REAL AND EFFECTIVE EXCHANGE RATES *

A comparison of US and Hong Kong prices does not suggest that at the linked rate the HK dollar is either significantly over or under-valued. Two real effective exchange rate indices (REERIs) are presented for Hong Kong. Increased demand for Hong Kong services, and structural factors, resulted in the REERI based on consumer prices rising significantly during the 1990s. However, when the calculations are done using the prices of traded goods, the REERI shows no trend and relatively small fluctuations. This suggests the linked exchange rate system has provided stability without causing any loss of competitiveness for the traded goods sector.

The exchange rate against the US dollar

The HK dollar has been linked to the US dollar since October 1983. The combination of a modified currency board system and a resolute monetary policy has kept the market-determined exchange rate very close to the link rate of HK$7.8 = US$1. The average absolute deviation from the link rate has been only 0.3% over the period.

It has been claimed at various times that the HK dollar is either "over-valued" or "under-valued"; that the link is keeping the exchange rate away from some equilibrium value.[1] The implication usually drawn is that this will result either in a poor economic performance for the Hong Kong economy or that the link cannot be maintained. However, the economy's performance under the link does not seem to support this concern. Hong Kong's real GDP has grown at among the fastest rates in the world and consumer prices have increased no more rapidly than when Hong Kong had a floating exchange rate regime.

Discussions of whether currencies are "correctly" valued usually refer to developments in prices. The "law of one price" holds that, at least for freely traded goods with low transport costs, prices expressed in a common currency should equalise across countries. This idea is sometimes referred to as "absolute purchasing power parity" (PPP).

This belief is what leads people to compare the prices of certain homogenous commodities, such as a Big Mac or a Mars bar, across countries to assess whether currencies are over or under-valued. For example, at present according to *Economist* (1995) a Big Mac costs HK$9.50 here and US$2.32 in the US, implying a PPP value for the HK dollar of HK$4.10 to the US dollar. Of the 32 economies included in the *Economist's* comparison, HK had the second most undervalued currency on this basis. Of course Big Macs are not traded across national borders. Perhaps a better example is the internationally traded Mars bar which costs HK$4.50 here and 60 US cents in Washington. This implies a ratio of 7.5 HK dollars per US dollar, quite close to the linked exchange rate.

Rather than comparing just one price, of course, it is more instructive to compare a large number of prices. The most serious attempt to do this has been by the International Comparison Programme conducted under the auspices of the United Nations and the University of Pennsylvania with assistance from the OECD, World Bank, Eurostat and others. The researchers in this project collect between 400 and 700 prices from 1500 closely specified commodities or services in a growing number of countries every three to five years.[2] They are currently working on the results from their 1993 survey but these will not be released for some time.

The first column in Table 1 shows the results from their 1985 survey. For most of the broad categories shown here (but not necessarily all individual commodities and services within the categories) the PPP (i.e. the ratio of prices in HK dollars to prices in US dollars) was well below 7.8.

Table 1:
Purchasing Power Parities

	1985 PPPs (HK$/US$)	1985 - 1994 HK Price Increase	1985 - 1994 US Price Increase	1994 PPPs (HK$/US$)
Meat	5.95	55.0%	37.1%	6.73
Bread	3.14	110.4%	51.1%	4.37
Fish	4.02	94.2%	52.3%	5.13
Dairy products	5.11	118.9%	27.6%	8.77
Fruit & Vegetable	4.57	45.0%	52.2%	4.35
Oils & Fats	8.36	119.5%	22.6%	14.97
Non-alcoholic drinks	4.68	97.8%	18.1%	7.84
Alcoholic drinks	6.75	129.6%	42.4%	10.88
Tobacco	5.72	203.7%	88.5%	9.22
Furniture	5.90	34.2%	22.2%	6.48
Household textiles	3.38	53.9%	17.1%	4.44
Appliances	3.80	34.1%	-13.6%	5.90
Clothing	4.77	103.3%	25.4%	7.73
Footwear	3.74	55.5%	23.2%	4.72
Books & Magazines	8.14	151.1%	45.7%	14.03
Sporting goods	5.38	62.3%	16.8%	7.48
Cars	8.89	105.6%	28.2%	14.26
Rent, residential	6.20	106.0%	37.7%	9.28
Meals away from home	8.76	130.7%	34.5%	15.03
Public transport	2.00	114.5%	55.7%	2.76
Medical care	2.72	142.4%	85.9%	3.55
Entertainment services	3.23	97.2%	50.4%	4.24
Education	5.62	280.3%	100.3%	10.67
Private consumption	4.11	87.8%	38.9%	5.56
Government consumption	4.44	155.6%	34.1%	8.46
Residential building	9.84	105.7% (a)	32.9%	15.23
Other construction	4.33	125.6% (a)	23.9%	7.88
Equipment investment	6.74	60.4%	3.1%	10.49
Gross Domestic Product	4.68	110.1%	33.6%	7.36

Sources: 1985 PPPs from Table 5 in United Nations (1994). Prices from national sources. Note that definitions for some items may vary across these three sources. 1994 PPPs calculated by multiplying first column by (1+second column/100) and dividing by (1+third column/100). (a) 1985 – 1993 only.

