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# Neutral real interest rates revisited

Nils Björkstén and Özer Karagedikli, Economics Department<sup>1</sup>

Monetary policy decision-making commonly involves setting interest rates to stimulate the economy and prevent deflationary forces gathering momentum, or to constrain the economy and prevent inflationary forces gathering momentum. In setting interest rates, therefore, one needs to know what level of interest rates will stimulate and what level will constrain economic activity. Whereabouts is the dividing line? This is the question that we address in this article. It turns out that it is very difficult to come up with a precise answer, as a range of different analytical approaches provides a range of answers.

In the process of trying to identify the “neutral” interest rate that is the dividing line between stimulatory and contractionary, we discuss its evolution through time. We also note that, after allowance for inflation, and for a decline in the inflation-adjusted neutral interest rate, the neutral interest rate in New Zealand remains high relative to comparable countries. Although possible reasons for the decline and for the relatively high level in New Zealand are ventured, they are not the prime focus of this article.

## 1 Introduction

Monetary policy today is conducted by adjusting interest rates with the end objective of keeping inflation over the medium term within the specified target band of 1-3 per cent per year. If there is a danger of inflation rising above this range, interest rates raised high enough for long enough will remove stimulus from the economy and eventually bring inflation back down or even prevent it from rising in the first place. Likewise, persistently low interest rates add stimulus to the economy and will eventually increase inflation. Accordingly there is some middle-ground interest rate which would correspond to a neutral monetary policy setting. At this interest rate, known as the *neutral nominal interest rate*, monetary policy would neither add nor subtract stimulus to/from the economy, and inflation would neither rise nor fall in the absence of shocks to the economy or other imbalances. The *neutral real rate* (NRR) can be thought of as this interest rate minus the expected rate of inflation.

In most circumstances, monetary policy settings will not be at neutral. Monetary policy has a job to do, namely to keep prices reasonably stable, even as economic events unfold that push the economy sometimes toward booms in activity, and at other times toward slowdowns and more difficult business environments. With this objective in mind, an appropriate interest rate stance at any given time may involve interest rates above or below neutral settings, offsetting the forces that would otherwise push inflation too high or too low.

Accordingly, when conducting monetary policy, decision-makers implicitly take a position on where the NRR lies, because they need to reflect on just how much stimulus current interest rate settings might be adding to/subtracting from the economy. Here it is the *level* of interest rates that matter. While *changes* in interest rates can affect business and household confidence, expectations and price-setting behaviour, this is far from the whole story. Thus, for example, if real interest rates remain unchanged at a level that is clearly and consistently lower than the neutral level, people will continue to find it attractive to borrow to bring expenditure forward, and unattractive to lend or save. Conversely, if real interest rates are at a level that is clearly above the neutral

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rate, economic activity will be continuously constrained, even if they remain stable.<sup>2</sup>

At the same time, the NRR itself cannot be observed directly. Its level can only be inferred by observing the behaviour of inflation in response to monetary policy once all other inflation-affecting factors have been controlled for. Unfortunately, controlling for all factors that affect inflation is no easy task, which makes the NRR rather hard to nail down with much confidence.

Does this matter? In a practical policy sense, it is perhaps not so serious. Policy-makers routinely deal with a great deal of uncertainty already in determining just where the economy is at the moment and in which direction things are developing, as well as how quickly and how seriously shocks to exchange rates, migration, oil prices, growth in trading partners, among other factors, will affect business activity, and ultimately inflation. Under such circumstances, sound judgement based on experience, plus a sense that monetary policy is either broadly stimulatory or broadly contractionary, may be enough. While getting the level of the NRR wrong may temporarily lead to either excessively stimulatory or contractionary levels of interest rates, it could be expected that the monetary authorities will realise this and correct policy once inflation starts to surprise upwards or downwards.<sup>3</sup>

Nevertheless, as this article demonstrates, there is sufficient uncertainty about the “true” level of the NRR that significant time can elapse before it becomes obvious that the authorities’ understanding of the NRR is wrong. For this reason, and especially if the NRR is likely to be changing through time, it is important periodically to revisit assumptions made regarding the NRR.

The remainder of this article is structured as follows. Section two explains why it might be more reasonable to think of a time-varying NRR than one which is constant over time.

Section three presents a range of simple indicators that could in principle shed light on the evolution and level of the NRR. Section four provides various model-derived estimates of the evolution of the NRR in New Zealand. Section five discusses why the NRR may be higher in New Zealand than in other countries. Section six summarises and concludes.

