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Editor’s note

In the September edition of the Reserve Bank Bulletin for 2010, we present a number of articles that span a range of the Reserve Bank’s functions.

In our lead article, Leo Krippner explains how yield curves, which connect interest rates on debt with different maturities, can help our understanding of the economy. The paper shows how market participants’ views on aspects such as inflation, output growth, monetary policy and credit risk influence the yield curves for government debt, bank securities, and mortgage interest rates. The paper then discusses yield curves for government, bank and mortgage debt before looking at how researchers have attempted to summarise yield curve information at particularly changeable periods, such as over the global financial crisis.

The second article by Enzo Cassino and Zoe Wallis from our Financial Market Research team, looks at the impact of the Global Financial Crisis on the New Zealand dollar. The article looks at three primary drivers of the exchange rate: (i) interest rate differentials, which appreciate the New Zealand dollar when New Zealand’s interest rates are higher than other countries’ rates; (ii) commodity prices – exporters need to convert export receipts denominated in foreign currency to New Zealand dollars in order to purchase New Zealand goods; and (iii) investors’ risk appetite. They outline a modelling framework that suggests there have been several occasions over recent history when the key exchange rate driver has changed from relative interest rates to investors’ risk appetite. The article notes the decline in the importance of the carry trade on the New Zealand dollar, and a decline in liquidity conditions in the market for the dollar.

The third article in the Bulletin outlines the Reserve Bank’s responsibilities under the new Anti-Money Laundering and Countering Financing of Terrorism Act from 2009. The article notes that acting to reduce these activities is important because of the direct damage caused by these activities and also the risk to a nation’s financial system. The article describes the Reserve Bank’s supervisory framework.

The fourth article, by Kelly Eckhold is a follow-up article from the June Bulletin article that described the Reserve Bank’s approach to holding and managing foreign reserves. The article in this edition of the Bulletin describes the currency denomination of the unhedged part of the Reserve Bank’s foreign reserves and the development and implementation of the Bank’s new strategic foreign exchange benchmark.

I hope you find the articles in this edition are both interesting and useful.

Kirdan Lees
Editor
1 Introduction

Interest rates play a fundamental role in the economy and financial markets. A glance at the business news illustrates how interest rates range from a financial investment in their own right to the tool the Reserve Bank uses to operate monetary policy. More broadly, interest rates, as the price of credit, affect people’s decisions on consumption, investment, savings and borrowing. Given their pervasive influence, it is not surprising then that records of interest rates have existed over at least the last five millennia.¹

When it comes to the modern global economy, there are certainly many different interest rates to contend with. For example, the average New Zealander will be familiar with the mortgage rates at which banks lend. But mortgage rates can vary considerably over time and by their term, or time to maturity. Figure 1 shows that, since 1998, the six-month fixed mortgage rate has varied between 5 and 10 percent. By time to maturity, as at June 2009, mortgage rates ranged from 5.39 percent for six months to 7.9 percent for five years. Such substantial differences in interest rates impact materially on borrowers’ wallets, so it’s little wonder that choosing when to fix, and the mortgage term, is an inevitable source of angst.

Besides mortgage rates, there are retail interest rates on bank deposits, non-bank deposits, personal loans, business loans, etc. At the wholesale level, there are interest rates on government bonds, bank bills, corporate bonds, etc. These interest rates all vary over time and by term, and can be found in almost all economies around the world (although this article will concentrate on New Zealand interest rates).

To help put the multitude of different interest rates in perspective, economists often construct so-called yield curves. Put simply, a yield curve is a plot of interest rates or yields with different maturities (but otherwise almost identical characteristics) observed at a single point in time. As examples, figure 2 shows three key yield curves for the New Zealand economy as at 31 May 2010. The mortgage yield curve connects fixed mortgage rates with maturities of six months and one year to five years. The government and bank yield curve are two all-important wholesale benchmarks for interest rates throughout the economy.

Once different classes of interest rates are grouped together within their appropriate yield curve as in figure 2, they each become easier to monitor over time and the relationships between different classes of interest rates becomes clearer. For example, one could simply say that the mortgage yield curve is roughly three percentage points above the bank yield curve, rather than specifying the gap for each individual maturity. As we shall also see, yield curves are also amenable to careful analysis that can reveal information about the economy and financial markets, and other aspects of interest to the Reserve Bank.

To follow through these ideas, this article proceeds as follows. Section 2 begins by discussing in more detail the government, bank, and mortgage yield curves from figure 2. Using the common themes that show up as influences on these yield curves, we then briefly introduce several other yield curves and their relationship to the government, bank, and mortgage yield curves. Section 3 describes the consistent government and bank yield curve data being produced and used by the Reserve Bank for yield-curve-related research. Section 4 introduces two topics from that research agenda. Section 5 concludes.

2 Three benchmarks: the government, bank and mortgage yield curves

2.1 The government yield curve

The government yield curve is an all-important benchmark because it represents the interest rates at which the state, almost always the largest and most creditworthy entity in any economy, can borrow at for different maturities. Other entities and individuals, being smaller and less credit worthy, should typically expect to borrow at higher rates. In this sense, the government yield curve may be seen as the base component in a hierarchy of yield curves within the economy, and so we spend some time discussing it.

Like any household, the government needs to borrow if it spends and invests more than the revenue it receives plus proceeds from any asset sales. Borrowing for the New Zealand government is undertaken by the New Zealand Debt Management Office (NZDMO) who issue (that is, sell) debt securities to investors. For the investors, the securities are assets (so they can be traded as discussed further below) and the cash payment investors make to buy the securities is government borrowing.

The two main securities issued are Treasury bills and government bonds and together these may be used to define the government yield curve. Treasury bills are currently issued each week with maturities of three, six and 12 months. The interest return, or the yield to maturity, on Treasury bills results from the purchase price being lower than the face value that is promised to be returned on maturity, so the difference is effectively the interest payment.

Government bonds are issued for longer maturities. For example, the longest maturity bond currently on issue (15 May 2021) had a time to maturity of nearly 11 years when it was first issued. The buyer of a government bond is promised fixed interest payments, so-called coupons, paid at

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Full details about these securities and the issuance process are available from the NZDMO website http://www.nzdmo.govt.nz. The site also provides information on Kiwi Bonds and inflation indexed bonds, the latter which we discuss briefly at the end of this section.

Major international markets, such as the US, Japan, Germany, and the UK issue bonds with maturities of up to 30 years.
six-monthly intervals. The final interest payment and return of face value occurs on maturity. A simple calculation based on the purchase price, the coupon payments and principal repayment gives the yield to maturity of the bond. This is like an average return, or the internal rate of return, over the lifetime of the bond.

The advantage in issuing debt securities is that they may be traded in so-called secondary markets. That is, holders of the securities that have since decided they would rather have cash can sell them to investors that would rather have securities. The NZDMO has no further involvement, apart from registering the change of ownership so the promised future payments associated with the security are directed to the new security holder.

However, the secondary-market buyer of a security will only be prepared to purchase it at a yield that they think is appropriate in the current market, which will not necessarily be the yield for the original investor. For example, if interest rates have generally risen in the economy (we discuss possible reasons for this soon), then buyers in the secondary market will seek to pay a lower price for the security (thereby raising its yield) than the original buyer. Conversely, the security price will rise (lowering its yield) if interest rates have fallen.\footnote{The precise relationships between security prices and yields are given by the Treasury bill and government bond price formulae available on the NZDMO website http://www.nzdmo.govt.nz. The concept is easiest to illustrate for Treasury bills: given the return of a fixed face value at maturity represents the return of the purchase price plus interest, the purchase price must fall for the interest return to increase.}

Through such market pricing and trading, the prices of the government securities change over time and therefore yields always reflect up-to-date market views. And grouping those yields together at any point in time always gives an up-to-date government yield curve.

Figure 3 illustrates the government yield curve from figure 2 along with two distinctly different yield curves from other dates. Using market terminology, the May 2010 yield curve is ‘positively sloped’, with yields rising as time to maturity increases. Conversely, the June 2007 curve is ‘negatively sloped’ (or inverted), with yields declining as time to maturity increases. The August 2004 yield curve is “flat”, with similar yields at all maturities.

So what causes the yield curve to change over time? The influences are many, but the most dominant are macroeconomic factors. As two key examples, we first discuss inflation and economic growth. Monetary policy and fiscal policy are then introduced as additional macroeconomic influences on the yield curve, although all of these factors are often intertwined. Finally, we note how similar global factors can also influence the New Zealand government yield curve.

Inflation has always been the enemy of bond investors, and for good reason. If one is promised a fixed payment in the future, as with a coupon or the return of face value from bonds, then the future purchasing power of that fixed payment (that is, the amount of goods and services it can buy in the future) becomes lower as inflation becomes higher. In other words, the real (that is, inflation-adjusted) return from bonds falls as inflation rises. The real return can even become negative if inflation rises sharply and unexpectedly, leaving an investor with less purchasing power than originally invested.

The yields of bonds therefore tend to include an element to compensate for inflation, or more precisely to compensate for expected inflation over the lifetime of the bond. So if inflation is expected to rise, market yields will typically rise to offset the anticipated impact on real yields. In general, if an investor is seeking a stable real return, then an expected...
increase in inflation should be compensated for by a one-for-one increase in yields.\footnote{Indeed, because investors are taxed on their total return (inflation compensation plus the real yield), yields may rise even more to ensure the after-tax real return does not deteriorate unduly. For example, with a 10 percent bond yield and 2 percent inflation, the real annual return is $(1+0.1)/(1+0.02)-1=7.8\%$. If that real return was taxed at 33 percent, the result would be 5.3 percent. However, the real after-tax return is actually $(1+0.1(1-0.33))/(1+0.02)=4.6\%$ because tax is charged on the total return. The distortion gets worse with higher inflation.}

Real economic growth is also an important influence on the government yield curve. To illustrate this, it is useful to introduce the idea of opportunity cost. The opportunity cost of investing in a bond is the bond yield versus the return on alternative investments suitably adjusted for risk. So, for example, if prospective returns on shares rise, then the opportunity cost of holding an investment in bonds rises, and investors will have an incentive to sell their bonds to invest in shares. That would lead to lower bond prices, therefore raising bond yields to a level where the appropriate balance of risk and return between bonds and shares was attained.

More broadly, real Gross Domestic Product (GDP) measures the inflation-adjusted value of all final goods and services produced in the entire economy. GDP may be viewed as a measure of returns to all of the underlying factors of production in the economy (for example, labour, physical capital, entrepreneurship, etc.). Therefore, if GDP growth is expected to rise, the prospective returns from investing in at least some of the factors of production of the economy are rising, and so bond yields will tend to rise in response.

The Reserve Bank uses the OCR as its tool for the operation of monetary policy. The OCR determines the levels at which banks can borrow (against collateral) or lend overnight cash to the Reserve Bank. The setting of the OCR is an anchor for short-term government yields: banks won’t buy or sell short-maturity government securities at yields materially different from the OCR while they know they have an alternative to lend to or borrow from the Reserve Bank via the OCR. Similarly, yields on longer-term government securities will be influenced to a large degree by expectations of where the OCR will average over the lifetime of the security. Those expectations are in turn influenced by the objectives of monetary policy.

The Reserve Bank sets the OCR with the intention of keeping CPI inflation between 1 and 3 percent on average in the medium term, while avoiding unnecessary instability in economic growth, interest rates and the exchange rate.\footnote{There are several caveats. The Reserve Bank website www.rbnz.govt.nz contains more detail on New Zealand’s price stability framework, including the Reserve Bank Act 1989, the Policy Targets Agreement and related background information.} If market participants believe that the prevailing OCR might lead inflation to become inconsistent with the Reserve Bank’s objectives (either by their own forecasts or relying on published Reserve Bank projections), they should naturally anticipate appropriate changes to the OCR to dampen or stimulate economic growth and inflation. That in turn changes the expected average of the OCR for all times to maturity, which therefore leads to changes in the shape of the yield curve.

Of course, forecasts of inflation and the appropriate decision on the OCR are made using a wide range of relevant macroeconomic data, including current inflation and economic growth (and other information such as wages, employment, retail sales, confidence surveys, exchange rates, etc.). So macroeconomic data, monetary policy and the yield curve may be viewed as being intertwined within a macroeconomic system. As new information comes to hand that affects expectations about the evolution of the macroeconomy and likely monetary policy responses, the yield curve will change to reflect that new information.

There is also another influence that monetary policy with an inflation-targeting objective has on the yield curve. The more strongly the market believes the Reserve Bank will adhere to its inflation objectives going forward, the less compensation the market will require in bond yields for the risk of rising inflation. That helps to keep the bond yields of all maturities lower in general, but particularly for longer maturities, where higher inflation would have a longer span to make its negative impact.

One final macroeconomic influence is fiscal policy (that is, government revenue and spending decisions), which also
feeds into the macroeconomy/yield curve mix as discussed above. But fiscal policy also makes a contribution to net government debt issuance or repayment. That can directly affect the government yield curve via market perceptions about the government’s future debt levels, and therefore the reliability of government promises to make interest and face value payments on its securities. That possibility is known as default risk, which we will discuss further in the next section.

One example of the impact of fiscal policy on the yield curve was during the period 2005 to 2008, when government budget surpluses led to a shrinking volume of government securities on issue. That resulted in lower yields across all bond maturities than would otherwise be expected purely from macroeconomic factors prevailing at the time.

Finally, it is worth noting that government yield curves around the world are also influenced by the same factors discussed above, as relevant to their economies. But global macroeconomic factors are also a major influence on New Zealand’s macroeconomy, given the increasing interdependence between global economies (for trade and investment, etc.). Hence, global macroeconomic factors indirectly have a heavy influence on the New Zealand yield curve. Or more directly, from day to day, the movements in global yield curves are typically translated into similar movements in the New Zealand yield curve.

The bank yield curve

The banking system is essentially an intermediary between end borrowers and end lenders in the New Zealand economy and around the globe. That is, banks borrow from those with excess cash and then lend to those requiring funds, subject to making an appropriate assessment of the risk of that lending.

Of course, the amounts and maturities of the loans individual banks receive never precisely match the amount and maturities of loans they make. Hence, the banks use wholesale markets to borrow and lend from each other at different maturities to balance their own cash excesses or shortfalls and to better balance any maturity mismatches between borrowing and lending.

The main securities used in this process are bank bills and interest rate swaps. Together, these securities may be used to define a yield curve for the banking system. We will refer to this as the bank yield curve from this point but, for reasons explained below, it is important to bear in mind that the bank yield curve is distinct from the yield curve for any individual bank.

Bank bills are identical to Treasury bills, apart from their issuer being a bank rather than the government. A bank that requires funds will sell bank bills to other banks or institutional fund managers. That creates a liability for the seller/borrower and an asset for the purchaser/lender, which can again be traded in secondary markets.7

Interest rate swaps are a derivative agreement between two parties where fixed interest payments agreed at the time of the trade are exchanged for floating payments based on the realisation of future three-month bank bill rates.8 Using market terminology, the ‘swap receiver’ is the party receiving fixed interest payments (and therefore making floating interest payments) and the ‘swap payer’ is the party making fixed interest payments (and therefore receiving floating interest payments).

As shown in figure 4, receiving fixed cashflows from an interest rate swap could be combined with a rolling investment in three-month bank bills to offset the floating payments of the interest rate swap. The end result would be like investing in a bond with a time to maturity equal to the interest rate swap tenure, which can be up to 15 years in New Zealand.9 In reverse, paying fixed cashflows is like selling a bond.

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7 There are also other avenues for banks to obtain short-term wholesale funds (for example, the currency forwards market), but the effective interest rates from those avenues are usually very similar to bank bills of the same maturity.
8 The terminology ‘derivative’ denotes that the security derives its value by reference to an underlying security or securities. In this case, the reference is to rates on three-month bank bills. Hawkesby (1999) provides an overview of derivatives commonly used in New Zealand markets.
9 Major foreign markets have interest rate swap tenures up to 30 years.
Therefore, the interest rate swap rate for a given maturity may be treated as the yield to maturity for a bond. However, such a “synthetic bank bond” is distinctly different from a bond issued by any individual bank where the default risk is to that bank for the term of the bond. Conversely, the rolling bank bill investment within the synthetic bank bond only ever has default risk for three-month periods, and the investment would be divided among the different banks of the New Zealand banking system for diversification (and, at any rollover state, less credit-worthy banks could be avoided altogether).