So in 1985 most things were cheaper in Hong Kong than in the US.

The second and third columns show how much these prices increased between 1985 and 1994 in Hong Kong and the US respectively. This information can be used to update the PPP series in the first column from 1985 to 1994 and the result is shown in the final column.

The final column suggests that in 1994 housing, cars and books were more expensive in Hong Kong than in the US but most food, appliances and medical care were cheaper. This probably accords with the impression of most travellers.

It will be observed that in general the PPPs for 1994 are closer to the 7.8 linked rate than were those for 1985. This is not surprising. Hong Kong went through an extremely turbulent period in 1983. The exchange rate declined from HK$6.5 : US$1 at the start of the year to HK$7 : US$1 in June, then fell rapidly to touch briefly HK$9.6 : US$1 on September 24. After such turbulence, it is not surprising that the economy would take some time to adjust to the new linked exchange rate.

It will also be observed that in 1994 the PPPs are generally closer to the linked rate for those goods which can be readily traded, such as

clothing, drinks and sporting goods than for those components such as residential construction, public transport, medical care and restaurant meals, which by their nature cannot be readily traded.[3] This is again not surprising. If Asia makes cheaper clothing, Americans and Europeans will import them; they are less likely to come to Asia to get a cheaper haircut.
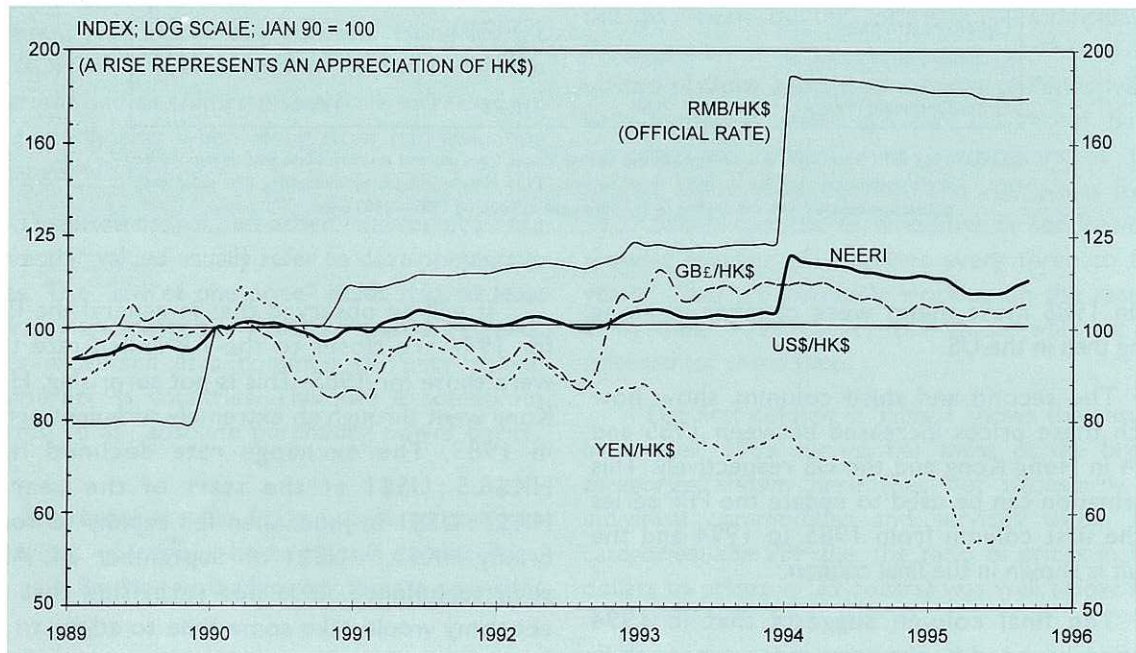
In terms of overall GDP the PPP rate for 1994 is HK$7.36 : US$1. Assuming the GDP deflator rises 8% in Hong Kong and 3% in the US, then the 1995 rate is HK$7.72 : US$1. That this rate is almost exactly the current exchange rate is partly a coincidence, given the differences in the composition of GDP in the two economies. The more pertinent calculation is to restrict the comparison to tradable goods such as those in the first 17 rows of Table 1. The weighted average PPP for these goods is between 7.0 and 8.5, depending on whether Hong Kong or US weights are used. Either way, given the margins of error involved in these calculations, purchasing power calculations do not suggest the linked rate is out of line.