## 2 Why might the NRR change over time?

Under stable conditions, the NRR represents the point at which the supply of and demand for loanable funds is matched, which in New Zealand largely implies a willingness of foreigners to lend and New Zealanders to borrow in New Zealand dollars. As such, the NRR is affected by a number of factors, many of which may be time-varying. Such factors include anything that might affect country risk, including perceptions of fiscal soundness, a reliable monetary policy framework, perceived robustness to exchange rate shocks and a sustainable external debt. Other factors include trend productivity growth, stability of inflation expectations and appetite for debt. To the extent that some of these factors change or can be affected by policy decisions, the NRR may also change.

Would such changes be material enough to matter for practical policy purposes? If there is evidence of a substantial observed shift over time in the level of the New Zealand NRR, the answer to this could be yes. This is because a standard approach to estimating the NRR is to observe an extended period in history during which inflation has been roughly stable, and calculate the NRR as the average prevailing interest rate minus the inflation rate<sup>4</sup>. This approach makes sense if we expect that, over time, exchange rate fluctuations, randomly occurring economic shocks and other elements of boom-bust cycles roughly cancel out, so that their net effect on the economy is neutral. Likewise, if inflation has been stable, and the economy has on average been healthy, the monetary policy that has been offsetting the cyclical factors in order to stabilise inflation must also, on

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<sup>2</sup> Note that if inflation is pushed up or down (respectively) in these examples, a constant *real* interest rate requires a changing *nominal* interest rate. If inflation is accelerating, the nominal interest rate can be increasing at the rate that inflation is expected to rise without the real interest rate changing.

<sup>3</sup> The cost of under- or over-estimating the NRR may not be symmetric. In particular, Orphanides and Williams (2003) argue that the cost of under-estimating the NRR is greater.

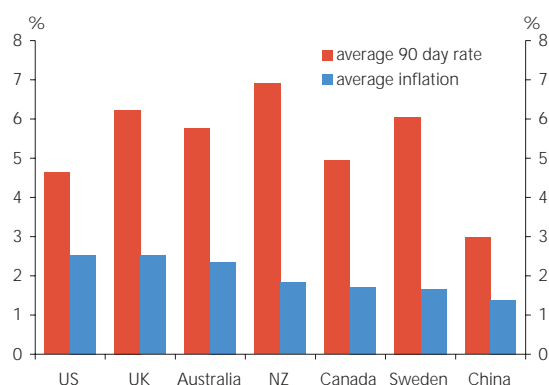
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<sup>4</sup> There are in fact several questions that need to be addressed in following this approach. For a good exposition of the issues in the context of New Zealand, see Archibald and Hunter (2001).

average, have been neutral. But it will give misleading estimates if the NRR has in fact been changing through time.

Figure 1 shows the average inflation and interest rates for a number of countries between 1992 and 2002. When we subtract the average inflation rate from the average 90-day rate in New Zealand, we arrive at an average real short-term interest rate that is close to 5 per cent. This seems implausibly high to be a true representation of neutral, considering that it implies that an Official Cash Rate level up to 7 per cent would normally be adding stimulus to the economy. An average that seems too high suggests that the NRR has been trending downwards over time, from levels higher than 5 per cent during the early years of the 1990s to lower levels today.

**Figure 1**  
Average inflation and average nominal interest rates in New Zealand and elsewhere, 1992-2002



Is it plausible that the NRR might have declined in New Zealand to an extent that makes a 5-plus per cent average real rate a bad estimate of the current NRR? There are several reasons why the NRR might have declined. One is that the NRR may have increased in the 1980s, and has been returning toward more normal levels since. It should be recalled that the programme of reforms in the 1980s and into the early 1990s led to a fundamentally changed economic environment, including much better access to international financial markets. To the extent that New Zealanders' access to credit improved dramatically, an upward adjustment in debt-to-income ratios might be expected. This adjustment might justify a temporarily higher NRR for some time following financial liberalisation reforms. Because of the pent-

up demand for credit, borrowing activity might need to be restrained by monetary policy initially in order to keep the pressure on the economy's productive resources at sustainable levels with respect to inflation control.<sup>5</sup>

Other factors may also have exerted a downward influence on the NRR, such as gradually receding fears of renewed inflation, as inflation targeting established a successful track record, or greater foreign investor confidence in the New Zealand economy over time, as fiscal consolidation proceeded and various external crises were successfully weathered.

