Alternative Measures of the Real Effective Exchange Rate

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Indices of the real effective exchange rate (REER) provide important information about the competitiveness of an economy. This article presents a number of alternative measures of the REER for the Hong Kong dollar, and compares these to the REER series currently published in our *Monthly Statistical Bulletin*. The current series and the alternative indices considered here all suggest that Hong Kong's competitiveness has improved significantly over the past few years owing largely to declines in domestic prices. While the current REER series is a good indicator of the competitiveness of the Hong Kong economy, it can be usefully supplemented by some alternative measures that provide information on competitiveness from different perspectives.

I. INTRODUCTION

Indices of the real effective exchange rate (REER) provide important information about the competitiveness of an economy. These are typically computed as a weighted average of bilateral real exchange rates. The latter is defined as the product of the nominal bilateral rate, expressed as the value of foreign currency in terms of domestic currency, and the relative price level, expressed as the ratio of domestic to foreign price level.[1] There are three key elements in the calculation of a REER index: the number of bilateral exchange rates included, their weights, and price indices used.

The choices of which bilateral exchange rates to include and the appropriate weights to use are not clear. In large part, the usefulness of a REER index depends on the issues being investigated. There is no single "right" measure of the exchange rate.[2] Any REER indices should be used in conjunction with other indicators in order to obtain an assessment of competitiveness that is as complete as possible.

The discussion below is organised as follows. Section II discusses the REER index, which is currently used by the HKMA. Section III presents several alternative measures of competitiveness in comparison with the current REER series and highlights their relative strengths and weaknesses. Section IV examines the information content of the REER indices. Section V provides concluding remarks. The computation of the indices is explained in Appendix.

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[1] The real exchange rate can be written as q = e (p/p*), where e is the nominal exchange rate, and p and p* are the domestic and foreign price levels, respectively.

[2] For instance, an index weighted by import shares might be most appropriate when investigating the effects of exchange rate movements on the domestic prices of imported goods. The effect of nominal exchange rate movements on a nation's foreign debt should be measured by an index weighted by the different currencies' shares in foreign borrowing.

II. THE CURRENT SERIES OF EFFECTIVE EXCHANGE RATES

The current REER series is computed using a conventional method and is published by the HKMA in its *Monthly Statistical Bulletin* (www.info.gov.hk/hkma/eng/statistics/msb/index.htm) and the Government in its *Quarterly Economic Report*. The series has been widely used by policymakers and market analysts alike in assessing the competitiveness of the Hong Kong economy. The popularity of the current series may be explained by three factors. First, it is transparent and provides a good basis for international comparison, as the methodology is commonly used in other economies of the world. Secondly, the series has a fairly comprehensive coverage of trade partners (Table A1). Thirdly, it can be updated frequently, as information needed for compiling the series, including data on merchandise trade and CPI, is readily available on a monthly basis and is relatively accurate.

Despite these advantages, the current series suffers from a number of shortcomings. First, the weights exclude trade in services, which is an important part of the external trade in Hong Kong.[3] Secondly, it does not reflect the degree of competitiveness of Hong Kong firms operating outside the local economy. Thirdly, it is not appropriate for measuring Hong Kong's competitiveness relative to its competitors in third economies, which import similar products from both Hong Kong and its competitors.

III. ALTERNATIVE MEASURES

As noted above, REER indices differ in the weighting schemes and price indices used. A REER index, q, can be calculated as a geometric average of the bilateral real exchange rates, using the following formula,

$$\log (q) = \sum_{i=1}^{N} \log \left(e_i \frac{P_{HK}}{P_i}\right) w_i \qquad (1)$$

where w_i is the weight for partner country i, e_i is the bilateral nominal exchange rate (expressed as the Hong Kong dollar value of foreign currency i), P_{HK} and P_i are the price level in Hong Kong and country i respectively, and N is the number of partner countries included.

The most commonly used weighting scheme and price index are based on merchandise trade and CPIs respectively. CPIs are calculated using a basket of commodities that is broadly comparable across countries. They have the advantage of being relatively accurate, frequently published, and timely available for a wide array of countries over a long time period, although there are theoretical reasons to prefer other types of price indices when measuring competitiveness.[4] For this reason, the alternative REER measures discussed below use CPI indices, but differ in the weighting schemes used.

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[3]   Although the weights are based on trade in goods only, the prices cover both goods and services and many services are traded. In this respect, the current series may be a reasonable REER measure for tradables in both goods and services.

[4]   CPIs may be a poor proxy for prices of traded goods. The reason for this is that CPIs include prices of services, many of which are nontraded. Furthermore, a large portion of international trade is in intermediate goods and therefore does not take place at consumer prices.