The influences on the bank yield curve are many. However, the macroeconomic influences of inflation, economic growth, monetary policy and fiscal policy already discussed for the government yield curve apply equally to the bank yield curve.

One major difference between the government and bank yield curves comes down to relative default risk: how reliable is the promise to have funds lent to the banking system returned relative to the government’s promise of its future interest and face value payments?\footnote{Default risk is more precisely a combination of the risk of default (for example, missing an interest payment or the return of principal, or a company bankruptcy) and the expected value of the debt security given a default event (for example, the new market value of the security after a debt/capital restructuring, or the recovery of some cash as a creditor in the event of a company liquidation).}

Government securities are usually regarded as having a lower risk of default than the securities that compose the bank yield curve. This is because governments generally have more flexibility and incentives to meet their obligations.\footnote{For example, raising taxes, cutting spending or, in some cases, printing money (albeit at the risk of generating higher inflation). Government securities are sometimes regarded as default-free, although it is more accurate to describe them as having low default risk. Reinhart and Rogoff (2009) contains a detailed history of explicit or implicit government defaults. Regarding views of the future, there are derivative securities known as credit default swaps available on the government debt of most countries, including New Zealand. They pay out in the event of a default, and so their prices provide a gauge of the market’s perception of government default risk.}

Conversely, banks are limited liability entities and so even a diversified rolling investment in bank bills, as for the synthetic bank bonds introduced above, carries an exposure to bankruptcy that would potentially result in some loss of value from funds lent.\footnote{Retail deposits in banks are currently protected by the retail bank guarantee for up to $1 million.}

Another aspect that can differ between the government and bank yield curves is liquidity risk: essentially, how easy is it to trade securities for a cash amount close to their prevailing market value? Government and bank securities are generally regarded as being highly liquid in normal times, which is evidenced by the volumes traded and the presence of price makers in the interbank market with narrow bid-ask spreads. However, during periods of financial stress, such as the global financial crisis, government bonds are generally perceived to be much more liquid than securities in the banking system.

The combination of both relative default risk and relative liquidity risk means that the bank yield curve has usually remained above the government yield curve. That is, at each maturity, some extra yield is required to compensate investors for bearing the higher risk of default and the risk
of illiquidity. A notable exception occurred from late 2008 when the government introduced the wholesale and retail guarantees for banks. We shall revisit this episode in the discussion of figure 11 from section 3.

Because the government yield curve already captures macroeconomic factors, it makes sense to plot the difference, or spread, between the government and bank yield curves rather than plotting the bank risk curve outright. Examples of this government/bank spread curve at different points in time are presented in figure 5. Note that the maturities of the interest rate swaps don’t match exactly to the maturities of the government bonds. The spreads beyond six months are calculated as the rate on the interest rate swap less a government yield curve for the same maturity obtained by linearly interpolating the actual government bond yields available.

Figure 5
Examples of the government/bank spread curve

Just like the government yield curve itself, the government/bank spread curve can assume a variety of shapes over time. Hence, the August 2004 curve is positively sloped, May 2010 negatively sloped, and June 2007 fairly flat beyond the spread between Treasury bill and bank bill rates.

The mortgage yield curve

Like it or not, each individual bank is a business and seeks to make a profit for its shareholders to compensate them for the risk of being in the lending business. That profit mainly comes from the difference between the bank’s revenue from lending less the cost of its funding and potential losses on lending.

On the revenue side, one avenue of bank lending is via mortgages to property owners, with the property involved as collateral. The mortgage conditions and different terms from major banks are usually standardised enough to consider the mortgage rates together within what we will call a mortgage yield curve. The Reserve Bank collects data for the mortgage yield curve as at the end of each month, which was the data used to create figure 1.

The cost of funding for an individual bank can be thought of as coming from a weighted average of the bank’s unique yield curves for its different funding sources. For wholesale funding, the yield curve at short maturities will be around bank bill rates, but we have seen that the yields for longer-maturity bonds issued by individual banks will usually be above the bank yield curve.

To ensure they make a profit from mortgage lending, an individual bank will seek to ensure there is always a positive gap between its cost of funding at any point on its yield curve and the mortgage rates it has on offer. As the bank yield curve moves, the yield curves for the funding of individual banks will also move, and that will then flow through to the range of mortgage rates on offer and so a change in the mortgage yield curve.

For example, the prevailing two-year fixed mortgage rate will generally be related to the prevailing two-year interest rate swap yield, the three-year fixed mortgage rate to the three-year interest rate swap yield, etc. out to five years in New Zealand.\footnote{Floating rate mortgages are a bit different, being more related to the rolling average cost of funding from three-month bank bills rather than the three-month bank bill rate at a given point in time.}

The connection between the bank yield curve, bank funding rates, and mortgage rates above means that movements in the mortgage yield curve will predominantly be influenced by the factors driving the bank yield curve. As we have seen, these factors include the macroeconomic influences on the government yield curve, including global factors, plus the additional influences of the differences in default risk and liquidity risk between the government and bank yield curves.

\footnote{Fixed mortgage rates for longer terms are available internationally. For example, 30 years is a standard term in the US.}
The additional influences for the mortgage yield curve relative to the bank yield curve should reflect shifts in the funding costs for individual banks, which we discuss further below, and the relative default and liquidity risk between mortgage borrowers and banks. Default risk is essentially the probability that borrowers might be unable to meet their payments for any reason. Liquidity risk reflects that, while mortgages can in principle be bought and sold via an appropriate legal process, it cannot be done as readily as for wholesale securities.

Analogous to the bank yield curve previously, it is more useful to plot the difference between the bank yield curve and the mortgage yield curve rather than plotting both yield curves outright. Examples at different points in time are given in figure 6. The May 2010 bank/mortgage spread curve is the difference between the bank and mortgage yield curves shown in figure 2.

The bank/mortgage spread curve is noticeably wider as at May 2010 than past dates. This is mainly due to the effect of the global financial crisis, via several interwoven channels, on the cost of funding for individual banks. First, following the crisis, banks sought to reduce their susceptibility to disorder in short-term wholesale money markets, an arrangement that has recently been formalised by the Reserve Bank Core Funding Ratio requirements. Specifically, banks have reduced their proportion of short-maturity wholesale funding at around bank bill rates, and have increased the proportion of retail deposits and longer-term bank bond issuance that are further above the bank yield curve. Second, the global financial crisis directly widened the spreads between bank-issued bonds and the bank yield curve, as markets now allow for higher bank default risk than in the past. Third, short-term retail deposit rates relative to bank bill rates have risen because the Core Funding Ratio treats deposits as substitutes for bank-issued bonds (given retail deposits are less prone to flight than short-maturity wholesale funding).

In summary then, individual banks now have a higher proportion of funding at more expensive rates (relative to the bank yield curve) than previously, but with the offsetting benefit of being less susceptible to potential adverse market events.

Ever more yield curves

We have now discussed three yield curves in detail, and have broadly categorised the influences on those yield curves in terms of macroeconomic factors, default risk and liquidity risk. From that perspective, we can consider other classes of interest rates within their own yield curves and even conjecture how they should usually sit relative to the government, bank and mortgage yield curves.

For example, the overnight indexed swap (OIS) yield curve is based almost purely on expectations about the OCR, which we have seen are dominated by macroeconomic factors. Not surprisingly then, the OIS yield curve is usually around par with the government yield curve.

As another example, personal loans and business loans will typically have higher default risk (and less security in the event of default) than mortgages. Therefore, the yield curves for personal loans and business loans will usually sit above the mortgage yield curve.

Finally, yield curves for individual corporates usually sit above the bank yield curve. That is especially so if they have higher default risk than the banks (which is often proxied by their relative credit ratings). However, the lower liquidity of most corporate-issued bonds in New Zealand means that even highly-rated securities can still sit above the bank yield curve.
3 Yield curve analysis at the Reserve Bank

The discussion so far has indicated how different factors can influence the yield curve. Inverting that interpretation gives a basis for inferring information from the yield curve (or the spread curves). That is, if the yield curve is shaped in a particular way, what does that imply for expectations that the market holds about inflation, economic growth, default risk and liquidity?

Before addressing questions of that nature in section 4, we need to ensure that complete and consistent data sets for the relevant yield curves are available. The first part of this section describes the steps used by the Reserve Bank to create a comprehensive government yield curve dataset, and the second section discusses the creation of a comprehensive bank yield curve dataset.

Note that the Reserve Bank has made representative yield curve data available in its Bulletin and on its website. However, from the perspective of undertaking research work in economics and finance, the representative yield curve data set has several unsatisfactory aspects. First, it mixes bank bill rates and government bond yields. Second, the bond yields are indicative only, given they use the yields for the government bonds closest to the maturities of one, two, five and ten years. Third, the data do not have the standardisation, to be introduced below, that is usually required for economic and financial research.

Government yield curve data

Securities

The data used to define the government yield curve at each point in time are the three-month and six-month Treasury bill rates and the yields of all major government bonds on issue at the time along with their exact maturities. The data are collected by the Reserve Bank and are originally sourced from an interbank broker. That source ensures up-to-date and consistent data at each point in time because the interbank broker provides market participants with indicative rates and yields for all securities even if trading is not occurring.

There are two technical issues with the data as it stands. The first issue is that the compounding period is different for the Treasury bill and bond data. Specifically, the compounding period for Treasury bills is effectively their time to maturity, while government bonds are compounded six-monthly (matching the spacing of their interest payments).

The second issue is that a bond yield is a ‘fuzzy’ measure of the interest rate for its maturity because the yield is effectively a weighted average of the interest rates applying to the different cashflows prior to and on maturity. Conversely, a Treasury bill yield is a precise measure of the interest rate for its maturity because there are no coupon payments. For that reason, securities like Treasury bills are often called zero-coupon securities.

A very convenient and useful standardisation for data on interest-bearing securities is to transform all rates and yields into zero-coupon continuously compounding interest rates. Readers interested in an overview of how the Reserve Bank does this using the Nelson and Siegel (1987, hereafter NS) model are invited to read the box. The intuition is simply that the NS model represents almost any yield curve using just three components: a Level component that captures the general level of long-maturity interest rates; a Slope component that captures the extent to which short-maturity interest rates are below (or above) long-maturity interest rates; and a Bow component that captures a ‘hump shape’ where mid-term interest rates might lie above (or below) both short-maturity and long-maturity interest rates. The interest rate data that can be generated from the NS model is automatically zero coupon and continuously compounding.

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16 While continuous compounding may sound strange, it can be seen simply as the natural limit as the compounding period gets shorter. To illustrate, assume a 10 percent annual interest rate, which would give a return of $(1+0.1)=1.1$. With semi-annual compounding $(1+0.1/2)=1.1025$, quarterly $(1+0.1/4)^4=1.10381$, monthly $(1+0.1/12)^{12}=1.10471$, weekly $(1+0.1/52)^{52}=1.10506$, daily $(1+0.1/365)^{365}=1.10516$. As the compounding frequency $N$ gets larger, the limit is $(1+0.1/N)^N=\exp(0.1)=1.10517$. That means a 10 percent continuously compounding rate would give the same return as a 10.517 percent annual rate. Or a 10 percent annual rate would give the same return as a 9.531 percent continuously compounding rate, because $\exp(0.9531)=1.1$.
Box

Fitting government yield curve data with the Nelson-Siegel model

The Reserve Bank uses the Nelson and Siegel (1987, hereafter NS) yield curve model to fit yield curve data. The NS model uses Level, Slope, and Bow components to represent the yield curve, and the resulting fitted interest rate curve is a continuous, smooth and stable (that is, not unduly varying) function of time to maturity.

The NS interest rate curve has the following functional form:

\[
R(t,m) = L(t) + S(t) \left( \exp(-\theta_m) - 1 \right) + B(t) \left( \frac{1 - \exp(-\theta_m)}{\theta_m} \right)
\]

where \( R(t,m) \) is the zero-coupon continuously compounding interest rate curve at time \( t \) as a function of time to maturity \( m \). \( L(t), S(t), \) and \( B(t) \) are respectively the Level, Slope and Bow coefficients multiplied into the given functions of time to maturity illustrated in figure 7. The fixed parameter \( \phi \) regulates the decay of the Slope function and the hump/decay of the Bow function. Estimating the NS coefficients from yield curve data observed at time \( t \) proceeds by finding the best fit to the prices of the securities used to define the yield curve.

Figure 7

Nelson-Siegel yield curve shapes

A useful quantity that can be derived directly from the NS zero-coupon continuously compounding interest rate curve is the NS instantaneous forward rate curve. The NS forward rate curve turns out to be another simple function of time to maturity, and the components of the forward rate curve have intuitive shapes analogous to their counterparts in the interest rate curve. Specifically, the corresponding forward rate curve is:

\[
f(t,m) = \frac{L(t)}{1 + \Phi(t)} + S(t) \left( \frac{1 - \exp(-\phi m)}{\phi m} \right) + B(t) \left( \frac{1 - \exp(-\phi m)}{\phi m} \right)
\]

where \( f(t,m) \) is the forward rate at time \( t \) as a function of time to maturity \( m \) (or future time \( t+m \)). Figure 7 includes the functions of maturity for the NS forward rate curve.

Figure 8 shows an example of fitting the government yield curve data from May 2010 with the NS model. Together with our previous discussion on yield curve influences, this gives us a comprehensive perspective for discussing the yield curve shape at 31 May 2010. That is, we’ve already noted that the yield curve is ‘positively sloped’, with observed yields increasing by time to maturity. The NS interest rate curve ‘fills the gaps’ between the observed yields, clearly showing the rising trend of interest rates. Furthermore, the NS forward rate curve (derived from the NS interest rate curve) provides a quantitative indication of the expected path of the OCR, showing it rising to around 6 percent over roughly four years. The expected rise in the OCR at that time was in turn consistent with market expectations of a gradual economic recovery following the 2008-09 global financial crisis.
Repeating the curve fitting over the entire set of government yield curve data gives the estimated NS Level, Slope, and Bow components for the government yield curve over time. The results are plotted in figure 9.

**Figure 9**

**Level, Slope and Bow coefficients for the government yield curve**

The positive slope of the yield curve for May 2010 is reflected in figure 9 by the positive value for the Slope component at that point in time. The government yield curve examples in figure 3 also included an observation from June 2007. That had a negative slope, which corresponds to the negative NS Slope component at that time in figure 9. The negative slope is consistent with an expectation of a declining OCR (from an historically high level of 8.25 percent), in line with expectations for a slowing economy. The yield curve example from August 2004 was flat, corresponding to the approximately zero Slope coefficient in figure 9. That is consistent with an expectation for the OCR to remain steady at around 6.00 percent. Note that combining the NS Bow component and Slope components for the forward rate curves provides more finesse about the path of OCR expectations at any given point in time than just using the NS Slope component itself.

Another point of interest in figure 9 is the mild downward trend in the NS Level component over the early part of the series. The NS Level component reflects the dynamics in the long-maturity part of the yield curve, which is the most sensitive to inflation expectations and inflation risk. Hence, the noted trend suggests growing market confidence in the Reserve Bank’s operation of monetary policy to maintain low and stable inflation as time progressed.

The interpretations above show how the time series of NS components may be used as data to summarise the yield curve at any point in time, and its evolution over time. However, if zero-coupon continuously compounding interest rates for particular maturities are required as data, they can be evaluated from the NS interest rate curve at each point in time. The Reserve Bank calculates interest rates and forward rates for the times to maturity of three, six and nine months, and then each year from one to ten years.

**Bank yield curve date**

**Securities used to define the bank yield curve**

The securities used to define the bank yield curve are the three-month and six-month bank bill rates and the interest rate swap rates for the maturities of one, two, three, four, five seven and ten years. The data are all collected by the Reserve Bank, being originally sourced from an interbank broker. The data begin on 29 September 1997, when the ten-year swap was first collected as a standard quote.\(^{19}\)

**Fitting the bank yield curve with the NS model**

As for the government yield curve, the Reserve Bank uses the NS model to fit the bank yield curve data observed at each point in time by finding the best fit to the prices of the securities. Figure 10 shows the results of fitting the bank yield curve data shown earlier from 31 May 2010, and then subtracting the fitted government yield curve at the same date.

