New Zealand's currency risk premium

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In this article we examine whether New Zealand having its own currency leads to higher interest rates in New Zealand when compared to Australia or the United States.

Differences between domestic and foreign interest rates can arise: (1) because the underlying assets are subject to differences in liquidity risk and default risk; (2) because of expected changes in the exchange rate; and (3) because of a 'currency risk premium' that might occur on account of uncertainty about the future value of the currency. Given that the currency risk premium is not directly observable, our methodology is to estimate it as a residual, by subtracting estimates of (1) and (2) from the interest rate differentials we observe.

We present a variety of different estimates for New Zealand's currency risk premium using different measures of exchange rate expectations. Our estimates of the currency risk premium depend crucially on the assumptions that are made about expected exchange rate movements.

Our analysis suggests that over the 1990s New Zealand has faced a relatively significant currency risk premium versus the United States. There is also some evidence of a currency risk premium in our interest rates versus those of Australia, although this premium seems to be smaller in magnitude.

These results suggest that forming a currency area with Australia would have less impact on New Zealand interest rates than would forming a currency area that included the United States. However, before deciding whether such an outcome would be desirable or not, the other costs and benefits involved in adopting a common currency would need to be considered.

1 Introduction

The advent of the Euro and recent volatility in the NZ dollar have fuelled debate on whether a currency union might also be appropriate for New Zealand. Forming a currency union with Australia or adopting the US dollar are two alternatives that are commonly mooted as replacements for New Zealand's current exchange rate regime.

The debate about currency areas has prompted a reconsideration of the costs and benefits of having an independent currency and independent monetary policy.[2] As part of this discussion, there has been interest in the 'currency risk premium'. More specifically, are interest rates in New Zealand higher, on average, because we have our own independent, flexible currency? And would joining a currency union with Australia or the United States actually lower interest rates in New Zealand?

In this article, we examine New Zealand interest rate differentials relative to both Australia and the United States in an attempt to understand whether New Zealand interest rates are higher because we have our own currency. We focus exclusively on the cost of debt, tracing out the factors that affect the differential between domestic and foreign interest rates.

The article is structured as follows. In section two we motivate the discussion by presenting a simple comparison of New Zealand and foreign nominal interest rates. In section three we discuss the theoretical issues associated with a currency risk premium and outline an analytical framework that can be used to quantify the currency risk premium for New Zealand. Using this framework we present a variety of estimates of the currency risk premium in section four. Concluding remarks appear in section five.

1 The authors would like to thank Bruce White, Anne-Marie Brook, Brian Quartarolo and Michael Reddell for helpful comments and discussion.

2 For an overview of the issues associated with currency areas for New Zealand see Hargreaves D and J McDermott (1999), "Issues relating to optimal currency areas: theory and implications for New Zealand", *Reserve Bank of New Zealand Bulletin*, 62, 3, 16-29.

2 A comparison of interest rates

In order to motivate the discussion in the following sections of this article, figures 1 and 2 depict New Zealand short- and long-term nominal interest rates since 1987 versus those of our main trading partners.

These figures indicate that New Zealand and Australian interest rates have tended to converge with those of the United States, the United Kingdom and Germany (with Japan being somewhat of an outlier). At least in part, this result reflects a convergence in inflation rates. Notwithstanding this convergence, New Zealand and Australian interest rates have generally been higher than those of the United States for most of the 1990s (although in the last year or so short-term rates have become very similar). New Zealand short-term interest rates have usually been higher than those in Australia, although there have been periods when New Zealand long-term interest rates have been below their Australian counterparts.

Figure 1
Domestic and foreign 90 day interest rates

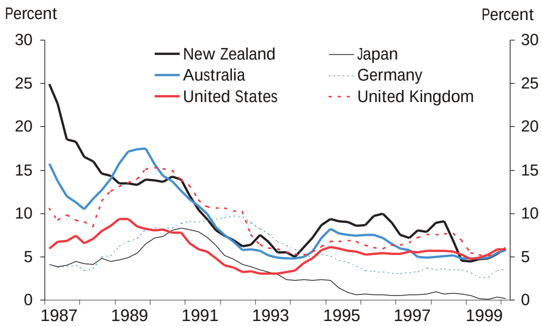
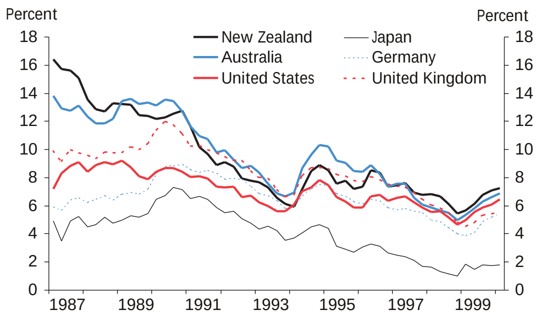


Figure 2
Domestic and foreign ten year interest rates



As indicated in the introduction, the purpose of this article is to investigate what proportion of these differentials between New Zealand and foreign interest rates is due solely to the fact that New Zealand has its own currency.

3 Analytical framework

3.1 Decomposing interest rate differentials

In this section we describe the methodology that we use to quantify the currency risk premium. We assume that interest rate differentials, as depicted in the figures above, can be decomposed into different components associated with:

1) expected currency movements;

2) default and liquidity risks; and

3) unexpected currency movements, or currency risk.

As the currency risk premium is not *directly* observable, we estimate this component indirectly. Essentially, we subtract estimates of (1) and (2) from the interest rate differentials observed above to obtain (3), the component associated with currency risk.