REER based on Trade in Services

When weighted by merchandise trade, a REER index is associated with changes in a country's balance of trade in goods. This may be appropriate if the economy is dominated by the manufacturing sector. Given, however, that a large part of the external trade in Hong Kong is in services (including tourism, transportation, trade-related services, and other services), consideration is given to a service-based index.

A major drawback of the service-based index is the data availability problem. Data on trade in services are not available as frequently as on merchandise trade. In addition, data on bilateral trade in services with some trade partners are not available. In Hong Kong, such data at present are available only for eight trade partners, which account for 80% of the total trade in services (Table A1). Ideally, services prices should be used to calculate the service-based REER. Unfortunately, data on services prices of partner countries are not readily available.

The service-based REER index appreciated more than the current series during 1994-1996 but appreciated less in the following years (Chart 1). This reflects the exclusion of several Asian trade partners (such as Thailand, the Philippines, South

Korea, and Malaysia), whose inflation rates were generally higher than the eight trade partners included in the basket and their currencies experienced sharp depreciations during the 1997 crisis (Table A1).

Third-country Effects

The above weighting schemes use bilateral trade shares and are therefore appropriate for assessing the competitiveness of the Hong Kong economy relative to its trade partners. But they do not reflect the "third-country" effects — the competition that Hong Kong exports experience in foreign markets from other sources of these exports. To measure the third-country effects, consideration is given to a weighting scheme using exports of Hong Kong's major competitors to three important markets: the United States, the European Union, and Japan. Exports to these three destinations account for 45% of Hong Kong's total merchandise exports (Table A2).

Although the third-country index looks similar to the current REER series, there are a number of important differences (Chart 2). First, the former is more volatile than the latter. The third-country index appreciated more drastically during 1997-98 and fell more
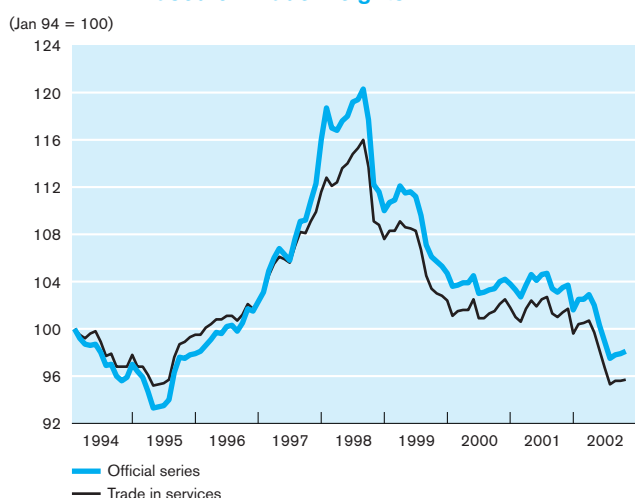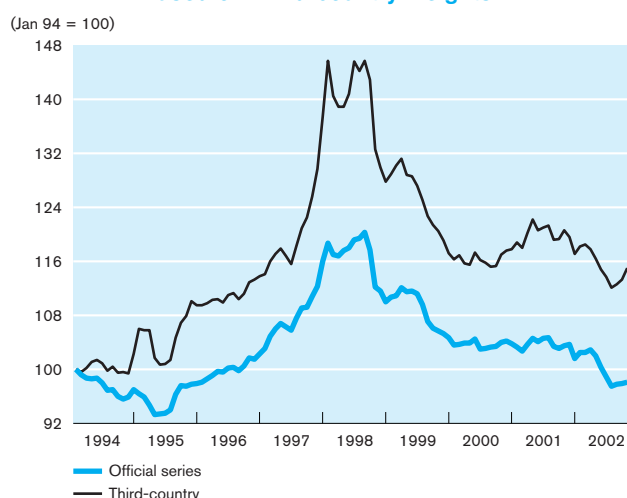

CHART 1

REER Based on Trade Weights

(Jan 94 = 100)

Official series
Trade in services

CHART 2

REER Based on Third-country Weights

(Jan 94 = 100)

Official series
Third-country

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significantly in the following years. The movements reflected the fluctuations of the currencies of the Asian countries included in the basket. Secondly, the third-country index is more appreciated than the current series. The former is currently at the level of mid-1997, while the latter is at the level as of end-1995.[5]

REER based on Outward FDI

The geographical distribution of an economy's outward investment has important implications for its investment income. Exchange rate movements in a host country may have different impacts on foreign direct investment and portfolio investment.

