

REAL EXCHANGE RATES AND AUSTRALIAN  
EXPORT COMPETITIVENESS

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## ABSTRACT

This paper develops several summary measures of the real exchange rate, based on the international price competitiveness of Australian exports. The concept of a real exchange rate is briefly discussed, as well as a number of methodological issues relating to the construction of exchange rate indices. Using bilateral export weights and relative price levels, a summary bilateral exchange rate index is developed. A summary index based on third country export weights is also developed to take account of some of the weaknesses inherent in a bilateral index. The merits of other exchange rate indices are discussed and compared. Particular attention is given to the behaviour of the real exchange rate in the period since the float of the Australian dollar in December 1983. Our results confirm that a large part of the depreciation of the real exchange rate in 1985 and 1986 was eroded by the subsequent appreciation of the Australian dollar.

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# REAL EXCHANGE RATES AND AUSTRALIAN EXPORT COMPETITIVENESS

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## 1. INTRODUCTION

The exchange rate between the Australian dollar and other currencies is an important relative price in the Australian economy. The exchange rate is a key factor in the level of competitiveness of Australian industry, and can have a significant impact on Australia's trade flows. Given the large current account deficits of Australia in the 1980s, the exchange rate is particularly important in addressing our external imbalance.

The Australian dollar exchange rate is often quoted in the media as a nominal exchange rate with another currency such as the US dollar or Japanese Yen. Although bilateral exchange rates are important in determining trade flows between countries, they give little information about the overall competitive position. Nominal bilateral exchange rates make no allowance for inflation differentials, and ignore the third country effects of independent changes in the exchange rates of other countries. A summary index which incorporates a number of real bilateral exchange rates can be used to give a more accurate indication of competitiveness.

Existing measures of Australia's real exchange rate are either unavailable over a long period, have a narrow coverage, have inconsistencies in their calculation, or are not based on recent trade data. The object of this paper is to address the shortcomings of available indices by developing a long run and consistent external measure of the real exchange rate, based on Australian export competitiveness. Since there are several conceptual problems in defining and measuring real exchange rates, we briefly consider some of the concepts behind the construction of a real exchange rate index. We also discuss a number of methodological issues relating to the construction of exchange rate indices.

This paper develops several quarterly measures of the real exchange rate for the period 1960 to 1989. The indices are calculated as geometric weighted averages of bilateral real exchange rates, where the real exchange rates are estimated using the CPI as the price

deflator. Several different bilateral and third country based export weights are used. The merits of other exchange rate indices are discussed and compared. Particular attention is given to the behaviour of the various exchange rate indices in the period since the float of the Australian dollar in December 1983. The paper concludes with a brief summary.

## 2. CONCEPTUAL ISSUES

At a conceptual level there are two possible measures of competitiveness. The first is a domestic relative price (the ratio of traded to non-traded goods) which determines the flow of productive resources within the economy to and from the traded goods sector. The second measure of competitiveness focuses on the ability of Australian exports to compete in international markets - our prices compared with foreign prices, adjusted for exchange rates. For the purposes of this paper, we consider the latter: a measure of international price competitiveness, adjusted for exchange rates.

There are several other issues involved in the construction of an exchange rate index. The first issue to consider is whether to use a real or nominal index. As Maciejewski (1983, p. 494) suggests, a *nominal* exchange rate index only measures changes in the value of a basket of currencies arising from exchange rate changes, relative to a specific base period.

One commonly used nominal measure of the exchange rate is the Trade Weighted Index (TWI). Nominal indices such as the TWI do not take account of inflation differentials, an important determinant of competitiveness.<sup>1</sup> It is necessary to use a *real* exchange rate measure to remove the influence of price movements on the effective exchange rate. The purpose of this paper is to develop an index which measures the real effects of exchange rate and price movements on Australia's export competitiveness. This requires an index of *real* exchange rates.

### Weighting Schemes

Another important consideration involved in the construction of an exchange rate index is the particular weighting scheme to use. Ideally, the weights in an index of export competitiveness should reflect the effects of exchange rate changes on export receipts. Such a weighting

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<sup>1</sup> A discussion of the TWI is presented in the 'Nominal Measures' section of the Appendix.

system should, therefore, take account of the effects of different forms of competition upon trade flows: competition between our exporters and home producers in export markets, and competition with other exporters selling to the same market.<sup>2</sup> For this paper we use two alternative weighting schemes. Firstly, we calculate weights using aggregate bilateral export data. Secondly, we use data that is disaggregated by product, market, and competitor to calculate multilateral export weights.

Weighting bilateral exchange rates according to the value of our exports to that country assumes that the trade balance effects of exchange rate changes are proportional to bilateral export shares. This ignores the third country competition which Australia faces in its export markets. As an example, although we have only a small amount of direct trade with Canada, both Canada and Australia export very similar products to the USA - one of our major trading partners. Even if there was no change in the \$A/\$US real exchange rate, a change in the \$A/\$Canadian real exchange rate is likely to have an impact on Australia's real exports to the USA.

A bilateral index also takes no account of different supply and demand elasticities between commodities. Estimating the weights according to respective demand and supply elasticities is beyond the scope of this paper.<sup>3</sup>

As an alternative, we examine an index based on disaggregated third country weights. Following McGuirk (1987), we use disaggregated export data to calculate third country export weights, which take some account of third country competition in our export markets.<sup>4</sup>

### **Price Deflators**

Another consideration involved in the construction of a real exchange rate index is which price index is most appropriate. It is important to select a measure which provides an indication of the competitiveness of the export sector. The clearest alternatives are factor price

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<sup>2</sup> Disaggregated export data are used in this paper to ensure that only competition between relatively close substitutes is captured by the index.

<sup>3</sup> The IMF's Multilateral Exchange Rate Model (MERM) index does estimate the different demand and supply elasticities for several countries. See Rhomberg (1976) and Artus and McGuirk (1981) for a discussion of this index.

<sup>4</sup> The construction of third country export weights assumes that an equiproportionate change in the product prices of all countries leaves real trade flows unchanged, and that there is a uniform elasticity of substitution between all pairs of suppliers of all commodities in all markets.

measures (real unit labour costs or producer input prices), or final product or expenditure prices. Neither type of price index provides a full indication of changes in the competitiveness of the export sector.

Ideally, an index based on the prices of traded goods should be used to measure competitiveness, but such indices have a very narrow coverage and are not widely available for most countries. The price indices that are most widely available are the consumer price index, wholesale price index, GDP deflator, or an index of real unit labour costs. Whilst none of these indices provides an ideal measure of price competitiveness,<sup>5</sup> our choice of price index is largely constrained by data availability. The CPI is used in this paper because it is the only price index readily available on a consistent basis for the countries included in the index.

The CPI can be used as a proxy for the costs of production by assuming that changes in unit costs are reflected in final consumption prices. The disadvantage of using the CPI is that it excludes capital goods and includes non-traded goods and services that are not relevant to trade flows, and it only measures final consumption prices. Using the consumer price index may also distort cost comparisons if production structures vary widely between countries. Despite its limitations, this index gives a broad indication of the pattern of price changes between countries.

### 3. TECHNICAL ISSUES<sup>6</sup>

The real exchange rate indices calculated in this paper are geometric weighted averages of relative prices, adjusted for exchange rate movements.<sup>7</sup> The nominal exchange rate measures are calculated as geometric averages of nominal exchange rates.<sup>8</sup>

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<sup>5</sup> A competitiveness measure based on labour costs excludes other costs of production and is not specific to the traded sector. GDP deflators are based on current weights and (usually) market prices (not factor costs) so they may not be adequate for international comparison. Wholesale price indices differ widely in their coverage from country to country and may be distorted by indirect taxes and subsidies.

<sup>6</sup> Details of the construction of the indices and results are presented in the Appendix.

<sup>7</sup> Maciejewski (1983) shows that a nominal exchange rate index adjusted for inflation differentials is equivalent to an index of real exchange rates.