External factors are almost certainly at least partly responsible for the decline in the NRR. New Zealand is a small economy, and long-term interest rates depend a great deal on the evolution of long-term rates abroad. As it happens, long-term rates overseas have trended downwards over the past decade, perhaps because of broad fiscal consolidation in Europe and (until recently) in the United States, as well as decreased fear of renewed inflation or lately even an increased perceived risk of deflation. New Zealand-specific factors, to the extent that they differ from common factors that have affected a 'world NRR', would only explain the evolution of a differential between NRRs here and abroad.

None of this suggests that a trend decline in the NRR over the past decade would necessarily continue, either in New Zealand or overseas. As mentioned above, the drivers of the NRR probably also include such variables as productivity growth, whereby an economy that becomes more productive should (in the absence of any other factors) see an increase in the NRR. This is because an increase in productivity growth raises the rate of return to investment, and as a result, the neutral real interest rate increases to balance saving and borrowing. Thus, if the United States and/or Europe see a trend increase in productivity following technological change, this will be reflected in higher rates of return to investment and thus a higher neutral real interest rate.

<sup>5</sup> More persistent effects might subsequently follow if it emerged that New Zealanders' appetite for debt resulted in higher household debt-to-income and external debt to GDP ratios than overseas. In the latter case, a New Zealand risk premium might be tacked on to interest rates as a result of greater perceived credit risk from the perspective of international lenders.

### 3 Simple indicators of the New Zealand NRR

Apart from using period averages of real interest rates, the level of the NRR might be able to be inferred from the behaviour of a range of simple indicators as to whether monetary policy today is adding or subtracting stimulus to/from the economy. The usefulness of this approach of course depends on what else might be going on at the time. Informal allowance can be made for the role of other factors; more formal allowance requires the use of more sophisticated techniques (see next section).

To find potentially useful indicators, it makes sense to look at the things that might help to explain the evolution of the NRR. One of these relates to the gradual increase of the household debt-to-income ratio, as a consequence of financial liberalisation in the 1980s that gave households better access to credit. According to this hypothesis, the NRR in New Zealand is only temporarily higher than the world NRR during a period of transition, as households collectively take advantage of better opportunities to borrow, and the ensuing pressure on productive resources, and thus inflation, causes interest rates to rise. Under this hypothesis, once debt-to-income levels in New Zealand approach their new equilibrium, the rate of household debt accumulation will decline, associated additional pressure on the real economy will slow and the New Zealand NRR will settle toward the world NRR<sup>6</sup>.

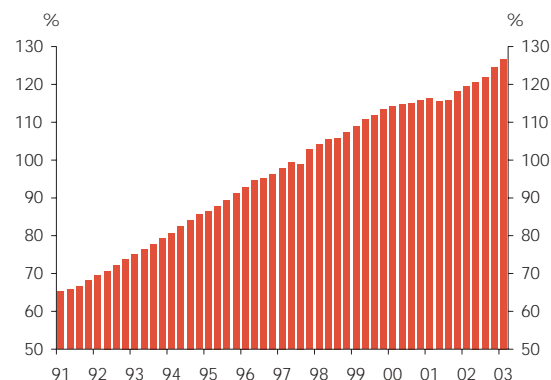
However, there is no sign that debt-to-income ratios have stabilised. Figure 2 shows a continued steady increase in the debt-to-income ratio of households, which does not yet seem to be tapering off. That might partly explain why the New Zealand NRR is noticeably higher than in countries where debt ratios are evolving at a more gentle pace.

#### Housing market activity

A more direct indicator of both the current level and any change in the NRR might be the behaviour of household

<sup>6</sup> Some differential might remain due to a risk premium associated with the effect of higher household debt levels on the likelihood of loan default. If New Zealand household debt stabilised at the same levels as household debt anywhere else in the world, this might not be a factor.