Foreign direct investment (FDI), particularly export-oriented FDI, in an economy with a high degree of competitiveness helps strengthen the overall competitiveness of the home country. A large part of Hong Kong's FDI is export oriented and invested in the Mainland, where prices are lower and productivity is higher than in many other economies in the region. This helps generate investment income for Hong Kong — as evidenced by the relatively large share of factor income in GNP (Table 1) — by elevating the competitiveness of its firms operating in the Mainland.

However, while a depreciation in the exchange rate of a host country improves the competitiveness of its

export-oriented inward FDI, it lowers the value of portfolio investment in terms of the home currency. In this respect, REER indices based on FDI and portfolio investment have different implications. Since data on Hong Kong's portfolio investment flows are not available, only the FDI-based REER index is calculated.

The FDI-weighted index declined during 1994-95 (Chart 3), reflecting the devaluation of the renminbi, which accounts for 90% of the basket (Table A2). The increase during 1996-98 and the decline in the following years were largely due to the changes in the relative price level. The index has been at the lowest level since 1994.
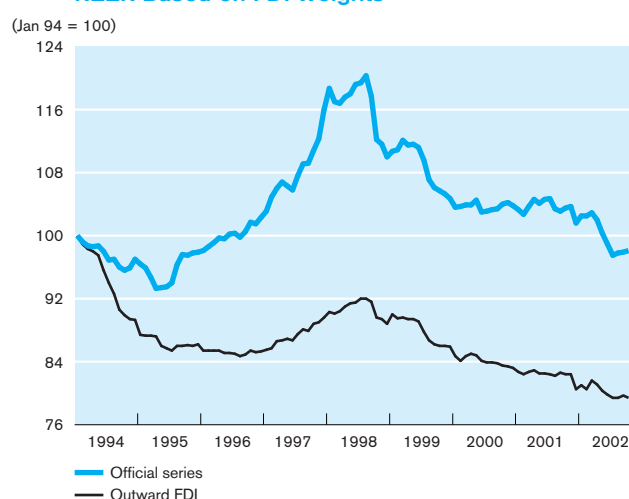

CHART 3
REER Based on FDI Weights
(Jan 94 = 100)

Official series
Outward FDI

TABLE 1
Share of Net Factor Income in GNP in Selected Asian Economies (percentage)

	Hong Kong	Taiwan	Japan	Singapore	Korea	China
1993	1.4	1.9	0.8	0.3	-0.1	-0.2
1994	1.2	1.6	0.8	2.2	-0.2	-0.2
1995	1.8	1.6	0.8	2.7	-0.3	-1.7
1996	0.0	1.4	1.1	1.5	-0.3	-1.5
1997	0.8	1.1	1.3	6.4	-0.5	-1.8
1998	2.2	0.8	1.3	5.7	-1.8	-1.8
1999	2.7	0.9	1.2	2.4	-1.3	-1.8
2000	1.7	1.4	1.2	0.6	-0.5	-1.4
2001	2.7	2.0	1.6	0.8	-0.2	-1.7

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[5]   An index using both bilateral and third-country weights is calculated as well. It is similar to the third-country index.

IV. INFORMATION CONTENT OF THE INDICES

The importance of the alternative indices of REER depends on the extent to which they explain changes in the balance of payments. The service-based and third-country-based indices are expected to affect trade in services and total exports, respectively, while the FDI-based index should be able to explain changes in factor income. This section estimates the information content of the first two indices, given that the quarterly series on factor income is too short to produce reliable results.

The results suggest that the alternative indices are roughly as good as the current REER series in explaining external trade. Estimation of equations (in the error-correction form) for both exports of services and total exports reveals that the coefficient of the service-based index is of the correct sign and statistically significant (Table 2). However, the index does not perform significantly better than the current REER series in explaining changes in exports, judged by the value of t-statistics and the Akaike information criterion. Moreover, the elasticities of exports with respect to the third-country-based index and the current REER series are similar.

V. CONCLUSION

This article has compared a number of alternative REER indicators with the series currently used. The indices are useful supplements to the current series, because they help assess competitiveness from different perspectives. The current series and the alternative indices considered here all suggest that Hong Kong's competitiveness improved dramatically over the past few years due largely to declines in domestic prices. The alternative measures demonstrate patterns more or less similar to the current REER series, despite the difference in their absolute levels. However, an important drawback of the alternative indices is that they are less transparent than the current series and are subject to data availability problems.

In sum, the current series, now published in the *Monthly Statistical Bulletin* since January 2003, serves as a good measure of competitiveness of the Hong Kong economy. However, because of data availability problems, regular publication of the alternative indices may not be helpful.