<sup>8</sup> In an arithmetic index, proportionate changes become dependent upon the base period selected. An arithmetic index will have an upward bias because currencies that appreciate against the Australian dollar more than the average

The base period chosen for the bilateral index is the average of the period 1980-1989. By using the average of a long period as the base, the index will not be as sensitive to short-run fluctuations, but should reflect broad trends.<sup>9</sup> The global export index is based in calendar year 1987. Although the selection of one individual year is not desirable, the large amounts of disaggregated data required to construct this index explains the choice of a single base year.<sup>10</sup>

## Weights

Several different weighting schemes can be employed, based on fixed or moving weights. Moving weights ensures that the index reflects the actual pattern of trade, but changing the weights every year obscures the precise meaning of the index. On the other hand, using fixed weights may cause the index to become less relevant as trading patterns change. A compromise between the two weighting procedures can be achieved by changing the weights at fixed intervals, then splicing the new series with the old one, or by employing a system of smoothed moving weights.<sup>11</sup>

Five sets of weights are used in this paper, the first four being based on aggregate bilateral export data. The first set of weights used is based on raw annual export shares, whilst the second set of weights is based on a centred five yearly moving average of export shares. The third series is based on a fixed set of export weights which changes every five years, where the new series is spliced on to the old one. The fourth series is estimated using fixed weights which are an average of the annual export shares from 1980 to 1989. The final set of weights is the third country export weights, calculated by measuring the importance of each market to Australian exports, weighted by the degree of competition with other countries in each export market.<sup>12</sup>

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are given a greater weight. See Brodsky (1982) for a discussion of the shortcomings of arithmetic exchange rate indices.

<sup>9</sup> Koch (1984) argues that the base period should reflect recent economic developments and should be cyclically neutral.

<sup>10</sup> Using fixed weights in a geometric averaging formula ensures that proportionate changes in the index are not dependent upon the base period chosen.

<sup>11</sup> In this paper, five yearly centred moving averages are used to smooth trade share weights. Figures for 1988/89 and 1989/90 are 3 and 2 year moving averages.

<sup>12</sup> Details of the products, markets and competitors used can be found in the Appendix.



The weights used for six of Australia's major trading partners under the moving average (MA) and third country weighting schemes are presented in Table 1. The weights used in the International Monetary Fund (IMF) and Australian Bureau of Agricultural and Resource Economics (ABARE) trade weighted real exchange rate indices are included for comparison.<sup>13</sup> This table shows that the third country weighting scheme gives substantially higher weight to Canada and the USA. These countries are significant competitors in Australia's export markets, and hence their weight in the index is greater than the export share assigned to them in the other indices. The weights given to the UK and Japan are much lower in the third country weighting scheme, because bilateral export shares overstate the importance of these countries to the competitive position of Australian exports. The export weighted indices also give a higher weight to Japan than the ABARE trade weighted index. This is because Japan is more important to Australia as an export destination than as an import supplier. The MERM index gives a higher weight to the US, because of its importance to trade between industrialized nations, and a much lower weight to Japan, since the weights are based on trade flows in 1977.

**Table 1**  
**Export and Trade Shares of Major Trading Partners in 1989**  
 (percentage weight assigned to each country, normalized)

Country	MA	3rd Country	MERM	ABARE
Canada	3.2	29.4	13.6	3.4
Japan	53.0	11.0	15.2	40.6
New Zealand	10.3	8.7	0.0	8.4
UK	7.4	4.4	2.9	10.3
USA	21.1	36.6	58.1	28.7
West Germany	5.0	9.9	10.2	8.6

<sup>13</sup> ABARE weights are 1988/89 trade weights. The IMF weights are based on MERM weights- see Artus and McGuirk (1981).

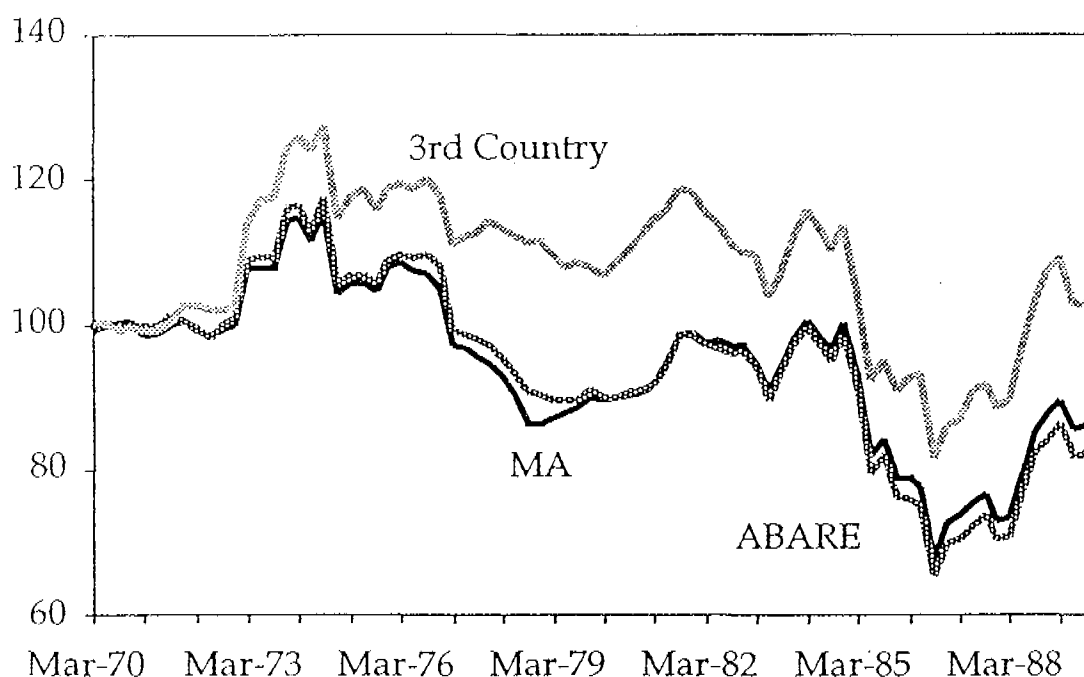
## 4. RESULTS

### Pre-Float Period

Five real export exchange rate indices were calculated in this paper - one for each of the alternative weighting schemes considered. In all of the following figures, an appreciation of the exchange rate implies a rise in the real exchange rate, and hence a fall in competitiveness. In Figure 1, the moving average and the third country weighted real exchange rate series are compared with the ABARE real exchange rate index.<sup>14</sup> Overall, these three series exhibit broadly similar movements. For all series, the appreciation of the early seventies was almost entirely eroded by about 1977, and from then until around 1984 there was little movement in the series.

The most notable feature of Figure 1 is that the third country index is at a higher level than the other indices for almost all of the period.

**Figure 1**  
**Real Exchange Rate Measures**  
**Index 1970 = 100**



<sup>14</sup> The results of the annual, spliced, and 1980/89 weighted series were found to be very similar to the MA series and so are not presented here. Our preferred index is the MA index, which represents a compromise between using fixed weights and changing weights every year.