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\(^{19}\) Data excluding the ten-year interest rate swap goes back further, and a standard quote for the 15-year swap also became available several years ago. We intend to incorporate that additional data into the bank yield curve data set, historically and going forward.
Applying the NS model to each day of the entire data set gives the time series of the estimated NS Level, Slope, and Bow coefficients for the bank yield curve over the full sample. Figure 11 plots the spread between the NS Level component of the government yield curve and the NS Level component for the bank yield curve.

Indeed, the spread became negative on occasions. On the face of it, that would suggest markets perceived the short-term default risk associated with synthetic bank bonds as lower than the default risk on long-maturity government bonds. That, in turn, would be consistent with the market anticipating a rising stock of government debt (and hence default risk) as the government’s fiscal position turned from surplus to deficits. However, fluctuations in relative liquidity perceptions and the short-term effects of increased government bond issuance may also have made an impact.

4 Research projects

Given consistent sets of yield curve data, we can now turn to some examples of how that data may be used to infer information of use to the Reserve Bank. The first part of this section describes a research project that tests the slope of the yield curve as an indicator for future GDP growth. The second section describes an investigation into the relationship between interest rates and the exchange rate.

The relationship between the yield curve and economic growth

In section 2, we discussed how expectations of future economic growth should influence the shape of the yield curve. If those expectations prove correct on average, then the shape of the yield curve now should indicate how economic growth is likely to evolve over time.

We can capture the essence of that idea by plotting annual GDP growth one year ahead along with a measure of the yield curve slope now (in this case, the ten-year interest rate less the three-month interest rate from our government yield curve dataset). It is apparent that future economic growth tends to be higher, on average, when the yield curve is steeper, although the relationship is certainly not perfect (see figure 12).

20 The correlation between these two series is 0.47. The results from estimating a regression equation gave a constant of 2.95 and a regression coefficient of 0.86. The standard deviations are 0.25 and 0.20 respectively, so both estimated parameters are statistically significant to the 5 percent level. The results are typical: relationships between the yield curve slope and future GDP growth have been investigated and established as statistically significant for many international economies.
The slope of the yield curve could be expressed as the difference between any long-maturity and short-maturity yield. The results of regressions using an extensive range of slope measures are detailed in Krippner and Thorsrud (2009), along with tests that use the data as it would have been available at each point in time. The combination of those regression results is now used within the Reserve Bank’s suite of statistical models as one of the indicators of GDP growth.

The relationship between interest rates and the exchange rate

The uncovered interest parity hypothesis (UIPH) is the usual theoretical starting point for considering the relationship between interest rates and the exchange rate, and is based on the well-used adage “there are no free lunches”. So the UIPH essentially maintains that the gain a foreign investor expects to make from investing at the higher interest rates in New Zealand should be offset by an equal expected depreciation in the New Zealand dollar against the investor’s home currency.

Unfortunately, to the chagrin of economists the world over, the UIPH is often rejected at short horizons; that is, using short-term changes in the exchange rate and short-maturity interest rates. Indeed, a common finding is counter to the UIPH prediction (but consistent with conventional wisdom):

Higher interest rates tend to precede a currency appreciation. However, there is empirical support for the UIPH at longer horizons, and theoretical models show how cyclical factors in the economy and financial markets might lead tests of the UIPH to fail for short horizons even if the UIPH is explicitly incorporated within the model.22

Yield curve analysis offers a perspective for trying to link the different pieces of evidence outlined above. Firstly, the NS model components allow us to decompose interest rate differentials into a Level component (capturing long-maturity interest rates) and a non-Level component (that is, the sum of the Slope and Bow components). Both of those components may be tested separately within the UIPH regression equation. Secondly, Krippner (2008) establishes that the Level component of the NS model corresponds with the fundamentals of the economy, while the non-Level components together correspond to the cyclical components of the economy.

The results from Krippner (2006b) using Canadian and US data indicate that the non-Level/cyclical component is behind the rejection of the UIPH, while the UIPH would hold if just the Level/fundamental component were used. The results from Graham and Krippner (2009) using the three-month data for New Zealand and Australia show similar results.

Specifically, figure 13 shows that the exchange rate depreciates, on average when the Level/fundamental component of the three-month interest rate differential is positive (that is, the left side of the brown line). Similarly, the exchange rate appreciates on average when the Level/fundamental component of the three-month interest rate differential is negative (that is, the right side of the brown line).

Conversely, the non-Level/cyclical components of the three-month interest rate differential show the opposite relationship. As the interest rate differential moves from less positive to more positive (that is, following the green line from left to right), the exchange rate changes move from large depreciations to large appreciations. The non-zero intercept of the line also suggests a positive term premium,

Notes:

21 Alternatively, the measure of the yield curve slope could be the NS Slope coefficient, which effectively captures the average slope across the entire yield curve.

22 Krippner (2006) and Graham and Krippner (2009) contains further discussion and references.
on average, of around 0.20 percentage points between New Zealand and Australia.

Figure 13
Data and results for testing the uncovered interest parity hypothesis between New Zealand and Australia

5 Conclusion
The yield curve is a concept that helps provide some perspective to the multitude of different interest rates that exist in modern economies. Specifically, we have seen how the interest rates of government securities with similar characteristics apart from their maturities may be grouped into a single government yield curve. Other groups of similar securities, such as bank securities or mortgage rates, may also be grouped into their own yield curves. These may be viewed as a hierarchy relative to the government yield curve.

Yield curves are predominantly influenced by macroeconomic factors, which implies that market expectations of those factors may be inferred via yield curve analysis. For example, we have seen how the slope of the yield curve may be used as an indicator of future GDP growth. Going forward, we would like to extend that simple relationship to simultaneously model inflation and economic growth in conjunction with the NS Level, Slope and Bow components of the yield curve, as undertaken by Diebold, Rudebusch and Aruoba (2006) for the US. It would also be interesting to add the exchange rate data to that mix, particularly given that our yield curve perspective offers an interesting avenue for research into the relationship between interest rates and the exchange rate. One aspect that might be addressed in such analysis is how (or if) exchange rate dynamics influence the persistent interest rate differentials that New Zealand usually experiences relative to Australia and to major global economies such as the US.

To conclude, interest rates in their own right have been interesting enough to have a recorded history of at least five millennia. And interest rates are even more interesting when viewed within the context of the yield curve. So the yield curve perspective on interest rates is likely to keep the interests of followers of economics and finance for a long time yet.

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The New Zealand dollar through the global financial crisis

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In this article, we examine the impact of the global financial crisis on the New Zealand dollar (NZD). The NZD fell, on a trade-weighted basis, by 35 percent over the period from 2007 to early 2009 during the peak of the crisis, and remains around 10-12 percent below its pre-crisis peak. The impact of the carry trade on the value of the NZD appears to have diminished, as international investors shifted their attention to higher-yielding currencies, such as the Australian dollar and the Brazilian real. There have also been several periods of market turbulence during the crisis, during which movements in the exchange rate have been driven primarily by declines in the risk appetite of international investors. These developments are consistent with the decline in liquidity in the NZD currency market compared to pre-crisis levels. Our regime-switching model of the NZD/US dollar (USD) exchange rate identifies several instances during the past three years when the key exchange rate driver has changed from relative interest rates to investors’ risk appetite.

1 Introduction

The global financial crisis (GFC) generated one of the most volatile periods in the history of financial markets. This article looks at some of the ways in which the nature of the market for the NZD has changed over the crisis. In particular, we examine movements in the NZD around the time of key events in the evolution of the financial crisis. We also examine how the role of some of the key drivers of the NZD changed over this period, including the influence of the ‘carry trade’ before and after the crisis. We also describe how our in-house empirical model of the exchange rate identifies changes in impact of different driving factors during the crisis period.

2 The crisis and the NZD

Prior to the crisis, the NZD was trading at an all-time high on a trade-weighted basis. In the lead-up to the crisis, New Zealand experienced strong economic growth, a booming housing market and record-high interest rates, which attracted significant investments from overseas investors. The international environment was one where investors generally searched for the best return they could find for their money and were prepared to take on higher levels of risk in their search for yield. The relative interest rate differential between New Zealand and Japan, for example, saw a surge in the carry trade (carry trades typically involve borrowing in a country with relatively low interest rates and investing in higher-yielding currency assets).1

Figure 1

New Zealand dollar trade weighted index and real exchange rate*

*Normalised to same mean
Source: Bloomberg, RBNZ

a) Movements in the NZD through the crisis

Over the period from September 2008 to around March 2009, the NZD experienced a sharp depreciation against most of its major trading partner currencies, declining by 35 percent on a trade-weighted basis (see figure 1). However, it did not fall to the post-float low point seen in mid-2000. Since then, the currency has reversed much of its losses, although it is still around 10-12 percent down from the

1 See Section 3 for more details.
2007 peak. The movement in the value of the NZD against individual currencies has varied. During the financial crisis period, there was a strong demand for the USD as a ‘safe-haven’ currency, with investors repatriating money out of ‘risky’ currencies and assets and back into USDs. The sell-off in the NZD against the USD started when Bear Stearns started to liquidate some of their hedge funds in July 2007 and gathered pace when the firm was taken over by J P Morgan in March 2008 (figure 2). The NZD then fell steadily until the collapse of Lehman Brothers in September 2008, when risk appetite in markets collapsed and investors moved out of higher-yielding currencies such as the NZD in favour of currencies that were viewed as ‘safe-havens’ such as yen and the USD. The NZD continued to decline as equity markets fell, reaching its crisis-period low in March 2009. Since then, the NZD has continued to be buffeted by different driving factors; some of the dominant forces are discussed below.

Figure 2
NZD and USD exchange rate indices

1. Bear Stearns starts liquidating hedge funds
2. Bear Stearns purchased by J P Morgan
3. Lehman Brothers collapses
4. Equity markets reach crisis lows
5. European sovereign debt concerns emerge
Source: Bloomberg, RBNZ

To a large extent, the NZD’s moves against other major currencies have been driven substantially by the moves in fundamentals of the other economy or by shifts in risk appetite, rather than domestic factors in New Zealand (figure 3). This saw the NZD recover strongly against the USD after reaching its crisis-period low in March 2009 as market confidence began to improve. The NZD has gained strongly against the euro, particularly over the past year as demand for the euro as an alternative ‘safe-haven’ currency has faded. European fiscal woes caused a sell-off in the euro at the start of 2010. The NZD/Australian dollar (AUD) exchange rate (that is, the number of Australian dollars received for one NZD) has generally traded in a historically narrow range of 0.78-0.82 since the start of 2009, as the attractiveness of the Australian dollar from a growth and interest rate outlook has seen continued demand for the AUD. The NZD/Japanese yen (JPY) cross rate fell sharply during 2008, and has remained below its long-term average, as the volatility in markets has made the NZD carry trade relatively unattractive to Japanese investors (see Section 3 for further details of the carry trade).

Figure 3
NZD bilateral nominal exchange rates (Deviations from long-term averages)

Source: Bloomberg, RBNZ

b) Liquidity in the NZD market

The moves in the NZD over the crisis period have also been partially driven by changes in liquidity and the dynamics of different market participants in the NZD market. Prior to the financial crisis, liquidity (that is, the ease with which currency can be bought and sold without impacting the price) in the NZD market was relatively good. In the lead-up to the crisis, the NZD was a relatively high-yielding currency during a period of low market volatility, which made it attractive to many different market players. Hedge funds, real money accounts (managed accounts that have funds to buy securities rather than use leverage, e.g. pension funds), Japanese margin traders (borrowing money to purchase assets using a margin account), Toshin funds (foreign-currency denominated investment trusts), ‘quants’ (traders using empirical models to make trading decisions) and proprietary traders (institutions investing their own funds rather than

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2 Some of these are discussed in Section 3, which discusses drivers of the exchange rate.
their clients’ funds) were all quite heavily involved in the market. The number of market participants helped maintain a relatively liquid market. During the crisis however, as market conditions deteriorated, the bid-offer spread for the NZD widened and traders reported poor liquidity for most of 2009 (figure 4).

**Figure 4**

Bid-offer spreads in foreign currency markets (10-day moving average)

![Bid-offer spreads graph](image)

Source: Reuters, RBNZ

An indication of the impact of the financial crisis on turnover in the NZ dollar market is available from the Reserve Bank’s survey of foreign exchange turnover by domestic banks. According to this measure, turnover volumes in the NZD market declined by around 30 percent over the crisis period, compared to the typical volumes seen over 2005-07 (figure 5). Volumes have tended to remain at a lower level compared to before the crisis.

The Reserve Bank’s market contacts have confirmed that liquidity conditions are only slowly recovering relative to the peak of the crisis. While many of the major NZD market investors still trade the NZD, contacts report that their trade volumes have significantly diminished compared to pre-crisis levels. The NZD is generally getting less attention from international investors compared to before the crisis, as relatively higher policy interest rates in other economies are attracting investors’ attention and funds. For example, one of the countries gaining favour for its relative interest rate differentials is Australia, where policy rate hikes over the start of 2010 and a more liquid market (compared to New Zealand) have attracted increasing investment interest.

c) Volatility in the NZD market

The NZD has historically been one of the more volatile major currencies, although the Australian dollar has at times been similarly volatile (figure 6). The volatility of all currencies increased sharply over the crisis, as uncertainty and risk-aversion saw spreads widen and currency markets fluctuate in response to news. Although the level of volatility declined from its crisis peak during 2009, it rebounded in 2010 during the euro area sovereign debt crisis. Increased exchange rate volatility has had a significant impact on the attractiveness of international investment strategies such as the carry trade (see the discussion below).

**Figure 5**

Foreign exchange contracts traded in NZD*

![Foreign exchange contracts graph](image)

* Based on flows during Australasian time zones. Participants in the survey are inter-bank NZD price-makers. The survey includes spot, outright forwards and foreign exchange swaps.

Source: RBNZ

**Figure 6**

Exchange rate volatility*

![Exchange rate volatility graph](image)

* Rolling 30-day standard deviation of daily percentage changes in exchange rates against the USD

Source: Bloomberg, RBNZ
Drivers of the exchange rate

There have been three key drivers of the NZD in recent years: interest rate differentials, commodity prices and risk appetite, which can explain most of the movements in the exchange rate over the short-to-medium-term. The remainder of this section discusses each of these key drivers in turn. It is important to note that many of the drivers of the exchange rate are not independent. For example, a positive shock to global economic demand could boost commodity prices and also lead to increased risk appetite by international investors. Both of these factors could put upward pressure on currencies. In theory, exchange rates can also be influenced by the difference in inflation rates between countries. However, empirical evidence suggests this only affects exchange rates over very long-run horizons, not the short periods we are examining here.

Interest rate differentials

In recent years, interest rate differentials have primarily impacted the NZD through the carry trade. There is no generally accepted definition of a carry trade, but it usually involves obtaining funding in low-interest rate currencies (such as the Japanese yen, Swiss franc or more recently, the USD), and investing in higher yielding currency assets (such as the NZD). The trade is often leveraged (that is, funded by borrowing), but this does not have to be the case. The presence of leverage makes the trade riskier and more vulnerable to market volatility. In this section, we interpret the carry trade broadly to cover a wide range of trades and investment flows that have taken advantage of persistently high returns on NZD assets relative to returns in other currencies. The existence of persistent profits from a carry trade violates the predictions of the Uncovered Interest Parity Hypothesis, which argues that the exchange rate should adjust to offset interest rate differentials and equalise returns across countries. According to the theory of Uncovered Interest Parity, high-yielding currencies should depreciate and low-yielding currencies should appreciate, but in practice the opposite is often found to occur. There is still significant academic debate about why the carry trade works and Uncovered Interest Parity fails. The failure of Uncovered Interest Parity is often called the ‘forward premium puzzle’. A common strategy is to argue that the persistent excess return on investing in high-yield currencies is because investors are risk averse, and require compensation to take on the additional risk. However, empirical analysis has found it difficult to find a correlation between the returns on the carry trade and traditional risk factors. One possibility is that the excess return compensates investors for the ‘peso problem’; that is, low probability events that cause large negative payoffs. Another strand of the literature focuses on the microstructure of the currency market and differences in behaviour by different types of traders to explain the failure of empirical tests of Uncovered Interest Parity.

