The trade weighted index (TWI) measure of the effective exchange rate

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In this article Bruce White reviews aspects of the construction and use of the TWI as a measure of "the" effective exchange rate.

I Introduction

The TWI is an index measure of the value of the New Zealand Dollar (NZD) relative to other countries' currencies. Because there are many other currencies with which the NZD can be exchanged, it is necessary, for the purpose of measuring "the" exchange value of the NZD, to combine those other currencies into some form of composite currency. This is what the Trade Weighted Index (TWI) is - a weighted average value, expressed in index number form, of a basket of other currencies. The TWI can be thought of as a weighted average of the prices of a basket of foreign currencies, just as the CPI is an index measure of the prices of a basket of locally available goods and services. The currencies included in the TWI basket are those of the five countries which account for the largest share of New Zealand's external merchandise trade.

Earlier this year, aspects of the construction of the TWI were reviewed. A prompt for the review was the changing pattern in New Zealand's external trade, with an increasing proportion of trade taking place with countries in the Asia-Pacific region (see table 1 overleaf). These developments have been such that it seems likely that soon there will be changes in the composition of New Zealand's five largest (merchandise) trading partners. Indeed, recent data indicates that Korea and China are closing on Germany as the fifth largest trading partner.[1]

At first glance, the question whether to substitute the currencies of countries whose trade with New Zealand is growing for those whose relative share is declining seems one that should have a simple answer. But closer examination of the issues indicates otherwise. The answer turns importantly on what it is about the external value of the NZD that one is trying to capture in a summary measure like a TWI. In other words, in order to determine the relative importance we should attach to individual currencies when calculating the index, we need to identify what it is about exchange rates that is of importance to us. Two broad strands of interest present themselves: the link between the exchange rate and inflation, and the link between the exchange rate and external competitiveness.

The structure of the remainder of this article is as follows. Section II provides some background on the evolution of policy as it relates to the exchange rate during the 1980s and 1990s. Section III describes how the TWI is constructed at present. Section IV reviews a selection of previous studies which examine the present TWI currency weighting regime from the standpoint of the "goodness of fit" of movements in the TWI with inflation. Section V looks at how a TWI might more appropriately be constructed where the focus is on external competitiveness, drawing on the methodology used by the IMF in constructing effective exchange rate indices for IMF member countries. Section VI draws some conclusions.

II Background

The two main strands of interest in the exchange rate are:

- its influence on inflation, particularly the "passthrough" effect of exchange rate changes on the domestic prices of internationally traded goods and services; and
- the influence the exchange rate has on the "real" economy and the balance of payments, through changing the relative price of "tradeables" versus "non-tradeables".

While these strands of exchange rate influence on the economy are far from being mutually exclusive, nor entirely distinct, there have been clear shifts in emphasis given to each over time[2]. In the early part of the 1980s

[1] A further consideration was whether China and Hong Kong should be treated as a single country from 1 July 1997. However, since Hong Kong and China are to retain their own respective currencies, they appropriately continue to be regarded as separate for TWI purposes.

[2] Note that the exchange rate transmission mechanism through the nominal and real economies are not unrelated; indeed, for a monetary shock, they are essentially the same transmission mechanism. It's just that in the case of tradeables the transmission mechanism through to prices tends to be direct, whereas for non-tradeables it is indirect, via the effect that exchange rate induced shifts in demand for domestically produced goods and services, relative to foreign goods and services, have on activity levels. In the long run, the effect of an exchange rate change (all other things being held equal) should be the same for tradeables prices as for non-tradeables prices.

Table 1

Merchandise trade (exports plus imports) - major trading partners

March years	Percentage of total merchandise trade			
	1976	1982	1990	1997
Country				
Australia	16.0	17.4	19.9	22.2
Japan	14.5	14.8	17.3	14.4
USA	12.9	15.5	15.1	12.9
UK	19.4	11.0	8.1	6.0
Germany	3.0	2.8	3.3	3.5
Korea		1.3	2.7	3.3
China		1.2	1.3	3.2
Taiwan		1.1	2.3	2.7
Malaysia		0.8	1.1	2.1
Italy		1.4	1.9	2.0
Hong Kong		1.3	1.5	1.9
Canada		2.1	1.9	1.7
Singapore		2.7	1.2	1.6
Saudi Arabia		2.6	1.8	1.4
France		1.2	1.4	1.2
Other	34.2	22.8	19.2	19.9
	100.0	100.0	100.0	100.0

Source: Statistics New Zealand

exchange rate policy was focused mainly on the need to maintain external competitiveness, in the face of a domestic inflation rate which significantly exceeded the average for our trading partners. At the time there was also growing concern about the sustainability of the current account deficit on the balance of payments. It was during this period that New Zealand operated a "crawling peg" exchange rate regime, under which the New Zealand dollar (NZD) was steadily devalued so as to offset the disadvantage the tradeables sector would otherwise have faced as the result of our high inflation rate, and to lessen the pressures on the balance of payments. Much of the exchange rate related work undertaken in the Reserve Bank around that time was focused on how best to measure changes in external competitiveness and to evaluate the effects of changes in competitiveness on the economy and balance of payments. A TWI which weighted currencies according to relative trade shares was a natural summary measure of "the" exchange rate to use for those purposes.

