

# ESTIMATING NEW ZEALAND'S REAL EFFECTIVE EXCHANGE RATE

*This article, prepared mainly by Shelley Cooper, discusses and compares various methods of calculating New Zealand's real effective exchange rate index as a measure of international competitiveness.*

## Introduction

New Zealand's heavy reliance on international trade has always focused attention on the international competitiveness of this country's traded goods sector. This attention has been warranted by the large proportion of the nation's resources employed in the sector or directly servicing it, and by the misuse and waste of resources that can be involved when an expansion or contraction in the sector occurs that is not viable in the medium term. When discussing changes in New Zealand's competitiveness, commentators have often simply referred to the nominal exchange rate, but this indicator is not particularly helpful by itself. New Zealand's price level relative to that of our trading partners also needs to be taken into account, as occurs when a *real* exchange rate is calculated. However, there are in practice a number of possible measures of this concept and where discussion has centered on the real exchange rate, it has usually not been clear which real exchange rate measure was being used.

This article briefly outlines some of the alternative weighting systems that can be used to calculate real exchange rate indices and emphasises that different calculation methods are appropriate for different end uses. For example, the measure of competitiveness most appropriate for domestic producers of import substitutes is different from the one most relevant for exporters. Over the period from June 1979 to March 1988, cumulative movements in the real exchange rate vary from an appreciation of 5 per cent up to an appreciation of 18 per cent, depending on which method is used. Using a more comprehensive measure of competitiveness it is found that the New Zealand dollar real exchange rate index has appreciated by 11 per cent over the same period and that, since the July 1984 devaluation, the appreciation has been 30 per cent. This measure of the real exchange rate is henceforth to be regularly published by

the Reserve Bank. It must be emphasised that this real exchange rate index should always be interpreted in the light of the qualifications discussed in this article.

## Real Exchange Rate

The real exchange rate is defined as the nominal exchange rate adjusted for price levels at home and abroad –

$$R = \frac{ep^*}{p}$$

Where R = real exchange rate

e = nominal exchange rate (expressed in terms of New Zealand currency per unit of foreign currency)

p = domestic price level

p\* = foreign price level

Movements in the real exchange rate indicate changes in the competitiveness of the traded good sector. For example, if the nominal exchange rate depreciates (e rises) or the foreign price level rises or the domestic price level falls, then the real exchange rate depreciates (R rises). Each of the potential price changes that could comprise a real exchange rate depreciation makes the domestic traded good sector more competitive – a depreciation of the nominal exchange rate increases domestic currency returns for traded goods while a rise in the foreign price level relative to the domestic price level increases the relative costs of foreign traded good producers' inputs.

Although a nominal exchange rate depreciation entails a real exchange rate depreciation in the short run, this relationship may not hold in the long run. For sustained real exchange rate depreciation to occur, it is necessary that there be a response of some real domestic economic factor such as New Zealanders spend-

ing less/saving more, productivity rising more quickly in this country than in others, declining protection for traded good producers, or a terms of trade decline. In the absence of these sorts of changes, a nominal exchange rate depreciation before long will be either offset by higher domestic prices or (in a float) will be directly reversed by a subsequent appreciation if attempts are made to restrict domestic price inflation.

Real exchange rates can take either a bilateral or multilateral (effective) form. A bilateral real exchange rate assesses changes in competitiveness against one country only. Using the equation above to calculate a bilateral real exchange rate would involve setting  $1/e$  = bilateral nominal exchange rate (expressed as foreign currency per unit New Zealand currency) and  $p^*$  = price level in the foreign country. A multilateral exchange rate index, on the other hand, is a summary measure of changes in competitiveness against several countries. Calculating a multilateral real exchange rate index involves setting  $1/e$  = effective nominal exchange rate index in the above equation, where  $1/e$  is defined as the weighted average of bilateral exchange rates. Similarly,  $p^*$  is an index calculated as the weighted average of other countries' price levels. Clearly, the weights used for calculating the effective nominal exchange rate index and the index of foreign countries' price levels should be the same but the question remains as to what weighting system should be used to calculate these indices.