Figure 2  
Ratio of household debt to disposable income

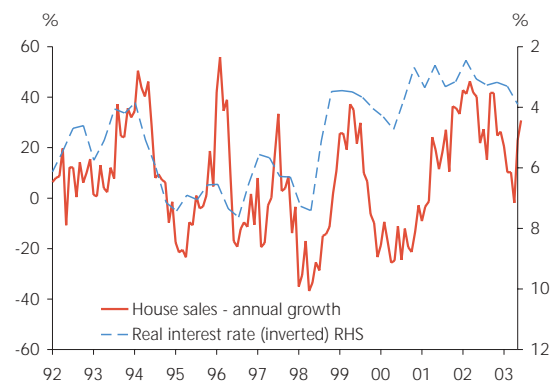


borrowers, as viewed through the window of the relationship between the level of interest rates and housing market activity. The borrowing activity of households relative to longer-term averages gives an indication as to whether borrowers think real interest rates are high or low. By looking at these interest rate levels relative to their longer-term averages, we can detect whether there seems to be a change in the borrowing point.

Figure 3 plots the relationship between annual growth in house sales and a measure of the real interest rate: nominal interest rates deflated by the CPI.

The relationship shown in Figure 3 seems to suggest that lower interest rates are less stimulatory now than they were in the early 1990s. While real interest rates have trended lower, house sales have continued to fluctuate within historical ranges. Of course, house sales will also be affected by other variables, such as population growth.

Figure 3  
House sales and real interest rates (CPI deflator)



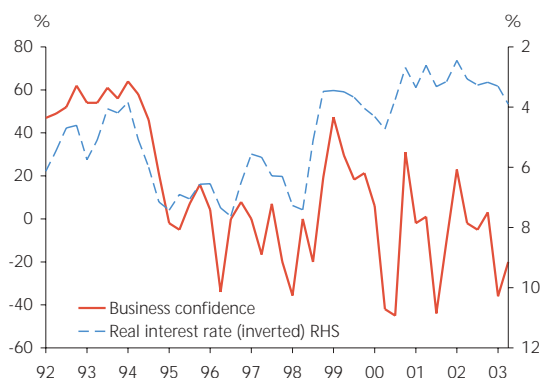
## Confidence measures

Trends in business confidence can also provide information on the possible trend in the NRR. Given that low interest rates provide stimulus to business activity via greater incentives to borrow for consumption and investment, one might expect a declining trend in real interest rates to have been reflected in higher business confidence.

Figure 4 plots business confidence against real interest rates<sup>7</sup>. The broad decline in real interest rates seems to have been accompanied by a tendency for business confidence to decline. In Figure 4, this appears as a divergence between the two lines. The same divergence can be observed with regard to "own activity" expectations<sup>8</sup>, as plotted in figure 5.

Given that business confidence is driven by many factors, the link between business confidence and interest rates is weakly indicative at best. In this particular case, post-reform increases in competitiveness in many sectors, associated with deregulation and increased globalisation, have probably decreased average margins and so had a negative effect on business confidence over the period that is separate from the trend decline in real interest rates.

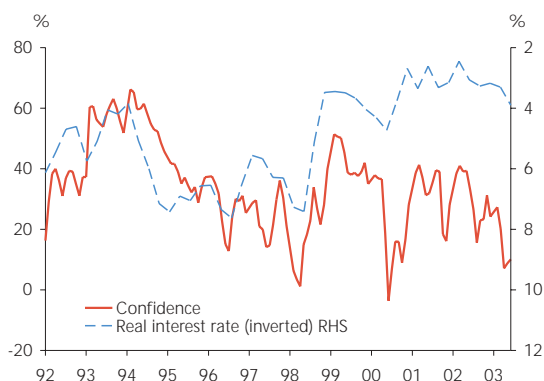
Figure 4  
QSB0 business confidence and real interest rates



<sup>7</sup> Business confidence refers to the Quarterly Survey of Business Opinion (QSB0) survey measure of the percentage of respondents expecting an improvement in general business conditions minus the percentage expecting a deterioration.

<sup>8</sup> NBBO survey measure, reflecting the percentage expecting an increase in own activity minus the percentage expecting a decrease.

Figure 5  
NBBO own activity expectations and real interest rates



A tentative conclusion that might nevertheless be drawn from trends in business confidence in recent years is that lower interest rates do not provide proportionately more stimulus to the economy today than has been the case in the past. This is another way of saying that the NRR may have fallen over the latter half of the 1990s and early 2000s.