Figure 2

Real Bilateral Exchange Rates  
Index Mar 1970 = 100

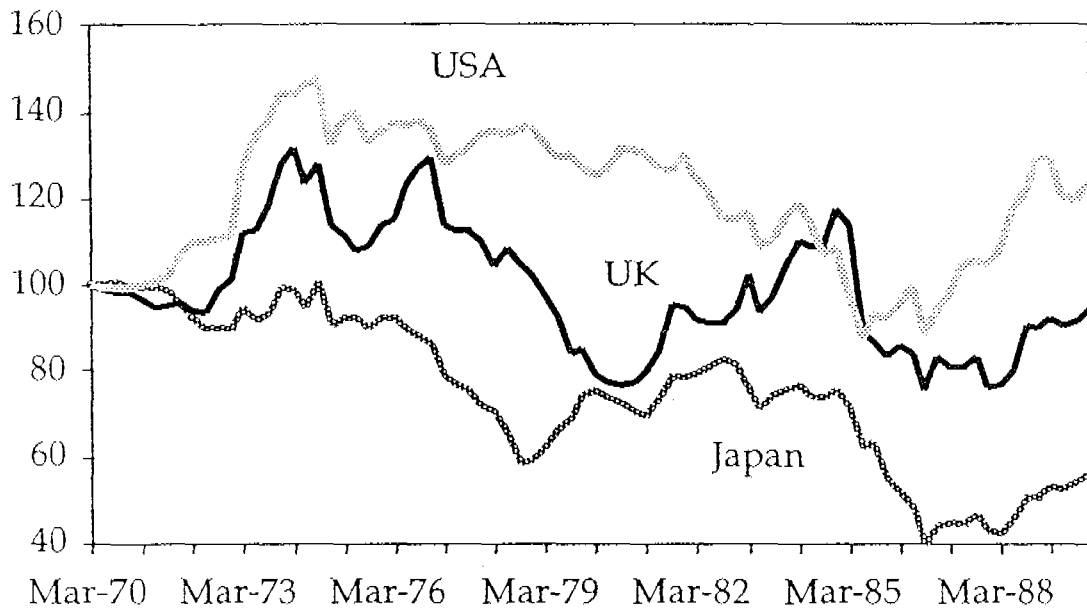
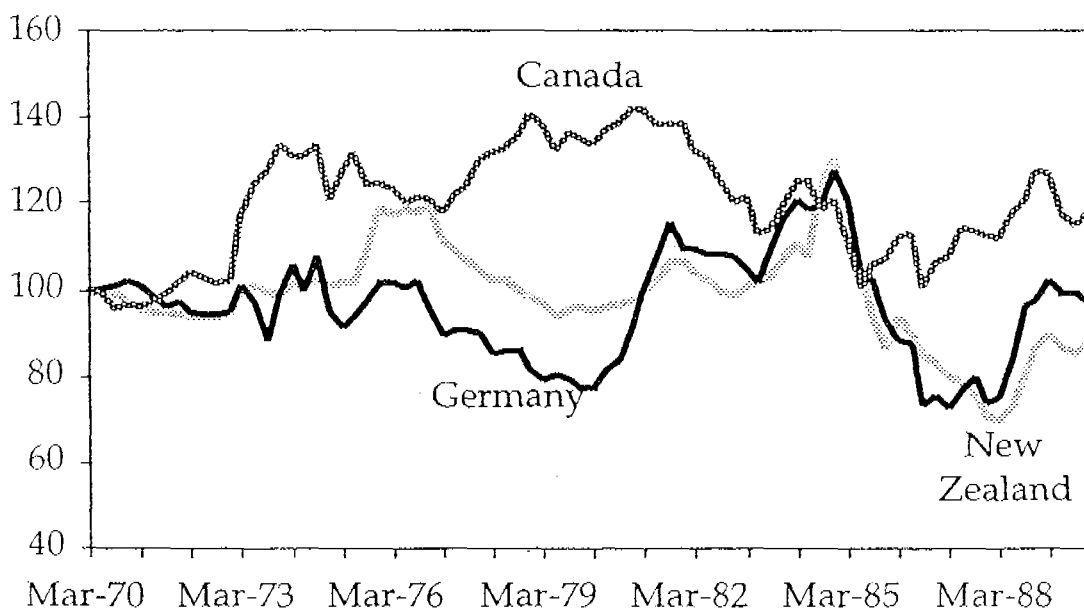


Figure 3

Real Bilateral Exchange Rates  
Index Mar 1970 = 100



This indicates that our level of export competitiveness has been lower over the seventies and eighties than the other measures suggest. The gap between the three measures first opened during the real appreciation of 1973/74, and widened during 1977/78 when the third country index depreciated by less than the other two indices. The divergence in the measures is dominated by the higher weight placed by the third country index on the real exchange rate between Australia and the USA or Canada, and the lower weight on the exchange rate between Australia and Japan.

In Figures 2 and 3, the real exchange rates between Australia and each of its six major trading partners are shown to further highlight this point. The sharp appreciation of the real exchange rate with Canada and the US in 1973/74 is a major factor in the rise in the third country index. The sharp fall in the real exchange rate against Japan in the second half of the seventies also helps explain the larger falls in the bilateral indices compared with the third country index.

It is also interesting to note that for most of the seventies and eighties Australia has been less competitive with the USA and Canada than it was at the beginning of the seventies. This is particularly important given that we produce very similar products to these countries, and thus compete with them widely in Australian and overseas markets.

Our real exchange rates with Germany, New Zealand and the United Kingdom have not shown as dramatic trends as the other three exchange rates over the pre-float period.

### Post-Float Period

Table 2 summarizes the changes in the three main indices since the float in December 1983. This table shows that the appreciation of the Australian dollar to December 1989 has largely eroded the real depreciation since the float.

Referring again to Figures 2 and 3, we can see that of the 48% real depreciation against the Japanese Yen between March quarter 1984 and September quarter 1986, less than half was eroded - i.e. in December quarter 1989 the index was still 26% below its level of March quarter 1984. In contrast, although the Australian dollar depreciated by over 25% against the US dollar between March quarter 1984 and September quarter 1986, this fall was entirely eroded - by December 1989 the index was only five percent above its level of March quarter 1984. Examining the real exchange rate with Germany, New Zealand

**Table 2**  
**Changes in the Real Exchange Rate since the Float**  
 (percentage change)

Period	Annual	MA	Spliced	80/89	3rd Country
Mar Q 84 to Sep Q 86	-33.2	-32.7	-32.6	-32.9	-29.5
Sept Q 86 to Dec Q 89	+31.2	+30.6	+31.5	+31.6	+28.4
Mar Q 84 to Dec Q 89	-12.4	-12.1	-11.3	-11.7	-9.4

**Table 3**  
**Changes in Components of the Real Exchange Rate**  
 (percentage change<sup>15</sup>)

Period	RER Index	Relative Prices	Exchange Rates
Mar Q 84 to Sep Q 86	-33	+11	-39
Sept Q 86 to Dec Q 89	+32	+13	+16
Mar Q 84 to Dec Q 89	-12	+25	-29

and the United Kingdom shows that Australia was in a substantially more competitive position in December quarter 1989 than it was in March 1984. Overall, however, the increase in competitiveness from the depreciation of the Australian dollar in 1985 and 1986 was substantially diminished, as Figure 1 clearly shows.

### Composition of Changes

Table 3 shows the percentage changes in the different components of the real exchange rate index based on 1980/89 export shares. A fixed weight index is used to abstract from the effects of changing weights. The depreciation in the index to September 1986 was largely driven by nominal exchange rate depreciation, despite an eleven percent increase in relative price levels. The subsequent appreciation of the real exchange rate occurred as a result of both exchange rate and

<sup>15</sup> The percentage changes are calculated as geometric weighted averages of the respective components, using 1980/89 export shares as weights. The sum of percentage changes of the components will not equal the change in the index, as the sum will only equal the product when percentage changes are small.

**Table 4**  
**Measures of the Real Exchange Rate**  
 (percentage change)

Period	MA	3rd Country	IMF	ABARE
Mar Q 84 to Sep Q 86	-32.7	-29.5	-34.3	-34.2
Sept Q 86 to Dec Q 89	+30.6	+28.4	+29.9	+28.3
Mar Q 84 to Dec Q 89	-12.1	-9.4	-14.7	-15.6

relative price increases. Overall, however, this table clearly shows that the main influence on changes in the real exchange rate over the period considered was nominal exchange rate change, rather than relative inflation.

### Comparison with Other Measures

The behaviour since the float of several different measures of Australia's real exchange rate are shown in Table 4. This table compares the real exchange rate index calculated by ABARE and the IMF with the measures developed in this paper.

The real effective exchange rate calculated by the IMF is a geometric fixed weighted average of CPIs, expressed in a common currency.<sup>16</sup> The IMF index takes account of both bilateral and third country competition. The weights are calculated by aggregating four sets of weights based on exports and imports of manufactured goods and primary products for the period 1980-1982. Weights for manufactured goods are simple averages of bilateral and third country weights. Primary products are weighted according to shares in world imports and exports on a commodity-by-commodity basis, aggregated across a large number of commodities. The index is based in 1985.

The IMF index provides an estimate of 14.7% for the fall in Australia's real exchange rate since the float. This estimate is larger than that suggested by both the bilateral and third country based indices. This may be due to the combination of third country effects upon imports and internal trade not measured by the indices calculated in this paper. The differences may also reflect the fact that our indices are weighted using more recent trade data.

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<sup>16</sup> See IMF (1990) for a discussion of the methodology behind this index.

The ABARE real exchange rate index is an arithmetic average of CPIs, adjusted for exchange rates. The index is based in 1980, with weights calculated according to the trade share of twelve of Australia's trading partners, updated annually. The ABARE index shows a net fall of 15.6% since the float. The differences between our index and the ABARE index relate mainly to the methodology and coverage of the respective indices.<sup>17</sup>

## 5. SUMMARY

This paper develops several long-run external measures of the real exchange rate, based on international price competitiveness. The indices are calculated over the period 1960 to 1989 as geometric weighted averages of bilateral real exchange rates. Several different bilateral and third country based export weights are used. The real exchange rate indices are estimated using the CPI as the price deflator.

The most notable difference between our various indices is that over the 1970's and 1980's the third country index consistently measures Australia's real exchange rate at a higher level, and hence our competitiveness at a lower level, than do the other bilateral export weighted indices. And, since the March quarter 1984, the third country index suggests our competitive position has improved by less than the other measures suggest.