It is worth noting in passing that a rather wide range of different weighting systems is possible for a nominal effective exchange rate index, depending on the purpose for which it is to be used. For example, if the intention is to assess the effect of exchange rate changes on domestic consumer prices, the weights would reflect the share of various traded goods in the consumer price index. Similarly, if the intention is to assess

the effect on the valuation of external debt, the weights would reflect the proportions of overall external debt denominated in various currencies. The range of options is narrowed if the objective is to assess competitiveness, but even so there remain several possible weighting systems.

### Choice of Weights for Multilateral Real Exchange Rate Indices

The choice of weights to be used for calculating a multilateral real exchange rate index depends on the type of traded good competition that the index is intended to measure. For competition between New Zealand's exporters and home producers in the markets to which this country exports, a 'bilateral export weighted' real exchange rate index is calculated. The bilateral nominal New Zealand dollar exchange rates and foreign price indices of each of New Zealand's export markets are weighted according to the proportion of New Zealand's exports that goes to each of the countries concerned. For instance, if the United States takes 20 per cent of New Zealand's exports, then a 20 per cent weighting should be given to both the US\$/NZ\$ exchange rate and the US price level when calculating the real exchange rate index.<sup>1</sup>

To measure competition between New Zealand exporters and other exporters selling to the same markets (i.e. third market competition), a 'global export weighted' index can be calculated. Weights are assigned to each currency in a global index on the basis of the corresponding country's share of world exports in a particular commodity. This procedure is repeated for all major commodities exported by New Zealand. The country weights calculated for

each major commodity are then weighted according to the share of that commodity in New Zealand's total exports, giving New Zealand's global export weighted real exchange rate index. As an illustration of this methodology, suppose that Australia produces 20 per cent of world exports of wool. The Australian currency and price level would then be given a 20 per cent weighting for wool. This 20 per cent weighting would then be multiplied by the proportion of wool exports in New Zealand's total exports to obtain the Australian weighting for wool in New Zealand's global export weighted real exchange rate index. The total Australian weighting in the global index would be obtained by summing across the Australian weightings for all the major commodities exported by New Zealand, each weighting being multiplied by the ratio of the commodity concerned to total New Zealand exports.

It may be wondered why this kind of global export index is used to measure third market competition when a simpler approach would be to assign weights to competing exporters on the basis of their share of total exports to each of New Zealand's major export markets. The problem with this simpler, aggregate approach, however, is that third market competition would be measured where it does not exist because goods being sold by some other countries to an export market may be totally different from the ones being sold by New Zealand. For example, if Mexico only sells copper to the US and New Zealand only sells tractors, the simple aggregate approach would show Mexico as one of New Zealand's competitors in the US market. By using disaggregated global export data, this supposed competition is not included in the calculation of trade weights.

For competition between local import substitute producers and foreign producers exporting to New Zealand, a 'bilateral import weighted' real exchange rate index is cal-

culated. Foreign currencies and price levels are weighted according to the proportion of imports derived from each of the countries from which New Zealand imports. For example, if 20 per cent of New Zealand's imports come from Australia, the Australian dollar and price level would receive a 20 per cent weighting in the import weighted real exchange rate index.<sup>2</sup>

An important qualification which needs to be borne in mind with each of the above indices is that quota protection may effectively render some domestic or external markets non-tradeable at the margin. If this outcome occurs, these indices will give a misleading impression of the extent to which the market share of New Zealand producers might be threatened or enhanced by the measured real exchange rate changes.

To illustrate this point, consider New Zealand's trade in dairy products with the European Economic Community. A globally weighted index would include world dairy trade exports of dairy products from Belgium to West Germany. Yet New Zealand dairy exporters are not allowed to compete freely with Belgian exporters on the West German market. Consequently, the globally weighted index allows for third market competition that does not really exist. To overcome this problem, it would be necessary to exclude from the global index any weighting for intra-EEC trade in dairy products. More generally, it would be desirable to exclude from global exports those exports that are not subject to international competition and from bilateral trade those exports or imports for which quota protection is so severe that

<sup>1</sup> Note that for this and the other weighting systems discussed, the weights would ideally be assigned on the basis of the currency in which traders' pricing decisions are made. But these data are not available, so the country of origin or destination is used as a proxy.