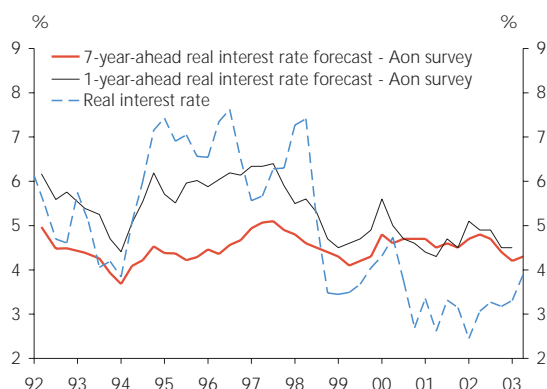
## Long-term interest rate forecasts

Another indirect way of gauging trends in the NRR is to assess expectations of longer-term interest rates to see whether they suggest a fall in the NRR over recent years. Surveyed expectations of real interest rates 1 and 7 years ahead, as plotted in figure 6, have been quite stable over recent years. The relative stability in longer-horizon expectations reflects less cyclical volatility over the period 1992-2003 than the bumpier 1-year-ahead real interest rate expectations series. The average level of the 7-year-ahead forecast of 10-year real interest rates has consistently been around 4.5 per cent. This stability is not consistent with expectations of a declining NRR, and stands at odds with the trend fall in the expected 1-year-ahead real rate.

## Perceptions of the monetary policy stance

It is possible to directly survey perceptions of how stimulatory monetary conditions are, to correlate this with measures of the real interest rate, and to draw inferences as to the level of the NRR. The RBNZ survey of expectations contains a

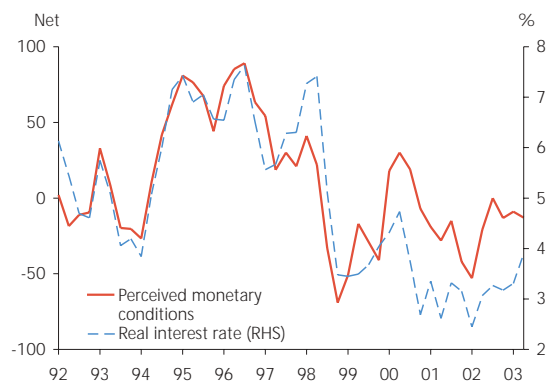
**Figure 6**  
Actual and forecast real interest rates, 1 and 7 years ahead



question about perceived monetary conditions, but responses to this question over time show a correlation with the exchange rate as well as with actual levels of nominal interest rates. Figures 7 and 8 plot the perceived monetary conditions variable<sup>9</sup> against the real interest rates and the TWI, respectively.

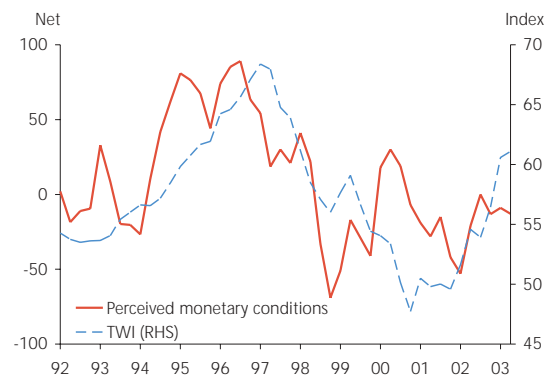
Given the correlation with the exchange rate of perceived monetary conditions, it is difficult to draw inferences about the level and behaviour of the NRR based solely on this indicator. Nevertheless, it is interesting to note that in the face of very low levels of 90-day interest rates, and an exchange rate that has until quite recently been widely perceived as undervalued, monetary policy has still not been

**Figure 7**  
Perceived monetary conditions and real interest rates



<sup>9</sup> This is defined as the percentage of respondents who believe that monetary conditions are tighter than neutral minus the percentage believing that conditions are easier than neutral.

**Figure 8**  
Perceived monetary conditions and the TWI



perceived as unusually stimulatory. This would also suggest that the neutral real interest rate has declined in recent years.