The Nominal Effective Exchange Rate

In assessing the implications for trade, however, it is not just the rate against the US dollar which is important. The exchange rates against the currencies of our other trading partners also matter. Given the link, the movements of the HK dollar against these currencies will be determined by how they perform against the US dollar, rather than by any actions on the part of the Hong Kong authorities.

During the 1990s the US dollar, and hence the HK dollar, has tended to appreciate against the Chinese renminbi (RMB), depreciate relative to the Japanese yen and show little net movement against the pound sterling (Chart 1). To measure the overall strength of the HK dollar, a weighted average of these bilateral exchange rates, called the effective rate, is often used. It is referred to in this paper as the nominal effective exchange rate index (NEERI) as it makes no allowance for inflation rates. The NEERI is constructed by taking the percentage changes in the exchange rates of the HK dollar against the currencies of our major trading partners since a base period. The percentage

Chart 1
Nominal Exchange Rates

INDEX; LOG SCALE; JAN 90 = 100
(A RISE REPRESENTS AN APPRECIATION OF HK$)

RMB/HK$ (OFFICIAL RATE)

NEERI

GB£/HK$

US$/HK$

YEN/HK$

3   The major exceptions are those tradable goods where taxes drive a wedge between domestic and foreign prices. Alcohol and tobacco are subject to specific taxes in Hong Kong and new cars are subject to a registration fee of 40-60%.

changes are then weighted by the importance of the countries in Hong Kong's trade.[4] For the purposes of presenting the data in Chart 1, the NEERI is rescaled to be 100 in January 1990 and it was at 113 in September 1995, which means the HK dollar had appreciated by 13% in effective terms since January 1990.

There is a particular problem in the calculation of an NEERI for the HK dollar. The movement of the RMB has a significant influence on the index for the HK dollar since the RMB has the largest weight in the calculation. Before January 1994 there were two exchange rates for the RMB; the "official" rate and the "swap" rate. Over time, a series of reforms meant that fewer Chinese entities were required to transact at the official rate set by the authorities. Instead an increasing proportion of Chinese entities and all foreign enterprises were able to access swap centres. The swap rate, which reflected market forces to a greater extent, was more volatile. The two rates were unified on 1 January 1994 (Chart 2).

Chart 3 shows two NEERIs for the HK dollar. The solid line is the NEERI calculated using the official RMB rate only, which is the procedure used by the Census & Statistics Department. The sharp jump at January 1994 was caused by the merging of the official rate with the swap rate when the official rate for the RMB was de facto devalued from RMB5.7 = US$1 to the swap rate of RMB8.7.

It is commonly considered that most of China's trade with Hong Kong in the early 1990s was already conducted at the swap rate rather than the official rate. There is no exact data on the proportion of transactions at the swap rate. For illustrative purposes the estimate of 80% in an IMF study by Tseng et al (1994) is used here. With this 80/20 assumption (swap rate/official rate), another NEERI, represented by a dotted line in Chart 3, is constructed. As expected there is a much smaller rise in this NEERI in January 1994. In the period from January 1989 to January 1994, the NEERI based on the official rate appreciated over 29% while the alternative appreciated around 11%. The latter measure is used in the rest of the paper because it is believed to be a more relevant index for this purpose.

The Real Exchange Rate

In assessing the impact of monetary policy on the trade competitiveness of the economy, however, the nominal exchange rate (even expressed in effective terms) only tells part of the story. For this reason, the concept of the "real exchange rate" is often used. This recognises that competitiveness depends on the prices of a good expressed in national currencies and the rate of exchange between those two currencies. The real exchange rate is therefore defined as EP/P^* where E is the nominal exchange rate expressed in units of foreign currency per unit of domestic currency, P is the domestic price index and P^* is the foreign price index. Other things being equal, the domestic economy becomes less competitive when the real exchange rate appreciates (i.e. rises). This occurs when the nominal exchange rate appreciates and/ or domestic inflation is higher than foreign inflation.[5]

The real exchange rate is closely related to the PPP rates discussed above. It is a measure of relative rather than absolute PPP as it measures how prices and the exchange rate have moved since the base period. If, but only if, the base period used for the components of the real exchange rate happened to be a time when the exchange rate was equal to its PPP does a real exchange rate index measure whether the exchange rate is over or undervalued. A common approach to this problem is to use a long-term average rather than a single year as the base period on the assumption that over the longer term the average exchange rate equals the average PPP.