<sup>2</sup> One could also conceive of a 'global import weighted' real exchange rate index to capture potential competition with local import substitute producers from overseas exporters from whom we do not currently import. Such third country potential competition is not as important for imports as it is for exports, however. Third country competition in imported products will be directly reflected in revised weights for the bilateral import weighted index, once it becomes relevant, but third country export competition is not directly reflected in the bilateral export weighted index at all.

any prospective change in competitiveness will not affect trade volumes. Unfortunately, adjustments of this kind would be very complex and time consuming and consequently have not been made in the indices reported in this paper.

Each of the weighting systems that has been discussed – bilateral export, bilateral import, global export – gives a real exchange rate

index that adequately measures one kind of competition (given the trade protection qualification). Other kinds of competition, however, are unlikely to be reliably calibrated. For example, the export weighted bilateral index is not a good measure of third market and home market import competition; the import weighted index fails to capture the other two types of competition, namely, export and third market; and the global export weighted index does not adequately measure direct export or home market import competition.

If it is desired to measure more than one of these kinds of competition, a real exchange rate index that combines some or all of these weighting systems can be constructed. The two most typical combination weighting systems used are aggregate bilateral and composite systems. An aggregate bilateral weighting system is obtained by combining bilateral export and import weights; the weight given to each country is determined by the proportion of total export plus import flows accounted for by trade with that country. A modified form of this weighting system, which abstracts from third market competition, is used to calculate the Reserve Bank's published nominal effective exchange rate index. (The modification simply involves restricting the calculation to New Zealand's five major trading partners.)

A composite weighting system would capture the three most important types of competition and is calculated as a weighted average of aggregate bilateral and global export weighted measures. Such a

Table 1  
Average Weights by Region

	GE <sup>1</sup>	BE <sup>2</sup>	BI <sup>3</sup>	Total Composite	5B <sup>4</sup>
Australia	.146	.196	.215	.186	.269
United States	.117	.195	.180	.164	.241
Japan	.019	.192	.206	.139	.250
United Kingdom	.056	.163	.116	.112	.184
Europe (excl. UK)	.523	.115	.120	.253	.055
Latin America	.055	–	–	.018	–
Pacific (excl. Japan)	–	.101	.094	.065	–
Middle East	–	.012	.042	.018	–
Other	.084	.026	.027	.046	–

Where GE = Global Export Index  
BE = Bilateral Export Index  
BI = Bilateral Import Index  
5B = Five Currency Bilateral Index

<sup>1</sup> Global export weights were calculated using all products that made up over 0.1 per cent of New Zealand's total exports in 1985. Disaggregation to the three digit SITC level was used to ensure that products were fairly narrowly defined. This degree of disaggregation was made to reduce the extent to which third country direct competition in export markets might be overstated by the inclusion of irrelevant products. A total of 49 products were included in the study. The data are on an annual basis for 1979 to 1985 and were obtained from the United Nations' *International Trade Statistics Yearbook*.

<sup>2,3</sup> Data source was the IMF publication *Direction of Trade Statistics* and weights were calculated on an annual basis from 1979 to 1986.

<sup>4</sup> New Zealand's five major trading partners are: Australia, Japan, US, UK, West Germany. These weights were calculated on a quarterly basis from March 1979 to June 1987 as a four quarter moving average. Data source was the Department of Statistics' *External Trade* series.

weighting system is more appropriate for a real exchange rate index than any of the alternatives because it captures all three kinds of competition encountered. This weighting system is used to calculate the real exchange rate series being published by the Reserve Bank. The actual weights used by the Bank for this series are calculated by taking a simple average of the bilateral export, bilateral import and global export weighted indices.<sup>3</sup> This method of combination is somewhat arbitrary, but is based on the analysis in a recent IMF paper which examined many-good multilateral trade weighted indices for a number of industrial countries.<sup>4</sup>

<sup>3</sup> In other words, a weight of  $\frac{1}{3}$  is given to each of the three indices.

<sup>4</sup> A. McGuirk, 'Measuring Price Competitiveness for Industrial Country Trade in Manufactures', *IMF Working Papers WP/87/34*, April 1986. Of the countries covered in this study, Denmark and the Netherlands most resembled New Zealand in terms of certain key trade-related characteristics and, for both of these countries, the implied weighting for each of the three indices was approximately  $\frac{1}{3}$ .