### Neutral real interest rate estimates for other countries

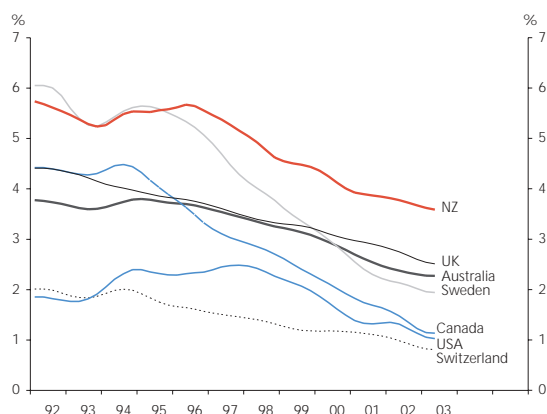
Figure 9 plots estimates of time-varying real interest rates in various countries, including New Zealand, using long-term and short-term interest rates as a guide, and correcting for actual inflation levels. The methodology involves the use of "Kalman filters"<sup>10</sup>, and assumes that inflation expectations are stable and the same as actual inflation. On this basis, a simultaneous downward shift in the cyclically adjusted long and short interest rates (i.e. a downward shift in the entire yield curve) is interpreted as evidence of a decline in the NRR, as depicted in figure 9.

This graph can be interpreted as giving us point estimates of neutral real interest rates, as well as some indication of country-specific premia around a world NRR<sup>11</sup>. Strikingly, the NRRs have declined in most of the comparator countries, except for the United States. In addition, it appears that the New Zealand premium over that of many other countries has declined somewhat since 1992, but remains substantial in all cases.

<sup>10</sup> See Bjorksten and Karagedikli (2003) or Basdevant et al (2003).

<sup>11</sup> It should be recognised that the filtered series in figure 9 are subject to wide bands of uncertainty, and that other filtering methods will yield different end point estimates. Nevertheless, for all of its faults, Figure 9 is indicative of the 'New Zealand premium'.

Figure 9  
Yield spread based estimates of NRRs



#### 4 Empirically estimating a time-varying NRR

If the NRR fluctuates materially over time, then it makes little sense to take an average of the real interest rate, even if over some sample period which is long enough for the ups and downs of business cycles to cancel each other out. If the true NRR is trending down over time, as the simple indicators examined above seem to suggest is the case for New Zealand, then an estimate based on the average will be biased downwards at the beginning of the sample and upwards at the end. What alternative methods are available to estimate a time-varying NRR for New Zealand?

Several recent pieces of research have addressed this question, all of them examining the period of stable inflation which started in 1992. Because the NRR cannot be observed directly, it must either be inferred from the movements of other variables, or modelled theoretically as a function of other economic relationships, or a combination of both.<sup>12</sup>

One of the simplest methods of estimating the NRR is to calculate a moving average of actual 90-day interest rates.<sup>13</sup> One benefit of this approach is that as monetary authorities adjust interest rates to counteract inflation deviations from target, the moving average of those rates automatically

<sup>12</sup> Internationally, efforts to model a time-varying neutral real rate and/or the associated real interest rate gap include Laubach and Williams (2003) and Orphanides and Williams (2003) for the US, and Neiss and Nelson (2003) for the UK, and Giammaroli and Valla (2003) for the Euro area.

<sup>13</sup> A standard way to do this is by using a Hodrick-Prescott filter, as explained in Hodrick and Prescott (1997) and a procedure for which is now contained in most statistical packages.

adjusts itself to reflect any trend that might exist. Thus, as levels of real interest rates have broadly declined over the 1990s, even as inflation itself has remained stable, the moving average of real interest rates displays a declining trend since 1992. In practice, the Reserve Bank continuously adjusts its view on the neutral real interest rate in a way which is consistent with such a moving average (Basdevant and Hargreaves 2003).

The moving average, as described above, is nevertheless backward-looking, and so this method leaves us with a great deal of uncertainty when it comes to guessing what the NRR might be today. Plantier and Scrimgeour (2002) tried to improve upon the moving average approach by taking into account the fact that short term interest rates are largely determined by monetary policy judgements, which in turn should respond in predictable ways both to deviations of inflation from target, and to output from its trend. By using this information, it should be possible to improve the accuracy of estimates. Over history, any persistent adjustments to the 90-day rate which are not explained by deviations of inflation from target and output from trend are assumed to reflect a change in the NRR. The NRR estimates derived in this way also show a declining trend in New Zealand, and closely match the moving average approach over history. But because the approach allows explicitly (if crudely) for the influence of monetary policy, the estimates are probably somewhat more accurate in real time decision-making.