Estimates derived in this paper show that although the real exchange rate fell by about thirty percent between the March Quarter 1984 and the September Quarter 1986, this was subsequently substantially eroded. By the December quarter 1989, the real exchange rate was only about ten percent below its March 1984 level. Over this period, we found that movements in the real exchange rate were dominated by movements in the nominal exchange rate.

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<sup>17</sup> Using the same countries and methodology as ABARE, we estimate a fall of 14.8% since the float. This difference may reflect different data definitions and our use of smoothed quarterly weights. By extending the coverage of the ABARE index to 22 countries and retaining their methodology, this fall is reduced to 10.1%. Changing the base year from 1980 to 1985 reduces the change since the float to 13.8% for the 12 countries, then 10.3% when extended to 22 countries. Using a geometric averaging technique, the change in the index equals 11.1% for the 22 countries.

## APPENDIX

## Weights

The weight for country  $j$  in a bilateral export weighted index is the ratio of total exports of goods and services between Australia and country  $j$  to total Australian exports. Weights are calculated for 22 of Australia's trading partners. They are given by:

$$w_i = \frac{X_i}{\sum_{j=1}^{22} X_j} \quad (1)$$

where  $X_j$  is the value in \$A of Australian exports to country  $j$ .

The third country export weight of country  $j$  provides a measure of the importance of a change in the relative price  $P_j/P_{AUS}$  for the demand for Australia's real exports.<sup>18</sup> It can be calculated by measuring the importance of each market to Australian exports, weighted by the degree of competition with other countries in each export market. It is given by:

$$w_j = \sum_{k \neq AUS} \left[ \frac{\sum_i X_{iAUS}^k}{\sum_k \sum_i X_{iAUS}^k} \right] \sum_i \left[ \frac{X_{iAUS}^k}{\sum_i X_{iAUS}^k} \frac{X_{ij}^k}{\sum_j X_{ij}^k} \right] \quad (2)$$

where  $X_{ij}^k$  is the value in \$US of good  $i$  country  $j$  exports to market  $k$ .

The weighting formula has two components. The first component measures Australian exports to market  $k$  as a proportion of total Australian exports. In the second component, the index is constructed as a product of two terms. The first term measures the importance of Australia's trade in good  $i$  to market  $k$ . The second term measures the importance of country  $j$  as an export competitor in market  $k$ . The index is then summed over all markets. We have not extended the index to include measures of "internal" trade due to the large data requirements.

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<sup>18</sup> The methodology discussed in this section is drawn from McGuirk (1987).



For the calculation of the third country weights, Australian exports in 1987 were disaggregated at a three digit SITC level into all products making up more than 0.5 percent of the total. Twenty-eight individual categories, making up 70 per cent of total exports, were identified and were then divided into 7 markets of destination. Competition between Australia and our 15 major competitors in each market was captured.

Table A.1 provides a snapshot of the weights under several different indices.<sup>19</sup>

**Table A.1**  
**Weights Comparison**  
(Index weights for 1989, expressed as a percent)

Country	Annual	80/89	3rd Country	TWI	ABARE
Belgium	1.0	1.0	-	0.9	-
Canada	1.9	1.9	24.3	2.2	2.6
China	3.2	4.1	-	2.8	-
France	2.6	2.6	6.4	2.8	3.3
Germany	2.9	3.2	8.2	5.0	5.9
Hong Kong	4.8	3.1	0.2	3.4	4.1
India	1.5	1.3	-	1.0	-
Indonesia	2.1	2.0	-	1.4	-
Ireland	-	-	1.3	-	-
Italy	2.8	2.6	1.6	3.0	3.5
Japan	32.0	33.0	9.1	26.7	31.8
Malaysia	2.1	2.4	0.4	1.8	-
Netherlands	1.9	1.7	3.3	5.2	6.2
New Zealand	6.1	6.2	7.2	1.5	-
P N G	2.1	2.4	-	1.1	-
Saudi Arabia	0.7	1.4	-	0.9	-
Singapore	4.1	3.4	1.5	3.2	3.8
South Korea	5.9	4.5	1.4	4.2	5.0
Sweden	0.4	0.3	-	1.2	-
Switzerland	1.1	0.3	-	1.0	-
Taiwan	4.3	3.4	-	4.3	5.1
Thailand	-	-	1.2	1.1	-
United Kingdom	4.2	4.9	3.7	6.1	7.3
United States	12.3	13.4	30.2	17.9	21.4
USSR	-	-	-	1.3	-

<sup>19</sup> See Artus and McGuirk (1981) T. 7, pp. 305-306 for the MERM weights.

**Table A.2**  
**Categories of Disaggregation in 3rd Country**  
**Export Based Index**

Commodities	Competitors	Markets
001 Live animals for food	Canada	USA
011 Meat fresh, chilled, frozen	France	Japan
022 Milk & cream	Germany	Other Asia
024 Cheese & curd	Hong Kong	UK
036 Shellfish fresh, frozen	Ireland	Other Europe
041 Wheat, unmilled	Italy	New Zealand
043 Barley, unmilled	Japan	Middle East
054 Veges etc fresh, simply pres.	Korea	
057 Fruit, nuts, fresh, dried	Malaysia	
081 Feeding stuff for animals	Netherlands	
211 Hides, skins excluding furs, raw	New Zealand	
246 Pulpwood, chips, wood waste	Singapore	
263 Cotton	Thailand	
268 Wool excluding tops, animal hair	United Kingdom	
281 Iron ore concentrate	USA	
286 Uranium, thorium ore, concentrate		
322 Coal, lignite & peat		
674 Iron, steel, universal, plate, sheet		
682 Copper		
684 Aluminium		
685 Lead		
686 Zinc		
713 Internal combustion piston engines		
781 Pass. motor vehicles excl. buses		
784 Motor vehicle parts & access, nes		
882 Photo, cinema supplies		
931 Specials transactions		
971 Gold, non monetary, nes		

## Index Formulae

The real exchange rate indices estimated in this paper provide a summary measure of the real value of the Australian dollar. A rise in the indices implies an increase in the value of the real exchange rate, or a loss of competitiveness. Each exchange rate index is calculated according to the formula:

$$\text{RER}_t = 100 \cdot \prod_{j=1}^l \left[ \frac{\text{CPI}_{\text{AUS } t}}{\text{CPI}_{jt}} \cdot \frac{E_{jt}}{E_{j0}} \right]^{w_j} \quad (3)$$

where  $\prod$  denotes the product of the bracketed terms over  $l$  trading partners,  
 $\text{CPI}_{\text{AUS } t}$  is the level of the CPI in Australia at time  $t$ ,  
 $\text{CPI}_{jt}$  is the level of the CPI in country  $j$  at time  $t$ ,  
 $E_{jt}$  is the number of foreign currency units for country  $j$  per Australian dollar at time  $t$ ,  
 $E_{j0}$  is the number of foreign currency units for country  $j$  per Australian dollar in the base period,  
 $w_j$  is the weight of country  $j$ .

### *Splicing*

The spliced series are calculated by estimating the real exchange rate using 1960, 1965, 1970, 1975, 1980 and 1985 weights. These six series are chained together with the links equal to the ratio of the geometric averages of the calendar year of the link. For instance, observations from 1965:1 to 1969:4 for the spliced series are equal to the 1965 series multiplied by the splicing factor for 1965. The splicing factor equals the geometric average of the 1965 observations of the 1960 weighted series, divided by the geometric average of the observations of the 1965 weighted series. Similarly, observations for 1985 are equal to the weighted series multiplied by the 1965, 1970, 1975, 1980 and 1985 splicing factors.

### Nominal Measures

A set of nominal exchange rate indices were estimated using the five different weighting schemes. These nominal indices are similar to the TWI published by the Reserve Bank of Australia, but are estimated quarterly using consistent weights from 1960 to 1989. A comparison of

**Table A.3**  
**Measures of the Nominal Exchange Rate**  
 (percentage change)

Period	MA	3rd Country	MERM	TWI
Mar Q 84 to Sep Q 86	-39.4	-35.7	-40.1	-38.5
Sept Q 86 to Dec Q 89	+15.9	+14.5	+17.4	+17.7
Mar Q 84 to Dec Q 89	-29.8	-26.3	-29.7	-27.6

several summary measures of the nominal exchange rate is presented in Table A.3.

