



Measuring New Zealand's effective exchange rate

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The Reserve Bank maintains a range of exchange rate indices which summarise developments in the New Zealand dollar, by aggregating various bilateral exchange rates that are relevant to New Zealand's economy. In this article, we review some of the issues involved in doing this aggregation. From 17 December, the number of currencies in the official Trade-Weighted Index (TWI) basket has been increased to 17, and the weights on the various currencies will be calculated using shares of bilateral trade in goods and services between New Zealand and the country of each currency.

1 Introduction

Macroeconomic analysis requires summary data. For example, GDP and the CPI are two well-known summary measures - of domestic economic activity and prices respectively. 'Effective' exchange rate indices summarise the value of a country's currency relative to those of other countries. But doing so is not simple. There are more than 150 other currencies, and while some obviously matter more to New Zealand than others, there is no universally agreed answer as to how best to construct an index. As a result, there is often a range of different effective exchange rate indices for a single country.

A 'trade-weighted index' (TWI) is one way of constructing an 'effective' exchange rate index, based simply on trading partners' share of New Zealand's foreign trade. Since it was introduced in the late 1970s, the Reserve Bank's official exchange rate index (known as the TWI) has been a weighted average of just five exchange rates (those with the United States, Australia, Japan,

United Kingdom and Germany, and since 1999, the euro zone). The countries using these five currencies once accounted for the overwhelming bulk of New Zealand's external trade. But New Zealand's trade has become increasingly diversified. In particular, China is currently New Zealand's second largest trading partner.

In October, the Reserve Bank announced changes to the construction of its TWI. Those changes were implemented on 17 December 2014. In particular, the number of currencies included in the TWI has been increased from five to seventeen, and the weights for each currency will now be calculated based solely on direct bilateral goods and services trade with New Zealand (having since 1999 been based on both bilateral goods trade shares and the relative importance of each economy's GDP).

This article explains the motivation behind the changes, and also discusses the methodologies used in some other estimates of New Zealand's effective exchange rate.

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2 A summary measure of the exchange rate

Bilateral exchange rates are the rates at which one currency can be exchanged for another. The levels and/or changes in exchange rates can have important economic implications. Exchange rates are important for many firms, affecting (both directly and indirectly) export competitiveness, and the profitability and competitiveness of domestic firms that compete with imports. Exchange rates also affect the local prices of tradable goods and services, and hence the purchasing power of households and their ability or willingness to buy imported goods and services. For example, a holiday decision might be influenced both by the value of the New Zealand dollar against all other currencies (whether to go on holiday overseas) but also by the movements among currencies (which foreign country to holiday in). Rather than work with the bilateral exchange rates of each of New Zealand's many trading partners - and the relevant exchange rates will be subtly different for each different individual and firm - economists typically choose to work with a summary measure. Fluctuations in such an index over time are one element in assessing or interpreting macroeconomic developments.

The distinction between real and nominal indices also matters. The headline TWI quoted in the media and appearing in, for example, the *Monetary Policy Statement*, is a nominal series – a weighted average of the chosen exchange rates against the New Zealand dollar. It can be calculated and reported in real time, but changes in international competitiveness over time are better captured by developments in the real exchange rate. The Reserve Bank's real exchange rate series adjusts for the difference between New Zealand's consumer price inflation and inflation in the countries whose currencies are included in the exchange rate basket. For example, higher inflation in New Zealand than in the countries New Zealanders trade with will tend to cause the nominal exchange rate to depreciate over time. But such a depreciation provides no gain in competitiveness, as the fall in the nominal exchange rate is offset by the higher domestic inflation rate. Deflating using consumer price inflation is not the only possible approach - some international agency measures adjust for

differentials in producer price, or unit labour cost, inflation.²

Creating a summary exchange rate measure requires two sets of decisions: (1) how to weight the various bilateral exchange rates and (2) how many currencies to include.

2.1 How to weight currencies in the index?

The question of how to weight an exchange rate index is, at least ideally, about trying to represent the importance of each currency to New Zealand's economy. But even that way of framing the issue has a number of dimensions. If, for example, the Reserve Bank's primary interest was in the transmission of price changes from abroad to New Zealand, the appropriate weighting scheme might be rather different than if the primary focus was on the competitiveness of New Zealand's tradables sector (i.e. exporters and domestic import-competing firms). An index focused on price changes might focus largely on the exchange rates of the countries we import from (given that our exports are fairly heavily concentrated in products that only have modest weight in New Zealanders' consumption). In practice, the Reserve Bank tends to use the same summary index for a variety of purposes, but typically with a focus on the implications of changes in competitiveness (i.e. the real exchange rate) for the medium-term pressures on resources and domestic inflation.