Despite the uncertainty about its causes, it seems clear that the attractiveness of the carry trade breaks down when market conditions are stressed and exchange rate volatility increases. Unwinding carry trades, in turn, can increase the level of exchange volatility. For example, traders who had short positions in yen and long positions in NZD assets (i.e. borrowed yen to invest in NZDs) face a double hit when volatility rises and there is a rush into safe-haven assets, putting upward pressure on yen and downward pressure on the NZD. In crisis conditions, problems facing investors may be worsened by the lack of liquidity in the foreign exchange market if they try to close their positions. Investors may also be forced to close their positions during periods of exchange rate volatility by external factors. For example, institutional traders may find that volatility may increase their risk measures, such as their Value at Risk (VaR), above permitted levels.

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3 See Munro (2004) for more details.
4 See, for example, Burnside et al (2006).
5 The ‘puzzle’ is why does the forward exchange rate (that is, the exchange rate quoted today for the delivery and payment of funds on a future date) give biased forecasts of the spot exchange rate that will occur on the settlement date. If Uncovered Interest Parity and Covered Interest Parity (that is, interest rate differentials offset the difference between the current exchange rate and the forward exchange rate) held, then the forward exchange rate should, on average, equal the future spot exchange rate. See Burnside et al (2008).
6 See the survey by Lewis (1995) and also Burnside et al (2009).
7 Gagnon and Chaboud (2007) discuss three periods of yen appreciation attributed to unwinding carry trades.
limits, forcing them to close their positions. Similarly, leveraged investors, who have borrowed funds from brokers to trade, may face margin calls from their brokers, requiring them to either post more collateral or repay the loans.

Although it is difficult to measure to total volume of carry trade activity, we can construct measures showing how attractive the trade is to investors. To do this, we calculate the return to borrowing in a low-yield currency and lending in a high-yield one, adjusted for the level of exchange rate risk. These ‘carry-to-risk ratios’ are calculated as the interest rate differentials between the two currencies divided by the exchange rate volatility expected to occur over the period of the trade.\(^9\) According to this measure, the attractiveness of many carry trade strategies fell sharply in later 2008, during the financial market disruption following the collapse of Lehman Brothers (figure 7), as central banks slashed interest rates and currency volatility rose. Since then, the (risk-adjusted) return on carry trades invested in NZD assets has remained low. However, carry trades investing in Australia and emerging market currencies, such as the Brazilian real, have become more attractive as interest rate differentials against funding currencies such as yen and the USD have widened.

A wide range of trading strategies can be used to implement carry trades, using both spot and derivatives markets, by both retail and institutional investors. Below, we describe three methods that have been used in the NZD market. We concentrate mainly on methods used by retail investors, as data are more easily available. More sophisticated strategies are used by institutional investors, but because they often involve trading outside of public exchanges (‘over-the-counter’ trading), little information is available about their activities.

### Figure 7

**Indicators of carry trade attractiveness**

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<tr>
<th>Indicator</th>
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*Interest rate differential between the funding currency and the investment currency, divided by the implied volatility on options between the two currencies.*

Source: Bloomberg, JP Morgan

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\(^9\) We use one-month deposit rates for interest rate differentials, and one-month implied volatilities from options prices for the expected currency volatility. See also Kohler (2010) for discussion of carry trades during the global financial crisis.

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### (1) Foreign exchange margin trading

Foreign exchange margin trading involves investors putting down a deposit or ‘margin’ with a currency broker to take a leveraged position on a foreign currency.\(^10\) Margin trading has been used mainly by Japanese retail investors to take advantage of short-term currency fluctuations. The trading strategy investors have normally followed involves buying foreign currency when the exchange rate falls and selling when the currency rises. Recently, Japanese authorities introduced restrictions on the amount of leverage margin traders can take on. Under the new regulations, investors’ leverage will be limited to 50 times the amount of collateral posted from August 2010. From 2011, leverage limits will be tightened further to 25 times the value of collateral.

Margin trading positions on the NZD/japanese yen exchange rate rose steadily during 2007-08, as Japanese investors took advantage of the wide differential between New Zealand and Japanese interest rates (figure 8). During the turbulence in global financial markets during mid to late 2008, the cumulative net long positions held by Japanese margin traders in the NZD fell by nearly 90 percent, and have

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\(^{10}\) See Terada et al (2008) for more details of margin trading. Because many of these retail investors are Japanese housewives, they are often collectively described as ‘Mrs Watanabe’.
remained at broadly the same level since then. In contrast, investors’ appetite for positions on the Australian dollar/Japanese yen exchange rate, although volatile, have generally trended upward during the past two years, as investors take advantage of the more buoyant economic conditions and more positive interest rate outlook in Australia.

(2) Foreign currency investment trusts

Foreign currency investment trusts are also used by Japanese retail investors to take advantage of the higher yields on international assets. The majority of investment trust funds are invested in bonds, but some trusts also hold equities and other financial instruments. Unlike margin trading, which aims to profit from short-term exchange rate volatility, foreign currency trusts tend to be longer-term investments and are generally not leveraged. As a result, they are less likely to be unwound during periods of market volatility.

Total investments in foreign currency trusts in all currencies, which peaked in 2007 at around 35 trillion yen, declined to around 24 trillion yen in May 2007, as Japanese households have become more risk averse about long-term foreign currency investments. However, there has also been switching away from NZD assets towards other currencies.

Investment trust holdings of NZD-denominated assets peaked at around 600 billion yen in 2007 and have fallen to around 350 billion yen (figure 9),\(^1\) while holdings of assets denominated in currencies such as the Australian dollar and Norwegian kroner have risen.

(3) Uridashi / Eurokiwi bond issuance

Offshore bonds issued in foreign currencies are usually issued by foreign banks or supranational institutions, such as the World Bank. They are usually issued in countries with high savings rates where investors are aiming to receive a higher return than they typically get on local investments. Uridashi bonds are denominated in foreign currencies such as the NZD and sold to Japanese institutional and retail investors.\(^1\) Offshore bonds denominated in NZDs issued in global markets other than Japan are usually referred to as Eurokiwi bonds.

In theory, purchases of offshore bonds should put upward pressure on the NZD as investors demand dollars to buy the bond, and downward pressure on the currency when the bond matures, if the investor converts their funds back into their local currency. In practice, however, the link is less clear cut, as bond purchases may be funded by switching out of other NZD assets, and maturing bonds may be rolled over into other New Zealand securities.

Issuance of Eurokiwi and NZD-denominated Uridashi bonds peaked around late 2005, and the total stock on issue rose to around NZ$57 billion during 2007 (figure 10). As global

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\(^1\) In NZD terms, foreign currency trust assets have fallen from around 87 billion to around 86 billion. See Drage et al (2005) for more details of the Uridashi and Eurokiwi bond market.
risk appetite and funding market conditions deteriorated through the crisis, the volume of new issues fell below the level of maturing bonds, and the stock of bonds in circulation declined by more than 50 percent from its peak to around NZ$30 billion.

Figure 10
Eurokiwi and NZD-denominated Uridashi bonds

Source: Bloomberg, Reuters, RBNZ.

Commodity price movements
Currencies such as the New Zealand, Australian and Canadian dollars are often referred to as ‘commodity currencies’, because movements in the currencies can be correlated with movements in the prices of commodities these countries export.

There are several possible reasons why currency movements may be correlated with commodity prices. Suppose there is a positive shock to global demand conditions, which increases demand for commodities and raw materials, putting upward pressure on world commodity prices. If the exported commodities are priced in a foreign currency, such as the USD, higher world prices may push up the receipts of exporters, increasing their demand for local currency if they convert revenue back into local currency, pushing up the exchange rate.

Another channel through which commodity prices may affect the exchange rate is that, as export prices rise, there is an expectation that the local economy will grow more strongly, forcing the central bank to tighten monetary policy and raise interest rates, increasing demand for the local currency as investors aim to take advantage of the higher returns.

During the late 1990s and early-to-mid 2000s, movements in the NZD broadly followed the direction of movements in the world price of New Zealand’s commodity exports (figure 11). Since then, however, the relationship appears to have weakened, as export prices have been much more volatile than the exchange rate. However, the timing of turning points in the commodity price cycle still closely matches the timing of turning points in the exchange rate cycle.

Figure 11
New Zealand commodity export prices and the NZD

Source: Commonwealth Bank of Australia, Bloomberg, RBNZ.

Recently, in the Asia-Pacific region, higher commodity prices have also been associated with strong demand for raw materials as economic activity has grown strongly in China. Trading restrictions mean that investors cannot trade directly on the Chinese currency (the renminbi) to benefit directly from Chinese growth. As a result, international investors have used currencies such as the Australian dollar to take an indirect exposure to Chinese economic conditions, as Australia benefits from the higher prices of its commodity exports to China. To some extent, this has also put some upward pressure on the NZD, as a result of our strong links with the Australian economy.

Investors’ risk appetite
The standard Uncovered Interest Parity condition discussed previously assumes investors are indifferent about risk and focus only on the expected returns from different assets when choosing where to invest (that is, they are ‘risk neutral’). In reality, most investors take account of risks when making decisions, and need an additional premium to compensate them for taking extra risks (they are ‘risk averse’). As a
result, usually when investors’ risk appetite falls, the return on those assets should rise, to restore investors’ demand. During periods of extreme market turbulence, however, many investors will prefer to switch into safe-haven assets such as US Treasury bonds. This can lead to a collapse in liquidity in the markets for these assets.

The impact of risk appetite on the NZD can be illustrated by the correlation of movements in the currency with movements in the price of other risk-sensitive financial assets. For example, market participants have noted that, during periods of high risk aversion, movements in the NZD/USD exchange rate move closely in line with changes in the S&P 500 equity index in the US (figure 12). This does not necessarily imply that movements in US equity markets cause movements in the NZD. Rather, equities and NZD denominated financial products are both seen as ‘high beta’ risky assets, and are both driven by the common factor of investors’ risk appetite.

Before the crisis, there was much concern about mispricing of risk in many financial markets, as investors’ risk appetite increased as they searched for higher-yielding assets in a low interest rate environment. As a result, there was concern that investment returns did not accurately reflect the risk that investors were taking on. An example of this is in the carry trade investments in the NZD, where investors assumed exchange rate volatility would remain low into the future.

Melvin and Taylor (2009) trace the impact of the crisis on the foreign currency market. The first phase of the crisis in mid-to-late 2007 saw a sharp fall in risk appetite resulting in a major sell-off in carry trade activity and deleveraging as financial institutions faced margin calls from brokers and were forced to liquidate positions. The market stabilised temporarily after the failure and sale of Bear Stearns in March 2008, but deteriorated sharply after the collapse of Lehman Brothers, when liquidity collapsed, the cost of trading currencies soared and it was difficult to trade in any substantial amount. Despite the collapse in liquidity, Melvin and Taylor note that turnover in many currency markets actually rose during the peak of the crisis in September-October 2008.

4 The regime-switching model
In order to capture the different market focus at various points in time, we have developed a regime-switching model that allows the fundamental drivers of currency moves to be separated into different regimes that drive the exchange rate at different times. As discussed above, the main drivers of currency movements can vary over time and hence a switching model is useful, as it helps capture the changes in these currency drivers over time. Box 1 describes the regime-switching model in more detail.

The results of the model suggest that, on average, currency traders focus on relative interest rate differentials around 50 percent of the time (figure 13). Commodity prices account for currency moves around 30 percent of the time and risk appetite the remaining 20 percent of the time. Recently however, the risk regime has been dominant on a much more regular basis over the crisis period. This is in line with the strong correlation in moves across financial markets assets that have been observed over most of the crisis period.

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13 According to the Capital Asset Pricing Model (CAPM), the prices of ‘high beta’ assets tend to be more volatile than the price of the overall market portfolio, making them more risky, so investors demand a higher risk premium to buy them. Prices of ‘low beta’ assets are less volatile than the market portfolio and require a smaller risk premium. Goodhart (2006) has a discussion of the mispricing of risk prior to the crisis.

14 Goodhart (2008) has a discussion of the mispricing of risk prior to the crisis.

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Figure 12
New Zealand Dollar / US dollar exchange rate and the S&P 500 index

Source: Reuters, RBNZ
For an introduction to regime-switching models, see Brooks (2008).

The model presented here assumes there are three states in the foreign exchange market, under which movements in the NZD/USD exchange rate can be driven by risk appetite (regime 1), interest rate differentials (regime 2) or commodity prices (regime 3). When the parameters of the Markov model are estimated, it generates estimates of the probability of the NZD/USD being in a particular regime at any point in time. The three regimes are proxied using the S&P 500 index as a measure of risk appetite, the difference between New Zealand and US two-year swap rates for interest rate differentials and the Commonwealth Bank of Australia (CBA) commodity price index for commodity prices. The model can be written as:

\[
\begin{align*}
\text{NZD/USD} & = \text{3-week moving average of the weekly percentage change in the NZD/USD exchange rate}, \\
\text{S&P 500} & = \text{3-week moving average of the weekly percentage change in the S&P 500 index,} \\
\text{i}_{\text{NZ}} - \text{i}_{\text{US}} & = \text{spread between 2-year swap rates in New Zealand and US,} \\
\text{COMPRICE} & = \text{3-week moving average of the weekly percentage change in the CBA New Zealand commodity export price index.}
\end{align*}
\]

Box 1

The regime-switching (Markov) model of the NZD/USD exchange rate

This model shows that post-Lehman Brothers, trading is more likely to be focussed in a risk sentiment regime, with less of a focus on relative yields (figure 14, opposite page). This is in line with the discussions above, highlighting that the increasing volatility in financial markets over the crisis period has seen traders reduce their search for yield and, instead, be more commonly driven by risk appetite. It would be expected that as financial markets return to a more stable trading environment and the extreme level of risk aversion seen during the financial crisis subsides, that traders’ focus will again return to relative yield. However, if interest rates in New Zealand remain well below those in countries such as Australia, then the interest in the NZD could remain weak relative to pre-crisis volumes. The extent to which this occurs will depend on whether markets return to pre-crisis levels of liquidity and volatilility and any new trading restrictions/frameworks implemented by governments or individual firms. However, some market commentators have argued that the crisis has seen a permanent change or ‘new normal’.
in the behaviour of global financial markets. It is too early to determine the impact of the crisis on long-term trends in the NZD market.

Figure 14
Probabilities of exchange rate regimes

**Regime 1 – Risk appetite**

**Regime 2 – Interest rate differential**

**Regime 3 – Commodity prices**

NZD were dominated by the impact of the carry trade, which aimed to benefit from high yields on NZD assets, funded by borrowing in low interest rate currencies such as the Japanese yen. During and since the crisis, as global exchange rate volatility has increased, and international investors’ risk appetite has diminished, the impact of carry trade on the value of the NZD appears to have diminished.

Although movements in the exchange rate are still mainly influenced by interest rate differentials, since the crisis there have been several periods of market turbulence when the movements in the exchange rate have been driven primarily by movements in the risk appetite of international investors. These developments are consistent with the decline in liquidity in the NZD market compared to the pre-crisis period, as investors shift their attention to investment opportunities in other currencies. Our regime-switching model of the NZD-USD exchange rate identifies several instances during the past three years when the key exchange rate driver has been investors’ risk appetite rather than relative interest rates.

References


5 Conclusions

In this article, we have examined the impact of the global financial crisis on the NZD. The NZD fell sharply, on a trade-weighted basis, during the peak of the crisis, but has recovered some of its value since then. Movements in exchange rates against individual currencies have varied. There have been some changes in the underlying drivers of the exchange rate and trading behaviour in the currency market. Before the global financial crisis, movements in the...


Anti-money laundering and countering the financing of terrorism – the Reserve Bank’s responsibilities and approach

Hamish Armstrong

Taking action to reduce money laundering and the financing of terrorism is important, not only because of the social harm caused by these illegal activities, but also because of the damage these illegal activities can do to the stability and reputation of a nation’s financial system.

This article sets out the Reserve Bank of New Zealand’s role and responsibilities with regard to the Anti-Money Laundering and Countering Financing of Terrorism Act 2009. It briefly explains the regulatory and supervisory framework established by the Act, discusses the Reserve Bank’s Risk-Based Approach in this context and outlines some of the major areas of work to be undertaken in order to develop and implement the Reserve Bank’s supervisory framework.

1 Introduction

Money laundering is the method by which criminals disguise the illegal origins of their wealth in order to protect and enjoy their assets.

Financers of terrorism use similar techniques to money launderers to avoid detection by authorities and to protect the identity of those providing and receiving the funds.