In the mid 1980s the policy emphasis shifted. The floating of the exchange rate in March 1985 enabled the balance of payments to be de-emphasised as a policy concern, since by floating, the government passed the role of balancing the current and capital accounts on the balance of payments to the private markets. This enabled the Reserve Bank to become firmly focused on lowering the inflation rate.

There was a corresponding shift in the way in which the exchange rate was factored into policy assessments and formulation. Exchange rate policy ceased to be viewed as something separate from monetary policy, and the exchange rate was progressively factored in as part of the dis-inflation strategy. For a period, the exchange rate was included as one of a number of variables on a "check-list" of monetary policy indicators. This approach was progressively formalised as the *Economic Projections* prepared quarterly by the Bank - in which the exchange rate is a key variable - took on an increasingly central role in the formulation of monetary policy. These projections provided the base for establishing a "comfort zone" for the exchange rate, based on an estimate of the range over which the exchange rate could move without threatening the (then) 0 to 2 percent inflation target one to two years ahead (with a particular

focus on the direct "passthrough" effect of exchange rate changes on inflation).

More recently, this approach has been taken a stage further. The adoption of a Monetary Conditions Index (MCI) framework for monetary policy encapsulates essentially the same approach, although perhaps with some shift of emphasis toward the indirect effects of exchange rate changes on inflation, via the real economy.[3] The Bank's current approach, therefore, takes a comprehensive view of how the exchange rate matters for inflation and monetary policy: both the direct effects on local costs and prices, as the result of "pass-through" from foreign currency prices to local prices, and the impact of exchange rate changes on activity levels in the tradeables sector of the economy, are fully factored into policy assessments. The latter channel of influence is thought about in terms of how a change in the exchange rate - say an appreciation - causes domestic (and foreign) demand to be channelled more toward foreign supplied goods and services.[4] This results in an easing of pressure on the productive capacity of the local economy. Conversely, a depreciation helps remove slack in capacity, as demand is re-directed toward domestically produced goods and services. In this way, changes in the exchange rate affect estimates of the "output gap", that is, the assessed balance, or gap, between the economy's estimated productive capacity and the level of demand for domestically produced goods and services.

III Present TWI methodology

Currently the TWI is calculated as follows:

- it includes five currencies, being the currencies of Australia, the United States, Great Britain, Germany and Japan. These countries have been New Zealand's five largest trading partners in merchandise trade (imports and exports) since the TWI was first constructed in 1979;

- the weight assigned to each country is its share of the total merchandise trade - imports and exports combined - between New Zealand and the five countries in the basket. The weights are calculated on a four quarter rolling basis, and updated as data comes available for each new quarter;

- the index is calculated as a *geometric* average, according to the formula:

$$TWI_t = 100x\Pi\left[\frac{e_{it}}{e_{io}}\right]^{W_{it}} x\,\mathrm{IND}$$

where

Π = the product of the bracketed term over the five currencies;

e_{it} = the number of foreign currency units for trading partner i per New Zealand dollar, at time t;

e_{io} = the number of foreign currency units per New Zealand dollar in the base period;

= the trade weight for the currency of trading partner *i* at time *t*;

IND = a scale factor which ensures that the exchange rate index does not change on a quarterly re-weighting solely as the result of the change in currency weights.[5]

A worked example is shown in the box overleaf.

It will be evident from the above description that the TWI is not a comprehensive measure of the exchange value of the NZD relative to New Zealand's *total* trade. The five countries in the basket currently account for about 60% of total merchandise trade. Also, the absence of direction of trade data on trade in services means that the coverage of the data from which the weights are calculated is further constrained - although if trade in services were taken into account, it seems likely that the effect would be to increase the percentage of New Zealand's trade accounted for by the five TWI countries (ie, it seems likely that the TWI countries account for a higher proportion of trade in services than for merchandise trade). One alternative approach, which would result in a more broadly based TWI, would be to increase the number of currencies, say to whatever number is required to cover a specified percentage of total trade. The Reserve Bank of Australia, for example, calculates a TWI for the Australian dollar on the basis that the currencies in the basket should cover 90% of Australia's external trade. Presently the Reserve Bank of Australia's basket comprises 25 currencies.

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3 See Richard Dennis (1997) for a description of the Monetary Conditions Framework.

4 Strictly speaking it is movements in the *real* exchange rate, ie, the exchange rate change adjusted for any change in the price level in New Zealand relative to those of our trading partners which affects the real economy. However, given that the inflation rate in New Zealand is currently close to those of our major trading partners, changes in the nominal exchange rate closely approximate the change in the real exchange rate.