Uncovered interest parity (UIP) is a useful *starting point* from which to consider interest rate differentials. UIP is a theory based on the idea that 'similar assets' should yield 'similar expected returns'. When comparing assets denominated in different currencies, UIP implies that the differential between domestic and foreign interest rates should be offset by an expected change in the exchange rate. Otherwise investors would be able to make positive *expected* profits by borrowing in one currency, lending in another, and then converting back the return from the latter currency to pay off the original debt.[3]

Uncovered interest parity can be represented by the following equation:

$$i_t^* = i_t + \Delta s^e_{t+1} \qquad (1)$$

where:

i^*_t = a foreign nominal interest rate;

[3] UIP is unlikely to hold if capital cannot move freely between the different currency areas.

i_t = a comparable New Zealand nominal interest rate; and

Δs^e_{t+1} = the expected percentage change in the NZ dollar exchange rate (foreign currency per NZ dollar), this expectation being formed at time *t*.[4]

New Zealanders are currently net debtors with the rest of the world. In light of this fact, equation (1) can be thought of as an equality that is relevant for the foreign investors who finance New Zealand's net borrowing. The left-hand side of equation (1) tells us how much interest a foreign investor would earn from investing in a financial asset denominated in their own currency (eg US dollars). The right-hand side of equation (1) tells us the return the same foreign investor would expect to obtain from investing in a NZ dollar asset, taking into account the capital gain or loss the foreign investor expects to make from an appreciation or depreciation of the NZ dollar. For example, if the NZ dollar appreciates during the term of an investment, then the return on a NZ dollar asset is larger than it would be in the absence of the appreciation *once that return is converted back into a foreign currency*.

Uncovered interest parity abstracts from differences in default and liquidity risks. One of the reasons why UIP may not hold exactly is if we compare interest rates from assets that are not exactly 'similar'. If one borrower is more likely to default on its debts than another, we would expect this riskier borrower to be charged a higher interest rate.

Differences in liquidity are another reason why UIP may not hold in practice. In general, people prefer to hold 'liquid' assets: assets that can be readily and costlessly changed into money. Liquidity is valuable, since assets that can be converted into money can be used to cope with unforeseen contingencies. If New Zealand markets are less liquid, say because the market for New Zealand assets has fewer potential buyers, then interest rates in New Zealand are likely to be higher, to compensate for the reduced liquidity of New Zealand assets.

Liquidity and default risks modify equation (1) in the following way:

$$i_t^* + \text{liquidity and default premia} = i_t + \Delta s^e_{t+1} \qquad (2)$$

In other words, the foreign interest rate plus compensation for differences in default and liquidity risk equals the expected return from New Zealand interest rates and the expected change in the currency.[5]

We now consider another reason, associated with unexpected exchange rate movements, which may also explain why UIP does not hold exactly. UIP assumes that interest rates and the expected change in the exchange rate are the only factors that affect choices between different assets. However, future exchange rate movements are difficult to predict and are sometimes dramatically large. Thus, the *actual* return from holding an asset (encompassing both interest and the currency movement) may be quite different to the *expected* return. If investors are risk averse, that is if they do not weigh positive surprises *equally* with negative ones, then they may demand an additional premium as compensation for the possibility that the actual return may undershoot their expected return.

For example, suppose that a US investor expects no change in the USD/NZD exchange rate and sees that NZ dollar interest rates are 6.5 percent while US interest rates are only 6.25 percent. Clearly, given the investor's exchange rate expectation, the expected return from investing in NZ dollars is higher (6.5 percent) than the return from investing in US dollars (6.25 percent). Suppose however, that the NZ dollar actually depreciates by 6 percent over the period of the investment. Then, for the US investor, the *actual* return would be a mere 0.5 percent from investing in New Zealand, as compared to the 6.25 percent that could have been achieved from investing in the United States. Given the potential for these poor ex post outcomes, a risk averse US investor might demand a premium before they are willing to invest in NZ dollars.

The currency risk premium is thus *the component of a return which compensates for unexpected exchange rate movements*.

In practice, investors can make large errors when forming expectations of future exchange rates, and the profits or losses from these errors can easily swamp interest rate

[4] Expectations formed at time *t* and all variables with subscript *t* are assumed to be known at time *t*.

[5] In the analysis below we do not *empirically* distinguish between liquidity and default risks. Hence in equation (2) we have simply grouped them together.

differentials between countries. Overseas fund managers, for example, may be especially averse to investing in assets denominated in foreign currencies given that they have relatively short horizons in which their profits are reported. Fund managers may therefore be unwilling to take on an exposure to exchange rate movements unless they have a strong belief in the direction of the currency over the short term – since they risk having to report monthly or quarterly losses to their clients.

The presence of a currency risk premium modifies equation (2) in the following way:

$i_t^* + CRP_t$ + liquidity and default premium = $i_t + \Delta s^e_{t+1}$ (3)

where: CRP_t is the currency risk premium required by investors at time *t*.

Other things equal, the NZ dollar interest rate now needs to be higher, as a result of a positive currency risk premium.

Equation (3) can be rearranged so that the currency risk premium is on the left hand side:

$CRP_t = i_t - i_t^* + \Delta s^e_{t+1}$ - liquidity and default premium (4)

This equation forms the basis for estimating the currency risk premium. As mentioned in the beginning of this section, we calculate the currency risk premium by adding the expected appreciation of the currency and subtracting the liquidity and default premium from the interest rate differential.[6]

In section 3.2 we explore how to estimate the liquidity and default premium. And in section 3.3 we consider how to estimate the expected change in the exchange rate.

3.2 Default and liquidity risk

As introduced in the previous section, differences in default and liquidity risks are an important reason why interest rates diverge in different countries. The purpose of this section is to discuss these issues in more depth, and to provide some estimates of the default and liquidity premia relative to the United States and Australia.

As discussed in section 3.1, not all borrowers are 'similar'. If a New Zealand company, for example, is more likely to default on its debts than a foreign company, we would expect the New Zealand company to be charged higher rates (even after taking account of expected currency movements and currency risk). In such circumstances, the higher expected return encompasses a 'default premium' as compensation for the higher risk of default.

There may also be differences in the liquidity of markets for different financial assets. For example, the size of the market for US government bonds means that these bonds are usually easy to liquidate. By contrast, the small size of New Zealand financial markets means that an investor in NZ government bonds may find it more difficult to liquidate their investments at short notice (since there are fewer potential buyers for those assets). Consequently, investors may demand a higher return to compensate for this reduced liquidity.