The underlying criminal acts (money laundering and terrorist financing) are of course matters for the Police. However, because financial firms are at risk of being used by criminals to further these illegal activities, those firms and their supervisors have important roles to play in minimising the risks of money laundering or terrorist financing.

When a financial system makes it more difficult for criminals to hide and use their illegal funds, criminals may be caught more easily, a criminal lifestyle becomes less attractive and crime can be reduced. In addition, money laundering and terrorist financing activities can undermine the integrity and stability of financial institutions and systems, discouraging both domestic and foreign investment.

For these reasons, the international community has increasingly prioritised the fight against money laundering and terrorist financing and New Zealand has recently enacted legislation consistent with developing international standards.

The Anti-Money Laundering and Countering Financing of Terrorism Act 2009 (‘the Act’) seeks to implement recommendations of the Financial Action Task Force, the international body (of which New Zealand is a member) set up to promote and develop policies for combating money laundering and terrorism financing at an intergovernmental level.

Under the Act, certain financial institutions as well as casinos (collectively referred to as ‘reporting entities’) are required to establish and maintain Anti-Money Laundering and Countering Financing of Terrorism (‘AML’) compliance programmes and regular AML risk assessments. This includes developing and implementing effective policies and procedures for customer due diligence, reporting of suspicious transactions and record keeping.

Although the Act is in force, these requirements will not come into effect until around November/December 2012. This delay is intended to give industry the opportunity to prepare themselves for compliance with the Act and also allow supervisors time to develop their own supervisory programmes.

Money laundering is the method by which criminals disguise the illegal origins of their wealth in order to protect and enjoy their assets.
Under the Act, the Reserve Bank is the AML supervisor for banks, life insurers and non-bank deposit takers. This means that we are charged with:

- monitoring and assessing the level of money laundering and terrorism financing risk across these reporting entities;
- developing a supervisory programme that will monitor reporting entities for compliance with the Act and any subsequent regulations;
- providing guidance to assist reporting entities to comply with the Act and any subsequent regulations;
- investigating reporting entities and enforcing compliance with the Act and any subsequent regulations; and
- co-operating with domestic and international counterparts to ensure consistent, effective and efficient implementation of the Act.

Importantly, our focus is always on the effectiveness of firms’ systems and controls and not on detecting the primary offences, which is a matter for the NZ police.

2 What approach will the Reserve Bank take?

The Anti-Money Laundering and Countering Financing of Terrorism Act 2009 sets out the high level responsibilities placed on reporting entities. These include:

- developing and maintaining a risk assessment and a risk-based AML programme;
- customer identification and verification;
- ongoing customer due diligence and transaction monitoring;
- suspicious transaction reporting;
- record keeping;
- auditing; and
- annual reporting.

Certain minimum standards are set out in the legislation (for example, the requirement for firms to monitor their customers’ activities). The specifics of how this might be carried out can vary greatly depending on the nature of the risks reporting entities face and the types of products they sell. For example, a large retail bank with many customers will most likely develop or purchase customer transaction monitoring software, whereas a smaller organisation may be able to monitor its customers’ transactions manually.

Statutory obligations are intentionally set at a high level in order to allow sufficient flexibility for reporting entities. Important parameters such as what reporting entities will be required to do and proposed exemptions (which reporting entities are covered by the Act and in relation to which particular activities) will be specified in forthcoming regulations. In addition, supervisors expect to publish Codes of Practice and other guidance (discussed below) in the lead-up to full implementation.

Multi-agency approach

The Act establishes a multi-supervisor regime for supervision, monitoring and enforcement of AML obligations involving three supervisors – the Reserve Bank, the New Zealand Securities Commission (‘SecCom’) and the Department of Internal Affairs (‘DIA’) – each supervising different portions of the regulated sector.

The Reserve Bank is responsible for banks, life insurers and non-bank deposit takers. SecCom is responsible for issuers of securities, trustee companies, futures dealers, collective investment schemes, brokers and financial advisers. DIA is responsible for casinos, non-deposit-taking lenders, money changers and all other reporting entities.

In addition, the Act provides central roles for the Ministry of Justice (administering the legislation and driving AML policy) and the Financial Intelligence Unit of New Zealand Police (receiving, analysing and referring suspicious transaction reports and producing guidance and feedback).
This multi-supervisor approach was preferred primarily in order to use existing industry knowledge and expertise and to leverage off existing supervisory relationships. This will minimise compliance costs for reporting entities and supervisory costs.

With supervisors producing Codes of Practice and Guidance and establishing their own individual supervisory programmes, it will be important to achieve consistency and cost-effectiveness.

In order to assist in this, the Act establishes a national Co-ordination Committee, comprising representatives from the three supervisors, the Ministry of Justice, the New Zealand Customs Service and the Commissioner of Police.

This Committee is tasked with ensuring the necessary connections between the AML supervisors, the Commissioner and other agencies in order to ensure the consistent, effective, and efficient operation of the AML regulatory system.

To date this Committee has been largely focussed on the development of the Act and regulations, but is expected to focus on ensuring consistency across the national AML framework as the supervisors’ own programmes take shape.

In addition to this Coordination Committee, the RBNZ also participates in a regular supervisors forum as a mechanism for ensuring consistency at an operational level. This has proved to be an effective way of sharing experiences, resolving operational issues and providing consistent feedback to the Ministry of Justice with regard to their proposals. Striking an appropriate balance between consistency and sector focus will be one of the main challenges of New Zealand’s multi-supervisory model.

**Risk-based approach**

Fundamental to the regime established by the Act is the concept of a “risk-based approach”. A key principle of this approach is the recognition that individual businesses are best placed to make decisions on how to manage and mitigate their own money laundering and terrorism financing risks. The risk-based approach is intended to allow reporting entities to be flexible in their risk mitigation arrangements in order to maximise the benefits from the resources they put into AML.

To this end, the Act requires reporting entities to formally assess the AML risks in their own business context and to develop effective policies and procedures in proportion to those risks.

Reporting entities will need to identify higher risk customers, products, services, delivery channels and geographical locations in order to introduce appropriate mitigation or controls. These are not static assessments and will change over time, depending on how circumstances develop and how threats evolve.

For this type of approach to be successful, the Reserve Bank’s supervisory regime will require the following characteristics:

(i) **A thorough understanding of current risks.**

The risk-based approach recognises that a lot of the expertise in assessing risk lies with firms because it is they who have the knowledge and experience of their customers and products. However, firms need up-to-date, constructive information in order to effectively gauge current risks. While firms will need to be proactive in seeking out information regarding money laundering trends and threats from external sources such as law enforcement, as well as relying on their own experiences and observations, we also need to be willing to provide information, guidance and advice in this context.

(ii) **A regulatory focus on principles.**

We accept that firms will be seeking to achieve real outcomes and not implement prescriptive, detailed and inflexible rules. Our regime should focus on results. The supervisory framework should empower firms to be innovative and creative in their mitigation of money laundering risk so that
they may meet their obligations, while minimising the cost and inconvenience to themselves and their customers.

(iii) An acceptance that money laundering or terrorism financing will never be completely eliminated.

We will be realistic about what a firm with appropriate controls can reasonably achieve. We do not expect a zero-failure regime. What we expect is that firms take reasonable steps to identify and strengthen the weak links in their controls.

This will not be an easy task. But we are committed to this risk based approach to AML in order to deliver an efficient, effective and proportionate regime.

3 Where do we want to be?

National / Sector Risk Assessments

For a risk-based approach to AML to be effective, supervisors and firms require up-to-date information on the money laundering and terrorism financing risks at national, sector and firm-specific levels.

In December 2009, we surveyed the firms we supervise, as the first step in the process of assessing the money laundering and terrorism financing risks in our sector. The data collected has been referred to the Financial Intelligence Unit (FIU) of New Zealand Police, to assist them in developing a draft National Risk Assessment. This will be a public document, containing information on the nature and scale of money laundering and terrorism financing in New Zealand. It will also identify any weaknesses in AML systems and controls and other features of the national environment that make it attractive to money launderers and terrorism financiers.

In addition to assisting in the development of the National Risk Assessment, we will produce our own Sector Risk Assessment in relation to the sector for which we have responsibility. This will provide more sector-relevant detail on risks and typologies. It will also provide context and assistance for the business-level risk assessments made by reporting entities, allowing them to focus their resources on areas where they can make the most impact.

Information gathered during this process will also allow us to make our own assessments on where the risks are in our sector (at a firm-specific or product-specific level). This will assist in the risk-scoring of reporting entities and the subsequent allocation of supervisory resources to the areas of most risk, helping to ensure an efficient and effective supervisory programme.

Development and implementation of supervisory framework

In the lead-up to full implementation, we will develop and implement our supervisory framework for AML.

Much of the development of this framework will be undertaken in a collaborative manner between supervisors to deliver a reasonably consistent regime across the regulated sector.

The specific detail of much of this work will develop as information continues to be gathered from reporting entities and our understanding of the risks and countermeasures prevalent in our sector increases. However, we set out below preliminary indications of the scope of our supervisory arrangements and the major areas of work to be undertaken.

Much of the development of this framework will be undertaken in a collaborative manner between supervisors to deliver a reasonably consistent regime across the regulated sector.
Risk Framework

As a general principle, we will supervise firms according to the risks they present to the objectives of the Act (namely: to detect and deter money laundering and the financing of terrorism; to maintain and enhance New Zealand’s international reputation; and to contribute to public confidence in the financial system).

This will require a formal Risk Framework that identifies, assesses and prioritises the risks to these statutory objectives in terms of their probability (the likelihood of the particular risk crystalising) and impact (the effect of such an event). This assessment will inform any decisions regarding appropriate regulatory responses.

Supervisory approach

One of the Reserve Bank’s functions under the Act is to monitor our reporting entities to ensure they are complying with their regulatory obligations. The nature and extent of our supervisory relationship with any individual firm will depend on how much of a risk we consider it poses, as established via the Risk Framework discussed above.

We intend that the level of supervisory intensity assigned to a firm or group of firms will be a mixture of baseline and risk-sensitive monitoring.

Baseline monitoring will be undertaken for all firms regardless of their risk scores. This will likely involve desk-based activities such as analysing firms’ financial returns and annual compliance reports.

In addition, we will undertake further supervisory work sensitive to the size and riskiness of the firm concerned, including any specific risks identified by the baseline monitoring. This may include product, entity or risk-specific surveys or questionnaires, firm-specific information requirements or targeted on-site inspections.

Enforcement approach

A risk-based approach to supervision requires us to focus on firms’ AML outputs, and recognise that firms have a lot of scope in their decisions over how best to manage their money laundering and terrorism financing risks.

A risk-based regime is not a zero-failure regime and both our supervisory and enforcement approach will recognise this. We recognise the possibility that firms may not meet required standards and may not be in a position to satisfy their obligations upon the date they become effective. Some will require remedial action to address shortcomings and this is where outreach and communication will have an important role to play in ensuring that minimum standards are met.

Nevertheless, we are tasked with investigating the firms we supervise and enforcing compliance. To this end, the Act sets out a range of both civil and criminal sanctions for breaches of firms’ obligations.

As part of our overall approach to AML supervision, we will be prepared to use appropriate sanctions against firms who are not meeting their legal obligations or not taking AML risk management seriously, and are falling short of the required standards.

Not every breach of the Act will result in enforcement action and each specific breach will be judged on its individual merits. We intend developing an enforcement strategy that makes it clear that a firm will more likely face sanctions if there are significant and serious breaches; if a firm has been notified of breaches and failed to deal with them appropriately; or if breaches are deliberate or reckless.

Details of our enforcement strategy, including when criminal sanctions might be appropriate, will be developed in conjunction with the other AML supervisors and communicated to our regulated entities in advance of full implementation of the regime.

Codes of Practice/Guidance

As stated above, AML supervisors may develop Codes of Practice and/or Guidance material in order to clearly communicate our expectations and key areas of concern to reporting entities. This is to give firms some certainty about their obligations and our expectations in order to enable planning and infrastructure expenditure.

The function of Codes of Practice, as set out in the Act, is to assist firms by suggesting methods by which they can meet
Outreach/communication

Given that all participants in the financial sector are faced with new concepts and requirements under the Act, we believe it is imperative to have open and constructive dialogue between supervisors and reporting entities.

Firms will be relying on us to provide clear and timely communication of expectations in order to develop their own risk-based AML assessments, strategies and programmes. Firms will be looking to us to provide good-practice guidance, industry studies, typologies and other materials to assist them in complying with their obligations.

At the same time, we will be relying on firms to provide us with information on the risks that they have identified in their own business models to help shape our thinking on where to focus our supervisory efforts. We will also be requesting input from industry in developing best practice risk mitigation techniques and methodologies.

We hope to foster an open, transparent and constructive relationship with the firms that we supervise, particularly in the lead-up to full implementation.

4 Conclusion

The Anti-Money Laundering and Countering Financing of Terrorism Act 2009 places new obligations on financial firms and on the Reserve Bank as AML supervisor.

The fight against money laundering and the financing of terrorism is an important one and we are committed to a risk-based regime that allows firms the flexibility to deal with risks in a proportionate and effective manner.

We do not expect firms to eliminate money laundering or terrorist financing, but we do expect firms to take these risks seriously and act appropriately.

Please keep an eye on our website http://www.rbnz.govt.nz/aml/index.html for further updates, Codes of Practice, Guidance and other information.
Introduction

This article takes a look at how the Reserve Bank manages the foreign exchange risk on its unhedged foreign reserves. Since July 2007 the Reserve Bank has had a policy of maintaining a portion of its foreign reserves on a currency unhedged basis, that is, as unhedged foreign reserves. This means that some of the Reserve Bank's FX assets are funded via outright sales of New Zealand dollars (NZD) (raised from the Reserve Bank's NZD liabilities, such as the issue of currency or via the settlement account balances of commercial Reserve Banks or the government) leaving the Reserve Bank exposed to fluctuations in the value of the NZD against the currencies in which the Reserve Bank holds unhedged foreign reserves. The level of unhedged reserves is determined by the Governor and is available as a policy tool (albeit one with relatively modest effectiveness in moderating the broader cyclical movements in the NZD) – either through passive foreign exchange purchases/sales or via outright FX intervention operations.¹ The Reserve Bank's strategic FX benchmark takes the level of unhedged reserves as given and then looks at how to allocate the Bank's open foreign currency position among various alternative foreign currencies.

The article is structured as follows. Section 2 describes how the Reserve Bank's foreign reserves are structured and shows how the Bank's strategic FX benchmark fits into the Bank's broader balance sheet. Section 3 describes how the Reserve Bank developed its strategic FX benchmark and describes the trade-offs associated with different currency allocations within the FX benchmark. Section 4 describes the Reserve Bank's chosen benchmark and the framework used to manage tactical deviations away from the strategic benchmark. Section 5 concludes.

The structure of the Reserve Bank's foreign reserves

Hedged versus unhedged foreign reserves

The Reserve Bank's total foreign reserves consist of a portfolio of high quality liquid foreign-currency denominated financial assets. The main purpose of the Reserve Bank's reserves is to make available foreign exchange for FX intervention purposes in the event of dysfunction in the NZD FX market – perhaps due to some NZ specific shock (for example, an earthquake or disease outbreak) or perhaps due to some kind of global financial shock. In these circumstances, the Reserve Bank stands ready to liquidate its stock of foreign currency assets to fund purchases of NZD in the FX market in order to keep that market functioning at some basic level.

The Reserve Bank's reserves need to be invested in resilient, highly liquid and safe instruments and markets to ensure that the Bank's reserves will be available for intervention in what might be very difficult financial market conditions.

¹ See Eckhold and Hunt (2005) for detail on the Bank’s FX intervention policy and Eckhold (2010) for detail on the Bank’s Open FX management regime.
This means that the Reserve Bank typically only invests in instruments that are of a high credit quality (that is, AAA rated sovereign or quasi sovereign bonds or treasury bills) and in markets that exhibit a high and resilient level of liquidity in most circumstances. The table above summarises the Reserve Bank’s allocation of investments in its foreign reserves portfolio as at the end of June 2010.