Constructing a Real Effective Exchange Rate Index

Real exchange rates can be calculated between Hong Kong and other individual economies. However, for many purposes it is more useful to look at a real effective exchange rate index (REERI) which, in an analogous manner to the NEERI discussed above, summarises movements in real

4   Three NEERIs (along with bilateral rates) are presented in tables 5.1 of the HKMA's Monthly Statistical Bulletin. Further information on its calculation is given in Census and Statistics Department (1987).

5   Confusingly, there is another strand in the economic literature, popularised by Dornbusch (1974, 1980), which defines the "real exchange rate" as the relative price of traded to non-traded goods within a single economy. Dwyer and Lowe (1993) attempt to reconcile the two forms. See also Hutton (1992).
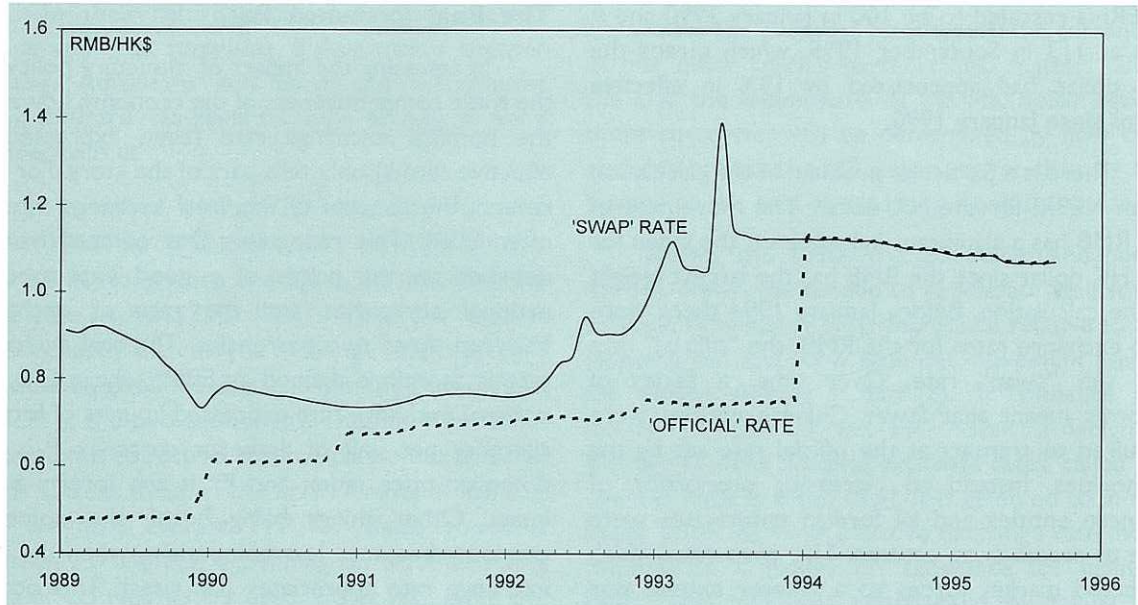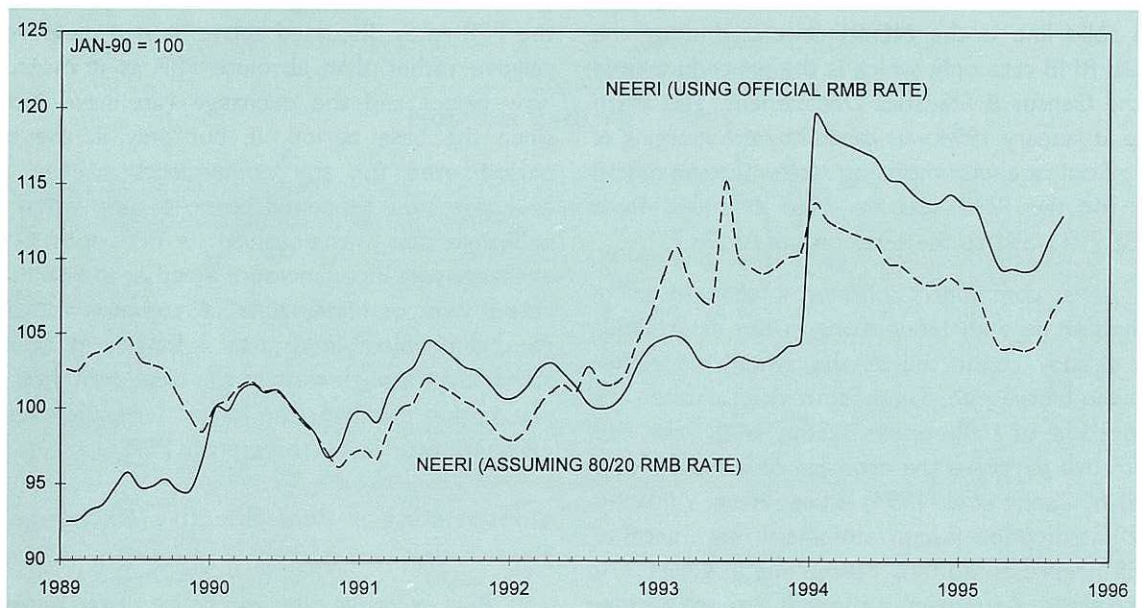
Chart 2
The RMB Versus The HK$