Measuring external competitiveness for a small, open, agricultural commodity exporting country like New Zealand can be challenging. Trade destinations for commodity products can fluctuate considerably, so that an index using trade weights calculated from previous years' trade patterns may not necessarily capture competitiveness changes during the current year. Commodities are also, to a substantial extent, priced on a global market, where prices are determined by global supply and demand conditions. This means that simply looking at which countries we sell to would ignore the

² Several price indices could be used to deflate the nominal TWI, each with their own advantages and disadvantages (see Kite 2007 for more discussion). Unfortunately, measures such as producer price indices, export price or unit labour costs tend not to be available over long time spans for a wide range of emerging economies, or sometimes are not available in a timely manner.

impact of third country competitors³ and could understate the impact of large producer and consumer countries on global prices. Take dairy products, New Zealand's largest export commodity, as an example: some major producers/consumers of dairy products, such as India, are relatively closed off from global trade, while New Zealand's major competitors, such as the European Union or United States, do very little bilateral trade with New Zealand. In many countries, the dairy market is also distorted by production subsidies or quotas that affect the responsiveness of production to changes in local currency production prices.

To calculate the weights of the various currencies in the exchange rate index, we considered three broad weighting schemes:

- a mix of trade and GDP weights;
- bilateral trade weights; and,
- a more sophisticated weighting scheme to better capture third-country competitiveness effects and the specific nature of the products New Zealand

trades in (especially its commodity exports).

In 1999, the Reserve Bank adopted a weighting scheme that put a 50 percent weight on bilateral merchandise trade shares and a 50 percent weight on the relative importance of each economy's GDP (Table 1). Large countries received larger weights, whether or not New Zealand traded extensively with those countries. That approach was designed to capture the role of third country competition, and the likelihood that large economies have the biggest impact on commodity prices set in global markets. One way of thinking about the logic behind that approach is that, to a first approximation, bilateral trade-weights might be most relevant for New Zealand's imports, while GDP weights might be more relevant for our (largely commodity-based) exports. Hargreaves and White (1999), after explaining in some depth issues around commodity export and third country competitiveness, showed that a 50:50 weighting scheme also tracked effective exchange rates incorporating third

Table 1
TWI methods through time

	Calculation	Country/Currency coverage	Calculation of weights	Weight reference period
1979-1986	Weighted arithmetic mean	Australia, US, UK, Japan, Germany	Merchandise trade only	
1987-1998	Weighted geometric mean	Australia, US, UK, Japan, Germany	Merchandise trade only	Four quarter rolling basis, updated quarterly
1999-2014	Weighted geometric mean	Australia, US, UK, Japan, euro	Merchandise trade (50%) GDP (50%)	Annual weights, updated annually, 2 year data lag (December year, i.e. December 2013 data for 2015 TWI)
2015 -	Weighted geometric mean	Australia, US, UK, Japan, euro, China, Malaysia, Hong Kong, Singapore, Vietnam, Indonesia, Canada, South Korea, Thailand, Taiwan, Philippines, India	Goods and services trade	Annual weights updated annually, 1 year data lag (June year, i.e. June 2014 data for 2015 TWI)

³ New Zealand exporters compete not just with local producers of similar goods, but also with 'third' countries that export to those trading partners. For example, there is not much direct trade between New Zealand and Chile, but the two countries compete directly in overseas markets, especially in categories such as wine, wood and dairy products.

country competitiveness and performed well in explaining inflation and import and export prices.

Table 2 sets out how a range of other central banks construct their effective exchange rate indices. A 50:50 weighting approach is not used by any other advanced countries that we are aware of. But using bilateral trade-weights is also relatively uncommon. Most advanced country effective exchange rates use weighting schemes that are designed to capture third country competitiveness, but only in manufacturing.

There is also a range of different index measures for the New Zealand dollar, calculated by international agencies (the IMF, the OECD, and the BIS) and by JP Morgan. Table 3 summarises the approaches used by each institution, while the Appendix provides some detail on the weights used in each of these other indices.

The BIS measures are often cited since they are consistently calculated, and updated in a timely way, for a range of countries. In principle, the BIS measure should not be a very good representation of New Zealand's effective exchange rate. The BIS indices for all countries are calculated using weights drawn from international trade in manufactured goods. Manufactures make up a large share of most advanced country imports and exports, but in New Zealand, for example, non-commodity manufactures account for only around 15 percent of total exports.

The IMF indices attempt to take a much more sophisticated approach to the measurement of competitiveness. For each country, they look separately at trade in manufactures, in services, and in commodities. However, the weights in these indices are updated only around once a decade, and so in New Zealand's case for example, they do not capture the emergence of China as one of our largest trading partners and as the largest global importer of dairy products. In addition, in respect of both services and commodities, there are real questions over how well the IMF weighting scheme captures the appropriate weights to reflect competitiveness for New Zealand. For example, they capture international trade in commodities but not the potential impact of domestic production and consumption.⁴

One option was for the Reserve Bank to develop such a sophisticated index specifically tailored to New Zealand's particular products and trade structures. Doing so would have required the commitment of considerable research resources with no certainty that the resulting series would have provided materially better insights into New Zealand's external competitiveness or our ability to assess the implications of changes in the exchange rate for inflation pressures.

On balance, the Reserve Bank decided to return to a TWI calculated using direct bilateral trade weights, the approach which had been adopted before 1999. This is also not a particularly common model internationally, although it is the approach used by the Reserve Bank of Australia, the central bank of another commodity-exporting country. Using simple bilateral trade weights for a much wider range of countries provides a readily comprehensible and easily updatable basis for calculating index weights. As will be discussed later, the key impact of moving to this weighting structure has been to materially reduce the weights on the currencies of the United States, Japan, and the euro zone.