Preserving the liquidity and safety of the Reserve Bank’s foreign currency investments is just one facet of what is required to maintain an adequate foreign currency intervention capacity. Another important consideration is the manner in which the Reserve Bank’s foreign reserves portfolio is funded. FX intervention requires the Bank to physically sell its FX assets and use the money raised to fund purchases of NZDs in the FX market. This restricts the options available to the Bank in an intervention event. Consider the following scenario. If the Reserve Bank chose to fund its foreign reserves portfolio by borrowing foreign currencies for a relatively short term, this could be problematic. Should the Reserve Bank need to intervene in the foreign exchange market, this requires the reserves portfolio to be liquidated. After intervention, the Reserve Bank would be left with outstanding FX-denominated liabilities maturing quite soon but with no FX assets left to cover those maturing liabilities. We need to manage this foreign currency refinancing risk to make our FX intervention capacity truly effective.

We have options available to organise the funding of foreign reserves and to manage this foreign currency refinancing risk. These are:

- **Fund with long-term foreign currency liabilities.** For example, we could raise FX loans of a long maturity of, say, 5-10 years. Under this scenario, if intervention was required, the Reserve Bank would have a longer period to organize the repayment of refinancing of its FX loans. The Bank could either resell NZD and repurchase FX after the FX crisis has passed, or refinance maturing FX loans with new long-term FX loans.

- **Fund with NZD – The Reserve Bank has ready access to NZD as it is the New Zealand central Reserve Bank. At the extreme, the Reserve Bank can print NZD although it has ongoing access to NZD from banks via our role as provider of liquidity to the Reserve Banking system. This means physically selling NZD and purchasing the foreign currency used to fund the foreign reserves portfolio. If the Reserve Bank intervenes, it has no remaining FX exposure, as there were no FX liabilities created to fund the foreign reserves sold for intervention purposes.

In normal times, funding reserves with FX liabilities leaves the Reserve Bank hedged against movements in the NZD against the currencies in its foreign reserves portfolio. The portion of total reserves funded via FX liabilities is known as the Reserve Bank’s hedged reserves. Funding reserves with NZD leaves the Bank fully exposed to fluctuations in the NZD on its foreign reserves portfolio. These reserves are known as unhedged reserves. In the case of both hedged and unhedged reserves the actual foreign currency assets are exactly the same (government securities, for example) and are indistinguishable from each other on the Reserve Bank’s balance sheet. The sole difference is the currency

<table>
<thead>
<tr>
<th>Currency/Market (NZD m, % of total reserves)</th>
<th>US dollars</th>
<th>Euros</th>
<th>Japanese yen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government securities</td>
<td>4230 (41 %)</td>
<td>2711 (26 %)</td>
<td>858 (8 %)</td>
<td>7799 (75 %)</td>
</tr>
<tr>
<td>Reverse repos</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
</tr>
<tr>
<td>Quasi-sovereign securities</td>
<td>2652 (25 %)</td>
<td>0 (0 %)</td>
<td>0 (0 %)</td>
<td>2652 (25 %)</td>
</tr>
<tr>
<td>Total</td>
<td>6882 (66 %)</td>
<td>2711 (26 %)</td>
<td>858 (8 %)</td>
<td>10 451 (100 %)</td>
</tr>
</tbody>
</table>

Table 1: RBNZ asset allocation as at June 30 2010

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2 Reverse repos are essentially short-term cash investments secured on high-quality government securities as collateral. Reverse repos are transactions where the Reserve Bank buys foreign government securities for cash while simultaneously agreeing to sell those securities back at an agreed price in the future. The difference in the purchase and sales price is equivalent to the interest rate on the reverse repo.

3 Includes investments in the securities of government guaranteed entities, AAA-rated state agencies and the Bank for International Settlements.
the Reserve Bank’s policy had been to preserve FX intervention solely for managing market disruption in a crisis. Beyond that, the Reserve Bank would not intervene for any other purpose and would not intervene to lean against movements in the NZD that might be thought to be fundamentally unjustified. In 2004, the Reserve Bank changed its policy to allow intervention when the exchange rate moves significantly away from fundamentally justified levels, effectively adding FX intervention to its monetary policy tool-kit. The new policy left open the possibility of the Reserve Bank intervening to try and lean against extreme cyclical movements in the NZD. This intervention has the effect of either adding unhedged foreign reserves to its stock of hedged reserves when the exchange rate is judged to be relatively overvalued, or by actually going short on foreign currency and long on the NZD, when the exchange rate is judged to be relatively undervalued. The objective of this new intervention approach is to lean against exceptional and unjustified deviations of the exchange rate.

3 Historical development of the Reserve Bank’s strategic FX benchmark

From the mid-1980s to 2004, the Reserve Bank had a policy of holding all of its foreign reserves on a fully hedged basis. The currency denomination of its FX liabilities matched its foreign reserves through that period. There was no strategic FX benchmark required, since the Reserve Bank had no net exposure to FX risk through its foreign reserves. The Bank merely ensured that it raised sufficient long-term FX liabilities to match its desired foreign reserve holdings in various currencies and markets.

In 2004, the Reserve Bank proposed – and the Minister of Finance agreed – a change to the Bank’s long-standing policy on FX intervention. From the mid-1980s to 2004, the Reserve Bank’s policy had been to preserve FX intervention solely for managing market disruption in a crisis. Beyond that, the Reserve Bank would not intervene for any other purpose and would not intervene to lean against movements in the NZD that might be thought to be fundamentally unjustified. In 2004, the Reserve Bank changed its policy to allow intervention when the exchange rate moves significantly away from fundamentally justified levels, effectively adding FX intervention to its monetary policy tool-kit. The new policy left open the possibility of the Reserve Bank intervening to try and lean against extreme cyclical movements in the NZD. This intervention has the effect of either adding unhedged foreign reserves to its stock of hedged reserves when the exchange rate is judged to be relatively overvalued, or by actually going short on foreign currency and long on the NZD, when the exchange rate is judged to be relatively undervalued. The objective of this new intervention approach is to lean against exceptional and unjustified deviations of the exchange rate.

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Figure 1
Hedged and unhedged FX reserves

3 Historical development of the Reserve Bank’s strategic FX benchmark

From the mid-1980s to 2004, the Reserve Bank had a policy of holding all of its foreign reserves on a fully hedged basis. The currency denomination of its FX liabilities matched its foreign reserves through that period. There was no strategic FX benchmark required, since the Reserve Bank had no net exposure to FX risk through its foreign reserves. The Bank merely ensured that it raised sufficient long-term FX liabilities to match its desired foreign reserve holdings in various currencies and markets.

In 2004, the Reserve Bank proposed – and the Minister of Finance agreed – a change to the Bank’s long-standing policy on FX intervention. From the mid-1980s to 2004, the Reserve Bank’s policy had been to preserve FX intervention solely for managing market disruption in a crisis. Beyond that, the Reserve Bank would not intervene for any other purpose and would not intervene to lean against movements in the NZD that might be thought to be fundamentally unjustified. In 2004, the Reserve Bank changed its policy to allow intervention when the exchange rate moves significantly away from fundamentally justified levels, effectively adding FX intervention to its monetary policy tool-kit. The new policy left open the possibility of the Reserve Bank intervening to try and lean against extreme cyclical movements in the NZD. This intervention has the effect of either adding unhedged foreign reserves to its stock of hedged reserves when the exchange rate is judged to be relatively overvalued, or by actually going short on foreign currency and long on the NZD, when the exchange rate is judged to be relatively undervalued. The objective of this new intervention approach is to lean against exceptional and unjustified deviations of the exchange rate.

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4 See Eckhold and Hunt (2005).
from fundamentally justified levels, if it is judged that the exchange rate is creating a problem for the implementation of monetary policy.

The Reserve Bank needed a strategic FX benchmark to help guide the management of its open FX position if intervention was used. Intervention itself typically involves the purchase or sales of NZDs against the US dollar (USD) as the NZD/USD cross rate is the main traded market. Intervention aims to influence the value of the NZD through operations in the NZD/USD market – however, after that it might not be necessarily optimal to leave the FX position obtained in the USD. It might be more sensible to diversify the Reserve Bank’s FX risk by spreading the exposure across more currencies, thus protecting the Reserve Bank from a shock to the USD. It might also be the case that there are better returns available in currencies aside from the USD, as interest rates differ across currencies. A strategic benchmark is designed to account for the differing levels of risk and returns that are available in alternative currencies.

The Reserve Bank ultimately chose a benchmark for its open FX position consisting of three currencies – the USD, the euro and the Japanese yen – with weights of 45 percent, 45 percent and 10 percent respectively. This choice reflected a desire to implement a simple while diversified benchmark that featured the most liquid currencies in markets where the Reserve Bank’s foreign reserves team had established expertise.

In 2007, the Reserve Bank decided to make another significant shift in its foreign reserves financing strategy, as part of the review of its balance sheet that had been ongoing from 2005. The outcome was the introduction of a permanent benchmark amount of unhedged foreign reserves to the Reserve Bank’s balance sheet of SDR 1000 million (around NZD 2250 million) or about 20 percent of the Reserve Bank’s total FX reserves. The Reserve Bank retained the option to adjust the actual amount of unhedged reserves, depending on the level of the exchange rate and macroeconomic considerations. It appeared likely that the Reserve Bank would have a significant ongoing net positive level of un-hedged reserves in most circumstances and hence a routine ongoing exposure to FX fluctuations on its un-hedged foreign reserves. This significant and ongoing exchange rate exposure drives a need for a more detailed strategic FX benchmark to ensure the Reserve Bank achieves the best risk-adjusted returns from its unhedged foreign reserves.

The Reserve Bank has adopted an FX overlay strategic benchmark that implies the addition of unhedged reserves to its foreign reserves portfolio does not have a direct effect on the composition of the assets the Reserve Bank holds in its portfolio. Box 1 discusses in more detail the concept of an FX overlay system compared to the alternative.

4 Developing a strategic benchmark for the Reserve Bank’s unhedged reserves

Desirable properties of potential reserve currencies

When developing a strategic benchmark for the Reserve Bank’s unhedged reserves, it is important to consider the properties we would want constituent currencies to satisfy in both normal times, and in a crisis when intervention might be occurring. In normal times we would ideally prefer currencies that:

- Have an adequate level of liquidity that allows traders to build and manage the portfolio without incurring undue transactions costs.
- Have developed hedging and capital markets that allow the Reserve Bank to manage changes in the relative size of the hedged versus unhedged portion of the reserves portfolio without incurring undue transactions costs. In addition, this gives the Reserve Bank an adequate range of instruments in which to invest reserves, should we choose to hold physical investments in the currencies concerned. Well developed hedging and capital markets will generally lead to a wider range of participants in the currency and thus better liquidity.
- Provide a high, or at least adequate risk-adjusted return thus helping the Reserve Bank maximise returns or minimise costs associated with holding foreign reserves.

See Eckhold (2010) for details.
Asset allocation = Currency Allocation

NZD Liabilities (source of funds)

Sold outright for:

FX Overlay System

Integrated Asset/FX Allocation System

“Real Money Fund Style”

Unhedged FX Reserves (Uses of funds)

USD

JPY

EUR

CAD

GBP

AUD

Assets

Funds purchases of:

Use FX swaps to fund purchases of:

FX Funding Mismatches equivalent to:

Unhedged FX Reserves (Uses of funds)

Funds purchases of:

Asset allocation = Currency Allocation

NZD Liabilities (source of funds)

Sold outright for:

FX Overlay System

Integrated Asset/FX Allocation System

“Real Money Fund Style”

Unhedged FX Reserves (Uses of funds)

USD

JPY

EUR

CAD

GBP

AUD

Assets

Funds purchases of:

Use FX swaps to fund purchases of:

FX Funding Mismatches equivalent to:

Unhedged FX Reserves (Uses of funds)
Both the level of interest rates and the volatility of the currency are important factors in determining the risk-adjusted return of a particular currency.

- Have a positive correlation to the NZD. Currencies that are positively correlated with the NZD (for example commodity currencies) are less risky to the Reserve Bank as unhedged reserves are financed through sales of the NZD. The stronger the positive correlation, the lower the risk as the value of the Reserve Bank’s unhedged foreign currencies assets will tend to vary less in NZD terms compared to less correlated currencies.

In a crisis situation, where we might need to liquidate the portfolio, a different set of properties is important. In particular, we would ideally prefer currencies that:

- Exhibit a strong level of liquidity in a range of circumstances, including situations of global financial market stress. First and foremost, we need to ensure that we can liquidate our portfolio when we need it most. The purpose of holding reserves is defeated if the portfolio is unavailable for intervention when required. Liquidity of the spot FX market is particularly paramount, as we will need to sell down our FX holdings for US dollars and then ultimately for NZ dollars in intervention operations.
- Have an absence of capital controls, and a low likelihood of these being introduced in a global stress event. It is not helpful to have our reserves tied up because of currency controls.
- Exhibit a high level of resiliency to New Zealand-specific shocks. It is unhelpful to have reserves invested in markets whose liquidity conditions are highly affected by developments in the NZD market.
- Exhibit a low and ideally negative correlation to the NZD in a crisis situation. The ideal would be for the value of our foreign reserves to be rising, or at least not falling, in line with the NZD in a crisis event. This better preserves our FX intervention capacity.

There are some currency choices that are clearly attractive in both normal markets and in a crisis situation. Highly liquid and widely traded currencies such as the USD and the Euro will always be highly favoured in the strategic benchmark. But some of the factors that make a currency attractive in normal markets make them less attractive in

**Figure 2**
Stylised investment choice “Hopper”
a crisis. For example, commodity currencies like Canadian and Australian dollars look good most of the time but could cause us difficulty if a global commodity crisis was putting stress on the NZD. Also, there are, typically, trade-offs to be considered. Often higher yielding currencies are less liquid. A framework is required to assess the risk-adjusted trade-offs inherent in different currency choices so we can balance the attractive aspects of alternatives against their costs and risks.

Box 2
Analysing the strategic benchmark allocation within a Markowitz portfolio optimisation framework

Portfolio choice problem

Maximise expected returns on un-hedged reserves

\[ E(R) = \sum w_i R_i - R_{NZ} \]

Where:
- \( R_i \) is currency i's 90-day interest rate (or 5-year swap rate in some scenarios)
- \( w_i \) is currency i's weight in the benchmark (0 \( \leq \) \( w_i \) \( \leq \) 1), \( \sum w_i = 1 \)
- \( R_{NZ} \) is the New Zealand 90-day interest rate (or 5-year swap in some scenarios)

Subject to a level of portfolio risk

\[ \sigma_p = \sqrt{\sum w_i w_j \sigma_i \sigma_j} \]

Where \( w_i \) and \( w_j \) are measures of the standard deviations of weekly returns in currencies i and j respectively against the NZD.

Other constraints include diversification constraints (i.e., \( w_i \) can’t be too large) and liquidity constraints (i.e., certain currencies can have minimum or maximum weightings in some scenarios).

Analyzing the trade-offs of alternative strategic benchmark choices

Box 2 describes the technical analytical framework employed to analyze the trade-offs between alternative currency allocations. Figure 2 provides a stylised view of the analytical process.

The potential investment universe constitutes a lengthy list of candidate currencies. The approach taken was to look at all of these and then assess them according to their normal and crisis properties. The analogy is like sifting wheat from chaff by emptying everything into a hopper and filtering...
everything, leaving the best options at the end of the process. In this case, we used both quantitative and qualitative filters. Quantitative factors include the returns, correlations and volatilities of various currencies. The quantitative factors were analysed within a standard Markowitz mean-variance optimization model (see box 2). This model found a set of portfolio combinations that delivered the best possible combination of currencies that maximised the returns on the Reserve Bank’s unhedged returns, subject to a given level of risk. Qualitative factors (for example, liquidity of markets or the prospect of capital controls) were taken account of by putting constraints on the relative amounts of currencies that could appear in the optimal portfolios. Stress tests of portfolio outcomes were done to assess the robustness of the choices available. The final strategic benchmark was selected by means of judgement, taking account of the insights obtained from the analysis, rather than from any one particular set of data/assumptions of scenarios.

Insights from the analysis
The fact that there are few constraints to account for the lack of liquidity in some currencies suggests that in simple risk-return terms the Reserve Bank’s FX benchmark should consist of:

- A high weight in the Australian dollar
- High weightings of some emerging market currencies such as the South African rand, Chilean peso and Icelandic krona, due to their very high interest rates
- Some gold (around 20-30 percent of the portfolio) as a commodity hedge against the NZD

There are a number of problems with this ‘optimal’ portfolio, from a risk management perspective. In particular, this sort of portfolio ignores the negative properties most of those choices would have in a crisis, as well as the generally low levels of liquidity and more limited capital and hedging markets in emerging-market currencies. The application of judgement and the imposition of appropriate constraints are critically important to capture these more qualitative factors in the portfolio allocation process.