The existence of premia to compensate for differing default and liquidity risks is also highlighted by the European Monetary Union (EMU). At the beginning of 1999 members of EMU irrevocably fixed their exchange rates, forming a currency union. Following this move, the interest rates on EMU government bonds converged, since they no longer reflect expected currency movements or a premium for currency risk.

Notwithstanding this convergence, interest rates on the government bonds of (non-German) EMU countries are still around 10 to 50 basis points higher than interest rates on German government bonds. These differentials reflect higher default risks compared to Germany, and other institutional differences such as liquidity risk.

What then, might be the default and liquidity risk between New Zealand and Australia if they were to form a common currency? For the purposes of this article we assume that differences in default and liquidity risk are not significant when making comparisons between New Zealand and Australia. We make this assumption for a number of reasons. First, Australian banks dominate the financial systems of both countries. Thus, an Australian bank bill should have a similar default risk to a New Zealand bank bill, since they are often

[6] Technically Δs^e_{t+1} is the expected percent appreciation of the NZ dollar; $-\Delta s^e_{t+1}$ is the expected percent depreciation of the NZ dollar. Adding the expected percent appreciation is thus equivalent to subtracting the expected percent depreciation.

liabilities of the same banks.[7] Second, the Australian and New Zealand governments have had broadly comparable credit ratings, suggesting that default risks on government bonds should also be broadly similar. We also assume that the liquidity of the two markets is broadly comparable. Given this assessment, the rest of this section is devoted to approximating default and liquidity premium for New Zealand vis-à-vis the United States.

When attempting to estimate the size of New Zealand's default and liquidity premium versus the United States it is important to recognise that default premia are likely to depend on the time until maturity. For example, an investor is more likely to be confident that a borrower will be able to repay their obligations in 90 days as opposed to 10 years, as they have less information about events that may affect the borrower's ability to repay over the longer horizon.

In practice, when New Zealand commercial banks borrow at short-term horizons in US dollars, they tend to pay around the same interest rate as US commercial banks.[8] Consequently, in our empirical analysis we assume that the default premium between NZ bank bills and US bank bills is negligible. We also assume that any liquidity premium between these two markets is minor. Given this assessment, the rest of this section focuses on estimating the default and liquidity premium between NZ and US *long-term* government bonds.

The most direct way to extract the default and liquidity premium embedded in NZ government bonds relative to US government bonds is to compare the interest rates faced by these two borrowers when issuing debt in US dollars. Because the returns from both assets are denominated in the same currency, the differential between the interest rates contains neither a differential to account for expected changes in the exchange rate nor a premium for currency risk. Instead, the interest rate differential reflects only the relative default and liquidity premia.

The New Zealand government has a small amount of debt denominated in US dollars.[9] The interest rates from US dollar New Zealand government bonds can be compared directly with the interest rates on US dollar US government bonds of a comparable maturity. Figure 3 illustrates the interest rate on a *specific* US dollar NZ government bond maturing on 15 November 2005 with a US dollar US government bond maturing on 15 August 2005.[10] (These bonds were both issued in the mid-1980s.) As we would expect, figure 3 shows that the interest rates on these two bonds track one another relatively closely. It is also clear that there is a premium in the interest rate of the New Zealand government bond relative to the interest rate on the US government bond – a premium independent of New Zealand having its own currency.

Figure 3
NZ government versus US government US dollar interest rates [11]

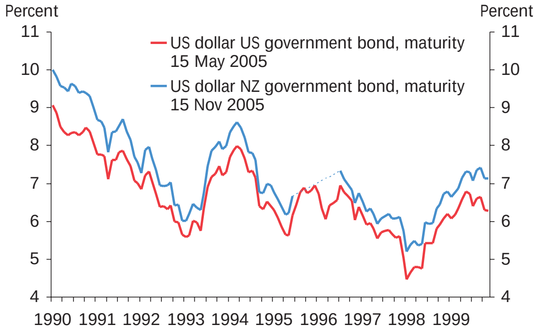


Figure 4 displays the *differential* between the US dollar New Zealand government bond and the US government bond. This premium has varied considerably over time. For example, from 1990 to 1997 it fell from around 1 percent to below 50 basis points. Since the beginning of 1997 the differential

[7] Actually, some of the banks operating in New Zealand are subsidiaries of Australian parent banks, but we ignore this distinction.

[8] For example, at a maturity of 90 days, New Zealand commercial banks tend to pay LIBOR (the London Inter-bank Offer Rate) plus or minus 5-10 basis points on US dollar borrowing.

[9] The New Zealand government's foreign bonds on issue are offset equally by the government's holdings of foreign assets, eliminating the government's net foreign debt position.

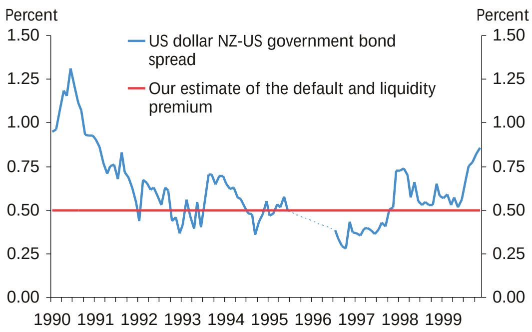
[10] This size of this US dollar NZ government bond issue is relatively small (at US$200 million) compared to the size of the NZ government's typical NZ dollar bond issues. However, in our analysis, we assume that the liquidity premium on this US dollar NZ government bond issue is broadly comparable to that of the average NZ dollar NZ government bond.

[11] Data are unavailable for the US dollar New Zealand government bond from August 1996 to February 1997, and hence this period has been replaced with a dotted line.

has averaged about 50 basis points, but has ranged from around 25 to 85 basis points.

As an approximation, in the empirical section of this article (section 4) we assume that the default and liquidity premium on New Zealand government bonds relative to US government bonds averages around 50 basis points.