Chart 3
The Nominal Effective Exchange Rate Indices for Hong Kong Dollar

exchange rates against a number of countries. The two most commonly cited REERIs are those compiled for a number of economies by the IMF and JP Morgan.[6] A simplified example of how such indices are calculated is given in the Appendix. Designing such an index involves trading off technical sophistication against transparency and ease of calculation.

6   In addition, a number of organisations compile publicly-available REERIs for their own countries. For example, the Bundesbank compiles one for Germany and the Bank of Estonia for that country. In the Asia-Pacific region, the Asian Development Bank publishes such indices for its developing member countries, as did SEACEN in Weerasekera (1992). The central banks of Australia, India, Japan, Sri Lanka and Tonga publish REERIs for their respective countries. Two REERIs for Hong Kong constructed by academic economists are discussed in Jao and King (1990). Many merchant banks compile such indices for their assessments of whether to buy or sell currencies; see G.T. Management (1992) and Swiss Bank Corporation (1995) for examples.

At one end of complexity, the IMF has developed a complicated weighting scheme that is derived from international trade flows in which (a) the price elasticity of demand for different classes of product, (b) bilateral competition and (c) third-market competition are considered. Separate weights are calculated for exports of manufactured goods, imports of manufactured goods, exports of primary products, and imports of primary products, and then combined into a single set of weights based on the importance of these four elements in the country's trade patterns. This approach requires a large amount of data on international trade flows, which tend to be available only with considerable lags.[7]

The more common approach, and that adopted here, is to ignore third party competition and price elasticities and use a single set of weights based only on trade shares. As with the NEERI, the trade weights reflect trade patterns in 1991-93. As Chart 4 illustrates, these are considerably changed from those in the early 1970s.

As should be clear from the earlier discussion of PPPs, a fundamental issue is the choice of price indices.[8] Some REERIs are based on consumer price indices. These have the advantage that the data are more readily available and they are the price series most familiar to the public. An REERI for Hong Kong based on consumer price indices, REERI(C), is shown by the dashed line in Chart 5. It shows a marked increase in recent years, reflecting the faster growth in consumer prices in Hong Kong than in most of our trading partners. It is quite similar to the IMF's REERI for Hong Kong, which is also based on consumer prices.

It would be wrong, however, to interpret the movements in REERI(C) as indicating a loss of competitiveness by Hong Kong in export markets. The predominant reason for the higher inflation in Hong Kong has been the price of non-tradables, particularly services.[9] In part this reflects the phenomenon noted by Balassa (1964) whereby service prices tend to rise faster than tradable prices in fast-growing economies; a good example is Japan in the post-war period. It also reflects some specific influences. The phenomenal growth in Southern China in recent years has meant the world now places a higher value on many of Hong Kong's services. At the same time, rents have risen sharply in the 1990s as a population growing in both number and affluence faces a limited supply of land. By contrast, the price of traded goods has grown quite moderately. Export prices have risen at an average annual rate of only 1% in the 1990s.

A preferable REERI measure for assessing the competitiveness of Hong Kong's exporters, and the ability of its domestic producers to compete with imported goods, is based on the prices of tradable goods. This is the basis upon which the JP Morgan indices for the OECD economies are based.

The solid line in Chart 5 shows such an index based on tradable goods prices; REERI(T). For reasons of data availability, the tradable goods price series for Hong Kong is constructed as a weighted average of the export and import unit value indices. Wholesale price indices are used for Australia, France, Germany, Italy, Japan, Korea, Switzerland, Taiwan, Thailand, UK and USA; producer price indices for Belgium, Canada, Malaysia and the Netherlands; the domestic supply price index for Singapore, and the retail price index[10] for China.

A third alternative for calculating an REERI, suggested by Artus (1978) and others, is to use

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7   A more detailed discussion of the technical issues involved in constructing an REERI can be found in Yiu (1995) and Maciejewski (1983). The latter explains that the IMF approach generates the uniform exchange rate change that would have induced the same movement in the trade balance as the variety of bilateral exchange rate movements actually experienced. It therefore depends on a range of behavioural assumptions. The Bank of England (1995) provides a further discussion of the IMF weightings.