Stress testing the analysis provided the following key insights:

- Diversification is important, as idiosyncratic risk can be an important driver of the attractiveness of a particular currency.
- Yield is only important at the margin if we restrict our attention to the most liquid and resilient currency markets.
- Commodity currencies and gold are useful diversifiers in most circumstances – although there needs to be caution in not having too high a weight of these sorts of currencies in the event of a commodity currency shock.

Figure 3
Global FX turnover April 2008 – BIS triennial survey

Note: The red dotted line indicates the level of turnover of the NZD in the survey.

The idiosyncratic risk associated with individual currencies proved to be important in determining the weight of most currencies within the optimal strategic benchmark. In particular, a common theme was that the optimal portfolio allocation was sensitive to the level of volatility in particular currencies. Hence, even the deepest and most liquid currencies such as the USD or euro still tended to be down-weighted significantly in scenarios where those currencies were subject to idiosyncratic shocks. An implication of this is that diversification is important as we cannot know for certain which currencies might be subject to shocks in the future.

In an unconstrained setting where liquidity is not taken into account, the best portfolio combinations tended to feature currencies with relatively high interest rates. This is unsurprising and consistent with the literature on the
application of the Markowitz framework in asset allocation. However, what was interesting was that if more weight was put on liquidity in selecting the investment universe then yield was much less important in determining the optimal currency benchmark. Put another way, if we restrict ourselves to choosing between the 8 or 10 most liquid currencies in the world, then their relative rates of return, while being important at the margin, were much less important in determining their importance in the strategic benchmark portfolio.

The risk-reduction properties associated with alternative currencies proved much more important. In particular, an enduring theme was that currencies that have a correlation with the NZD, such as the Australian dollar and Canadian dollar (and, to a lesser extent, the South African rand and Scandinavian currencies), tended to consistently feature in the optimal portfolios. This result reflected their risk-reduction benefits as opposed to their interest rates (which have tended to be higher than in traditional core reserves markets of the US, Europe and Japan). Gold also proved to be a resilient risk diversifier for the same reasons.

The Reserve Bank’s final strategic allocation is shown in table 2 below.

The rationale for the final choice of strategic benchmark reflects the following considerations:

- Diversification – we have widened the currency basket to include three additional currencies – GBP, CAD and AUD - to help spread the previous concentration of risks in the USD and euro (previously 45 percent each)
- Risk reduction/correlation to the NZD – the three new currencies tend to have a reasonable correlation to the NZD in most circumstances, hence helping reduce the volatility of the value of the Reserve Bank’s unhedged reserves in NZD terms.
- Liquidity – the currencies included in the Reserve Bank’s strategic FX benchmark are the most heavily and widely traded currencies in the world. Figure 3 illustrates the global turnover of the top 20 currencies as given by the most recent BIS FX turnover survey.
- Yield – on average, the currencies included in the new currency basket have maintained a higher yield as compared to the Reserve Bank’s previous, more narrowly defined, benchmark portfolio.

The Reserve Bank has allowed itself scope to move away from the strategic benchmark from time to time for tactical trading purposes. The rationale for this is to allow scope for the Reserve Bank to protect the value of the Reserve Bank’s reserves against longer term adverse trends in one or more of the currencies inside the strategic benchmark while still preserving the integrity of the portfolio. Table 2 summarises the extent of allowed tactical deviations from the strategic benchmark.

<table>
<thead>
<tr>
<th>Currency</th>
<th>Benchmark allocation (%)</th>
<th>Tactical deviation range (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USD</td>
<td>25</td>
<td>+/- 5</td>
</tr>
<tr>
<td>EUR</td>
<td>25</td>
<td>+/- 5</td>
</tr>
<tr>
<td>JPY</td>
<td>5</td>
<td>+/- 5</td>
</tr>
<tr>
<td>GBP</td>
<td>15</td>
<td>+/- 5</td>
</tr>
<tr>
<td>CAD</td>
<td>10</td>
<td>+/- 5</td>
</tr>
<tr>
<td>AUD</td>
<td>20</td>
<td>+/- 5</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

VaR refers to Value at Risk – this being the level of daily losses the Reserve Bank might expect to exceed on one in every hundred trading days.

5 Conclusion

The inclusion of unhedged foreign reserves into the Reserve Bank’s foreign reserves implied a significant increase in the Reserve Bank’s exposure to FX risk and required a close examination of the choice of currencies included in the Reserve Bank’s reserves portfolio to ensure this higher level of risk is appropriately managed. The Reserve Bank’s new
strategic benchmark achieves this by systematically trading off the risk and return associated with alternative currency choices, giving the Reserve Bank the best combination of risk and return.

References
DISCUSSION PAPERS

DP2010/04
Internationalised production in a small open economy
Aurélien Eyquem and Güneş Kamber

We show that internationalised production, modelled as trade in intermediate goods, brings the dynamics of a small open economy closer to that observed in the data. We build a stylised new-Keynesian small open economy model and we show that when production is internationalised, movements of international relative prices affect the economy through an additional channel, denoted as the ‘cost channel’. Both qualitatively and quantitatively, this channel (i) increases the share of output variance explained by foreign shocks, consistent with empirical evidence, (ii) implies that the exchange rate pass-through is closer to estimated values, and (iii) increases the international correlation of output relative to that of consumption.

DP20010/05
Using estimated models to assess nominal and real rigidities in the United Kingdom
Güneş Kamber and Stephen Millard

This paper aims to contribute to our understanding of inflation dynamics in the United Kingdom by estimating two dynamic stochastic general equilibrium models and assessing the role of nominal and real rigidities within them. We first obtain an empirical representation of the monetary transmission mechanism in the United Kingdom and then estimate the models by minimising the difference between this representation and its model equivalents. We find that both models can explain the data reasonably well without relying on undue amounts of price and wage stickiness.
NEWS RELEASES

A balancing act for New Zealand’s economic recovery

14 June 2010

As New Zealand is now back on a growth track, we could be doing more to reduce economic imbalances, especially external debt, Reserve Bank Governor Alan Bollard said today.

Dr Bollard told the Wellington Chamber of Commerce that New Zealand has taken action to address some of its imbalances, but households and banks can do more to reduce risks inherent in the external imbalance.

Dr Bollard said the state of balance of the New Zealand economy can be viewed through four different, but inter-related, lenses: funding imbalances for banks, fiscal imbalances of the government, savings imbalances by households, and external imbalances.

Resilience of bank funding has been bolstered by a liquidity policy imposed by the Reserve Bank, and the government accounts have a credible and improving track. But households remain the most obvious source of imbalance, with balance sheets heavily skewed to housing, high debt ratios, and very low savings.

“We believe New Zealanders have decided they are overexposed to property assets and to high debt, and they are prepared to constrain consumption to improve their savings. The question is how much rebalancing they contemplate, and for how long.”

On the external account, the trade balance has improved with strong export prices and less demand for imports from consumers, farmers and businesses. But a large deficit on the investment income balance is showing no signs of enduring improvement, and the strong New Zealand dollar has not helped.

“Indeed it will be difficult to improve this metric as it will require us to get our net external debt position on to a downward trend. The financing consequences of years of running external deficits mean that foreigners have more than twice as much invested in New Zealand as we have invested overseas.

“Our net external liabilities cannot keep increasing with impunity. Ultimately either the markets will penalise us by requiring a larger premium for its continued funding, and/or the sheer size of servicing our obligations will become an intolerable burden to the country. But rather than await such painful punishments, we should be looking to improve the situation.

“Some of this is largely outside our control, like the relative valuations of major currencies. But there is a lot that can be and is being done: designing fiscal and tax policy to reduce vulnerabilities, putting in place cautious bank regulation, and improving access to a range of investment opportunities. Ultimately, however, it is up to New Zealanders to improve the quantity and quality of household savings.”

Deposit-taker regulations gazetted

25 June 2010

The Deposit Takers (Credit Ratings, Capital Ratios, and Related Party Exposures) Regulations 2010 were gazetted yesterday and will come into force on 1 December 2010.

Reserve Bank Deputy Governor Grant Spencer said that under the regulations deposit-taking finance companies, building societies and credit unions will be required to maintain a minimum capital ratio, and to limit the amount of credit they can provide to related parties.

“In particular, deposit takers’ minimum capital ratios must not be less than 8 percent if the deposit taker has a credit rating and not less than 10 percent if the deposit taker does not have a credit rating. Deposit takers’ limits on aggregate exposures to related parties must be not more than 15 percent of their capital,” said Mr Spencer.

The new regulations also reiterate the type of credit rating deposit takers with liabilities of more than $20 million must have. This requirement has been in force since 1 March 2010.

“The governance requirements for deposit takers in the Reserve Bank Act will also come into force on 1 December 2010. From that date most deposit takers will need to have two independent directors and a non-executive chairperson.
“Overall the regulations will serve to improve investor confidence, as well as promote improved risk management by deposit takers,” Mr Spencer concluded.

Extensive public consultation was undertaken throughout 2009 on the policy behind the regulations and a further round of consultation was undertaken earlier this year on the draft regulations.

Questions and Answers and information on the new regulations can be accessed on the Bank’s website.

Reserve Bank SOI shows commitment to stability
30 June 2010

The Reserve Bank’s Statement of Intent 2010-2013 reflects a commitment to maximise its contribution to sustainable economic growth by ensuring financial system stability and price stability, Governor Alan Bollard said today when releasing the SOI.

New Zealand has emerged from its recession, benefiting from stronger growth in its major trading partners in China, Australia and emerging Asia. However, recovery remains sluggish in the UK and Europe, and sovereign debt concerns hovering over several European economies are disturbing financial markets.

Dr Bollard acknowledged there is a lively debate in New Zealand about the role of monetary policy in managing financial misalignments. “For our part, we are confident that medium-term price stability is the right objective for monetary policy. However, the Bank has been investigating the potential for macro-prudential policy tools to help support the traditional OCR instrument. The SOI shows we will continue this work,” he said.

“As banking supervisors, we are engaging in global discussions on changes to the international bank supervision regime that will help to reduce the chances of future financial crises.”

Dr Bollard said that the domestic economic recovery continues and, as indicated in the recent Monetary Policy Statement, the Bank expects to continue unwinding the current degree of monetary policy stimulus.

“While we have unwound most of the emergency liquidity support provided to the financial system during the financial crisis, our facilities remain under review given the current volatility in global markets.” He added that, although New Zealand has emerged from its recession, there were almost daily reminders that conditions remain fragile, especially in the global funding markets.

Dr Bollard said the SOI shows the Bank will continue to advance the implementation of the new Non-Bank Deposit Taker (NBDT) regime, concurrent with the gradual rationalisation of the finance company sector. The Bank will also continue to develop and implement the new prudential regime for the insurance sector.

At the same time, the Bank is guarding against other potential crises with a key initiative being the establishment of a business support centre in Auckland to improve its business continuity and disaster-recovery capability.

Dr Bollard said the Bank’s budget reflects the emerging environment. A new five-year Funding Agreement has been agreed with the Minister for the period 1 July 2010 to 30 June 2015.

“While ensuring that funding is available to carry out existing functions and new responsibilities, we have also been particularly conscious of the need to maintain strong financial disciplines and to carefully prioritise expenditure proposals,” he said.

The Bank’s budget for 2010–11 shows operating expenditure of $47.8 million, an increase of $0.9 million over last year’s Funding Agreement of $46.9 million, reflecting the Bank’s increased responsibilities in the Prudential Supervision area.

“This SOI reflects our response to the emerging financial and economic environment,” Dr Bollard concluded.

June 2010 Bulletin released
30 June 2010

The Reserve Bank today released the June 2010 issue of the Reserve Bank of New Zealand Bulletin.
Internationally, attention is turning towards new macro-prudential instruments that might enhance the stability of the financial system. The lead article, by Deputy Governor Grant Spencer, places the Reserve Bank’s macro-financial stability function within the international context and reviews the appropriate policy framework in light of the global financial crisis.

The recent international financial crisis has illustrated a variety of mechanisms through which financial markets and institutions can amplify business cycles, with potentially severe impacts on the real economy. The second article considers how the financial sector may contribute to credit booms and, in turn, business cycles in New Zealand.

The third article examines global trade linkages and how these trade linkages matter for New Zealand. The authors find that New Zealand is dependent on Australia and the broad emerging-Asia region. In turn, many countries are heavily influenced by output in the US and Euro area and more so than might be thought by a simple examination of bilateral trade data.

The final article outlines the nature and rationale for the significant changes in the structure and management of the Reserve Bank’s balance sheet that have occurred over the past five years. The Bank’s experience during the global financial crisis suggests the changes to the management of the Bank’s balance sheet have been effective in supporting the Bank’s functions at a time of system stress.

Reserve Bank Funding Agreement ratified
20 July 2010

A new five-year Funding Agreement (PDF 615KB) ratified by Parliament today ensures the Reserve Bank has resources for its existing and expanded roles, while reflecting tight control of underlying costs, Governor Alan Bollard said.

Unlike other government agencies, the Bank’s operating expenditure is funded from income from investments under a five-year funding agreement between the Minister of Finance and the Governor, reflecting the Bank’s operational independence.

The current Funding Agreement, signed in April 2005 and varied in April 2008, expired at the end of June 2010. The new Funding Agreement sees the Bank’s operating expenditure increase from $46.9 million in 2009-10, to $47.8 million in 2010-11, and then increasing to $56.4 million by the final year, 2014-15.

Dr Bollard said the increase in expenditure reflects additional responsibilities Parliament has given, or is in the process of giving, to the Bank, as well as the initial stages of an upgrade of New Zealand’s bank notes, and the establishment of an office in Auckland.

“The Bank has been given responsibility for the prudential regulation of non-bank deposit takers, and, if legislation passes, will shortly take on responsibility for prudential oversight of insurers. We also have a new role to play in anti-money laundering and countering the financing of terrorism,” Dr Bollard commented.

“The new Funding Agreement provides for the early stages of an upgrade of New Zealand’s bank notes, which will be 15 years old by the end of the agreement. A new small office is also being established in Auckland to ensure ongoing provision of key banking and market services in the event of a natural or infrastructure crisis in Wellington.”

Dr Bollard said the new five-year Funding Agreement has been negotiated in an environment of considerable scrutiny. The Bank was required to demonstrate value for money and tight control of underlying costs.

Disclosure review to reduce compliance costs
6 August 2010

The Reserve Bank is inviting submissions on proposals to change the current disclosure regime for registered banks.

Releasing a consultation document, Deputy Governor Grant Spencer said a key objective of the review is to reduce compliance costs associated with current disclosure requirements first introduced in 1996.

“We also want to better match the needs of the key stakeholders,” Mr Spencer said. “This review is likely to significantly reduce and modify the Reserve Bank’s disclosure requirements, while introducing other ways of collecting information for prudential purposes.”
Every quarter banks are currently required to publish a high-level Key Information Summary (KIS); a detailed General Disclosure Statement; and a Supplemental Disclosure Statement containing background documents. In addition, banks face other disclosure requirements through the Financial Reporting Act 1993 and the Securities Act 1978.

Mr Spencer said the existing disclosure regime was designed to improve market discipline on the banks, to increase the public's financial awareness, and to strengthen directors' responsibilities. However, feedback suggests that the current disclosure requirements may not be the most effective way of meeting these objectives.

The consultation document puts forward two preferred options for change in the bank disclosure regime. However, the Reserve Bank does not want to be prescriptive and welcomes ideas on alternative approaches, Mr Spencer said.

The consultation document (PDF 497KB) can be downloaded from the Reserve Bank's website.

**National finalists announced in Monetary Policy Challenge**

**16 August 2010**

The Reserve Bank today named the six secondary schools that have made it to the national final of the 2010 Monetary Policy Challenge (MPC).

The finalists were selected from 45 schools that competed in regional finals from 6 to 13 August 2010. Three economists from the Reserve Bank were judges.

The national finalists are: Kristin School from the Auckland regional final; Tauranga Boys' College from the Hamilton regional final; Scots College from the Wellington regional final; Christchurch Girls' High School from the Christchurch regional final; and Timaru Boys' High School from the Dunedin regional final. St Kentigern College from the Auckland regional final was selected as the 2010 Wildcard entry.