The nominal effective exchange rate index estimated by the IMF is based on its Multilateral Exchange Rate Model (MERM). The weights in the index are based on MERM estimates of the trade balance effects of a one percent change in the domestic currency price of each of 18 other currencies. The weights are based on trade flows in 1977, whilst the index has 1980 as the base year.<sup>20</sup> The index is calculated as a geometric weighted average of nominal exchange rates.

The TWI is calculated by the Reserve Bank of Australia as a trade weighted average of exchange rates with Australia's major trading partners. Since 1984 trade weights have been changed annually, in October, to reflect trade shares over the previous financial year. The index was calculated using an arithmetic averaging technique prior to October 1988, based on trade shares with 20 groups of trading partners. There are several breaks in the TWI series. Since 1988, the TWI has been calculated as a geometric trade weighted average of exchange rates, based on bilateral trade shares with countries making up 90 percent of our total trade (presently 24 countries).<sup>21</sup>

Table A.3 shows the behaviour since the float of several measures of Australia's nominal exchange rate. A comparison of Tables 4 and A.3 show that the range of changes in the measures of the nominal exchange rate is much smaller than the range for the real exchange rate. This can be explained by the substantial divergences in price levels which occurred over this period, which were magnified by the different weights used for the indices.

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<sup>20</sup> See Artus and McGuirk (1981) for a discussion of the MERM model.

<sup>21</sup> See Reserve Bank of Australia (1984,1988) for details of the calculation of the TWI.

## Data

Exchange rate and CPI data used in this paper are quarterly figures from the International Monetary Fund, International Financial Statistics. Period average exchange rate figures are used for all countries from 1960:1 to 1989:4. Australian CPI data are 'Medicare adjusted' figures. CPI data for China are quarterly averages of annual figures. Quarterly CPI data for Saudi Arabia, Indonesia, South Korea, Singapore, and Papua New Guinea are unavailable prior to 1971. Index figures for these countries prior to 1971 are based on geometric averages of annual CPI data.<sup>22</sup> Figures after 1971 include all 22 countries.

Export weights for the aggregate bilateral index are calculated using annual export figures for financial years 1956/57 to 1989/90 from Australian Yearbooks (various issues). More recent export data are from Exports, Australia Annual Summary Tables (ABS Cat. No. 5424.0). Figures for 1989/90 are based on the ten months to April 1990, from Exports, Australia Monthly Summary Tables, January 1990 (ABS Cat. No. 5432.0). Geometric averages are applied to annual figures to derive quarterly figures. Moving average export weights are centred five yearly moving averages of annual figures. Moving average figures for 1988/89 are 3 year centred moving averages, whilst figures for 1989/90 are annual averages of 1988/89-1989/90.<sup>23</sup>

Data used in calculation of the third country export weights are collected from the United Nations Commodity Trade Statistics, 1987.

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<sup>22</sup> Annual figures for Saudi Arabia are available from 1964. Annual figures for Hong Kong, Indonesia, Korea and Singapore are available from 1960, whilst figures for PNG are only available from 1971.

<sup>23</sup> Geometric 17 quarter centred moving averages are used to derive 5 year moving averages, whilst 9 and 5 quarter centred moving averages are used for the 3 and 2 year moving averages.

**Table A.1**  
**Selected Exchange Rate Measures**

Date	Real Export Weighted					Nominal Export Weighted				
	Ann.	MA	Spl.	80/89	3rd	Ann.	MA	Spl.	80/89	3rd
Mar-60	103.3	102.1	104.9	115.3	102.9	77.4	77.7	93.4	104.3	96.7
Jun-60	104.9	103.0	106.1	114.8	104.5	78.7	78.8	94.1	105.0	97.9
Sep-60	105.6	103.2	106.6	115.1	105.4	79.5	79.2	94.1	105.0	97.8
Dec-60	105.5	103.0	106.7	115.3	105.4	80.3	79.6	94.1	105.0	98.0
Mar-61	105.1	102.6	106.6	114.9	106.0	81.1	80.0	94.1	104.9	98.1
Jun-61	104.4	102.1	106.5	114.8	106.3	81.8	80.3	93.9	104.8	97.8
Sep-61	101.6	100.2	104.9	112.9	106.1	82.3	80.9	94.0	104.9	98.7
Dec-61	98.5	98.1	103.0	110.6	105.1	82.7	81.3	94.0	104.9	98.8
Mar-62	96.6	97.0	102.2	109.9	104.8	83.1	81.8	94.1	104.9	99.1
Jun-62	94.2	95.6	101.0	108.8	104.6	83.4	82.2	94.1	105.0	99.7
Sep-62	93.6	94.7	100.5	108.2	104.4	83.5	82.6	94.1	105.0	99.9
Dec-62	93.5	94.3	100.6	107.9	104.3	83.5	82.9	94.1	105.0	99.9
Mar-63	92.0	92.5	98.9	105.7	103.3	83.5	83.2	94.1	105.0	99.9
Jun-63	98.7	93.2	99.1	110.7	102.7	78.7	82.2	93.3	100.0	99.9
Sep-63	96.2	93.1	99.4	110.3	102.5	80.9	82.4	93.3	100.0	99.9
Dec-63	94.1	92.2	98.5	109.1	101.9	82.4	82.7	93.3	100.0	99.9
Mar-64	93.5	92.2	98.2	108.9	102.1	83.5	82.9	93.3	100.0	99.9
Jun-64	93.2	92.1	97.9	108.4	102.2	84.3	83.1	93.3	100.0	99.9
Sep-64	93.6	92.8	98.3	108.3	103.0	84.2	83.4	93.3	100.0	99.9
Dec-64	93.3	92.7	97.9	107.2	103.3	84.1	83.7	93.3	100.0	99.9
Mar-65	92.9	92.7	98.2	106.2	103.3	84.0	84.0	93.6	100.0	99.9
Jun-65	92.3	92.5	97.8	105.3	103.3	83.9	84.4	93.6	100.0	99.9
Sep-65	93.6	93.2	98.3	105.8	103.7	84.6	84.9	93.6	100.0	99.9
Dec-65	94.9	93.8	98.7	106.0	104.3	85.1	85.3	93.6	100.0	99.9
Mar-66	95.0	93.4	98.1	105.1	103.5	85.7	85.7	93.6	100.0	99.9
Jun-66	95.5	93.4	98.0	104.1	103.0	86.2	86.2	93.7	94.8	98.4
Sep-66	95.7	93.9	98.2	103.7	102.7	87.2	87.1	94.3	95.1	98.4
Dec-66	95.9	94.3	98.3	103.3	102.9	87.9	87.6	94.3	95.1	98.4
Mar-67	95.8	94.5	98.2	102.5	102.9	88.6	88.1	94.3	95.1	98.4
Jun-67	95.9	95.1	98.2	102.4	102.9	89.3	88.6	94.3	95.1	98.4
Sep-67	96.9	96.5	99.2	102.8	103.4	89.8	89.2	94.3	95.2	98.4
Dec-67	97.2	97.2	99.9	102.4	103.6	91.5	91.1	96.0	96.4	99.1
Mar-68	99.2	99.5	102.8	103.5	104.2	94.8	94.5	99.7	98.8	100.6
Jun-68	99.3	99.8	102.8	103.5	104.2	95.2	95.0	99.7	99.0	100.6
Sep-68	100.3	99.7	102.6	103.0	103.6	96.0	95.6	99.7	99.2	100.6
Dec-68	101.1	99.7	102.2	102.8	103.3	96.7	96.2	99.7	99.3	100.6
Mar-69	101.9	100.0	102.1	102.7	102.9	97.4	96.8	99.7	99.4	100.6
Jun-69	102.0	99.8	101.4	102.0	102.0	98.1	97.4	99.7	99.4	100.6
Sep-69	101.4	99.9	101.4	101.2	102.0	98.7	98.3	100.2	99.7	101.2
Dec-69	100.8	100.0	101.1	100.9	101.7	98.9	98.8	100.1	99.8	101.0

Table A.1 (Cont.)