5 See Ian Corfield (1996) for a formal description of this scale factor and of how it is applied.

Calculation of the TWI: an example

Currency	Trade Weight	Exchange rate - foreign currency units per NZD	
		Current period 30 May 1997	Base period 30 June 1987
AUD	0.3780	0.9013	0.8211
Yen	0.2482	80.4348	86.8200
USD	0.2152	0.6910	0.5923
Sterling	0.0988	0.4216	0.3697
DMk	0.0598	1.1720	1.0822
	1.0000		

$$TWI = \left[\frac{AUD/NZD}{AUD\ base}\right]^{Aus\ weight} x \left[\frac{Yen/NZD}{Yen\ base}\right]^{Japan\ weight} x \left[\frac{USD/NZD}{USD\ base}\right]^{US\ weight}$$

$$x \left[\frac{Stg/NZD}{Stg\ base}\right]^{UK\ weight} x \left[\frac{DMk/NZD}{DMk\ base}\right]^{German\ weight} x\ Scale\ factor\ *$$

$$= \left[\frac{0.9013}{0.8211}\right]^{0.3780} x \left[\frac{80.4348}{86.8200}\right]^{0.2482} x \left[\frac{0.6910}{0.5923}\right]^{0.2152} x \left[\frac{0.4216}{0.3697}\right]^{0.0988} x \left[\frac{1.1720}{1.0822}\right]^{0.0598} x\ 63.1863$$

$$= 67.57$$

* This scale (IND) factor was set at 63.00 at 30 June 1987, to convert the TWI calculated from base exchange rates as at that date back to a 1979 = 100 base. This was to maintain continuity in the series from 1979 when the TWI was first published. The change to the IND factor from 63.00 since June 1987 reflects the quarterly re-weightings since then.

IV The TWI as an "intermediate" inflation indicator - previous assessments of the currency weights

The shift in emphasis on the role of the exchange rate, from competitiveness and balance of payments considerations up until the mid1980s, to inflation control thereafter, was reflected at the time in a series of studies undertaken inside and outside of the Bank. These focused on the question: which nominal exchange rate index - in terms of currency composition and weights - is the best explanator of inflation?

This section provides a brief review of a selection of those studies:

Rae (1994) acknowledges that "the 'best' exchange rate index depends on what you want to use it for" and goes on to suggest that "for monetary policy purposes, the best index is the one which gives the most accurate forecasts of inflation". On this basis, Rae makes econometric estimates of the currency weights for the five existing TWI currencies which provide the best measure of export and import prices (when expressed in NZDs) in terms of goodness of fit in a CPI equation. In other words, the optimal currency weights are those which "fall out" from a CPI equation which includes individual currencies as explanators. Application of different estimation techniques results in some variation in the optimal currency weights, although a consistent feature of the results is an indication that the United States dollar (USD) should have a larger weight and the Australia dollar (AUD) a smaller weight than presently. Averaging the results from Rae's four estimations gives the following weights, with the then applicable TWI weights also given for comparison:

	AUD	Yen	USD	Stg	DMk
Rae	19	23	37	10	11
TWI	34	26	25	10	5

Rae suggests a possible explanation for the higher weight on the USD as being that the USD serves partly as a proxy for a number of Asian currencies, which are either implicitly or explicitly tied to the USD. Perhaps a further explanation of his results, at least in respect of the suggested lower weight on the AUD, is that a growing proportion of Trans-Tasman trade is invoiced in NZD, as a result of the integration of the two economies under CER.

Hansen (1994), like Rae, focuses on whether the trade weights currently used for constructing the TWI are the most appropriate ones for determining the effect of exchange rate changes on the CPI. Specifically, he investigates in an inflation forecasting context where taking account of so called "currency pricing effects" (ie, the currency in which trade is invoiced) , and the incomplete coverage of the TWI, results in weights for the five TWI currencies which are different from those based on the simple bilateral direction of trade data we use. His results, like Rae's, point to a higher weight for the USD (with the offset likely to be on the AUD), although Hansen qualifies his conclusion by indicating that his results are insufficiently robust, particularly out of sample, to support a change to the way we construct the TWI.

Clements (1992) also estimates weights for the five TWI currencies in the context of their CPI effects. He adopts a dis-aggregated approach to modelling the CPI components. Where an exchange rate influence is expected to be present, he tests the significance of the TWI and, additionally any individual bilateral exchange rates thought potentially relevant, eg, the yen in the private transport component of the CPI. In this way, the exchange rate influence on inflation is not constrained by the trade weighting scheme used in the construction of the TWI. Alternative TWI weights are then compiled by multiplying the long run (combined) currency effect in each component's equation by that component's weight in the CPI, and aggregating across components to derive an overall set of currency weights. His results were as follows, again with the then current TWI weights shown for comparison. (Note that the DMk and sterling weights were constrained to their TWI values):

	AUD	Yen	DMk	Stg	USD
Clements	20	35	5	10	30
TWI	35.92	25.27	5.84	10.23	22.74

Clements observes that in the period preceding his study, the NZD had depreciated against the Yen and the USD (the two currencies which, on the basis of his analysis are under-weighted in the TWI), but had remained relatively stable against the TWI. His conclusion was that, even though the TWI had remained stable, the bilateral exchange rate movements had been inflationary. In other words, according to Clements, "the TWI does not reflect the weightings relevant to the CPI... (and) a stable TWI does not imply a neutral impact on inflation".