2.2 How many currencies to include in the index?

Having settled on bilateral trade weights, the next important decision is how to determine which currencies to include in an exchange rate index. The five currencies used in the previous official TWI measure accounted for the overwhelming bulk of New Zealand's trade. Following the last review of the TWI in 2007 (Kite 2007), the Reserve Bank also began to publish and monitor a broader TWI-14 (which added China, Singapore, Malaysia, South Korea, Thailand, Indonesia, Taiwan, Canada, Hong Kong). Since that review, the trade coverage of the countries/currencies in the five-currency TWI measure has continued to decline as New Zealand's trade has continued to orient towards Asia, particularly China.⁵ The countries represented by

⁴ The IMF gives the euro zone a very large weight as a market/competitor for New Zealand's commodities (e.g. the EU is the world's largest dairy exporter), but the IMF approach does not up-weight the United States because although it is a large producer and consumer the US does only a limited amount of international trade in commodities relevant to New Zealand (see table A1 Appendix). Another example is that IMF's New Zealand's tourism weights put a very (and unduly) high weight on Australia, which takes a normalised weight of 100 percent in the IMF's all fund series.

Table 2
Effective exchange rate measures compiled by selected central banks

Central bank	Name(s)	Weighting approach	Number of countries/currencies	Calculation of weights	Data used	Updating
Australia	TWI	Trade-weighted	21	Minimum trade coverage of 90 percent.	Merchandise pre-2011, merchandise and services post 2011.	Currency basket and weights updated annually.
Canada	CERI	Competition-weighted	6	Largest trading partners (with trade weights > 2 percent in 1999-2001).	IMF multilateral trade (non-energy commodities, manufactured goods, and services), and incorporates third-market competition weights based on 1999-2001 trade data.	Currency basket and weight irregularly updated.
Chile	TCM	Trade-weighted	21*	Trade weighted with 1 percent trade share threshold.	Total exports and imports (raw copper and oil imports excluded).	Weights updated annually.
	TCM-5		5	Trade weighted top 5 trading partners.		
	TCM-X		4	TCM-4 excluding the US dollar.		
Euro zone	EER-20	Competition-weighted	20	Weighted average of import and double export weights (including weighted third market effects).	Manufactures trade. Weights based on three year averages.	Weights updated every three years.
	EER-40		40			
New Zealand	TWI	Trade-weighted	17	Bilateral trade.	Based on bilateral goods trade before 2009, and goods and services trade thereafter.	Weights updated annually.
	TWI-5 (50:50)	Trade and GDP-weighted	5	50 percent trade-weighted, 50 percent GDP-weighted.	Based on merchandise trade and GDP in US dollars.	
	TWI-14 (50:50)		14			
Norway	TWI	Trade-weighted	25*	Average of OECD current trade weights of 25 main trading partners.	TWI based on OECD weights.	TWI weights updated irregularly.
	I-44		44*	Import weighted.	Import weights.	Updated annually.
Sweden	TCW	Competition-weighted	21*	Average of exports and imports, incorporating third-country effects.	Based on manufactures trade and weights from IMF.	Updated irregularly.
	KIX		32*	Average of total manufactures and commodities trade.	Based on manufactures and commodities trade.	Updated annually.
United Kingdom	Broad ERI.	Competition-weighted	25	Import or export share over last 3 years > 0.5 percent.	Manufactured goods and services trade, with exports weights incorporating third market competition. Location of competition weights are based on IMF figures and held constant, country weights vary based on bilateral trade shares.	Weights and currency coverage updated annually.
	Narrow ERI.		19	Import or export share over last 3 years > 1 percent.		
United States	Major currencies index	Competition-weighted	7	Equal weights on imports and double weighted exports (incorporating third market competition).	Goods trade (exports exclude gold and military items, oil excluded from imports).	Weights updated annually.
	Broad		26	Same as MCI, but based on currencies where bilateral shares of imports or exports > 0.5 percent in 1997.		

* Counting euro zone countries individually.

Table 3

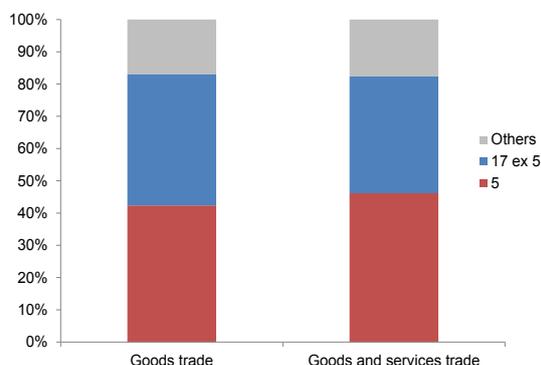
Effective exchange rate measures for the New Zealand dollar

	Name(s)		Weighting approach	Number of countries/currencies	Calculation of weights	Data used	Deflators	Updating
	Broad	Narrow						
BIS			Competition-weighted	26 15	Average of import and double weighted exports (incl. weighted third market effects)	Bilateral manufactures trade (SITC 5-8).	CPI	Average weight over three years, updated every three years. Current weights based on 2008-2010.
IMF	All Fund members		Competition-weighted	21*	Weighted average of import and double weighted exports based on weight in global markets and services sector weights (assumed to be the same as manufactures weight, except for countries where tourism comprises a high share of total trade).	Multilateral manufactured goods, commodities and services trade.	CPI	Updated irregularly. Current weights based on 2004-2006.
	Advanced economies			12			ULC	
JP Morgan	Broad		Competition-weighted	47	Weighted sum of bilateral imports and double weighted exports (incl. third market competition).	Bilateral manufactured goods trade.	CPI	Updated irregularly. Current weights based on 2000.
	Narrow			16				
OECD	Nominal Effective Exchange Rate		Competition-weighted	48*	Double weighting, based on competition in export and import markets	Export and imports of the goods sector.	CPI, ULC	Updated annually with weights for the measure for year t based on data from year t-1 (constant weights applied for missing values).

