(0)	3	10	I(1)	3	5	I(0)
Sri Lanka (1)	2	8	I(0)	3	12	I(1)	3	11	I(1)
Thailand	3	2	I(1)	3	7	I(1)	3	5	I(1)

*at 10%. ** Residuals auto-correlated. (1) From 1976:01.

Cointegration

The test consists in looking whether a linear combination of $E_{i\$}$ and $E_{Y\$}$ (resp. $E_{DM\$}$) is stationary, i.e. I(0). Using the Engle-Granger (1987) method, we regress:

(4) $$E_{i,\$}(t) = c + l E_{Y,\$}(t) + z(t)$$

Then, the stationarity of the residuals z(t) is tested using an augmented Dickey-Fuller unit root test. If z(t) is stationary, then $E_{i,\$}$ and $E_{Y\$}$ (resp. $E_{DM\$}$) are cointegrated and λ is the cointegrating coefficient.

Cointegration tests are carried out over the whole 1973-1993 period for I(1) curencies.

Country i	Cointegration between $E_{i,\$}$ and $E_{Y,\$}$			Cointegration between $E_{i,\$}$ and $E_{DM,\$}$		
	Lags p	ADF	λ	Lags p	ADF	λ
India	3	-2.55	0.040	3	-2.71	-0.050
Indonesia	2	-2.70	0.301	2	-2.58	-0.213
Korea	2	-1.62	0.199	2	-1.86	0.199
Thailand	3	-3.03	0.313	3	-2.37	0.292
Singapore	3	-2.65	-0.004	3	-2.58	0.063

* 10% rejection of the nul hypothesis of no cointegration.

Annex 3: Asian external trade

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Table 3: Estimates of the implicit, nominal basket pegs (equation 2.2).

1974:05-1978:10							1978:11-1985:02						
Country	B(0)	$\widetilde{B}(1)$	C(0)	$\widetilde{C}(1)$	$\overline{R}^2$	$k^{(1)}$	Country	B(0)	$\widetilde{B}(1)$	C(0)	$\widetilde{C}(1)$	$\overline{R}^2$	$k^{(1)}$
Bhutan	0.419**	0.545**	-0.046	0.133	0.532	0	Bhutan	0.278**	0.526**	0.039	-0.115	0.454	0
China	1.037**	0.890	-0.196	0.191	0.444	0	China	0.369**	0.483	0.147**	-0.073	0.615	0
Korea	Constant USD peg from 1975:01 to 1979:12						Korea	0.066	-0.132	0.026	0.066	0.174	12
India	0.419**	0.545**	-0.046	0.134	0.632	0	India	0.284**	0.640**	0.007	0.121	0.511	0
Indonesia	Constant USD peg until 1978:10						Indonesia	0.118	-0.060	-0.046	-0.134	-0.118	4
Malaysia	0.385**	0.541**	0.180*	-0.012	0.428	12	Malaysia	0.178**	0.358**	0.211**	0.115*	0.681	0
Pakistan	Constant USD peg until 1981:12						Pakistan	0.110*	0.144	0.082	0.144	0.366	0
Philippines	0.081	0.126	-0.016	-0.148	0.092	10	Philippines	-0.254	-0.009	-0.117	-0.322	-0.041	0
Singapore	0.554**	0.559**	0.038	-0.065	0.639	12	Singapore	0.162**	0.182**	0.244**	0.242	0.821	7
Sri Lanka	0.127	0.420	-0.186	-0.286	0.278	0	Sri Lanka	0.111*	0.238**	-0.023	-0.214	0.230	0
Thailand	0.003	-0.007	0.013	0.029	0.282	12	Thailand	-0.064	0.211	0.040	-0.005	0.124	0

1985:03-1990:04							1990:05-1995:05						
Country	B(0)	$\widetilde{B}(1)$	C(0)	$\widetilde{C}(1)$	$\overline{R}^2$	$k^{(1)}$	Country	B(0)	$\widetilde{B}(1)$	C(0)	$\widetilde{C}(1)$	$\overline{R}^2$	$k^{(1)}$
Bhutan	0.246**	0.022**	0.026	-0.077	0.502	0	Bhutan	0.095	0.809**	-0.125	-0.310	-0.011	5
China	-0.229	-0.543	-0.018	0.334	0.135	0	China	0.184	0.234	0.072	0.344	-0.139	0
Korea	-0.038	-0.453*	0.092	0.519**	0.758	0	Korea	-0.00	0.179	0.061	0.102	0.213	9
India	0.184**	0.432**	0.053	-0.054	0.525	0	India	0.085	0.787**	-0.117	-0.265	-0.023	7
Indonesia	-0.049	-0.115	0.122	-0.024	0.120	3	Indonesia	0.014	0.018	0.016	-0.015	0.143	0
Malaysia	0.111*	0.124	0.056	-0.078	0.369	8	Malaysia	0.081	0.122	0.026	0.132	0.250	0
Pakistan	0.106*	0.135	0.055	-0.012	0.294	0	Pakistan	0.155**	0.543**	-.106**	-.399**	0.540	0
Philippines	-0.004	-0.052	-0.064	-0.019	0.035	0	Philippines	0.043	0.313	-0.210*	-.678**	0.203	0
Singapore	0.119*	0.158	0.126**	-0.014	0.409	0	Singapore	0.211**	0.183**	0.096**	0.084	0.658	0
Sri Lanka	0.098	0.252	0.004	0.097	0.355	0	Sri Lanka	0.058	0.129*	0.020	-0.080	0.320	0
Thailand	0.057**	0.073*	0.125**	0.028	0.760	0	Thailand	0.075**	0.048**	0.103**	.070**	0.946	0