Figure 4
Estimated default and liquidity premium



The New Zealand government's foreign currency credit rating is AA+, whereas its rating on NZ dollar bonds is AAA. If this difference means that the New Zealand government is less likely to default on its NZ dollar bonds, our estimate of the currency risk premium in NZ dollar interest rates may be understated. However, we do not think that the difference between NZ dollar and foreign currency default risks is substantive. Clearly, it is very unusual for a government to default on domestic currency obligations, since a government with its own currency can always print currency to meet its domestic obligations. (This option is unavailable for a government that borrows in a foreign currency.) However, printing currency also constitutes a form of default, given that it would result in unexpected inflation, which would devalue the real value of the currency that the government had supplied.[12] As an approximation, we assume in this article that the probability of the New Zealand government defaulting on foreign currency debt is the same as the probability of the government defaulting on its NZ dollar debt.

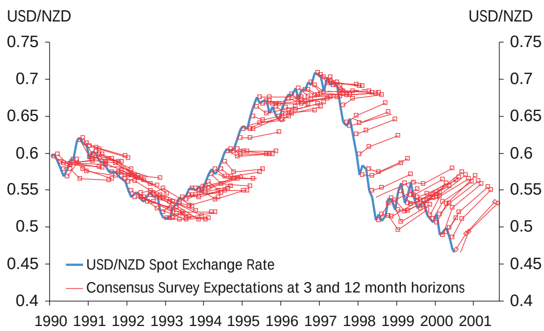
[12] A government could also default on domestic currency obligations by unexpectedly increasing taxation or simply by refusing to provide the requisite currency.

3.3 Expected exchange rate movements

In this section we consider how to estimate the expected change in the exchange rate, the term Δs^e_{t+1} in equation (4) in section 3.1. Unfortunately, modelling exchange rate movements is a particularly challenging task. Consequently, it is difficult to know how to model people's *expectations* of exchange rate movements. In light of this difficulty, we take an eclectic approach and consider a variety of methods that can be used to estimate expectations of future exchange rates.

First, however, we illustrate that people's expectations of future exchange rates often differ substantially from the exchange rates that actually *eventuate*. The blue line in figure 5 represents the USD/NZD spot exchange rate, while the red lines show the mean (survey) expected value of the exchange rate obtained from *Asia Pacific Consensus Forecasts* (henceforth *Consensus Forecasts*).[13] The squares on the red lines represent the expected exchange rate 3 and 12 months hence.

Figure 5
USD/NZD Spot rate versus *Consensus Forecasts*



Source: Consensus Forecasts

If exchange rates were easy to forecast, the red lines in figure 5 would closely approximate the path of the spot exchange rate. Instead, we see that the exchange rate can trend in a direction inconsistent with the mean *Consensus* expectation for quite some period of time. There have clearly been extended periods of time during which the mean *Consensus* expectation has been quite poor at picking future exchange rate movements.

[13] *Consensus Forecasts* is published by Consensus Economics Inc.

In the rest of this section we outline different methods that can be used to model exchange rate expectations. We consider four main methods: estimates based on purchasing power parity (PPP); estimates that assume *actual* exchange rates are a good proxy for *expected* exchange rates; estimates obtained from surveys of exchange rate expectations (as depicted in figure 5 above); and estimates obtained from assuming the exchange rate is a 'random walk'.

One of the oldest theories in economics is 'the law of one price', which asserts that, at least approximately, the price of identical tradeable goods or services should be the same irrespective of their country of origin. By contrast, absolute PPP assumes that a common bundle of goods and services should cost the same when the costs of the bundles are compared in the same currency. A modern variant of this theory, relative PPP, asserts that the nominal exchange rate should depreciate when domestic inflation is higher than the rate of inflation in the foreign country. According to this theory, the expected inflation differential should act as a predictor of future exchange rate movements.[14]

There are a number of ways to formulate the *inflation expectations* needed to form relative PPP forecasts of the exchange rate. The most common methods are to use historical inflation, ex post inflation, or survey measures of inflation expectations.[15] It should be noted, however, that relative PPP is a theory of exchange rates that works best over a long-term horizon. Over a short-term horizon, few economists expect the value of the exchange rate to be tightly linked to relative PPP.

An alternative to assuming relative PPP is to assume that expectations of future exchange rate movements are 'rational'. If this assumption is true we can use ex post realisations of *exchange rate* movements as a proxy for the expectation held by market participants at some earlier point in time. In effect, we pretend that actual outcomes are a good proxy for what people expected. Figure 5, with its large forecast errors, suggests that this assumption is not very convincing. However, provided that these forecast errors are not systematically biased, an average estimate of the currency risk premium using this method may have a plausible magnitude.

Another approach is to use *surveyed* expectations of exchange rate movements (as in figure 5 above). However, survey expectations raise a number of issues. First, we must assume that self-reported expectations are close analogues of actual expectations (among other things, we must believe that the respondents do not misrepresent their views). Second, we must assume that the survey respondents are representative of those people taking on exchange rate risk in the market. In the mid-to late-1990s a substantial amount of NZ dollar debt was issued to European and Japanese retail investors. The investors taking on the exchange rate risk were the proverbial 'Belgian dentists'.[16] It is not clear that these investors had well-thought-out expectations of New Zealand exchange rate movements, or that their expectations coincided with those of other market participants.

As mentioned previously, the exchange rate is very difficult to forecast. Another model of exchange rate expectations is therefore to assume that market participants act as if future movements of the exchange rate *cannot* be predicted, so that the best prediction of *future* exchange rates is simply the *current* value of the exchange rate. In other words, the exchange rate is assumed to be a 'random walk'. This assumption is appealing if we think exchange rates are so hard to predict that investors refrain from trying to make forecasts of their future movements.

However, it is apparent from figure 5 that the mean survey expectation obtained from *Consensus Forecasts* does not treat the exchange rate as a random walk. The expected change in the exchange rate is not simply zero all the time. Rather the forecast values fall both above and below the value of the exchange rate at the time the expectation was formed. It is instructive to note, from equation (4), that if the exchange follows a random walk the currency risk premium is simply the interest differential (less the default

[14] C Engel (1999), "Accounting for U.S. Real Exchange Rate Changes", *Journal of Political Economy*, 107, 3, 507-38, makes it clear that the real exchange rate also depends on the relative prices of non-tradeable goods and services. This dependence is another reason why PPP may be an imperfect model of exchange rate movements.