* Counting euro zone countries individually.

the five currencies in the TWI accounted for more than 65 percent of New Zealand's goods trade in 1999. Those countries now account for less than 50 percent of New Zealand's merchandise trade (figure 1).

Figure 1
Trade coverage for year ended June 2014



Source: Statistics New Zealand, author's calculations.

Services trade⁶ is often ignored in the construction of effective exchange rate measures (among central banks exceptions include the Bank of Canada, Bank of England and the Reserve Bank of Australia) mainly because such data, by country, have not always been easily available. Until now, the Reserve Bank used only goods trade data in calculating trade weights. However, New Zealand service trade data by trading partner have become available on an annual basis from 2008 onwards and will now be used in calculating trade weights.⁷ Services trade currently comprise around 25 percent of total trade.

In determining the number of currencies to include, again we considered a number of options. The Reserve Bank of Australia's index covers a minimum of 90 percent of bilateral trade by adding additional countries

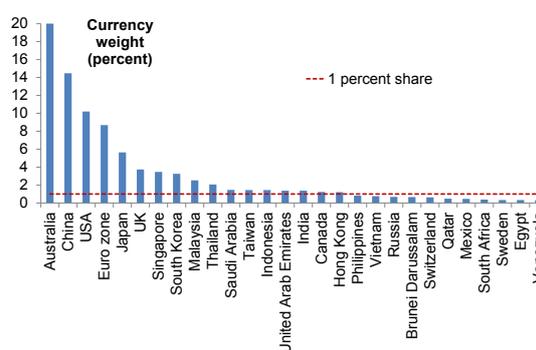
⁵ However, the import shares of some Asian economies, and China in particular, may somewhat overstate the economic significance of those countries to New Zealand imports. As global manufacturing has become progressively more important, measuring trade using final values exaggerates the importance of countries that make extensive use of imported intermediate inputs in their export production. The most often-cited example is the iPhone – assembled and exported from China, but the Chinese value added component in the New Zealand import price is small. In the absence of well-developed and regular disaggregated data about trade in value added terms, it is difficult to allow for this in calculating weights for an exchange rate index.

⁶ Services trade figures include commercial services, transportation, travel services, insurance, and government services.

⁷ This results in a small discontinuity in the weights of the backdated series in 2009 at the point of transition.

until this criterion is met (21 currencies currently). An index that covers 90 per cent of New Zealand's total trade would include 28 currencies, with 11 of those having a trade share of less than 1 percent (figure 2). Calculating historical real exchange rates for some of these countries would be quite difficult, for minimal gain in interpreting exchange rate developments.

Figure 2
Currency baskets to get 90 percent trade coverage (average 2012 to 2014)



Note: Based on average of June year-end goods and services trade data.

Source: Statistics New Zealand, author's calculations.

An alternative criterion could be to adopt a rule that all currency areas with weights exceeding some threshold are included (such as a 1 percent threshold, used in the IMF's methodology). New Zealand's foreign trade is very diffuse across a wide range of countries. For example, if a 1 percent total trade threshold was adopted, 17 currencies would be included. If a 2 percent trade threshold was adopted, on the other hand, only 10 currencies would be included in the TWI.

If a 1 percent threshold was used, the currencies of Saudi Arabia and the United Arab Emirates, which together account for around 3 percent of New Zealand's total trade, would be included. We have chosen not to include these countries in the TWI basket. There are two relevant considerations. First, the CPI series for these economies tend to be materially less timely than other economies in the basket (and historical CPIs are not available for the United Arab Emirates all the way back to 1984). Second, New Zealand's import trade with these countries largely involves oil, where prices -

and associated competitiveness issues, particularly for longer-term real exchange rate calculations - are largely determined in global markets.⁸ This exclusion is not ideal, although, for example, the Federal Reserve and the IMF exclude oil trade altogether in their calculation of trade weights. But it makes little difference to the behaviour of the series over time.

So our approach is a pragmatic one. Trade shares can jump around year to year, so the new official TWI will incorporate the 17 currencies of New Zealand's top trading partners (excluding predominantly oil producing countries) over the last three years, adding India, the Philippines and Vietnam to the TWI-14 basket.⁹

Moving to a 17-currency TWI, which captures 34 countries (including the 18 in the euro zone), will mean that the currencies of countries accounting, at present, for more than 80 percent of New Zealand's foreign trade in goods and services are included in the index.

Looking ahead, the Reserve Bank will monitor the extent of New Zealand's total trade covered by the 17 currencies in the index. Without adopting a firm rule, our aim will be to ensure that the TWI continues to capture currencies of the countries accounting for the bulk of New Zealand's trade.