8   This has been a long-running issue in the literature. The term "PPP" was coined by Cassel (1918) but Keynes (1923, p87) attributes the basic idea to David Ricardo. From the first the question of which prices should be used was controversial. Einzig (1962) even traces the argument back to the 16th century. Not only do economists disagree but their views change; compare Keynes (1923) with Keynes (1930). Officer's (1976) survey comments "the prices measures used ... tend to be selected if not haphazardly, then without sufficient awareness of the advantages and disadvantages of the alternative measures" (p53). The issue is of more than academic interest. Keynes (1925) attributes much of the blame for the severity of the Great Depression in the UK to the decision by Churchill to return sterling to the pre-World War I parity, a decision he partly attributes to inappropriately calculated PPPs.

9   This can also be seen in the CPI where the prices of components such as meat and vegetables, shoes and household goods, which have a high tradable element, have grown by less than those with a low tradable element such as restaurant meals, housing, education and medical care. The second column in Table 1 illustrates this.

10   Unlike retail price indices in some other countries, that in China excludes services and so is comparable with the wholesale price series used for most other economies.
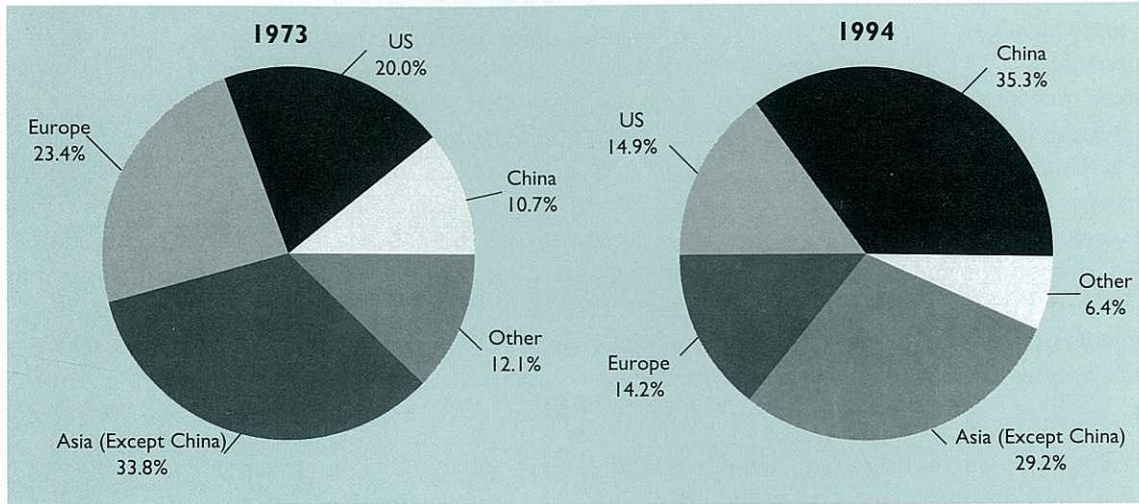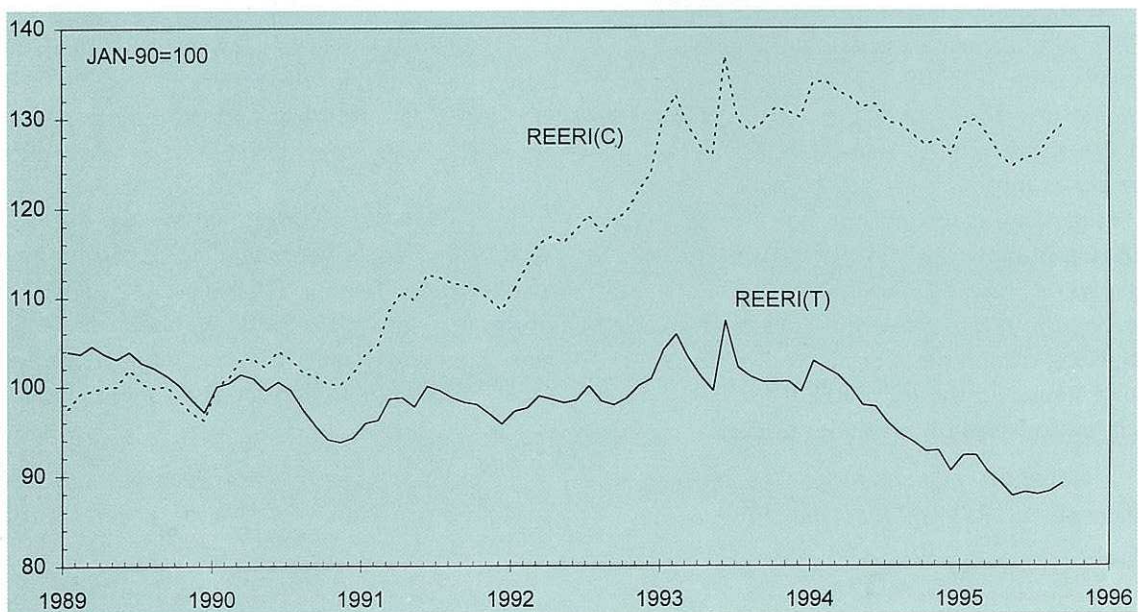
Chart 4
Hong Kong's Trade