[15] By ex post inflation we mean the inflation that actually occurred, even though this actual inflation rate was not known at the time the expectation was formed.

[16] See K Eckhold (1998), "Developments in the Eurokiwi bond market", *Reserve Bank of New Zealand Bulletin*, 61, 2, 100-111.

and liquidity premium), since the expected percent change in the exchange rate is then always zero.

In summary, in the empirical section below, we estimate the currency risk premium using the following proxies for expected exchange rate movements:

1) Assuming PPP, we use differentials from
   - *surveys of expected inflation*
   - *actual ex post inflation* and
   - *historical measures of inflation*

to proxy expected exchange rate movements.

2) We use *actual ex post exchange rate movements* to proxy expected *exchange rate* movements.

3) We use *survey measures* of expected *exchange rate* movements to proxy expected exchange rate movements.

4) We assume that the *exchange rate* is a *random walk*, implying that the expected change in the exchange rate is zero.

Before proceeding to our empirical estimates in section four, we take a couple of brief detours. First, we consider an alternative method of calculating the currency risk premium using forward exchange rates. Then, in section 3.5, we examine some alternative, non-currency risk, explanations for the 'residual' in interest rate differentials.

3.4 An alternative approach to estimating the currency risk premium

Thus far, we have talked about estimating the currency risk premium by subtracting liquidity and default risks and expected currency movements from interest rate differentials. The existence of a currency risk premium can also be explained in terms of forward exchange rate contracts.

Take the same foreign investor, as in section 3.1, who is faced with a choice between a NZ dollar bond or a bond denominated in their foreign (non-New Zealand) currency. Let us also suppose that the investor is uncomfortable with the risk associated with currency movements. One way for the investor to avoid the currency risk associated with the NZ dollar bond is to enter into a forward exchange rate contract.[17] By entering into a forward exchange contract the foreign investor can pre-arrange a price at which they will sell the New Zealand currency that they obtain once their NZ dollar bond matures. The forward exchange rate contract can be used to 'lock in' their future foreign (non-New Zealand) currency return.

By holding a NZ dollar bond but hedging their exposure to movements in the currency, the investor is essentially assured of a return denominated in their home currency. As a result, they will be willing to accept a forward rate that equalises the return from buying the NZ dollar bond (after hedging the currency risk) with buying a bond in their own currency. Such a condition is called covered interest parity (CIP) and is represented by equation (5) below.

$$i_t^* - f_t + s_t = i_t \qquad (5)$$

As above,

i_t^* = a foreign nominal interest rate;

i_t = a comparable New Zealand nominal interest rate;

the term f_t is the forward exchange rate. This is the exchange rate, agreed on at time *t*, at which foreign currency will be exchanged for NZ dollars at time *t+1*. Lastly,

s_t = the spot exchange rate that prevails at time *t*.[18]

There are always two sides to a forward exchange rate contract – a buyer and a seller. Consequently, on the other side of the forward exchange contract there must be someone willing to purchase the currency forward; the foreign investor is essentially passing the risk of the currency falling to the counter-party of the forward contract. This counter-party takes on the risk that the New Zealand dollar may depreciate by more than expected over the term of the investment. Consequently, they too, may require a currency risk premium to compensate them for this risk.

By applying the UIP and CIP conditions, it can be shown that the currency risk premium equals the difference between the forward exchange rate and the investor's *expectation* of

[17] See C Hawkesby (1999), "A primer on derivatives markets", *Reserve Bank of New Zealand Bulletin*, 62, 2, 24-43, for an explanation of forward contracts.

[18] Technically, s_t and f_t are the log of the spot and forward exchange rates respectively.

where the exchange rate will be at the time the forward contract matures. See the appendix for a derivation.

$$CRP_t = s^e_{t+1} - f_t \quad (6)$$

In practice, forward exchange rates are priced off interest rate differentials (through the application of equation 5). Thus, using forward exchange rates to calculate the currency risk premium is implicitly equivalent to the methodology described in section 3.1 (which decomposed interest differentials into different components). The advantage of using forward exchange rates is that we can assume that the market has calculated them using interest rates from assets that have similar characteristics, at least to a reasonable approximation. This means that default and liquidity risks can be assumed to be negligible. In the empirical section below, our survey-based measures of the currency risk premium have been derived using forward exchange rates and equation (6).[19]

3.5 The currency risk premium or other factors?

Once we have accounted for expected currency movements, and default and liquidity risks, the final piece of the puzzle is the residual that is left over from interest differentials. In our analysis we assume that this residual is the currency risk premium. However, it is worth noting that the response of risk averse investors to exchange rate uncertainty is not the only possible explanation for this residual. Before proceeding to the empirical results of the next section we discuss a few of the alternative explanations.

'Home bias' provides one explanation for the residual or unexplained component of the interest rate differential. With respect to asset markets, home bias is a generic term used to describe the fact that domestic assets tend to predominate in domestic residents' asset portfolios, even although theory emphasises that, due to the value of diversification, foreign assets should make up a significant proportion.

One explanation for home bias is simply that investors are inherently biased in favour of assets that come from their home country. In other words, a premium could arise between the returns on New Zealand and foreign assets if they are not perceived as perfect substitutes within investors' portfolios. Since New Zealand is a net debtor in global financial markets, New Zealand debtors may have to offer a premium over foreign asset returns to offset foreign lenders' bias against New Zealand assets. Note that this 'home bias' may be independent of the currency that the New Zealand asset is dominated in, and hence could exist even if New Zealand were to form a currency area with another country or countries.