Date	Real Export Weighted					Nominal Export Weighted				
	Ann.	MA	Spl.	80/89	3rd	Ann.	MA	Spl.	80/89	3rd
Mar-70	99.4	99.4	100.1	99.9	100.7	99.0	99.2	100.0	99.8	100.8
Jun-70	99.1	99.9	100.1	100.1	100.4	99.3	99.8	100.1	100.1	100.5
Sep-70	100.2	100.2	99.9	100.0	99.2	100.3	100.2	100.0	100.1	99.4
Dec-70	101.4	100.6	99.9	100.0	99.7	101.4	100.7	100.0	100.1	99.4
Mar-71	99.8	98.6	97.6	98.6	99.3	100.3	99.3	98.1	99.1	99.1
Jun-71	100.8	99.0	97.7	99.0	99.4	101.1	99.7	98.0	99.1	99.0
Sep-71	101.7	99.9	98.2	100.2	100.5	101.2	100.0	97.9	99.6	99.6
Dec-71	102.4	100.5	98.7	100.9	102.7	100.5	99.5	97.2	99.0	100.3
Mar-72	101.0	99.2	97.1	99.2	102.9	99.1	98.4	95.7	97.5	100.7
Jun-72	100.2	98.4	96.1	98.2	101.9	98.7	98.4	95.3	97.3	100.1
Sep-72	101.1	99.3	96.9	98.5	102.2	99.4	99.3	95.8	97.3	100.2
Dec-72	101.5	99.8	97.2	98.8	102.6	100.6	100.5	96.7	97.9	100.9
Mar-73	109.9	107.9	105.2	106.6	114.1	109.1	108.9	104.7	105.9	111.7
Jun-73	109.9	107.8	105.4	106.7	117.3	109.6	109.2	104.9	106.2	114.0
Sep-73	110.2	108.0	105.8	106.6	117.5	109.9	109.1	104.8	105.8	113.1
Dec-73	116.6	114.3	112.2	112.5	124.4	116.8	115.6	110.9	111.7	118.4
Mar-74	116.7	114.7	112.9	111.9	125.7	121.9	120.5	115.2	115.8	121.0
Jun-74	112.9	111.4	109.7	109.3	124.1	118.4	117.2	111.8	112.7	118.3
Sep-74	116.7	115.6	113.7	113.0	127.1	120.2	119.7	113.5	114.4	118.8
Dec-74	104.9	104.2	102.6	102.1	114.7	107.8	107.9	102.2	103.0	106.4
Mar-75	105.8	105.6	103.7	104.0	117.4	107.4	108.2	102.4	103.7	107.6
Jun-75	105.7	105.8	104.0	104.3	118.6	106.6	108.0	102.2	103.3	107.6
Sep-75	105.0	104.7	103.1	103.0	115.9	107.7	108.2	102.4	103.2	106.9
Dec-75	108.6	107.9	106.5	106.2	118.5	108.4	108.3	102.4	103.0	105.8
Mar-76	109.5	108.5	107.2	107.0	119.3	108.9	108.1	102.3	102.9	105.2
Jun-76	108.6	107.4	106.4	106.1	118.5	108.5	107.1	101.5	101.9	104.0
Sep-76	108.9	107.3	106.5	106.3	119.9	107.8	106.3	100.9	101.4	104.5
Dec-76	107.1	105.1	104.6	104.4	117.9	101.8	100.4	95.4	95.8	98.7
Mar-77	99.3	97.1	96.9	96.7	111.1	94.2	92.8	88.4	88.8	92.9
Jun-77	98.8	96.6	96.4	96.5	112.2	93.6	92.4	88.1	88.6	93.9
Sep-77	97.6	95.8	95.8	95.8	112.6	92.2	91.2	87.1	87.7	94.0
Dec-77	95.7	94.5	94.5	94.9	114.3	89.6	88.8	85.0	85.8	94.6
Mar-78	93.3	92.7	92.7	93.3	113.3	87.4	87.0	83.3	84.3	94.1
Jun-78	90.1	90.2	90.5	91.3	112.3	84.7	84.6	81.3	82.4	93.6
Sep-78	86.7	86.2	86.7	87.7	111.5	80.6	80.4	77.4	78.8	92.9
Dec-78	87.1	86.1	86.7	87.7	111.6	79.7	79.4	76.6	78.0	92.4
Mar-79	88.2	86.9	87.5	88.2	109.7	80.0	79.7	77.0	78.2	91.2
Jun-79	89.4	87.7	88.4	88.9	107.8	80.8	80.6	77.8	79.0	89.9
Sep-79	89.8	88.3	89.0	89.6	108.6	81.5	81.2	78.5	79.8	90.9
Dec-79	90.9	89.8	90.8	90.9	107.7	82.2	82.1	79.6	80.5	89.7

Table A.1 (Cont.)

Date	Real Export Weighted					Nominal Export Weighted				
	Ann.	MA	Spl.	80/89	3rd	Ann.	MA	Spl.	80/89	3rd
Mar-80	90.3	89.6	90.4	90.9	106.6	82.5	82.6	79.8	81.3	89.7
Jun-80	90.1	89.9	90.7	91.3	108.6	82.8	83.2	80.4	82.0	91.7
Sep-80	90.6	90.2	90.9	91.5	110.2	83.4	83.5	80.7	82.5	93.4
Dec-80	91.2	90.5	91.3	91.9	112.4	84.0	84.0	81.1	83.0	95.6
Mar-81	92.5	91.6	92.5	93.0	114.4	85.1	84.8	82.1	84.0	97.7
Jun-81	95.5	94.5	95.6	95.9	115.7	88.0	87.6	84.9	86.7	99.3
Sep-81	99.7	98.6	100.0	100.1	118.5	91.6	91.2	88.5	90.3	102.2
Dec-81	100.0	98.8	100.2	100.4	118.4	89.6	89.2	86.5	88.3	100.0
Mar-82	98.7	97.5	98.8	99.0	115.3	87.8	87.5	84.8	86.5	97.3
Jun-82	98.8	97.7	99.0	99.1	113.9	87.1	86.9	84.2	85.9	96.0
Sep-82	98.3	97.2	98.6	98.6	111.2	84.9	84.7	82.1	83.7	92.2
Dec-82	98.1	97.0	98.3	98.4	109.8	83.2	83.0	80.3	82.0	89.4
Mar-83	95.9	94.7	96.0	96.1	109.5	80.1	79.8	77.2	78.8	87.6
Jun-83	91.9	90.8	91.8	92.0	103.9	76.1	75.8	73.2	74.8	82.5
Sep-83	95.7	94.4	95.4	95.6	107.0	78.4	78.0	75.3	77.0	84.5
Dec-83	99.7	98.1	99.1	99.4	112.3	80.7	80.1	77.2	79.0	87.5
Mar-84	102.3	100.5	101.6	101.9	115.7	82.7	81.9	79.1	80.9	90.0
Jun-84	100.0	98.1	99.2	99.4	113.4	80.7	79.8	77.1	78.8	88.2
Sep-84	98.4	96.7	97.9	98.0	110.3	78.9	78.2	75.7	77.2	85.6
Dec-84	101.8	100.3	101.8	101.6	113.7	81.3	80.7	78.3	79.7	87.9
Mar-85	94.3	93.2	94.3	94.4	104.6	75.0	74.6	72.3	73.7	80.7
Jun-85	83.0	82.1	83.2	83.2	92.4	65.3	65.1	63.1	64.3	70.6
Sep-85	85.1	84.1	85.3	85.2	94.8	65.9	65.7	63.7	64.9	71.4
Dec-85	79.8	78.9	79.9	79.9	91.1	61.0	60.8	59.0	60.0	67.8
Mar-86	79.6	78.8	79.9	79.8	92.7	59.8	59.7	57.9	58.9	67.9
Jun-86	78.0	77.5	78.5	78.5	93.1	58.1	58.2	56.4	57.4	67.4
Sep-86	68.3	67.6	68.5	68.4	81.6	49.6	49.6	48.1	48.9	57.9
Dec-86	73.4	72.5	73.5	73.5	86.1	52.4	52.2	50.6	51.6	60.1
Mar-87	74.7	73.6	74.7	74.6	86.9	52.5	52.1	50.6	51.5	60.0
Jun-87	76.7	75.5	76.6	76.5	90.9	53.9	53.4	51.8	52.7	62.7
Sep-87	77.9	76.7	77.9	77.8	91.8	54.2	53.7	52.2	53.1	62.8
Dec-87	74.1	73.0	74.2	74.0	88.6	51.2	50.7	49.2	50.1	60.0
Mar-88	74.6	73.4	74.6	74.4	89.6	50.9	50.4	48.9	49.8	60.0
Jun-88	80.4	79.1	80.3	80.1	96.7	54.6	54.0	52.4	53.3	64.3
Sep-88	86.5	85.3	86.6	86.5	103.1	58.2	57.8	56.0	57.0	68.0
Dec-88	88.7	87.6	88.8	88.7	107.4	59.0	58.7	56.9	57.9	70.0
Mar-89	90.8	89.7	91.1	91.0	109.4	60.2	60.0	58.2	59.3	71.3
Jun-89	86.4	85.5	86.9	86.9	103.3	57.0	56.8	55.2	56.3	66.8
Sep-89	87.0	85.9	87.5	87.5	102.9	56.6	56.4	54.8	55.9	65.7
Dec-89	89.6	88.3	90.1	90.0	104.8	57.7	57.5	56.0	57.1	66.3