3 Operational details of the TWI changes

The following specific changes to the official TWI took effect as from 17 December 2014:

- The number of currencies in the basket has increased from five to 17;
- The weights are now calculated using a fully bilateral trade-weighted methodology;
- Services trade is now incorporated into the trade weights from 2009 onwards;
- Trade-weights for the coming year's TWI are based on actual trade data for the current year to June (previously weights for 2014, were based on December year-end GDP and trade data from

⁸ Around 40 percent of New Zealand's total trade with these economies is oil-related (with over 80 percent of total imports from them is in the form of mineral fuels and oil products.)

⁹ Note that the same 17 currencies are included through the entire backdated series of the new TWI. In earlier periods, some other countries might have been among New Zealand's 17 largest trading partners, although no other countries were among our very largest trading partners.

2012);¹⁰

- The new official TWI series has been rescaled to the prevailing level of the TWI-5 series as at 11.10am on 31 October 2014 (see box 1 for more detail);¹¹ and
- The new nominal and real TWI series have been backdated, on a consistent basis, to 1984.¹² This is a different practice than was followed when the last change in weighting scheme was made in 1999.¹³ Historically, the TWI has been spliced when methodological changes have been introduced. Adopting the new approach will ensure that the time series of the official TWI follows a consistent methodology and picks up the rapid growth in trade with Asia over time (which is not picked up by TWI-5). Compared to the old (but methodologically inconsistent) series, the dates of previous peaks and troughs are not, however, materially altered.¹⁴

Table 4 shows the weights that will be used, under the new methodology, for the 12 months from December 2014, with the last year's TWI-5 weights shown for comparison. The biggest changes are the introduction, with a large weight, of the Chinese yuan, reflecting China's position over the year to June 2014 as New Zealand's second largest trading partner, and the reduction in the weights on the currencies of the large advanced economies, the United States, the euro zone, and Japan. In the new TWI, the five currencies in the old TWI-5 still have more than a 50 percent combined weight. But the new TWI places a larger weight on the currencies of China

¹⁰ Services trade are available from Statistics New Zealand on a by country basis from 2008 onwards. As a result, 2008 (June year-end) data will henceforth be used to weight 2009 exchange rates). Using only trade data allows the data lag applied to the weights to be shortened.

¹¹ The nominal daily series of the new TWI uses base exchange rates of 31 October 2014 and is scaled to the 31 October value of the TWI-5 (76.44), while the new real monthly TWI uses October 2014 monthly average base exchange rates and is scaled to the October 2014 monthly average of the TWI-5 (76.57).

¹² For currencies without active trading in New Zealand dollar terms, nominal bilateral exchange rates were obtained from cross rates with the USD. Barrow, Howard and de Malmanche *Forthcoming*, provides more details about the data and methodology used to backdate nominal exchange rate and relevant CPI series.

¹³ The historical trade weights used for the nominal TWI will not be revised when the series is reweighted each year. While revising them would ensure consistency in the weights used for the nominal and real series (which get revised), it would lead to a revision of the historical published nominal TWI, each year.

¹⁴ The nominal and real TWI-5 and TWI-14 series are also being maintained for some time.

Box 1

How the TWI is calculated

The formula for calculating the daily TWI at a given time

t is unchanged, as follows:

$$\text{Nominal TWI}_{t,d} = \left\{ \prod_{n=1}^N \left[\frac{E_{n,d}}{E_{n,31Oct2014}} \right] W_{y,d} \right\} * \text{scale factor}_y$$

where

- W_n is the weight given to trading partner n in the TWI;
- bilateral exchange rates E are expressed as the number of currency units for 1 New Zealand dollar;
- d denotes daily frequency;
- y represents a particular year;
- Π is the product of the N currencies in the basket;
- and the *scale factor* smooths any impact of a transition to new weights.

Each exchange rate is normalised to the base period (updated to 31 October 2014). Weights are updated annually for the real TWI (nominal weights are not revised), with weights for year y based on June year-end trade data from year $y-1$. On days when weights are updated the scale factor is adjusted.

While the old TWI-5 was based to 5 January

1999 (monthly real series to January 1999), the new TWI has been based to 31 October 2014 (monthly real to October 2014). The base period chosen does not affect movements in the series, and because the new series is also scaled to the level of the old TWI series on the same date, does not affect its level at that date either. Differences between the old and the new series on dates other than 31 October 2014 arise because of the different methodology being used for the new series, not because of the base period used.

For the period between 1984 and 2014, reweighting occurs on the first business day of the year (previously mid-December), with the new weights coming into force on the following business day. From 3 November 2014 (the first working day after 31 October) onwards, the nominal series applies new weights and scale factors.