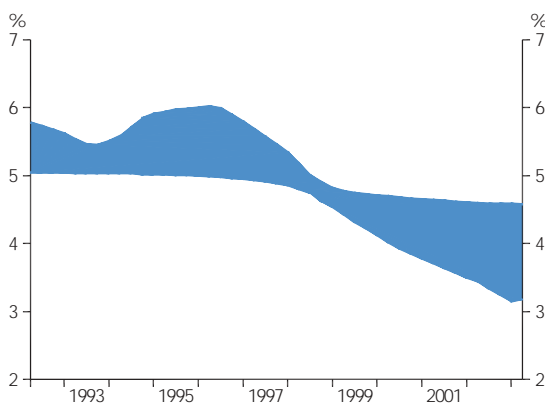
The approach of Plantier and Scrimgeour (2002) suffers from the problem that the most recent value of the estimated NRR depends heavily on the last available observations of inflation, output and the 90-day rate. In real time, the most recent observations are often subject to material revisions as new data emerge. Basdevant *et al* (2003) address this problem by considering movements not just in 90-day rates, but in 10-year rates as well.<sup>14</sup> Since 10-year interest rates provide information about how markets expect 90-day rates to evolve on average in the future, Basdevant *et al* have effectively inserted a forward-looking component into their estimates of the NRR. To check the robustness of such yield curve-based estimates of the NRR, Basdevant *et al* ran a series

<sup>14</sup> This "yield curve spread" approach has been suggested by Christensen (2002).

of counterfactual exercises where real-time data on inflation and output were substituted for *ex post* data. The results were that the yield curve spread-based estimates were not greatly affected by revisions to inflation and output data, and thus can be considered relatively reliable.

Basdevant *et al* estimated the NRR using a total of 14 different models, including (i) a simple yield curve analysis that takes 90-day and 10-year interest rates directly from the yield curve, (ii) acknowledgement of the central bank's role in setting short rates *à la* Plantier and Scrimgeour (2002), (iii) tests of different assumptions with regard to the formation of inflation expectations, and even (iv) a full structural model, all within a Kalman filter framework using a range of alternative filter parameters.<sup>15</sup> Figure 10 plots the envelope of the estimates derived using these 14 models. While every model estimated suggests a decline in the NRR over the time period since the early 1990s, the end points are, unsurprisingly, more uncertain than the middle. The estimates of today's NRR turn out to be fairly evenly spread in a range of about 3.2 to 4.6 per cent, with an average just under 4 per cent.

**Figure 10**  
Envelope of 14 empirical estimates of the NRR for New Zealand



Source: Basdevant *et al* (forthcoming), RBNZ

<sup>15</sup> The Kalman filter is a recursive algorithm which enables us to jointly estimate a model with an “unobserved” component” such as the neutral real interest rate. For a review of the Kalman filter and its applications in macroeconomics, see Basdevant (2003).

## 5 Why does the NRR seem to be higher in New Zealand than elsewhere?

A remarkable observation from this variety of work is that the estimates of the NRR in New Zealand remain considerably higher than in many other parts of the world. The question of why this is so is understandably a matter of some debate in New Zealand. What is it that is different about New Zealand which obliges New Zealand borrowers to pay more than, say, borrowers in the United States, the UK or Australia?

Without attempting to be at all definitive, the answer may be a combination of the following factors, probably none of which individually is decisive, but all of which might jointly interact, resulting in a material structural New Zealand premium over a ‘world’ interest rate:

- New Zealand is a small economy, with less diversification in its economic activity than is the case in most of the other OECD economies. Consequently, it is likely to have greater volatility in GDP than would larger and more diversified economies. In the period 1992-2003, volatility of the New Zealand output gap has been an estimated 47 per cent higher than in the US, 84 per cent higher than in Australia, 31 per cent higher than in Canada and 2.5 times higher than in the UK. At the same time, trend GDP growth has been lower in New Zealand than overseas.
- New Zealand also has substantial exchange rate volatility, with large and persistent fluctuations against major world currencies, such as the US dollar. Taking a 2-year moving average of currency exchange rates against the US dollar, New Zealand is twice as volatile as Canada, 40 per cent more volatile than the UK, but only 6 per cent more volatile than Australia.
- While well-integrated in foreign currency markets, the liquidity of New Zealand dollar denominated debt is lower than debt denominated in many other currencies. This matters in the event that investors may wish to quickly liquidate a large position, or many investors at once try to sell New Zealand dollar denominated assets in response to bad news. The risk of losses for the sellers

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increases if it is harder to find a buyer on the other side of the transaction.