Brooks and Corfield (1991) construct two alternative effective exchange rate indices. The first, labelled MCI25, incorporates the currencies of all countries whose bilateral (merchandise) trade with New Zealand makes up 1 percent or more of our total merchandise trade. The second, labelled RGDPI, is constructed to include currencies and weights chosen on the basis of selected major trading partners' shares of USD denominated world GDP (the countries selected being the G7 countries and Australia).

Brooks and Corfield test these alternative exchange rate indices against the criterion: "the most suitable exchange rate index (for monetary policy purposes) is the index which best summarises the impact of changes in NZ dollar bilateral exchange rates on domestic prices".[6] The thinking behind the alternative indices is, in the case of MCI25, the possible desirability of a measure based on more comprehensive coverage of trade and, in the case of RGDPI, to test the importance of major currencies on the basis of the relative importance of "currency areas". During the later part of the sample period both alternative indices diverge somewhat from the path for the effective exchange rate shown by the TWI (by as much as 4-6% within certain twelve month periods) although the divergences tend to be temporary. Econometric estimates indicate that the comprehensive trade based index (MCI25) provides the best goodness of fit with inflation - although a caveat is that to obtain statistically acceptable results, it is necessary to include a trend variable in the equation. This implies that there exists an autonomous, self generating level of inflation, which conflicts with well established theory and suggests that there are problems with the specification of the equation they estimated.

Schoefisch (1990) undertook a study of the TWI weights along broadly similar lines to Rae: ie, he estimates a CPI equation using producer prices for manufacturing output for individual TWI countries (US, Japan, Germany, UK and Australia), world commodity prices (both in foreign currency terms), and bilateral exchange rates as explanators. The weights to be attached to the respective currencies are then taken from the long run bilateral exchange rate coefficients, with the following results:

	AUD	Yen	USD	Stg	DMk
Schoefisch	13.2	29.4	31.1	11.8	14.5
TWI	30.7	28.9	23.8	11.7	4.9

Schoefisch's equation performed well in terms of the standard theoretical properties that:

- the effect of a 1 percent increase in foreign prices on the CPI should be the same as a 1 percent currency depreciation (his estimates were respectively 0.478 percent and 0.446 percent); and
- a 1 percent increase in domestic costs combined with a 1 percent currency depreciation (with foreign prices constant) should result in a 1 percent increase in the CPI (his estimate was 0.976%).

However, the equation performed materially less well out of sample and, on this basis, Schoefisch concluded that his results were insufficiently robust to warrant changing the TWI weighting regime (which would have resulted in larger weights to the USD and DMk, and a correspondingly smaller weight to the AUD).

V Effective exchange rates from a competitiveness standpoint: the IMF methodology

Given the recent re-emergence of a focus on the influence of the exchange rate on real economic activity and the "output gap" (as discussed earlier), it is useful to devote some space to clarifying the way in which exchange rate changes affect the external "competitiveness" of domestic industries in a multilateral trading system.

The IMF calculates and publishes two principal measures of exchange rates. First, effective exchange rates are calculated for virtually all IMF member countries on the basis of a currency weighting scheme based on comprehensive measures of trade flows. The weighting methodology also takes into account the different implications of currency changes for trade in primary commodities and trade in manufactures. (These are discussed below.) Real (ie, price level adjusted) effective exchange rates are calculated from this measure by adjusting for differences in CPI price levels between the country concerned and its trading partners. Additionally, for 21 IMF members, including New Zealand since 1994, the IMF calculates real effective exchange rates in respect of trade in manufactures alone. In this case, the nominal exchange rate is converted into a real exchange rate by using data on unit labour costs instead of CPI data. The discussion in this article is limited to the framework that the IMF uses for calculating the *nominal* component of the first mentioned measure (ie, that which takes into account trade in both manufactures and primary commodities).

The IMF's approach to calculating effective exchange rates is firmly founded on the role of exchange rates as a variable which affects *competitiveness* and thus trade, real activity and balance of payments sustainability over the medium term. This perspective doubtless stems from the IMF's mandate to exercise surveillance over members' exchange rates in the context of balance of payments sustainability - and perhaps also the Fund's experience in working with countries with balance of payments problems attributable, at least in part, to mis-aligned exchange rates.