The importance of the weighting system used to calculate exchange rate indices can be seen from a comparison of trade weights constructed using each of the weighting systems discussed; namely, global export, bilateral export, bilateral import, and composite, together with the five country combined bilateral export and import index on which the published nominal effective exchange rate is based. Calculated trade weights are shown in table 1, and cover a range of periods. All countries that make up over 0.1 per cent of New Zealand's total exports or imports were included in the calculations except China, Hong Kong, the USSR, Fiji and Iran; these countries were excluded because of difficulties obtaining CPI data.

The weighting system used to calculate the Reserve Bank's nominal exchange rate index (five currency bilateral) is shown in the fifth column. The weights given by this system to the US, Australia, and the UK are significantly higher than in either of

the bilateral export or import systems (second and third columns) because trade with the Middle East and Europe, apart from Germany and the UK, is ignored under the five currency weighting system.

Global export weights (column 1) given to the US, Australia and the UK are significantly lower than under the five currency system as is the weight given to Japan. This difference is explained by the inclusion in the global measure of a number of countries that are major competitors with New Zealand in agricultural products on third markets. In particular, France and Belgium export large volumes of dairy products and Argentina and Brazil export large quantities of meat and wool. Reflecting this competition, the Europe and Latin America country categories receive higher weightings under the global export system than under the five currency bilateral system.

The weighting system used to calculate the Reserve Bank's real exchange rate index is presented in column 4 and, as previously noted, is a combination of the global export, bilateral export and bilateral import weights. In keeping with its components, the composite index gives higher weights to Europe, Latin America and the Middle East than does the five currency bilateral index and lower weights to US, Australia, Japan and the UK.

Before the sets of weights presented in table 1 can be used to calculate a corresponding set of real exchange rate index series, it is necessary to determine which price deflator(s) to use in the calculations. There are five main options for the choice of price deflator: relative producer input prices; relative unit labour costs; relative consumer prices; relative producer output prices; relative GDP deflators. The first two options are cost measures, and the remainder are final expenditure price deflators. Neither of these groups of measures provides a full indication of changes in profitability. At least in the shorter term, output price measures may not re-

flect changes in profitability arising from production cost changes, and measures of cost competitiveness may not reflect changes in profitability arising from output price shifts. Notwithstanding these considerations, the Consumer Price Index (CPI) was used as the deflator in this study as it is the only index available on a quarterly and more or less comparable basis for all countries included in the calculations.

There are, however, several drawbacks in the use of the CPI. First, the CPI does not measure prices received by producers. Rather it measures the prices paid by consumers. Secondly, the CPI includes factors which are not relevant for an assessment of competitiveness, such as indirect taxes and prices of existing assets like houses. Goods and Services tax is included in New Zealand's CPI but should be excluded from any assessment of changes in exporter's profitability because GST is not payable on exports; to overcome this problem, 6 per cent was deducted from New Zealand's CPI in the December quarter 1986, this amount being the estimated impact of the introduction of GST.<sup>5</sup> Thirdly, while the CPI is useful for giving a broad indication of price changes, it is not an adequate measure of changes in competitiveness in specific sectors.

### Comparison of Alternative Real Exchange Rate Index Series

Real exchange rate series using CPI deflators and the five sets of weights shown in table 1 are presented in graph 1.<sup>6</sup> It is evident that, over the

period covered by the graph (1979:2 – 1988:1), cumulative real exchange rate movements are sensitive to the weights being used, varying from an appreciation of 5 per cent using bilateral import weights to an appreciation of 18 per cent using global export weights; the composite series being published by the Reserve Bank shows an 11 per cent appreciation over this period. The global index is, however, the one which stands out most from the others in terms of the cumulative appreciation. It can be seen that the appreciation (i.e. deterioration in competitiveness) shown by this index occurs mainly between December 1980 and December 1982. After December 1982, the global index follows a similar pattern to the other indices.