1973

US 20.0%
Europe 23.4%
China 10.7%
Other 12.1%
Asia (Except China) 33.8%

1994

China 35.3%
US 14.9%
Other 6.4%
Europe 14.2%
Asia (Except China) 29.2%

Chart 5
REERIs for Hong Kong

JAN-90=100

REERI(C)

REERI(T)

(chart y-axis: 80, 90, 100, 110, 120, 130, 140)
(chart x-axis: 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996)

unit costs rather than prices as a guide to whether an economy is able to operate viably at a given exchange rate. A cost-based REERI should incorporate rent, interest, wages, raw material prices, taxes and so forth, with wages adjusted for trend productivity improvements, and be appropriately weighted for the home country and its competitors. This would be a very difficult exercise. The closest approach to it adopted in practice is to use unit labour costs, generally restricted to the manufacturing sector, as a proxy measure for all costs. This is how the IMF calculate one of their REERIs for the OECD economies. Such an approach would be of limited value in Hong Kong as wages only make up half of value added by Hong Kong firms and manufacturing only

Table 2:
Real Effective Exchange Rate Volatility

average absolute quarterly % change, Mar quarter 1989 to Dec quarter 1993

Freely Floating Exchange Rates		Other Exchange Rates	
Switzerland	2.0	Hong Kong	1.7
Canada	1.9	Belgium	1.5
Japan	2.4	France	0.7
United States	1.9	Germany	1.3
		Netherlands	1.3

Table 3:
Bilateral Real Exchange Rate Volatility

average absolute monthly % change, Jan 1989 to Dec 1993

	against US$	against Yen	against RMB	against DMark
Hong Kong	0.4	1.7	2.1	2.1
Canada	0.8	1.9	2.2	2.2
Australia	1.4	2.0	2.4	2.3
Netherlands	2.2	2.1	3.1	0.4

a tenth of GDP. For this reason this paper uses REERI(T). It is worth noting that in the medium term Hong Kong has had an overall trade surplus, and healthy corporate results, suggesting that maintaining a relatively steady REERI(T) has not unduly strained corporate viability.

The REERI(T) shows no significant upward or downward trend and has rarely moved more than 5% above or below its average value. Table 2 compares the average absolute quarterly percentage change in REERI(T) for Hong Kong with the IMF's measure for other economies based on export prices.

Clearly the exchange rate link has not only all but eradicated fluctuation in the nominal exchange rate against the US dollar but has made the real effective exchange rate less variable than that in economies with a floating exchange rate also.[11] Table 3 shows that this result holds for most real bilateral rates as well. Avoiding swings in competitiveness helps business make long term plans based on fundamental considerations. There is also some evidence that more stable real exchange rates provide a stimulus to international trade.[12]

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[11] This accords with other studies. Williamson (1983) and IMF (1984) showed that REERIs became more than twice as volatile after the general move to floating exchange rates in the early 1970s and Artis and Taylor (1994) show that the European Union's Exchange Rate Mechanism has led to reduced volatility of REERIs there. A broad study by Mussa (1986) covering a number of countries and time periods showed that real exchange rates are consistently more volatile under floating exchange rate regimes than under fixed rate regimes, a conclusion Clark et al (1994) still regard as valid. The variability of REERIs under floating rates has been attributed to "overshooting" in models based on Dornbusch (1976) and to "speculative bubbles".

[12] This is the view of the Bretton Woods Commission (1994) and supported by some econometric studies. Frankel & Wei (1993, p301) conclude based on econometric work that "real exchange rate volatility depresses bilateral trade" in the Asia-Pacific region. For developed economies, de Grauwe (1988) found that volatility in real bilateral exchange rates depresses trade while Kenen and Rodrick (1986) reach the same conclusion for REERIs. Yip (1994) finds REERI volatility depresses trade in Singapore. Corbo and Rojas (1995) conclude that greater variability in real exchange rates causes slower economic growth. It should be admitted there are also studies which fail to find such effects.

REERI(T) is taken further back on an annual basis in Chart 6.[13] Clearly the REERI(T) was more variable during the floating exchange rate period of 1974-1983 than it has been subsequently under the link. Shocks to the real exchange rate seem to dampen out over time and there seems to be no long run trend.[14]

The chart also shows that the REERI(T) is currently quite close to its long-term average value. This is consistent with the earlier conclusion that there is no reason to think the HK dollar is either significantly overvalued or undervalued.