[6] Brooks and Corfield note that other countries' "TWIs" generally include more than just five currencies (eg, the RBA with, at the time, 25, the US Federal Reserve Board with 10 and the Federal Reserve Bank of Dallas with 131), and that this may reflect that "the indices for other countries (are) designed for purposes other than monetary policy indicators, such as an indicator of competitiveness" (page 7).

Two key aspects of the IMF trade weighting methodology used by the IMF bear elaboration:

- the above mentioned distinction between trade in primary commodities and in manufactures;

- that the trade weights in respect of trade in manufactures take account of both bilateral direction of trade data (recognising that the exporters of country A compete with the domestic producers of the importing country B) *and* third country competition (recognising that the country A exporters selling to country B also compete with third country C exporters who sell to country B). In other words, the IMF's methodology is a system of multilateral trade weights, not just bilateral trade weights.

The trade weights we use in constructing our TWI take account of neither of these points. However, one notable strength of our TWI over the IMF methodology is that the trade weights are updated quarterly, so that changes in trade patterns are captured almost continuously. The IMF's weights are updated only infrequently and, due to the demanding data requirements (and delays in the availability of dis-aggregated direction of trade data for some countries), are usually several years out of date. The exchange rate indices currently being calculated by the IMF are based on trade data averaged over the years 1988-90.[7]

Another point often discussed in relation to the weighting of currencies in an exchange rate index basket is whether the trade weights should be calculated according to country of source/destination, or the currency in which trade is invoiced. On this point, the Reserve Bank's TWI and the IMF's effective exchange rate index adopt a common approach: trade weights are calculated on the basis of the source/destination of trade, not the currency of invoicing. This reflects that changes in the value of a currency of invoicing (relative to the currencies of the parties actually engaged in trade) will tend to be reflected in corresponding movements in the prices at which the traded goods are invoiced. For example, if beef is typically traded internationally in USD, and the USD depreciates, and assuming that global demand for and supply of beef does not shift, then the USD price of beef will tend to rise by the same amount that the USD has depreciated. From a New Zealand producer's standpoint, the appreciation of the NZD (against the USD) will be offset by a higher USD price for beef than would have been obtained in the absence of the currency adjustment. Of course, the assumption that the demand for and supply of beef does not change may not be very realistic. The rise in the USD price of beef might be expected to result in some curtailment of demand, and, thus offsetting downward pressure on prices. (As we will see later, however, these effects are also incorporated into the IMF's methodology for weighting trade in primary commodities).

Trade in manufactures v trade in primary commodities

The first mentioned distinguishing feature of the IMF's approach to calculating trade weights is the application of different methodologies to trade in manufactures and in primary commodities. Lying behind the distinction are differences in the way in which international trade prices for manufactures and primary commodities are determined. In the case of primary commodities, prices tend to be determined in a world market, with the result that there is generally one "world price" for each commodity (or "benchmark" grade of each commodity). The reason why we find that primary commodity prices tend to converge on a world price is because primary commodities, irrespective of where in the world they are produced, are generally very close substitutes: a kilo of New Zealand prime beef is much the same as a kilo of US prime beef. The corollary is that the USD price of a kilo of New Zealand beef will generally be nearly identical to that for a kilo of the same grade of beef produced in the US. If the USD price of New Zealand beef were materially lower than that for comparable US beef, demand for the New Zealand product would be such as to drive its price up to the world price. Conversely, if New Zealand producers attempted to raise the price of their product above the world price, they would likely sell very little - given the availability of comparable product on the world market at a lower price. From this, it will be evident that producers of primary commodities do not compete internationally on *price*. To put the same point in different - perhaps more familiar words - producers of primary commodities are price takers.

How does this compare with the situation facing producers of manufactured goods? The key point is that manufactured goods are generally less homogeneous: a Mercedes car is not a perfect substitute for a Toyota, or a Ford. Certainly, there will always be a degree of substitutability - in some cases perhaps a reasonably high degree of substitutability - between different "brands" of the same manufactured good. And in the case of many primary commodities, products will be capable of being differentiated *to some degree* according to their source of origin, eg, beef grown on New Zealand pasture is not identical with US grain fed beef. But, as a generalisation, it is fair to say that manufactures are less homogeneous than are primary commodities. The corollary is that there exists greater scope for prices of similar, but differentiated, manufactures to diverge internationally. Exporters of manufactures are less price takers

[7] 1989-91 for the alternative indices based only on trade in manufactures.

than typically is the case for exporters of primary commodities. The corollary is that changes in exchange rates will tend to show up, to some degree, in changes in international *price* competitiveness of manufacturing exporters (and producers of import substitutes), whereas for exporters of primary commodities, exchange rate changes will be reflected almost totally in a change to the local currency price received by the producer.