The factors contributing to the fall in competitiveness as indicated by the global index over 1980 to 1982 can be seen in graph 2, which shows the CPI deflated exchange rate changes. The graph shows that New Zealand deteriorated in competitiveness against Europe and Latin America, especially over 1980 to 1982. This deterioration impacts on the global export index because of its large European and Latin American weighting.

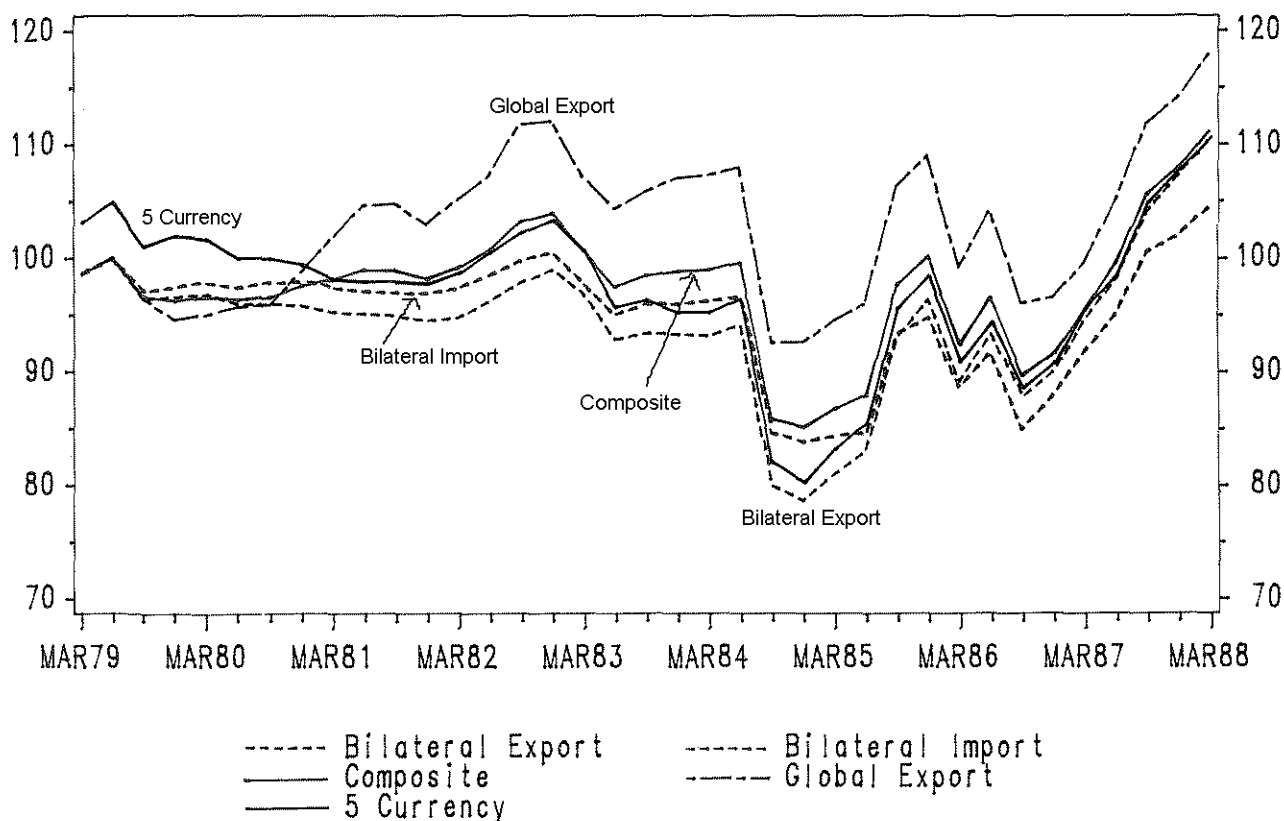
It is also evident in graph 1 that the real exchange rate devaluation of July 1984 was short-lived. By the December quarter 1985, the composite real exchange rate had returned to its pre-devaluation level. When the loss of assistance to exporters is also taken into account, it is clear that exporters were much worse off by then than they had been in July 1984. The further marked real appreciation of the New Zealand dollar since September 1985 (14 per cent to March 1988 using the Reserve Bank composite series), has aggravated the loss of exporters' competitiveness in recent years.