The judges were impressed with the calibre of presentations this year, and said that deciding the overall national finalists was a very difficult task.

The MPC is designed to enhance senior secondary school economics students' understanding of monetary policy and links to NCEA achievement standards.

Like economists working in the Reserve Bank, each team analyses the economic conditions facing New Zealand and the outlook for inflation. On the basis of that analysis, they decide on an appropriate setting for the Official Cash Rate (the Reserve Bank's interest rate). Each team presents the reasons for their decision in a written submission and, if selected as a regional finalist, an oral presentation.

The national final takes place at the Reserve Bank in Wellington on 26 August 2010. The winning team will receive $2,500 for their school and will be invited back to the Reserve Bank on 16 September 2010 to watch the Governor announce the *Monetary Policy Statement*.

**RBNZ MPS/OCR and FSR dates for 2011**

**18 August 2010**

The following is the Reserve Bank's schedule for the release of its 2011 quarterly *Monetary Policy Statements*, the intervening Official Cash Rate announcements, and the six-monthly *Financial Stability Reports*.

Each *Monetary Policy Statement* includes within it an OCR announcement, so, as usual, in total there will be eight OCR announcements during 2011. Each announcement will be made at 9.00 am on the day concerned.

For the first time, the Bank is also adding the first six months' dates for the following year to assist financial markets' planning, but these 2012 dates are provisional, subject to confirmation in August 2011.
The Financial Stability Report release dates are also released for 2011 and the first half of 2012.

2011
11 May Financial Stability Report
9 November Financial Stability Report

2012
9 May Financial Stability Report

The Reserve Bank reserves the right to make changes to this schedule, if required, due to unexpected developments. In that unlikely event, the markets and the media will be given as much warning as possible.

Keeping inflation anchored
19 August 2010

Given the fragile economic recovery, it is important that firms base their pricing decisions on low underlying inflation, not the upcoming temporary spike, Reserve Bank Governor Alan Bollard said today.

Speaking to the Taranaki Chamber of Commerce, Dr Bollard had a particular message of restraint for those public and private sectors that have a record of increasing prices by more than the rate of economy-wide inflation. He warned that if businesses, labour groups and households use the upcoming GST increase as a veil to increase margins and wages, they will simply spread inflation and harm the recovery.

Dr Bollard said inflation has been well contained recently, with consumer prices increasing 1.8 percent in the year to June. Although the recovery is certainly not a fast or robust one, underlying inflationary pressures are expected to increase somewhat as the economy moves into its second year of recovery.

“We expect growth to continue, led by exports as household and business spending remains subdued. This outlook and associated policy implications will be reviewed over coming weeks as we prepare the September Monetary Policy Statement.”

As the economy grows, employment levels will increase, and plant and equipment will be worked harder. But consumer price inflation is forecast to remain comfortably inside the target band in the second half of the Bank’s forecast horizon.

“However, the most significant event is the increase in the rate of GST on 1 October. This will push headline inflation substantially higher. Our current expectations of the peak in inflation are around 5 percent. But we expect that spike in inflation to be short-lived, and the inflationary effects should be largely out of the system by later next year.”

Dr Bollard said that while higher headline inflation would pose a challenge for monetary policy, the Bank’s Policy Targets Agreement with government allows it to “look through” temporary inflation spikes.

“The degree to which monetary policy can ‘look through’ temporary inflation spikes depends crucially on the extent to which New Zealanders’ inflation expectations are impacted by such spikes. The price and wage setting behaviour of firms and households will be monitored for evidence of indirect and second-round effects on inflation. For now, it is assumed that the coming policy changes will have only limited impact on perceptions of future inflation.

“However, there are examples of persistent price increases in sectors such as energy and local authorities that have not suffered persistent cost increases, and these have an inflationary effect.
“Monetary policy would need to respond if inflation expectations and prices were ratcheted up significantly. The result would be higher interest rates and a dampening of the economic recovery. We are hopeful this will not need to be the case, so that monetary policy can play as full a part as possible in supporting economic growth.”

National winners announced in Monetary Policy Challenge

27 August 2010

The Reserve Bank announced today that Kristin School from Auckland is the national winner of the Reserve Bank of New Zealand 2010 Monetary Policy Challenge (MPC). Tauranga Boys’ College was placed second and Scots College from Wellington came third.

The national final took place at the Reserve Bank in Wellington yesterday and was hotly contested. The judges were Assistant Governor John McDermott and two economists from the Bank.

Kristin School won $2,500 in prize money for their school and will visit the Reserve Bank on 16 September to watch the announcement of the next Monetary Policy Statement by Governor Alan Bollard.

Tauranga Boys’ College won $1,500 and Scot’s College won $750 in prize money for their respective schools. The other competitors in the national final were St Kentigern College (Auckland), Christchurch Girls’ College and Timaru Boys’ High School.

The judges said the finalists performed to a very high standard, and determining the winning school was a very difficult task. They were particularly impressed with the depth of economic understanding shown by Kristin School.

“Kristin School demonstrated exceptional understanding of economics and how monetary policy operates in New Zealand. They provided a comprehensive analysis on the economy and worked really well together to answer some very challenging questions.”

The MPC is designed to expand senior secondary school economics students’ understanding of monetary policy, and it links to NCEA achievement standards.

Just like economists working in the Reserve Bank, each team analyses the economic conditions facing New Zealand and the outlook for inflation. On the basis of that analysis, they decide on an appropriate setting for the Official Cash Rate (the Reserve Bank’s interest rate). Each team provides the reasons for their decision in a written submission and, if selected as a regional finalist, an oral presentation.

Reserve Bank Assistant Governor John McDermott said:

“Rather than just expecting students to learn established facts, this competition confronts them with the challenges, ambiguity and uncertainty of actual decision making.”

The MPC is open to all New Zealand secondary school economics students and runs annually from May to August.

Insurance law provides greater certainty

30 August 2010

The enactment of the Insurance (Prudential Supervision) Bill provides increased certainty for New Zealand insurance policy holders, Finance Minister Bill English says.

The Bill, passed last week, makes the Reserve Bank of New Zealand the prudential regulator of all insurance providers that carry out insurance business in New Zealand. It is the first time the New Zealand industry has been subject to legislated prudential regulation.

“The Bill’s main purpose is to promote the maintenance of a sound and efficient insurance sector. Policyholders will benefit from greater certainty their insurer has sufficient financial strength to ensure it can pay claims when they are made,” Mr English says.

“In addition, it is a clear signal to the rest of the world that New Zealand is aligning itself with established trends in overseas insurance regulation. “The strong consultative and collaborative approach followed in developing this legislation has ensured the Act does not impose excessive or unnecessary compliance costs on providers and is generally accepted by the industry,” Mr English says.

The implementation phase of the new Act will include a transitional period of up to three years to enable insurers to bring themselves into compliance with the new requirements.
Foreign exchange and derivative turnover survey

1 September 2010

New Zealand’s foreign exchange market handled an average of US$9.5 billion per day in April 2010 (relative to US$13 billion, US$7.5 and US$4.2 billion per day in April 2007, April 2004 and April 2001 respectively), according to a Reserve Bank survey released today.

These results are part of a triennial survey of 53 central banks and monetary authorities co-ordinated by the Bank for International Settlements (BIS) and reported in US dollars. In New Zealand the survey captures the activity of the five major banks participating in the local wholesale financial markets.

Commenting on the survey, Head of Financial Markets Simon Tyler said: “Since 2007, foreign exchange turnover in New Zealand has decreased by almost 31%. Much of the decline is due to a fall in foreign exchange swap transaction volume, only a modest 3% is due to a fall in the New Zealand dollar versus the United States Dollar since April 2007. This contrasts sharply with international data which show a 20% increase in global foreign exchange turnover (including spot transactions, outright forwards and foreign exchange swaps) to $4.0 trillion per day from $3.3 trillion in April 2007.

“The decrease in foreign exchange derivatives turnover (cross-currency swaps and foreign exchange options) in New Zealand mirrored that in the non-derivatives, with a 33% fall in turnover since 2007.

“The survey also covers single currency interest rate derivative products, such as forward rate agreements and interest rate swaps. Average daily turnover in these products was US$1.6 billion – a 45% decrease since 2007.

“Overall, the falls in transaction volumes in New Zealand and the New Zealand dollar have been mainly driven by less overseas interest in the New Zealand dollar and a shift from short to longer-term funding by New Zealand’s banks.”

This news release follows similar releases from the BIS and other central banks at 0100 CEST today. More details of the results are contained in the attached information note. The BIS preliminary global report can be found at http://www.bis.org/publ/rpfx10.htm.

New designated settlement system

3 September 2010

The Reserve Bank of New Zealand and the Securities Commission today announced that the newly established NZCDC Settlement System has been declared a designated settlement system under Part 5C of the Reserve Bank of New Zealand Act.

The Reserve Bank and Securities Commission are joint regulators of designated settlement systems. The NZCDC Settlement System is operated by New Zealand Clearing and Depository Corporation, a wholly-owned subsidiary of NZX Limited.

Reserve Bank Head of Prudential Supervision Toby Fiennes, and Securities Commission Chairman Jane Diplock said the designation gives statutory backing to the finality of settlement and netting of transactions through the system so that in the event of failure by a participant, transactions cannot be unwound. Designated settlement systems are subject to ongoing oversight by the Securities Commission and the Reserve Bank. However, it is not compulsory for settlement systems operating in New Zealand to be designated.

New Zealand has two existing designated settlement systems: the Reserve Bank’s Exchange Settlement Account System and the Continuous Linked Settlement System operated by CLS Bank International.

A settlement system will only be recommended for designation after a thorough assessment by the regulators, they said. The regulators assess, amongst other things, the clarity and legal certainty of the rules of a system, its financial soundness and risk management policies, and the capability and capacity of the operator.

Questions and answers on the new settlement system are available on the Reserve Bank website http://www.rbnz.govt.nz/finstab/payment/3816027.html.
OCR unchanged at 3.0 percent

16 September 2010

The Reserve Bank today left the Official Cash Rate (OCR) unchanged at 3.0 percent.

Reserve Bank Governor Alan Bollard said: “While the global and domestic economies continue to recover, the outlook has weakened since our June Statement. We consider it appropriate at this point to keep the OCR on hold.

“The earthquake that struck Canterbury on 4 September has significantly disrupted economic activity and is likely to continue to do so for some time yet. Many homes and businesses have been damaged, as have significant parts of Canterbury’s public infrastructure. Eventual reconstruction and repairs will require considerable resources over the next year or two, particularly in the construction sector. If, in the aftermath of the earthquake, the prices of some goods and services increase temporarily, monetary policy would remain focused on the medium-term trend in inflation. The Policy Targets Agreement explicitly instructs the Bank to look through temporary price increases generated by a natural disaster.

“Looking more generally at the domestic economy, the household sector remains cautious, with consumer spending soft, house sales falling and house prices remaining flat. With continued soft demand for credit, this suggests household spending will not increase to the extent previously projected.

“The pace of expansion in the global economy appears to have slowed in recent months with forward indicators of US growth, in particular, deteriorating noticeably. Nevertheless, continued strong growth in Australia and China will support demand for New Zealand exports, reinforcing the continued contribution of high export commodity prices.

“Overall, despite the weakened outlook, we still expect that growth will progressively absorb current surplus capacity over the next few years. In addition, changes to indirect taxes and earthquake impacts will cause headline inflation to spike higher over the coming year. Previous experience of GST increases, the fact that annual CPI inflation has been near 2 percent for the past year and a half, and the subdued state of domestic demand suggest this inflation spike will have little impact on medium-term inflation expectations.

“Over time, it is likely that further removal of monetary policy support will be required. The pace and extent of further OCR increases is likely to be more moderate than was projected in the June Statement.”
PUBLICATIONS

Regular publications
- Annual Report
- Financial Stability Report
- Monetary Policy Statement

Reserve Bank of New Zealand Statement of Intent, 2010-2013

Recent Reserve Bank Discussion Papers

2009
- **DP2009/04** Forecasting national activity using lots of international predictors: an application to New Zealand
  Sandra Eickmeier and Tim Ng
- **DP2009/05** Using wavelets to measure core inflation: the case in New Zealand
  David Baqaee
- **DP2009/06** Analysing wage and price dynamics in New Zealand
  Ashley Dunstan, Troy Matheson and Hamish Pepper
- **DP2009/07** Developing stratified housing price measures for New Zealand
  Chris McDonald and Mark Smith
- **DP2009/08** Evaluating a monetary business cycle model with unemployment for the Euro area
  Nicolas Groshenny
- **DP2009/09** Entrepreneurship and aggregate merchandise trade growth in New Zealand
  Richard Fabling and Lynda Sanderson
- **DP2009/10** A theoretical foundation for the Nelson and Siegel class of yield curve models
  Leo Krippner
- **DP2009/11** A cobweb model of financial stability in New Zealand
  Paul Bedford and Chris Bloor
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  Viv B Hall and C John McDermott
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  Richard Fabling and Arthur Grimes
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  Anthony Garratt, James Mitchell and Shaun P. Vahey
- **DP2009/16** Structural macro-econometric modelling in a policy environment
  Martin Fukac and Adrian Pagan
- **DP2009/17** Global shocks, economic growth and financial crises – 120 years of New Zealand experience
  Michael D Bordo, David Hargreaves and Mizuho Kida
- **DP2009/18** Forecasting New Zealand’s economic growth using yield curve information
  Leo Krippner and Leif Anders Thorsrud
- **DP2009/19** Whatever next? Export market choices of New Zealand firms
  Richard Fabling, Arthur Grimes and Lynda Sanderson
- **DP2009/20** Measuring changes in firm-level volatility – an application to Japan
  Emmanuel De Veirman and Andrew Levin

2010
- **DP2010/01** Evaluating household expenditures and their relationship with house prices at the microeconomic level
  Mark Smith
- **DP2010/02** All together now: Do international factors explain relative price co-movements?
  Özer Karagedikli, Haroon Mumtaz and Misa Tanaka
- **DP2010/03** Multi-period fixed-rate loans, housing and monetary policy in small open economies
  Jaromír Beneš and Kirdan Lees
- **DP2010/04** Internationalised production in a small open economy
  Aurélien Eyquem and Güneş Kamber
- **DP2010/05** Using estimated models to assess nominal and real rigidities in the United Kingdom
  Güneş Kamber and Stephen Millard
A full list of Discussion Papers is available from Administration, Economics Department.

**Selected other publications**

*Testing stabilisation policy limits in a small open economy: proceedings from a macroeconomic policy forum*

*Finance and Expenditure Select Committee inquiry into the future monetary policy framework: submission by the Reserve Bank of New Zealand*

**Pamphlets**

*Explaining Currency*

*Explaining Monetary Policy*

*The Reserve Bank and New Zealand’s Economic History*

*This is the Reserve Bank*

*Your Bank’s Disclosure Statement – what’s in it for you?*

*Snakes and Ladders – a guide to risk for savers and investors, by Mary Holm*

For further information, go to [www.rbnz.govt.nz](http://www.rbnz.govt.nz), or contact:

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Articles in recent issues of the Reserve Bank of New Zealand Bulletin

Vol. 72, No. 3, September 2009
- Quality of bank capital in New Zealand
- Anchoring fiscal expectations
- ‘Mordacious years’: socio-economic aspects and outcomes of New Zealand's experience in the Great Depression
- Financial crises, sound policies and sound institutions: an interview with Michael Bordo
- The financial crisis: whodunnit?
- Economic recovery

Vol. 72, No. 4, December 2009
- The Reserve Bank’s new liquidity policy for banks
- Assessing recent external forecasts
- Banking crises in New Zealand – an historical perspective
- The evolution of New Zealand’s trade flows

Vol. 73, No. 1, March 2010
- The crisis and the Reserve Bank’s stabilisation rate
- Twenty years of inflation targeting
- Inflation targeting, the financial crisis and macroeconomics: an interview with Mark Gertler
- How may the new architecture of financial regulations develop?
- Lessons from previous US recessions and recoveries
- The crisis and monetary policy: what we learned and where we are going
- Recent trends and developments in currency

Vol. 73, No. 2, June 2010
- The Reserve Bank and macro-financial stability
- Financial sector amplification and credit cycles in New Zealand
- World trade interdependencies: a New Zealand perspective
- The Reserve Bank’s new approach to holding and managing its foreign reserves