This difference in the ways in which exchange rate changes affect exporters of primary commodities and manufactures has important implications for how we most usefully think about weighting currencies in an exchange rate index. In the case of trade in manufactures, changes in exchange rates will be reflected in changes in the *price* competitiveness of New Zealand producers, and the significance of the currency in question will be a function of how important the market of the other country is to New Zealand's manufacturing exporters/import competitors. Hence, the currency weight is determined with reference to the proportion of New Zealand's trade in manufactures (exports to and imports from) the market in question.[8] If, for example, New Zealand exports only a small amount to that market, then a change in the value of its currency will be of little consequence for New Zealand (and vice versa if it is a large market for New Zealand manufactures).

Now consider trade in primary commodities. If changes in trading partners' currency values relative to the NZD do not result in changes in the price competitiveness of New Zealand primary producers, in what sense are exchange rate changes important to this part of the economy? The answer, as foreshadowed above, is that they result in shifts in supply and demand for the commodities in question. In the example introduced above, a depreciation of the USD, all else remaining unchanged, would result in a rise in the USD price of beef by an amount equivalent to the fall in value of the monetary unit in which its price is denominated. But as we also saw above, all else would not remain unchanged: US demand for - and thus the world price of - beef could be expected to fall (or not increase by the same amount as the USD had fallen). Correspondingly, New Zealand beef production, and exports, could be expected to fall as beef producers substitute into alternative lines of production eg, sheepmeat, or venison, or pine trees.[9]

On the basis of this analysis, the IMF's approach to weighting currencies in respect of our trade in primary commodities is to calculate the weight for each trading partner's currency according to:

- that trading partner's share of *world* trade in the commodity concerned; scaled by
- the importance of the commodity in New Zealand's *total trade* in primary commodities.

For example, the Korean won's weight in our TWI in respect of our log exports to Korea would be the product of Korea's share of the world log trade and of logs' share of New Zealand's total trade (and similarly for other primary commodities exported to Korea). Imports of commodities are treated similarly. For example, the weight we would attach to the AUD in respect of bauxite would be Australia's share of the world bauxite trade, scaled by bauxite's share in New Zealand's total import bill. The key point to note is that the weights that would go into our TWI have nothing to do with bilateral direction of trade. In the above examples, the weights we would attach to Korea and Australia relate to the importance of those countries in the *world* market, and the importance of the *commodity* in question in our *total* trade (with all countries, not just with the countries in question).

One major advantage of this approach to weighting currencies in respect of trade in primary commodities is that it also recognises that countries which export primary commodities generally compete more against other exporters of primary commodities, and correspondingly less against the domestic producers in the country of destination. For example, in the case of New Zealand's log exports to Korea, New Zealand will be competing more against other log exporting nations (eg, Chile) than against Korean growers. To the extent that this is the case, the Chilean peso is more relevant to New Zealand than the Korean won, the opposite from what is suggested by a (bilateral) direction of trade based exchange rate index.

Third country competition (in respect of manufactures)

The IMF's methodology for weighting currencies in respect of trade in manufactures also recognises the multilateral dimension of trade. However, given that the underlying weighting structure is different from that for primary commodities, a different approach is required. The approach adopted is perhaps again best explained with reference to an example. Take New Zealand's exports of, say, furniture, to Australia. The bilateral trade weights we use in the construction of our TWI are predicated on there being only

8 In practice, it is assumed that the price elasticity of demand is the same for all manufactures in all countries. This enables currency weights (in respect of trade in manufactures) to be calculated from aggregated import and export trade data.

9 Note that trade in petroleum products is excluded from the IMF's primary commodity trade weights. This is because in the petroleum industry, variable costs are low relative to output prices, making production relatively insensitive to exchange rate changes in the short to medium term, and demand elasticities are similarly low.

Chart 1

New Zealand nominal exchange rate measures
(Rebased to a March 1979 quarter value of 100)