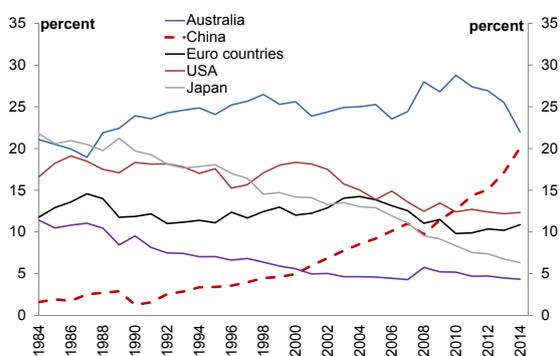
Table 4
TWI weights (percent)

	TWI-5 (50:50, goods trade only) applied for 2014	New TWI (100% goods and services trade) weights for 2015
Australian dollar	22.02	21.98
Chinese yuan		20.09
United States dollar	31.23	12.34
Euro	25.32	10.87
Japanese yen	15.10	6.31
Singapore dollar		4.34
Pound sterling	6.33	4.34
South Korean won		3.97
Malaysian ringgit		3.28
Thai baht		2.58
Indonesian rupiah		1.80
Taiwan dollar		1.74
Indian rupee		1.49
Canadian dollar		1.47
Hong Kong dollar		1.33
Vietnamese dong		1.04
Philippine peso		1.03
	100	100

and Australia (with a combined weight of more than 40 percent) with much reduced weights on the currencies of the United States, the euro zone and Japan (down from more than 70 percent combined to around 30 percent).

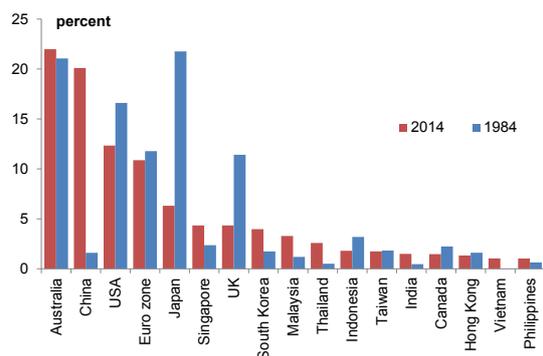
Figures 3 and 4 shows how the bilateral trade weights have changed over time in the new TWI. The weight on the Australian dollar has been fairly stable. The weights on the currencies of China, in particular, and other (non-Japan) Asian economies have trended upwards, at the expense of the weights on the currencies of the United States, Japan and the United Kingdom.

Figure 3
New currency weights in TWI, selected regions



Note: Weights are based on 100% goods and services trade using June year-end data from one year prior to the year to which the weights are applied.

Figure 4
TWI currency weights (1984 vs 2014)

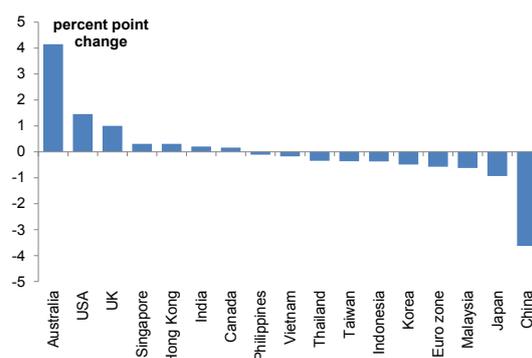


4 Implications of the TWI changes

4.1 Including services trade

Including services trade in the calculation of trade weights raises the weight of the Australian dollar by around 4 percentage points, and the currencies of the United Kingdom and United States by around 1 percentage point each (figure 5). The weight on China's currency declines by around 3.5 percentage points relative to what it would be if only goods trade were used. These differences in weights do not, however, have a significant impact on the historical behaviour of the TWI. In other words, a goods-only measure would look very similar to the new TWI over the last five years for which data are available.

Figure 5
Change in TWI weights when services trade is included



Note: Positive values indicate an increase in country weight when services are included, using June year end data for 2014.

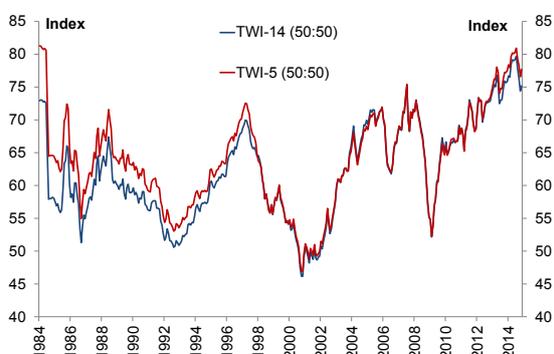
4.2 Broadening the currency basket

The new TWI is plotted in figure 6. Simply adding more countries to the TWI calculation (as was done with the 14-country index that the Reserve Bank has been publishing since 2007) does not materially alter the index. For example, figure 7 shows that the difference between the TWI-5 (50:50) and the TWI-14 calculated using the same methodology (TWI-14 50:50) over the last decade or so is small.

Figure 6
The new TWI (nominal)



Figure 7
Implications of adding currencies to the basket

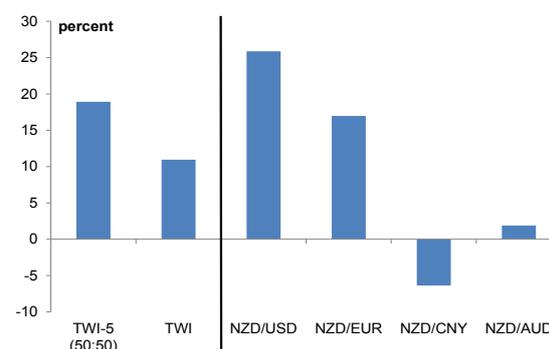


4.3 Reverting to full bilateral trade weighting

Neither inclusion of services trade nor increasing the number of currencies in the basket makes much difference to how the TWI would have behaved historically. However, there is a material difference between the old and new official TWIs over the last decade or so. These differences primarily reflect the move to weights based on bilateral trade shares.