TABLE 2

Responses of Exports to REER Indices

	Exports of services		Total exports		Total export earnings[a]	
	Current series	Service-based	Current series	Service-based	Current series	Third-country-based
Long-run elasticities[b]						
REER	-0.87 (-3.72)	-1.10 (-3.24)	-0.63 (-2.83)	-0.80 (-2.76)	-0.55 (-3.89)	-0.40 (-5.44)
External demand	1.27 (10.63)	1.20 (9.40)	1.10 (9.39)	1.05 (9.30)	1.00 (12.93)	1.06 (12.43)
Short-run elasticities[b]						
REER	-0.43 (-2.16)	-0.56 (-2.28)	—	—	—	—
External demand	—	—	2.43 (3.08)	2.45 (3.14)	1.66 (2.58)	1.51 (2.20)
Adjusted R-squared	0.23	0.24	0.46	0.46	0.35	0.40
AIC[c]	-4.51	-4.52	-4.87	-4.88	-5.21	-5.29

Notes:
a. Include domestic exports, re-exports margins, and exports of services.
b. The figures in parentheses are t-statistics.
c. Akaike Information Criterion.

APPENDIX

COMPUTATION OF REER INDICES

This appendix explains the computation of the current REER series and the alternative indicators. All indices are calculated as geometric averages. CPI indices are used in all cases.

Current REER Series

The current REER series of the Hong Kong dollar is a weighted average of the exchange rates of the Hong Kong dollar against the currencies of 14 major trade partners, which accounted for an average of 92% of the total value of Hong Kong's merchandise trade during 1999-2000 (Table A1). The REER series is computed using consumer price indices (CPI) of Hong Kong and its trade partners.

TABLE A1

REER Weights Based on Trade in Goods and Services

Trade partner	Merchandise Trade	Services[a]
China, Mainland	41.99	33.41
US	16.26	23.04
Japan	9.41	10.34
Euro area	9.26	9.91
Taiwan	5.37	8.47
Singapore	3.69	
S. Korea	3.53	
UK	3.20	7.21
Malaysia	1.67	
Thailand	1.38	
Canada	1.17	3.53
Australia	1.12	4.10
Philippines	1.04	
Switzerland	0.91	
Total	100.00	100.00
Basket total in % of total trade	92	80

Note: a. Data on bilateral trade in services are not available for the other six partners.

REER based on Trade in Services

The index is weighted by bilateral trade in services. Data on Hong Kong's bilateral trade in services are available only for eight trade partners (Table A1). The six trade partners that are excluded from the basket include the Asian countries, whose currencies depreciated considerably during the 1997 crisis. Strictly speaking, services price indices should be used to compute relative prices. Nevertheless, data on services prices are not available for the trade partners.

Third-country REER

This index is calculated by using data on imports of the United States, the European Union, and Japan from Hong Kong's major competitors.[6] An economy is defined as a competitor of Hong Kong if it exports similar products to the three destinations. Hong Kong's exports to the three destinations combined account for 45% of total merchandise exports during 1999-2000 (Table A2).

TABLE A2

REER Weights Based on Third-country and Outward FDI

Share of merchandise imports of the third-country, 1999-2000[a]		Outward FDI, 1998-2000[b]	
Competitors	Weight	FDI recipients	Weight
Japan	23.25	China, Mainland	89.57
Mexico	13.66	UK	5.75
China, Mainland	11.02	Singapore	2.88
Taiwan	7.91	US	0.96
Korea	7.77	Japan	0.83
Malaysia	5.28		
Singapore	4.16		
Thailand	3.82		
Indonesia	3.51		
Brazil	3.41		
Philippines	2.78		
India	2.48		
Hungary	2.34		
Poland	2.22		
Israel	2.21		
Turkey	2.10		
Czech Republic	2.08		
Total	100.00	Total	100.00
Hong Kong's exports to third-country in % of its total exports	45	Basket total in % of total FDI	65

Notes: a. Including the United States, the European Union, and Japan.
b. Excluding investment in "tax-heaven" countries and others.

REER based on Outward FDI

The index is constructed using data on Hong Kong's outward FDI during 1998-2000, excluding investment in "tax-heaven" countries and unidentified destinations. The basket covers 65% of Hong Kong's total FDI, and has a weight of 90% for the Mainland (Table A2). An index based on the stock of FDI is also constructed but not reported, because it is nearly identical to the one based on investment.

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6   The weight for competitor j is defined as $w_j = \sum_k \dfrac{M_j^k}{\sum_j M_j^k} \dfrac{X_{HK}^k}{\sum_k X_{HK}^k}$,

where M_j^k is imports of country k (k = US, EU, and Japan) from competitor j, and X_{HK}^k is Hong Kong exports to country k. The formula implies that the weight for a competitor depends on the market share of the competitor in the destination country and the share of Hong Kong's exports to that country.