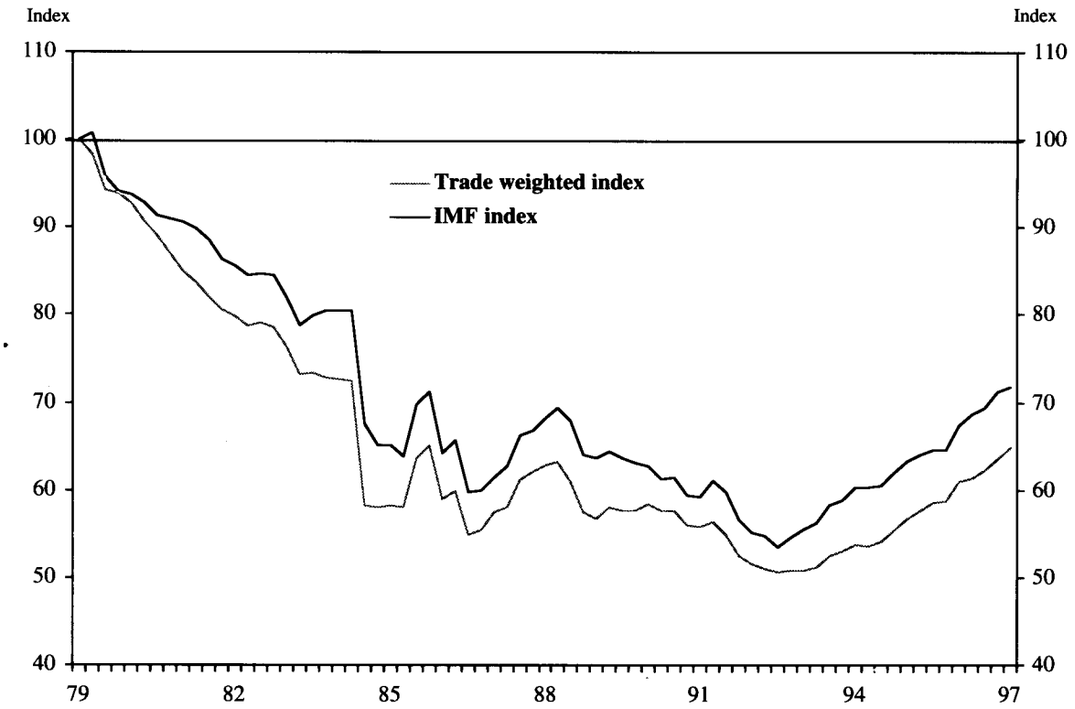
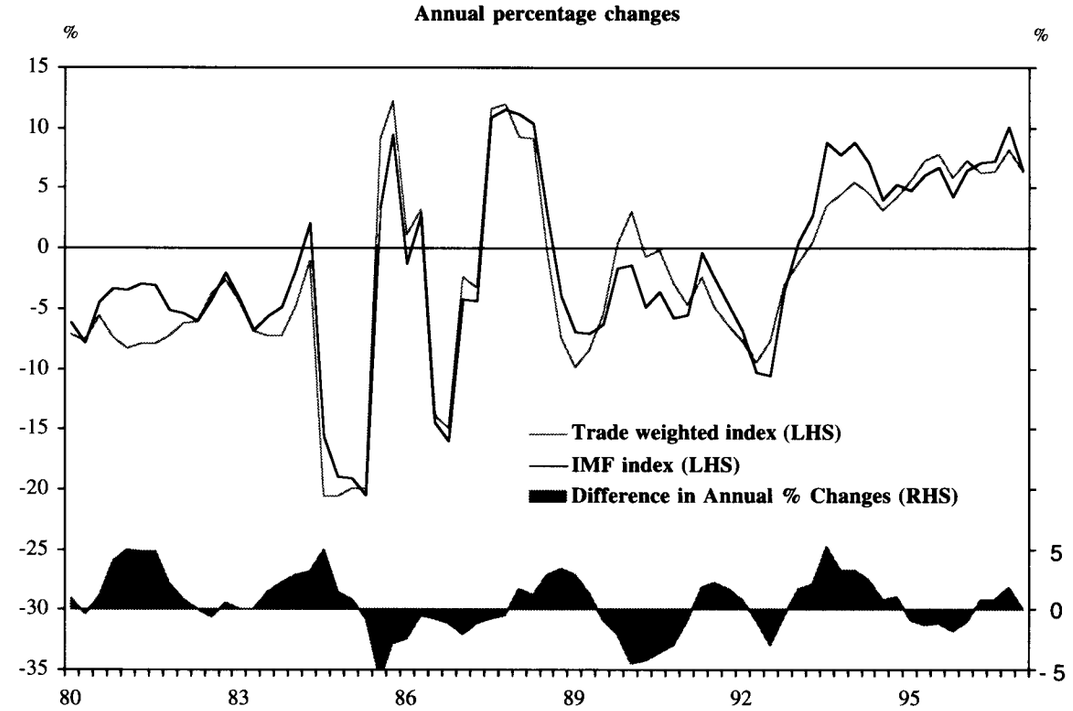


Chart 2

New Zealand nominal exchange rate measures
Annual percentage changes



bilateral competition, ie, between New Zealand manufacturers selling into the Australian market, and Australian manufacturers who supply only their home market. However, it is likely that New Zealand and Australian manufacturers of furniture may be competing with each other in third markets (say, if both are exporting to Japan). The trade weight we attach to the AUD, therefore, needs to take account of both New Zealand's bilateral trade with Australia (to take account of competition with Australian manufacturers in their domestic market) and also Australia's share of the other market(s) in which New Zealand and Australian manufacturers compete. The trade weight attached to the Australian dollar to account for competition between New Zealand and Australia in third markets is a weighted average of Australia's market share in those markets, with the weights reflecting the relative importance of each third market for New Zealand's exports.