Much of the difference is attributable to the substantial (and new) weight on the Chinese yuan (against which the New Zealand dollar (NZD) has not appreciated against over the last decade or so, figure 8) and a higher weight on the Australia dollar (against which the New Zealand dollar has also been largely flat). The new TWI also has a substantially lower weight on the US dollar and the euro (against which the New Zealand dollar has appreciated significantly over this period).

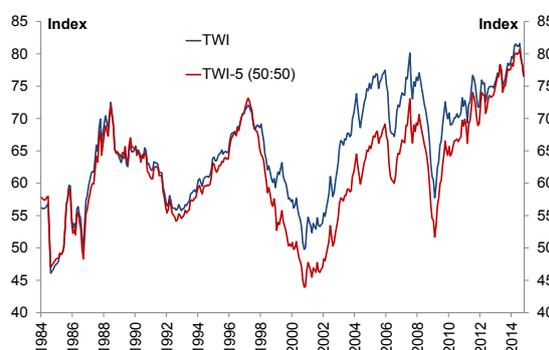
Figure 8
Changes in nominal NZD against selected currencies over the last decade



Note: 2004 monthly average compared to average between January and November 2014.

Different TWIs are presented in real terms (by deflating using CPI) in figure 9. Over the last decade or so, the new TWI has appreciated considerably less than the old TWI-5.

Figure 9
Selected real TWI Measures



Note: TWI-5 (50:50) scaled to the October 2014 average of the new TWI series for illustrative purposes.

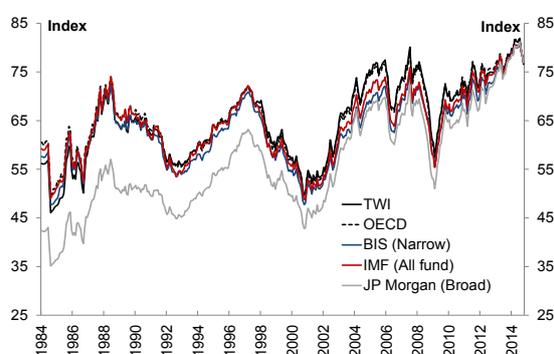
4.4 Comparison to alternative approaches

As discussed earlier, and shown in Table 3, there is a variety of different ways of measuring the effective exchange rate for the New Zealand dollar. Figure 10 illustrates some of the other real exchange rate measures. Although the various measures are highly correlated over the short term, their levels can be quite different over the long term. Most of the divergence of the new TWI from the BIS and IMF measures reflects differences in currency weights, rather than the currency coverage. The IMF and BIS measures put similar weights on the currencies of

Australia and the United States as the official TWI, but the IMF puts a much higher weight on the euro (table 5 and table A1 Appendix). Most of the alternative measures have a smaller weight on the Chinese yuan than our new TWI does. In terms of the importance of global commodity trade – one of the key issues for New Zealand - the IMF weights attempts to account for this directly. On its measure, the euro has a high weight, while the currencies of the United States and China have a very small weight in respect of commodity trade (table A1 Appendix). Unfortunately, the IMF weights are almost 10 years out of date.

The short-term fluctuations in various possible measures of the exchange rate index are all quite similar. New Zealand-specific influences, rather than the precise weights given to each individual currency, appear to have dominated the short-term fluctuations. But there is no certainty that this will always be so in future, which is why it is important to have as many of the currencies important to New Zealand in the basket.

Figure 10
Alternative Real TWIs



Note: Series scaled to the September 2014 average of the new TWI series for data availability reasons.

5 Implications for judgements about exchange rate impacts and sustainability

As already discussed, the new TWI has appreciated much less than the old TWI over the past decade or so. It is natural to ask whether the difference has, or should, affect how the Reserve Bank interprets or assesses the exchange rate. For example, are recent judgements about the 'unsustainability' of the exchange rate around recent levels affected?

The exchange rate, however measured, is never considered in isolation from everything else that is going on in the economy. The Reserve Bank has, for example, recognised the rising importance of Asia in New Zealand's trade and has taken that into account in its analysis and forecasting over the past decade or more. Exporters and importers deal with individual bilateral exchange rates, not summary indices. And New Zealand's longstanding economic imbalances have built up with the actual

Table 5
Comparison of TWI weights with those for other measures for New Zealand

Effective exchange rate measure	Effective weights on currencies %						
	Australia	Eurozone	United States	Japan	China	United Kingdom	Other countries
TWI	22.0	10.9	12.3	6.3	20.1	4.3	24.1
IMF (All Fund)	22.6	22.2	13.7	9.7	8.7	4.9	18.2
BIS (Broad)*	21.4	13.4	11.9	9.8	18.0	2.9	22.7
JP Morgan (Broad)*	17.6	13.4	20.3	15.7	7.3	4.2	21.3
OECD	19.0	11.6	11.5	7.7	16.1	2.4	31.7

* Euro zone treated as a single entity. For the IMF (All Fund) series, individual euro zone weights are aggregated, and for that series the euro zone includes Belgium, France, Germany, Italy, Netherlands and Spain only as these countries have individual trade shares exceeding 1 percent.

bilateral exchange rates that firms and households have faced over time. How those individual bilateral exchange rates are weighted into a summary index therefore does not materially alter the Reserve Bank's assessments around competitiveness and sustainability. Applying the macro-balance model (Steenkamp and Graham 2012) or the indicator model of the exchange rate (McDonald 2012) to the new TWI there are inevitably some changes, but the conclusions of those models, about how much of the exchange rate fluctuations are warranted or explainable over the past decade or so, are not materially altered.