* Significantly ≠ 0 at 10%. ** Significantly ≠ 0 at 5%. Source: author's calculations based on IFS data.

(1) highest order of autocorrelation of residuals (k = 0 to 12) at 5% (Breusch-Godfrey test).

Orientation of exports by selected Asian countries (% of total exports of each country).

Exporting country	To the US		To Japan		To NICs		To ASEAN		To the EU15		Elsewhere	
	1973	1993	1973	1993	1973	1993	1973	1993	1973	1993	1973	1993
Japan	27.7	29.4	-	-	13.5	19.1	7.4	9.2	14.3	16.2	37.1	26.1
Hong Kong	35.3	22.5	5.7	4.0	5.0	8.9	2.7	3.7	32.6	21.6	18.7	39.3
Korea	33.6	21.3	37.8	14.3	5.7	11.1	2.0	7.7	10.7	12.1	10.2	33.5
Singapore	16.6	21.9	10.3	7.0	9.2	15.6	22.4	23.4	16.2	14.5	25.3	17.6
Taiwan	42.1	28.3	14.8	11.2	9.4	9.9	4.1	7.1	13.0	15.3	16.6	28.2
Indonesia	12.1	13.0	56.3	31.7	14.9	21.1	1.1	3.9	11.5	14.8	4.1	15.5
Malaysia	13.3	21.0	29.7	15.5	16.1	29.4	1.4	5.5	23.0	14.9	16.5	13.7
Philippines	35.2	38.2	40.4	18.9	4.7	12.2	1.2	3.5	13.0	16.4	5.5	10.8
Thailand	10.7	22.2	28.3	17.9	14.8	15.5	12.1	4.3	19.4	18.9	14.7	21.2
China	1.4	29.0	20.1	19.8	19.3	9.0	1.1	3.2	13.8	20.5	44.3	18.5
India	13.7	18.0	16.7	9.1	2.1	7.6	1.4	5.1	24.7	29.1	41.4	31.1
Pakistan	11.9	13.4	15.9	7.7	15.3	10.8	3.9	3.5	23.9	31.6	29.1	33.0

Source: CEPII-CHELEM data base.

Origin of imports of selected Asian countries (% of total imports of each country).

Importing country	From the US		From Japan		From NICs		From ASEAN		From the EU15		Elsewhere	
	1973	1993	1973	1993	1973	1993	1973	1993	1973	1993	1973	1993
Japan	24.6	22.1	-	-	6.5	11.8	12.1	12.3	9.2	13.8	47.6	40.0
Hong Kong	13.4	9.1	21.1	18.7	10.3	23.3	3.3	6.0	18.7	22.0	33.2	20.9
Korea	27.2	19.3	13.0	26.0	1.8	4.4	8.1	6.6	7.2	13.7	42.7	30.0
Singapore	15.5	14.3	20.6	22.6	5.9	9.6	17.1	21.5	15.9	13.1	25.0	18.9
Taiwan	22.4	20.5	38.8	32.8	4.4	7.3	4.5	6.3	13.9	14.5	16.0	18.6
Indonesia	17.4	10.8	36.5	23.6	9.4	20.5	2.6	3.0	20.5	21.6	13.6	20.5
Malaysia	8.2	16.0	22.1	26.7	13.9	26.1	7.7	5.3	22.0	14.1	26.1	11.8
Philippines	26.9	19.3	33.7	27.2	4.2	17.3	1.5	5.0	13.3	12.6	21.5	18.6
Thailand	13.1	9.1	38.3	31.2	8.1	17.2	1.3	5.7	20.4	16.6	18.8	20.2
China	13.8	11.6	20.3	26.7	3.7	27.7	1.7	3.1	16.3	14.5	44.2	16.4
India	16.5	11.3	10.5	6.5	0.9	11.0	1.0	1.9	29.4	31.3	41.7	38.0
Pakistan	29.8	8.6	13.3	15.0	1.7	8.3	0.8	6.8	26.2	27.6	28.2	33.7

Source: CEPII-CHELEM data base.

Share of oil in the external trade of selected Asian countries

Importing country	% of total imports	Exporting country	% of total exports
South Korea	11.7	Indonesia	15.5
Singapore	10.0	Malaysia	9.0
Philippines	10.2		
India	15.8		

Source: CEPII-CHELEM data base.