In a similar vein, home bias may arise simply because of information costs.[20] For example, the US financial market is probably the most intensively analysed, and investors might therefore choose to concentrate their portfolio in the US market. Overseas investors are also likely to have a preference for US investments given the US market's size and liquidity. As an example of this, central banks tend to hold a large proportion of their foreign reserves in US government debt due to their liquidity, with only a secondary regard for the returns from holding those assets. Customary preferences and regulatory reasons may also be important: some US mutual funds, for example, simply cannot invest in non-US assets.

By way of contrast, New Zealand and Australian investments often seem to be classified in the same category by international investors. Australian financial markets are also reasonably closely integrated with New Zealand financial markets. We would therefore expect investments in Australasia to be considered relatively close substitutes, so that any external bias against Australasian assets should apply equally to assets from either country. Consequently, a substantial bias is not expected to arise between similar assets from New Zealand and Australia.

The conclusion to draw from this section is that the residual that we estimate, and attribute to the currency risk premium, may in fact be caused by other factors. Furthermore, some of these factors, such as preferences for non-New Zealand assets and differences in the availability of information, would not necessarily be eliminated if New Zealand formed a currency area with another country.

19 It would also be possible to use PPP-based exchange rate forecasts with forward rates to find a measure of the currency risk premium.

20 For an explanation of home bias based on information costs see Hasan I and Y Simaan (2000), "A rational explanation for home country bias", *Journal of International Money and Finance*, 19, 331-61.

4 Empirical measures of the currency risk premium

In this section we use the approaches outlined in section three to derive empirical estimates of New Zealand's currency risk premium. Given the focus of the currency union debate, Australia and the United States are chosen as the countries of comparison. All data is quarterly, from March 1990 to June 2000. Three financial instruments are considered: 90 day bank bills, 1 year bank bills, and 10 year government bonds.

The range of estimates that we obtain for New Zealand's currency risk premium (presented in box 1 on the next page) highlight the fact that this premium is not directly observable. At best, we can only gain a rough idea of where the true currency risk premium lies and thus only draw tentative conclusions from these results.

Estimates of default and liquidity premia

As discussed in section 3.2, we assume that long-term default and liquidity differentials are negligible between New Zealand and Australia. We also pointed out in section 3.2 that default and liquidity differentials tend to be fairly negligible in 90 day and 1 year bank bills. Consequently we estimate the default and liquidity premia to be zero for short-term interest rates. We also estimate that there is a 50 basis point default and liquidity differential on 10 year New Zealand government debt relative to US government debt. This number is used in our empirical analysis below. However, we stress that this estimate is only an approximation.

Estimates of expected currency movements

As outlined in section 3.3, we use an array of different estimates of the expected exchange rate movement in forming our estimates of the currency risk premium. For bank bills of short maturity we use all of the methods summarised at the end of section 3.3.[21]

For 10 year government bond data, we use *annual* inflation rates as proxies for the average inflation rates expected to occur over the lifetime of the bonds. Survey measures of inflation expected over a 10 year horizon simply do not exist, while actual ex post 10 year measures would leave us with a sample ending in 1990. Consequently, neither of these methods are used to estimate long-term exchange rate movements. We have also used average inflation outcomes between 1992 and 2000 as a proxy for expected long-run inflation under relative PPP. These inflation averages are 1.5 percent for New Zealand, 2 percent for Australia, and 2.5 percent for the United States.[22] Combined with PPP, these averages imply that the NZ dollar is expected to appreciate 1 percent per year against the US dollar, while the NZ dollar is expected to appreciate at 0.5 percent per year against the Australian dollar.

4.1 Short-term interest rates

As the currency risk premium estimates for both 90 day and 1 year bank bills exhibit similar trends, only the estimates for the former are depicted graphically (in figures 6 and 7).

Estimates of the currency risk premium that are based on relative PPP are close to estimates obtained from a random walk (which assumes the expected change in the exchange rate is zero). This result reflects the fact that inflation rates have been low and stable in all three countries since the early 1990s, and inflation differentials have been fairly small.

Overall, estimates of the currency risk premium are fairly modest against Australia, but are larger for the United States. Recently, however, the estimate versus Australia that is obtained from inflation surveys has risen above 3 percent. The recent introduction of a goods and services tax in Australia is likely to have contributed to this perceived increase in the currency risk premium. However, Australian

[21] Measures of expected inflation differentials between New Zealand and Australia come from the Marketscope survey and the Melbourne/Westpac survey. Expected inflation differentials between New Zealand and the United States are taken from the Reserve Bank of New Zealand Survey and the Survey of Professional Forecasters (available at the Federal Reserve Bank of Philadelphia). Measures of actual inflation differentials are for headline CPI. Surveys of the expected exchange rate are sourced from *Consensus Forecasts*. Australian consumer expectations are matched with New Zealand consumer expectations, while professional inflation forecasts are matched for the United States and New Zealand.

[22] The current inflation target for the Reserve Bank of Australia is 2-3 percent, on average, over the cycle.

Box 1
A comparison of estimates of New Zealand's currency risk premium (CRP) 1990Q1 – 2000Q2

$$crp_t = i_t - i_t^* + \Delta s^e_t - \text{default \& liquidity premia}$$

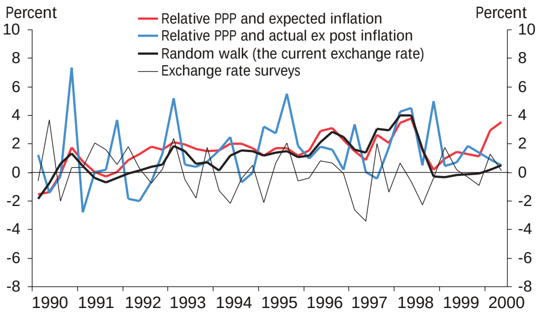
90 day currency risk premium	**Australia** % points Range	Mean	**US** % points Range	Mean
Method used to estimate expected currency movements				
Relative PPP and expected inflation	-1.6 to 3.8	1.5	0.1 to 6.2	3.8
Relative PPP and actual ex post inflation	-2.8 to 7.3	1.4	0.1 to 9.4	3.9
Ex post exchange rate	-13.1 to 29.3	1.4	-28.5 to 25.8	0.8
Exchange rate surveys	-3.4 to 3.7	0.0	-5.6 to 7.5	0.8
Random walk or (the current exchange rate)	-1.9 to 4.0	1.0	-0.7 to 6.5	2.8
Assumed default & liquidity premia	0.0	0.0	0.0	0.0