Prior to the July 1984 devaluation, the various real exchange rate measures (with the exception of the global export weighted index) were

<sup>5</sup> The CPIs of other countries covered in the calculated indices should also be net of the effect of indirect tax changes. However, there were not sufficient data available for this adjustment to be made.

<sup>6</sup> The CPI and average quarterly nominal exchange rate data required to calculate real exchange rates were obtained from the OECDs publication *Main Economic Indicators* and the IMF's publication *International Financial Statistics*. The CPI data were rebased so that all countries' CPIs were set equal to 100 in the second quarter of 1979; this choice of base period was arbitrary.

**Figure 1**  
Real Exchange Rate Indices  
Different Weighting Systems



more stable than they have since been. Indeed, during the period up until the beginning of the price freeze in June 1982, the crawling peg exchange rate policy kept most of the real exchange rate measures relatively constant. Following the imposition of the price freeze and abandonment of the crawling peg nominal exchange rate policy, competitiveness declined but was restored again with the March 1983 devaluation. Competitiveness then remained relatively constant during the remainder of the price freeze/ fixed exchange rate period (i.e., until July 1984).

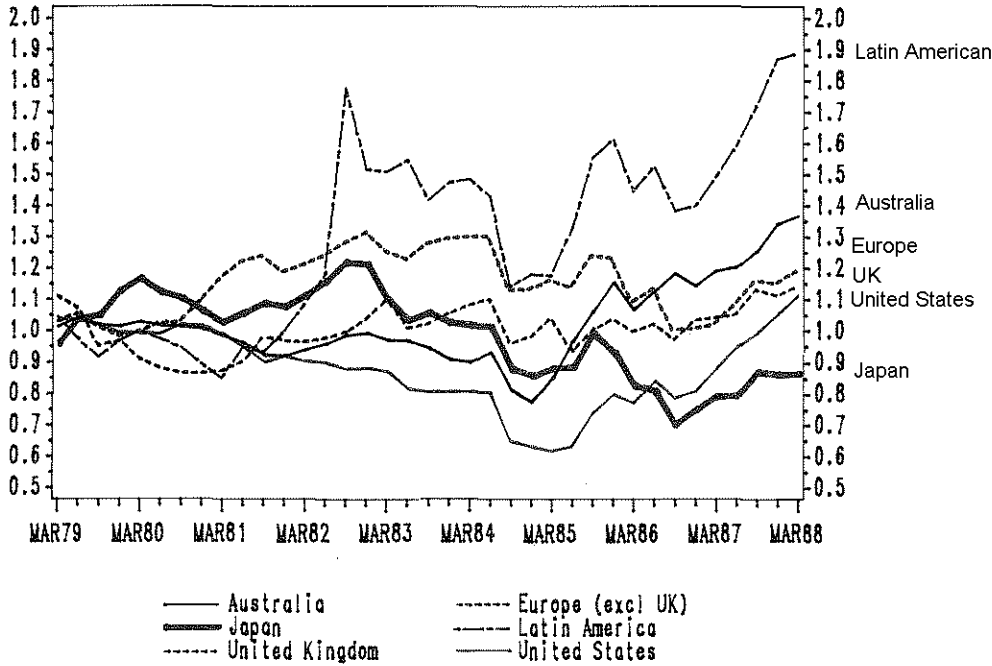
The role that high New Zealand inflation rates have played in generating real exchange rate appreciation in recent years is highlighted

by a comparison of the real exchange rate series in graph 1 with the corresponding nominal exchange rate series in graph 3. Over the period from June 1979 to September 1987, all of the exchange rate indices shown in graph 3 have declined strongly, except the global export index; this index has appreciated relative to 1979 levels because of the influence of some weak Latin American and European currencies. Yet despite the weakness of the nominal New Zealand dollar exchange rate, the corresponding real exchange rate measures all show an appreciation over this period (see graph 1). This result reflects the fact that New Zealand's inflation rate has been much higher over this period than inflation has been in competitor countries overall.