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Table 2 shows currency weights calculated according to the IMF methodology compared with those presently used for our TWI, and Charts 1 and 2 show how the effective exchange rate index calculated by the IMF according to its methodology has compared with the Bank's TWI over the last decade and a half. Two points stand out:

- The two indices have tracked each other quite closely, perhaps surprisingly closely given the extent of the differences in methodology (and sophistication) involved in their construction. The "discrepancy" line in chart 2 plots the difference between the two measures in four quarter percentage change terms, ie, the extent to which the alternative measures indicate different amounts of appreciation or depreciation in the preceding year. Generally the discrepancy between the two measures of appreciation or depreciation is less than 3 percent, although there have been a few occasions when it has been as much as 5 percent. However, the discrepancies have been only temporary, and over time have offset each other. This is reflected in the way in which the alternative measures of the level of the exchange rate (Chart 1) have moved together since the early 1980s.

- Application of the IMF's methodology attaches the largest weights to the same five currencies as produced by the simple bilateral trade share calculations which determine the currency weights in the Bank's TWI. However, the individual currency weights are quite different. It is also worth noting that the weight for the Korean won is substantially smaller than the bilateral direction of trade data would suggest. The latter difference likely reflects a combination of (a) the IMF's weight having been calculated on the basis of trade data for 1988-90, when New Zealand's trade with Korea was less than now, and the fact that New Zealand's trade with Korea is heavily weighted toward exports of primary commodities.[10]

VI Conclusions

This article reviews aspects of the methodology for weighting the currencies of our trading partners in the Reserve Bank's TWI from two standpoints: as an indicator of inflation and as a basis for assessing the effect of exchange rate changes on the "competitiveness" of the tradeables sector of the New Zealand economy.

Studies that have been undertaken in recent years suggest that if the purpose of the TWI is to capture the external value of the NZD which best explains inflation, then a case may exist for increasing the weight on the USD, and reducing the weight on the AUD. The evidence has, however, been assessed as insufficiently compelling to justify changing the current weighting methodology or adding currencies to the TWI basket.[11]

Neither does the IMF methodology for constructing an effective exchange rate point toward a need to change the TWI currency basket (assuming, for the moment, that it is to remain a five currency basket). The five currencies to which the IMF attaches the largest weights in its exchange rate index for the NZD are the same as those included in the TWI basket. Also, the index values for the IMF measure and the TWI have tracked each other quite closely over the last fifteen years.

Consideration was also given to the question of whether to expand the number of currencies included in the TWI basket to provide more comprehensive coverage of trade. However, at this stage at least, a larger basket is thought not warranted.[12] Extension of the coverage of bilateral merchandise trade would not necessarily give more meaning-

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[10] New Zealand's merchandise exports to Korea outweigh merchandise imports by nearly 3 to 1, and comprise overwhelmingly primary commodities (principally wood and wood products, aluminum, hides and skins, beef and methanol).

[11] Given the uncertainty about the appropriate weights for the purposes of forecasting inflation, the Bank monitors several indices with higher weights on the US dollar and Japanese Yen. However, it is rare for differences to occur for sufficient periods to make a significant difference to the inflation projections.

[12] However, if the Euro is adopted as the single European currency this will automatically extend the coverage of trade by the major currencies.

Table 2

Trade weights used in calculating effective exchange rate for New Zealand

	IMF	TWI	
	1988-90	1989 (May)	1997 (May)
United States	16.6	24.1	21.5
Japan	15.3	27.5	24.8
Australia	13.9	30.5	37.8
Germany	8.6	5.4	6.0
United Kingdom	8.5	12.5	9.9
France	5.5		
Italy	5.0		
Netherlands	4.9		
Canada	2.9		
Belgium	2.8		
Taiwan	2.8		
Korea	2.3		
China, Peoples Rep.	1.8		
Sweden	1.7		
Hong Kong	1.6		
Denmark	1.6		
Singapore	1.4		
Spain	1.4		
Switzerland	1.4		
Total weights	100.0	100.0	100.0

Source: IMF and Reserve Bank of New Zealand

ful results, at least not unless account were also taken of trade in services (for which direction of trade data is not available), and of the multilateral aspect of trade as well as the differences between trade in primary commodities and manufactures.

The case for modifying the TWI at this time therefore, seems insufficiently compelling to justify change. The simplicity of construction of, and the familiarity that users have with, the existing TWI are additional reasons supporting this conclusion. Having said that, it is worth taking the opportunity to:

- highlight that the TWI is only a summary measure, and will not necessarily be the best measure of the external value of the NZD for every purpose, or in every context. In particular, discussions about "the exchange rate" in relation to the "competitiveness" of the tradeables sector of the New Zealand economy would likely benefit from consideration of the different issues involved in trade in manufactures vis-a-vis trade in primary commodities;
- note that the TWI need not in future comprise the currencies of New Zealand's five *largest* trading partners; at least not on the basis of simple two way merchandise trade share calculations. Henceforth, the Reserve Bank will be describing the TWI as comprising five *major* currencies.

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