**Table A.2**  
**Selected Exchange Rate Measures**

Date	Real Trade Weighted				Nominal Trade Weighted			
	Ann.	MA	Spl.	80/89	Ann.	MA	Spl.	80/89
Mar-60	101.9	101.1	104.4	112.9	79.6	79.6	94.9	102.3
Jun-60	103.5	102.4	105.9	112.7	80.7	80.5	95.4	103.0
Sep-60	104.0	102.9	106.5	113.2	81.4	81.0	95.4	103.0
Dec-60	103.9	102.8	106.6	113.3	82.1	81.5	95.5	103.0
Mar-61	103.6	102.7	106.6	113.1	82.7	81.9	95.4	103.0
Jun-61	103.2	102.4	106.5	112.9	83.3	82.1	95.1	102.7
Sep-61	101.4	100.8	105.0	111.2	83.8	82.6	95.3	102.8
Dec-61	99.4	99.1	103.4	109.3	84.2	83.1	95.3	102.9
Mar-62	98.3	98.3	102.6	108.5	84.7	83.5	95.3	102.9
Jun-62	96.6	97.0	101.3	107.5	85.2	84.0	95.4	102.9
Sep-62	96.0	96.4	101.0	107.0	85.1	84.4	95.4	103.0
Dec-62	96.0	96.4	101.3	106.7	84.9	84.7	95.4	103.0
Mar-63	94.6	94.9	99.8	104.8	84.7	85.0	95.4	103.0
Jun-63	101.7	99.0	104.5	108.9	80.0	82.4	91.8	98.9
Sep-63	100.2	98.9	104.6	108.6	81.5	82.7	91.8	98.9
Dec-63	98.5	97.8	103.4	107.4	82.6	82.9	91.8	98.9
Mar-64	97.9	97.5	102.8	107.3	83.6	83.2	91.8	98.9
Jun-64	97.4	97.1	102.2	106.9	84.5	83.5	91.8	98.9
Sep-64	97.5	97.3	102.1	107.0	84.5	83.7	91.8	98.9
Dec-64	96.9	96.8	101.2	106.2	84.6	84.1	91.8	98.9
Mar-65	96.3	96.3	100.5	105.4	84.8	84.4	93.0	98.9
Jun-65	95.4	95.5	99.6	104.5	84.9	84.9	93.0	98.9
Sep-65	96.3	96.1	100.0	105.0	85.3	85.3	93.0	98.9
Dec-65	97.3	96.6	100.5	105.3	85.7	85.8	93.0	98.9
Mar-66	97.0	96.1	99.8	104.5	86.1	86.2	93.0	98.9
Jun-66	97.1	96.0	99.5	103.7	86.6	86.7	93.2	95.5
Sep-66	97.0	96.1	99.5	103.3	87.4	87.5	93.7	95.8
Dec-66	97.0	96.2	99.4	103.1	87.9	87.9	93.7	95.8
Mar-67	96.9	96.3	99.2	102.4	88.5	88.3	93.7	95.8
Jun-67	96.8	96.5	99.0	102.4	89.0	88.7	93.7	95.8
Sep-67	97.7	97.6	99.8	102.9	89.5	89.2	93.7	95.8
Dec-67	98.3	98.4	100.6	102.6	91.5	91.3	95.6	97.0
Mar-68	100.7	100.9	103.5	103.7	95.1	95.0	99.6	99.3
Jun-68	100.7	101.0	103.3	103.6	95.6	95.6	99.8	99.5
Sep-68	101.1	100.9	103.1	103.1	96.2	96.1	99.9	99.6
Dec-68	101.4	100.8	102.8	102.9	96.8	96.7	99.9	99.7
Mar-69	101.8	100.9	102.5	102.8	97.4	97.2	99.9	99.8
Jun-69	101.5	100.4	101.7	102.1	97.9	97.7	99.9	99.8
Sep-69	101.2	100.5	101.7	101.4	98.6	98.5	100.3	100.0
Dec-69	100.7	100.3	101.2	100.9	98.9	98.8	100.1	99.9

Table A.2 (Cont.)

Date	Real Trade Weighted				Nominal Trade Weighted			
	Ann.	MA	Spl.	80/89	Ann.	MA	Spl.	80/89
Mar-70	99.7	99.6	100.2	99.9	99.1	99.2	100.0	99.8
Jun-70	99.6	99.9	100.1	100.1	99.6	99.8	100.1	100.1
Sep-70	100.0	100.0	99.8	99.9	100.3	100.2	100.0	100.0
Dec-70	100.8	100.5	99.9	100.1	101.0	100.8	99.9	100.1
Mar-71	99.7	99.3	98.4	99.0	100.7	100.4	99.0	99.5
Jun-71	100.1	99.6	98.3	99.4	101.1	100.7	98.8	99.4
Sep-71	101.2	100.5	98.9	100.5	101.6	101.2	98.8	99.8
Dec-71	102.5	101.7	99.9	101.5	101.6	101.3	98.5	99.5
Mar-72	101.6	100.6	98.7	100.0	100.8	100.6	97.5	98.3
Jun-72	100.9	99.9	97.8	99.1	100.8	100.7	97.1	98.0
Sep-72	102.3	101.1	99.0	99.5	102.1	102.0	98.1	98.1
Dec-72	103.1	101.8	99.5	99.9	103.7	103.4	99.2	98.9
Mar-73	112.3	110.7	108.5	108.2	113.2	112.7	108.1	107.4
Jun-73	113.0	111.2	109.3	108.8	114.0	113.4	108.8	107.9
Sep-73	113.2	111.6	110.1	108.7	114.2	113.2	108.6	107.3
Dec-73	119.9	118.6	117.1	114.9	121.5	120.3	115.1	113.4
Mar-74	120.2	119.3	118.2	114.6	126.4	125.2	119.3	117.4
Jun-74	116.5	116.1	114.9	112.1	122.6	121.6	115.6	114.3
Sep-74	120.3	120.1	118.7	115.7	124.1	123.7	117.0	115.8
Dec-74	107.9	107.9	106.7	104.1	110.8	111.1	104.9	103.7
Mar-75	108.8	109.1	107.4	105.7	110.5	111.4	105.2	104.3
Jun-75	108.7	109.3	107.7	106.1	110.0	111.5	105.2	104.0
Sep-75	107.9	108.0	106.6	104.6	110.9	111.7	105.4	103.7
Dec-75	111.4	111.3	109.9	107.7	111.4	111.6	105.2	103.4
Mar-76	112.5	112.0	110.7	108.6	111.9	111.5	105.2	103.3
Jun-76	112.1	111.4	110.5	107.9	112.0	111.0	104.9	102.5
Sep-76	112.6	111.7	111.0	108.4	111.7	110.6	104.6	102.2
Dec-76	110.5	109.4	109.0	106.2	105.6	104.5	99.0	96.5
Mar-77	102.2	101.1	100.8	98.5	97.7	96.8	91.7	89.5
Jun-77	102.0	100.9	100.6	98.5	97.6	96.6	91.7	89.6
Sep-77	101.2	100.3	100.2	98.0	96.4	95.7	90.9	88.8
Dec-77	100.1	99.5	99.4	97.5	94.3	93.8	89.2	87.3
Mar-78	97.8	97.5	97.4	95.9	92.1	91.8	87.3	85.8
Jun-78	95.6	95.7	95.8	94.2	90.1	90.1	85.9	84.2
Sep-78	92.5	92.3	92.4	91.0	86.5	86.3	82.4	81.0
Dec-78	92.6	92.0	92.0	90.8	85.4	85.2	81.3	80.1
Mar-79	92.9	92.1	92.1	90.9	85.2	85.1	81.1	80.0
Jun-79	93.3	92.3	92.3	91.2	85.5	85.5	81.4	80.4
Sep-79	93.3	92.5	92.2	91.5	85.9	85.9	81.7	81.0
Dec-79	93.9	93.4	93.3	92.4	86.1	86.3	82.2	81.4

Table A.2 (Cont.)