- New Zealand has one of the highest levels of net foreign debt relative to GDP. Most lenders to New Zealand companies and other enterprises are therefore overseas investors, whose choice of investing in New Zealand involves an assessment of investment risks and returns across many alternatives worldwide.

The net foreign asset position features prominently in most stories of the New Zealand differential reflecting a premium imposed by foreign investors. Plantier (2003) has tested whether New Zealand's relatively high foreign indebtedness, as measured by net foreign asset positions as a percentage of GDP, might in fact be a driving factor of the persistent interest rate differential. His main result confirms that OECD countries' net foreign asset positions correlate well with the gap between domestic currency real interest rates and those in the rest of the world.

Plantier's work suggests that not only does the size of a country's net foreign asset position relative to GDP matter, the composition of this position matters as well. In particular, government indebtedness appears to have a larger effect than private indebtedness. In the case of New Zealand, Plantier's results suggest that reductions in the net indebtedness of the New Zealand government since 1994 have lowered real interest rates by almost 1½ percentage points, though this has at least partly been offset by increases in household indebtedness.

There are also other factors that might conceivably explain the higher NRR in New Zealand as compared to elsewhere. For one thing, residual fears of inflation, while probably tapering off after a decade of observed price stability, may still remain more of a factor in New Zealand than elsewhere. This does not seem to be supported by data from various surveys of inflation expectations, which show remarkable stability in New Zealand, but the possibility cannot be completely dismissed.

Likewise, the suggestion has been made that the RBNZ itself has been responsible for the higher rates, under the hypothesis that it is continually running an overly hawkish monetary policy. Following this argument, if the RBNZ were to follow a more relaxed approach to inflation control, then

real interest rates would be more similar to those in Australia, the US and Europe. A clear counterfactual test is not available, so the hypothesis cannot be conclusively rejected. Nevertheless, if monetary policy settings have indeed been above neutral on average, then one might expect inflation to have been in the lower half of, or below, the target range over a good part of the period, when in fact the opposite has been the case.

## 6 Summary and conclusions

The NRR conceptually defines the boundary between high and low interest rates, where the former drives inflation down, with the potential side effect of slowing the economy, and the latter stimulates the economy, with the potential side effect of higher inflation. The NRR is thus an important operational concept for monetary policy in determining the appropriate policy stance for the cyclical circumstances.

There is evidence to suggest that the NRR in New Zealand has been trending downwards since inflation was stabilised in 1992. In principle, taking a time-varying NRR into account from the start should allow for more efficient monetary policy in the sense of less output volatility (Giammaroli and Valla 2003). Unfortunately, however, the NRR is not directly observable, but rather it must be inferred from the behaviour of inflation, as imperfectly quantified by a range of alternative measures. Given that inflation is affected by many other variables as well, including several unobservable ones, such as the output gap, which for good measure operate at long and variable lags, the estimation of the NRR at any given point in time is subject to considerable uncertainty. Nevertheless, over longer time periods, some trend developments can be separated out from known cyclical and noise factors, and this is helpful to the estimation process.

There are two complementary approaches to determining the NRR. One can start from the idea that economies move through cycles, and so long as inflation is neither trending up nor down, interest rates must also have been cycling around their neutral level. So under conditions of broadly stable inflation over an extended time period, the average or trend interest rate provides a basis for assessment.

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At the same time, one can try to identify some underlying factors which determine cross-country differences between trend interest rates. This allows us to estimate country-specific premia around a world NRR which is prevailing in international financial markets, and which is driven by factors common to many market economies. This second approach may also suggest some policy measures that can affect the premium of some individual country.

Recent estimation work which makes use of these approaches has placed the current level of the New Zealand NRR somewhere around or just below 4 per cent, plus or minus about three-quarters of a percentage point.

In the end, the observed decline in the NRR in New Zealand can be partly explained by a general worldwide decline in the NRR, which has lowered real rates of return on competing investments overseas. Another part should in principle relate to New Zealand-specific developments, and here it becomes especially interesting for policy-makers to determine whether the observed decline relates to policy changes that we have some control over. Identifying these individual components of the decline in the NRR is an order of magnitude more difficult than just estimating the decline in the first place, however.

The NRR estimate for New Zealand has been and remains high in comparison with what we observe overseas. The article offers some possible reasons for this. One of the interesting questions for further analysis in the future is whether those factors will continue to result in a higher NRR in New Zealand than elsewhere, or whether the New Zealand NRR may slowly converge closer to the world rate.

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