5 Conclusion

There is no single ideal measure of an effective exchange rate index. Different TWI measures are useful for different purposes. In trying to understand changes in competitiveness it is likely to be prudent to keep an eye on them all. Developments in specific bilateral exchange rates will also have different relationships with economic variables and will be useful for different types of analysis. The focus of the Reserve Bank's approach is on assessing the impact of the exchange rate on the competitiveness of New Zealand's international trade, and the implications for future inflation pressures. Developing a full indicator of competitiveness, that reflected the specific nature of New Zealand's international trade, and in particular the importance of commodity markets would require a very substantial research programme. It is difficult to be confident that the results would offer a materially better summary exchange rate measure than the simpler approaches the Reserve Bank has customarily adopted. The changes introduced in December greatly increase the country coverage of the TWI, and in particular include the significant number of important Asian trading partners. Using a system of weights calculated simply on the basis of bilateral trade shares, ensures that weights that can be quickly and frequently updated in response to shifts in trade patterns over time.

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**Appendix
Table A1**

Detailed comparison of TWI weights with weights used for other effective exchange rate measures for New Zealand

Effective exchange rate measure for New Zealand	Weights	Effective weights (normalised to relevant currency basket) %										Data Period
		Australia	Euro zone	United States	Japan	China	United Kingdom	Other countries				
RBNZ*	TWI-5 (50/50, goods only)	22.0	25.3	31.2	15.1	0.0	6.3	0.0			2012 (December year end)	
	TWI-5 (100% goods only)	40.0	18.9	20.2	14.7	0.0	6.2	0.0				
	TWI-14 (50/50 goods only)	13.1	17.2	21.4	10.0	17.8	4.2	16.4				
	TWI-14 (100% goods only)	23.2	11.0	11.7	8.5	19.8	3.6	22.3				
	TWI (100% goods and services)	22.0	10.9	12.3	6.3	20.1	4.3	24.1		2014 (June year end)		
IMF (All Fund)	Overall weight**	22.6	22.2	13.7	9.7	8.7	4.9	18.2		2004-2006		
	Commodities***	3.4	44.6	13.0	5.8	5.2	6.5	21.5				
	Manufacturing (incl. third markets)***	23.0	15.3	15.3	13.0	11.7	4.2	17.6				
	Tourism***	100.0	0.0	0.0	0.0	0.0	0.0	0.0				
	Overall weight**	25.3	28.6	15.3	10.8	0.0	5.5	14.5		2004-2006		
IMF (Advanced)*	Commodities***	4.0	48.8	15.3	6.8	0.0	7.7	17.4				
	Manufacturing (incl. third markets)***	26.9	19.5	18.0	15.3	0.0	5.0	15.3				
	Tourism***	92.4	7.6	0.0	0.0	0.0	0.0	0.0				
	Overall weight	30.0	18.8	16.6	13.8	0.0	4.0	16.9		2008-2010		
	Manufacturing Imports***	29.6	19.9	15.9	12.7	0.0	4.1	17.8				
BIS (Narrow)*	Manufacturing Exports (bilateral)***	46.2	10.4	17.7	16.9	0.0	2.8	6.0				
	Manufacturing Exports (third markets)***	0.6	26.0	20.3	16.4	0.0	5.7	30.9				
	Overall weight	21.4	13.4	11.9	9.8	18.0	2.9	22.7				
	Manufacturing Imports***	20.5	13.8	11.0	8.8	20.1	2.8	22.9				
	Manufacturing Exports (bilateral)***	40.7	9.2	15.6	14.9	4.6	2.4	12.6				
BIS (Broad)*	Manufacturing Exports (third markets)***	0.4	16.3	12.7	10.3	21.7	3.5	35.2				
	Overall weight	19.1	14.5	22.1	17.1	8.0	4.6	14.6		2000		
	Overall weight	17.6	13.4	20.3	15.7	7.3	4.2	21.3				
	Overall weight	19.0	11.6	11.5	7.7	16.1	2.4	31.7		2011		
	Overall weight	19.0	11.6	11.5	7.7	16.1	2.4	31.7				

* Euro zone treated as a single entity. For the IMF (All fund) series, individual euro zone country weights are aggregated, and for that series the euro zone includes Belgium, France, Germany, Italy, Netherlands and Spain only as these countries have individual trade shares exceeding 1 percent.

** IMF component weights are weighted by the following sectoral trade shares: commodities (0.398), manufactures (0.526) and tourism (0.076).

*** Each component normalised to basket for illustrative purposes.

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