Date	Real Trade Weighted				Nominal Trade Weighted			
	Ann.	MA	Spl.	80/89	Ann.	MA	Spl.	80/89
Mar-80	93.0	92.8	92.3	92.0	86.1	86.6	82.1	81.8
Jun-80	93.4	93.4	93.0	92.6	86.9	87.5	83.0	82.8
Sep-80	94.1	94.0	93.5	93.1	87.9	88.2	83.6	83.4
Dec-80	94.9	94.7	94.2	93.8	88.9	89.0	84.4	84.2
Mar-81	96.3	96.0	95.6	95.2	90.4	90.3	85.6	85.4
Jun-81	99.0	98.7	98.5	97.9	93.2	93.0	88.3	88.0
Sep-81	103.2	102.9	102.8	102.1	97.0	96.8	92.1	91.7
Dec-81	103.6	103.2	103.1	102.4	94.9	94.7	90.0	89.7
Mar-82	101.8	101.5	101.3	100.7	92.7	92.6	88.0	87.7
Jun-82	101.6	101.3	101.1	100.5	91.7	91.8	87.1	86.8
Sep-82	100.8	100.6	100.2	99.7	89.0	89.1	84.5	84.3
Dec-82	100.7	100.5	100.2	99.6	87.3	87.4	82.9	82.7
Mar-83	99.1	98.9	98.7	97.8	84.5	84.6	80.3	79.9
Jun-83	94.8	94.5	94.1	93.4	80.2	80.2	76.0	75.6
Sep-83	98.8	98.2	97.7	97.0	82.7	82.5	78.1	77.8
Dec-83	103.4	102.5	101.9	101.2	85.4	85.0	80.5	80.1
Mar-84	106.3	105.2	104.6	103.8	87.6	87.1	82.5	82.1
Jun-84	104.0	102.7	102.2	101.2	85.6	85.0	80.5	80.0
Sep-84	101.9	100.9	100.2	99.3	83.4	82.9	78.5	78.0
Dec-84	105.4	104.7	104.1	102.9	85.9	85.6	81.1	80.5
Mar-85	97.7	97.2	96.5	95.5	79.2	79.1	74.9	74.3
Jun-85	85.8	85.4	84.8	83.9	68.8	68.8	65.2	64.6
Sep-85	88.1	87.6	86.9	86.0	69.6	69.4	65.8	65.2
Dec-85	82.8	82.4	81.7	80.9	64.5	64.4	61.0	60.5
Mar-86	82.8	82.4	81.7	81.0	63.3	63.3	59.9	59.5
Jun-86	81.5	81.3	80.6	80.0	61.7	61.9	58.5	58.2
Sep-86	71.0	70.9	70.2	69.8	52.5	52.7	49.7	49.6
Dec-86	76.2	75.9	75.2	74.8	55.3	55.3	52.3	52.1
Mar-87	77.3	76.9	76.3	75.8	55.2	55.2	52.2	52.0
Jun-87	79.7	79.2	78.5	78.1	56.9	56.7	53.6	53.5
Sep-87	81.1	80.5	79.9	79.4	57.4	57.1	54.0	53.9
Dec-87	77.4	76.7	76.1	75.7	54.2	53.9	50.9	50.8
Mar-88	78.2	77.4	76.7	76.3	54.2	53.8	50.7	50.7
Jun-88	84.6	83.6	82.8	82.4	58.3	57.8	54.4	54.4
Sep-88	91.1	90.4	89.4	88.9	62.3	62.0	58.2	58.2
Dec-88	93.5	92.9	91.9	91.4	63.3	63.1	59.2	59.2
Mar-89	95.7	95.2	94.2	93.7	64.6	64.6	60.6	60.6
Jun-89	91.0	90.7	89.8	89.4	61.0	61.1	57.5	57.4
Sep-89	91.5	91.0	90.4	89.9	60.5	60.5	57.0	56.9
Dec-89	94.0	93.3	92.8	92.2	61.7	61.5	58.0	58.0

## REFERENCES

- Artus, J. R. and McGuirk, A. K. (1981), "A Revised Version of the Multilateral Exchange Rate Model", *IMF Staff Papers*, vol. 28, no. 2, pp. 275 - 309.
- Artus, J. R. and Rhomberg, R. R. (1973), "A Multilateral Exchange Rate Model", *IMF Staff Papers*, vol. 20, pp. 591 - 611.
- Batten, D. S. and Belongia, M. T. (1987), "Do the New Exchange Rate Indexes Offer Better Answers to Old Questions", *Federal Reserve Bank of St Louis Review*, vol. 69, no. 5, May, pp. 5 -17.
- Brodsky, D. A. (1982), "Arithmetic Versus Geometric Effective Exchange Rates", *Weltwirtschaftliches Archiv (Review of World Economics)*, Band 118, Heft 3, pp. 546 - 562.
- Bruno, M. (1976), "The Two-Sector Open Economy and the Real Exchange Rate", *American Economic Review*, vol. 66, no. 4, September, pp. 566 - 577.
- Cooper, S. A. (1988), "Estimating New Zealand's Real Effective Exchange Rate", Reserve Bank of New Zealand discussion paper G88/7.
- Cox, W. M. (1986), "A New Alternative Trade-Weighted Dollar Exchange Rate Index", *Federal Reserve Bank of Dallas Economic Review*, September, pp. 20 - 28.
- Durand, M. (1986), "Method of Calculating Effective Exchange Rates and Indicators of Competitiveness", OECD Department of Economics and Statistics, working paper no. 29, February.
- Dwyer, J. (1987), "Real Effective Exchange Rates as Indicators of Competitiveness", paper presented to the 16th Conference of Economists, Economic Society of Australia, Surfers Paradise, 23 - 27 August 1987.
- Dwyer, J. and O'Mara, P. (1988), "Measuring Australia's Competitiveness", *Quarterly Review of the Rural Economy, ABARE*, vol. 10, no. 1, pp. 54 - 59.
- Fisher, I. (1927), *The Making of Index Numbers - A Study of Their Varieties, Tests and Reliability*, 3rd ed., Houghton Mifflin, Boston.

**Hooper, P. and Morton, J. (1978)**, "Summary Measures of the Dollar's Foreign Exchange Value", *Federal Reserve Bulletin*, vol. 64, no. 10, October, pp. 783 - 789.

**International Monetary Fund (1990)**, "Indicators of Real Effective Exchange Rates", Research Department, EBS 90/02.

**Juttner, D. J. (1988)**, "Effective Exchange Rates and Other Exchange Rate Indices", Macquarie University Centre for Studies in Money, Banking and Finance, Working Paper no. 8802A.

**Koch, E. B. (1984)**, "The Measurement of Effective Exchange Rates", BIS Working Paper no. 10, September, Basle.

**Maciejewski, E. B. (1983)**, "Real Effective Exchange Rate Indices - A Re-Examination of the Major Conceptual and Methodological Issues", *IMF Staff Papers*, vol. 30, no. 3, September, pp. 491 - 541.

**McGuirk, A. K. (1987)**, "Measuring Price Competitiveness for Industrial Country Trade in Manufactures", IMF Working Paper 87/34.

**Officer, L. H. (1976)**, "The Purchasing-Power-Parity Theory of Exchange Rates: A Review Article", *IMF Staff Papers*, vol. 23, no. 1, March, pp. 1 - 60.

**Ott, M. (1987)**, "The Dollar's Effective Exchange Rate: Assessing the Impact of Alternative Weighting Schemes", *Federal Reserve Bank of St Louis Review*, vol. 69, no. 2, February, pp. 5 - 14.

**Reserve Bank of Australia (1984)**, "The Trade Weighted Index of the Australian Dollar", *Reserve Bank of Australia Bulletin*, April 1984, pp. 696 - 697.

**Reserve Bank of Australia (1988)**, "Trade Weighted Index", *Reserve Bank of Australia Bulletin*, October 1988, pp. 21 - 23.

**Rhomberg, R. R. (1976)**, "Indices of Effective Exchange Rates", *IMF Staff Papers*, vol. 23, no. 1, March, pp. 88 - 112.

**Salter, W. E. G. (1959)**, "Internal and External Balance: The Role of Price and Expenditure Effects", *Economic Record*, vol. 35, no. 71, pp. 226 - 238.

**United Nations Statistical Papers, Commodity Trade Statistics, 1987**, Series D, vol. 37, nos. 1-19.

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