### Conclusion

There is no one measure of international competitiveness which is suitable for all purposes. The weighting system used to calculate a real exchange rate index series depends upon the type of international traded good competition to be measured. The three main types of competition discussed in this article were between: New Zealand exporters and foreign domestic producers; New Zealand exporters and other third country exporters to our markets; New Zealand import substitute producers and foreign exporters to this country. A weighting system that captures all three types of competition was discussed and compared with the other weighting systems. This weighting system, called a composite system, is used in

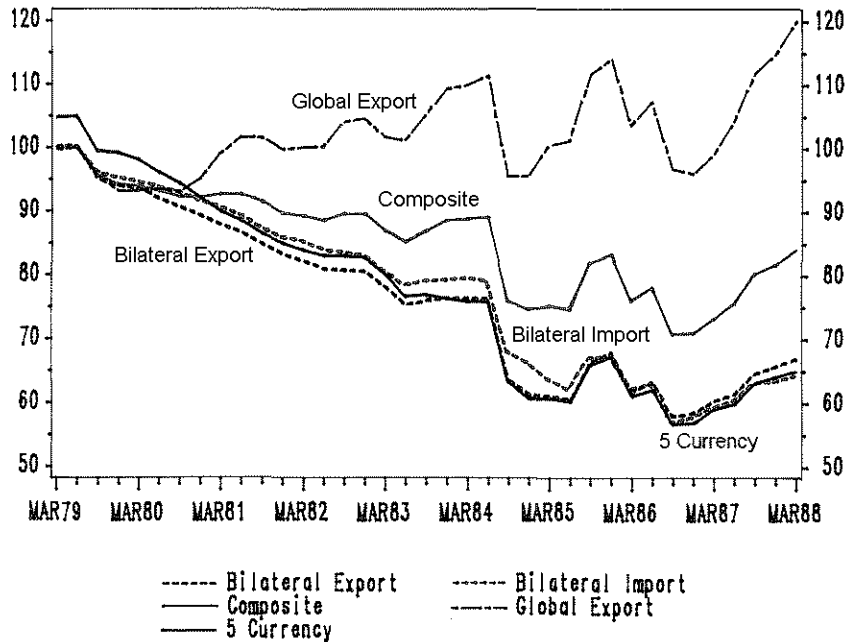
**Figure 2**  
CPI Deflated Exchange Rate Changes



the calculation of the real exchange rate index series being published by the Reserve Bank. However, there remain some important qualifications, such as those noted above, which need to be borne in mind when interpreting the data.

The importance of the weighting system was seen in the variation between the five real exchange rate index series considered. Over the period 1979:2 to 1988:1, the measured appreciation in the real exchange rate varied from 5 per cent using bilateral import weights to 18 per cent using global export weights. The Reserve Bank's composite real exchange rate index appreciated by 11 per cent over this period. The real exchange rate series calculated also showed that the July 1984 devaluation was reversed by December 1985 and that exporters have since continued to lose competitiveness. A comparison with nominal exchange rate indices calculated using the same sets of weights highlights the role of high inflation in New Zealand in undermining exporters' competitiveness over the past few years.

**Figure 3**  
Nominal Exchange Rate Indices  
Different Weighting Systems



APPENDIX  
Composite Real Exchange Rate Index  
(quarterly averages)

Mar. 1979	98.7	Mar. 1984	99.0
June 1979	100.0	June 1984	99.6
Sep. 1979	96.6	Sep. 1984	85.7
Dec. 1979	96.2	Dec. 1984	85.0
Mar. 1980	96.6	Mar. 1985	86.6
June 1980	96.3	June 1985	87.8
Sep. 1980	96.6	Sep. 1985	97.6
Dec. 1980	97.6	Dec. 1985	100.1
Mar. 1981	98.2	Mar. 1986	92.3
June 1981	99.0	June 1986	96.4
Sep. 1981	98.9	Sep. 1986	89.6
Dec. 1981	98.2	Dec. 1986	91.5
Mar. 1982	99.1	Mar. 1987	95.4
June 1982	100.7	June 1987	99.4
Sep. 1982	103.2	Sep. 1987	105.6
Dec. 1982	103.9	Dec. 1987	107.9
Mar. 1983	100.7	Mar. 1988	111.1
June 1983	97.4	June 1988	113.5(E)
Sep. 1983	98.4	Sep. 1988	104.7(E)
Dec. 1983	98.8		

(E) Estimated