1 year currency risk premium	**Australia** % points Range	Mean	**US** % points Range	Mean
Method used to estimate expected currency movements				
Relative PPP and expected inflation	-2.3 to 3.7	1.3	0.3 to 5.7	3.4
Relative PPP and actual ex post inflation	-1.7 to 3.5	1.0	-0.4 to 7.4	3.1
Ex post exchange rate	-7.0 to 14.0	1.2	-24.4 to 15.1	0.8
Exchange rate surveys	-5.9 to 6.0	-0.2	-3.2 to 14.6	3.0
Random walk (the current exchange rate)	-2.1 to 3.6	0.8	-0.4 to 6.1	2.4
Assumed default & liquidity premia	0.0	0.0	0.0	0.0

10 year currency risk premium	**Australia** % points Range	Mean	**US** % points Range	Mean
Method used to estimate expected currency movements				
Relative PPP and expected inflation	-1.9 to 3.6	0.1	0.6 to 3.1	1.9
Relative PPP and actual ex post inflation	-2.1 to 2.0	-0.1	-0.1 to 5.2	1.6
Ex post exchange rate	-	-	-	-
Exchange rate surveys	-	-	-	-
Random walk (the current exchange rate)	-1.7 to 1.1	-0.4	-0.6 to 3.9	0.9
Average inflation: 1992-2000	-1.2 to 1.6	0.1	0.4 to 4.9	1.9
Estimated default & liquidity premia	0.0	0.0	0.50	0.50

expectations of inflation are likely to be over-stated, and thus the expected depreciation of the Australian currency derived from PPP is probably too large. Given our methodology for estimating the currency risk premium, the introduction of the Australian goods and services tax has probably biased up this particular estimate of New Zealand's currency risk premium.

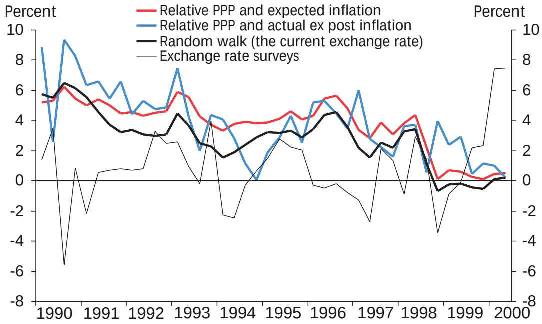
Figure 6
90 day currency risk premium estimates versus Australia



(Based on alternative assumptions about the expected exchange rate.)

Estimates of the currency risk premium that assume rational expectations, ie estimates that use ex post movements of the exchange rate to calculate *expected* changes in the currency, are extremely volatile: estimates based on ex post exchange rates not only provide large *positive* values but also large negative values, against both Australia and United States. For completeness, we report these estimates in box 1. However, we have excluded these estimates from figures 6 and 7, as we believe they are implausible.

Figure 7
90 day currency risk premium estimates versus the United States



(Based on alternative assumptions about the expected exchange rate.)

Estimates that use surveys of expected exchange rate movements suggest that the currency risk premium in short-term interest rates is also fairly volatile (but much less so than the measures that use ex post exchange rate movements). Indeed, in many instances, these estimates of the currency risk premium are negative. We would expect that, if anything, most foreign investors would not have a bias towards holding NZ dollar investments over Australian or US dollar investments. Therefore, negative estimates of the currency risk premium are puzzling, and should be treated somewhat warily.

One of the notable features of the currency risk estimates obtained from surveyed expectations of movements in the NZD/USD is the large and positive risk premium versus the United States in the last year or so. *Survey* respondents currently expect the NZD/USD currency to appreciate strongly. Given that our interest rates are currently broadly in line with the United States, this expectation implies that the foreign currency return from investing in New Zealand is also *expected* to be high. Notwithstanding this, neither the surveyed expectations, the spot exchange rate, nor interest rates have shifted to cause the expected return on New Zealand and foreign assets to converge.

One possible explanation for the lack of convergence is that there has been significant uncertainty about whether the NZD/USD will appreciate as expected. Perhaps, for example, there is a sizeable probability that the New Zealand currency will remain at its current levels or even depreciate. In this case, the return on New Zealand assets would not be as large as expected, when converted into a foreign currency. If this non-appreciation is considered a real possibility, risk averse US investors are likely to incorporate a large currency risk premium on the returns they require from New Zealand assets.

Interestingly, estimates derived from survey measures of exchange rate expectations suggest that the currency risk premium relative to Australia is currently much smaller than the currency risk premium estimated relative to the United States. This suggests that non-Australasian investors have similar biases against both the New Zealand and Australian currencies.

The influence of monetary policy

Given that the Reserve Bank of New Zealand, the Reserve Bank of Australia, and the US Federal Reserve set overnight interest rates, short-term interest rate differentials will be heavily influenced by the stance of monetary policy, both here and abroad.

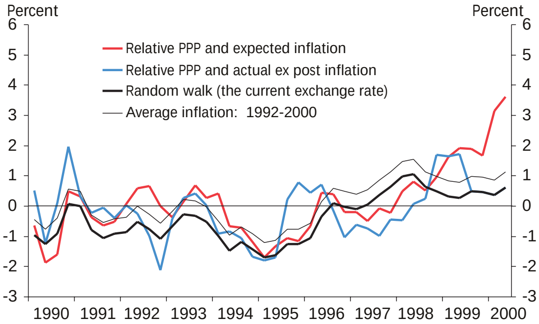
A potential problem is that *transitory* monetary policy may affect estimates of the short-run currency risk premium. One way of mitigating the impact of *transitory* monetary policy effects is by averaging the short-term currency risk premium estimates over a sufficiently long period of time – as in box 1. An alternative approach is to look at interest rates further along the yield curve since these are less influenced by monetary policy.