Conclusion

An appreciation of the real exchange rate would be expected to reduce Hong Kong's export volumes, other things being equal. However, when calculated using traded good prices, the movements in the REERI have not in practice been either large or sustained. A flexible outward-oriented economy such as Hong Kong's will not allow itself to be priced out of markets. This suggests the linked exchange rate system has provided stability without causing any loss of competitiveness for the traded goods sector. ✽

Chart 6
Real Effective Exchange Rate Index (Traded Goods) of Hong Kong Dollar

Index (1961-94=100)

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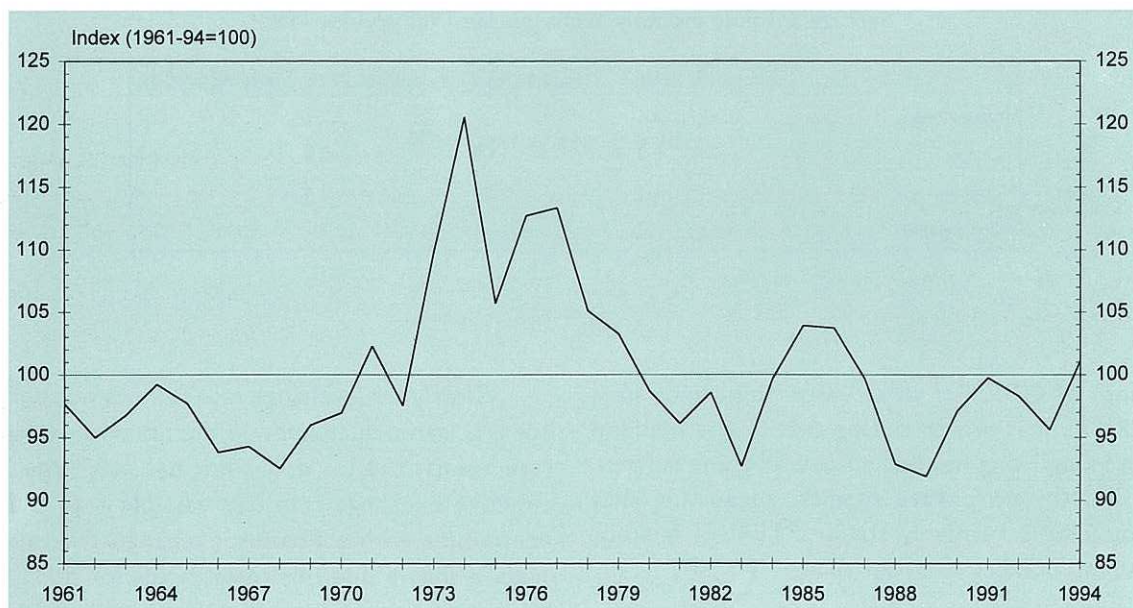
13 The longer term series uses a weighted average of the export and import implicit price deflators from the national accounts. The trade weights used are 1972 for 1961 to 1980; 1981 for 1981 to 1983; 1984-86 for 1984 to 1990 and 1991-93 for 1991 onwards.

14 Froot and Rogoff (1994) conclude in their wide-ranging survey that "shocks to the real exchange rate damp out over time, albeit very slowly. Consensus estimates put the half-life of deviations from PPP at about four years for exchange rates among major industrialised countries." Wagner's (1995) survey of empirical work leads her to conclude that real exchange rates exhibit frequent and persistent deviations but may settle down in the long term, as does MacDonald (1995).

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Appendix : Simplified Example of Calculation of REERI

The formula for calculating the REERI relative to k currencies at time t is

$$100 \times \frac{P_{it}}{P_{io}} \prod_{i=0}^{k} \left(\frac{E_{it}}{E_{io}} \Big/ \frac{P_{it}^{*}}{P_{io}} \right)^{W_i}$$

where the w_i are the weights on the various currencies, P's are prices and E's are exchange rates.

Suppose the only currencies in the basket were the US dollar and the yen, with the US accounting for 60% of trade, and 1990 was the base year. If inflation in 1991 was 1% in Japan, 2% in Hong Kong and 3% in the US then the calculation would be

$$100 \times \frac{1.02}{1.00} \left(\frac{7.77}{7.79} \Big/ \frac{1.03}{1.00} \right)^{0.6} \left(\frac{0.058}{0.054} \Big/ \frac{1.01}{1.00} \right)^{0.4} = 102.5$$

In this hypothetical example, the HK dollar depreciated slightly in real terms against the US dollar reflecting the higher inflation rate in the US. It appreciated against the Yen, by much more, however, giving an overall real appreciation of 2.5%.