4.2 Long-term interest rates

Interest rates further along the yield curve are still influenced by the market's expectation of *future* monetary policy decisions for the overnight cash rate. However, long-term interest rates tend to be more anchored, and less influenced by *short-term* changes in policy as these changes should average out over the economic cycle.

As with the analysis using short-term interest rates, relative PPP estimates of the currency risk premium for long-term interest rates are similar to those obtained from assuming the exchange rate is a random walk (ie the expected change in the exchange rate is zero). Of these estimates, those derived from actual ex post inflation are the most volatile.

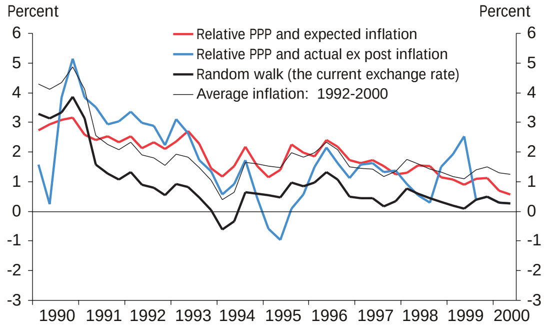
Figure 8
10 year currency risk premium estimates versus Australia



(Based on alternative assumptions about the expected exchange rate.)

Estimates of the 10 year currency risk premium versus Australia have been negative up until 1995. Despite trending down over time, estimates of the currency risk premium versus the United States are higher than those for Australia.

Figure 9
10 year currency risk premium estimates versus the United States



(Based on alternative assumptions about the expected exchange rate.)

Our estimates of the currency risk premium are consistent with those of other studies for New Zealand, such as Coleman (1999), Rae (1997) and Lally (2000). Coleman uses PPP to estimate currency risk premium for short-term bills, while Rae uses forward exchange rates to estimate a time-varying currency risk premium. Rae's estimate varies between about 0.2 and 1 percent. Among other things, Lally estimates real interest rates for long-term bonds. Lally's estimates are essentially equivalent to the mean long run estimates based on PPP and historical inflation (reported in box 1). He estimates the currency risk premium to be about 1 percent.

Another approach is to use inflation-indexed bonds to calculate real returns. Inflation-indexed bonds are a comparatively recent development. In the United States, for example, they have only been traded since 1997. The real returns from inflation indexed bonds suggest that New Zealand real interest rates are about 1.1 percent higher than the real interest rates available on US and Australian indexed bonds.

At longer horizons, risk premium estimates obtained from assuming relative PPP confirm that the currency risk premium between New Zealand and Australia is lower than the currency risk premium against the United States.

5 Conclusion

In this paper we have discussed a number of issues relating to New Zealand's currency risk premium. We have highlighted factors that may cause a currency risk premium, and considered different ways to estimate its magnitude. We have illustrated that the estimates obtained depend crucially on the types of assumptions that are made about exchange rate expectations, and other factors such as default and liquidity risks are also important at long horizons.

Our analysis suggests that the currency risk premium versus Australia is smaller than the currency risk premium found against US interest rates. On this basis, an Australasian currency area would therefore have less impact on the magnitude of New Zealand interest rates than a currency area that included the United States.

We have calculated estimates of the currency risk premium for assets maturing in 90 days, and at 1 and 10 year horizons. We believe that the estimates of the currency risk premium that arise from assuming rational expectations (ie using ex post movements in the exchange rate currency as proxies for expected movements) are simply implausible, and so we have largely disregarded them. The majority of our estimates are based on assuming PPP (ie expected inflation differentials are used as proxies for expected movements in the currency). However, as noted in section three, purchasing power parity is unlikely to be a particularly appropriate model of short-run exchange rate movements. At short horizons this leaves estimates based on forward exchange rates and survey expectations. The average magnitudes of these latter estimates do not seem unreasonable.

References

Coleman A (1999), "Economic Integration and Monetary Union", Treasury Working Paper 99/6, New Zealand Treasury.

Lally, M (2000), "The real cost of capital in New Zealand: Is it too high?", Discussion Paper prepared for the New Zealand Business Roundtable, July 2000.

Rae (1997), "New Zealand's forward exchange market", *National Bank of New Zealand Financial Research Paper* No 8.

Appendix

Covered interest parity (the absence of arbitrage) implies:

$$i_t = i_t^* - f_t + s_t \qquad \text{(A1)}$$

where:

i_t = the domestic interest rate from time *t* to *t+1*;

i_t^* = a comparable foreign interest rate;

f_t = the log forward rate agreement signed at time *t*, with exercise date *t+1*; and

s_t = the log of the spot rate exchange rate at time *t*.

Suppose that forecasts are related to the future spot rate in the following manner:

$$s_{t+1} = f_t + u_{t+1} \qquad \text{(A2)}$$

The term u_{t+1} can be thought of as an expectational error. Subtracting s_t from both sides gives

$$s_{t+1} - s_t = \Delta s_{t+1} = f_t - s_t + u_{t+1} \qquad \text{(A3)}$$

Substituting the RHS of equation (A3) into equation (4), and abstracting from default and liquidity risk, yields

$$CRP_t = i_t - i_t^* + E_t[f_t - s_t + u_{t+1}] \qquad \text{(A4)}$$

where:

$E_t[\Delta s_{t+1}] = \Delta s^e_{t+1}$ in the notation of equation (1).

Since the spot rate and the forward rate at time *t* are both known (and can be passed through the expectation operator), this implies:

$$CRP_t = i_t - i_t^* + f_t - s_t + E_t[u_{t+1}] \qquad (A5)$$

Consequently, equation (A1) and equation (A5) can only both be true if $E_t[u_{t+1}]$ equals CRP_t. This result links the currency risk premium to an extensive literature that has tested whether the expectations implicit in forward exchange rates are unbiased, ie whether $E_t[u_{t+1}] = 0$.