Methodology for risk-free discount rates and CPI assumptions for accounting valuation purposes

Review of long-term economic assumptions

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THE TREASURY
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New Zealand Government

Contents

1. Introduction

1.1. Background and purpose

1.1.1. The Methodology for Risk-free Discount Rates and CPI Assumptions for Accounting Valuation Purposes is set out in a report dated July 2010 (referred to as the Methodology report). As set out in paragraph 2.5.1 of that report, the intent at the time was for the long-term real-return assumption to reviewed two yearly.

1.1.2. This paper has been prepared to document the review of the long-term real-return, long-term risk-free discount rates and corresponding Consumer Price Index (CPI) assumptions for use in certain accounting valuations that are reported to the Crown for consolidation purposes.

1.1.3. Reviews of the long-term assumptions are envisaged to be done every two years or if there have been significant market changes. This review is a two yearly review and is also in response to the significant global debt market changes driven by the European debt crisis in the second half of 2011.

1.1.4. A review of the bridging methodology is also required due to the currently significant difference between the forward rates at the end of the yield curve (4.4%) and the long-term rate assumption.

1.2. Approach

1.2.1. In order to review the long-term assumptions, the Treasury contracted PricewaterhouseCoopers (PwC) to:

- consult with the Treasury forecasters and other stakeholders

- update the historical measures referred to in sections 5 to 7 of the Methodology report (long-term real risk-free discount rates, long-term nominal risk-free discount rates and long-term inflation)

- identify relevant international research completed since the Methodology report was published and comment on the implications for the long-term assumptions

- update the forecasters views referred to in sections 5 to 7 of the Methodology report

- review the methodology of bridging the short-term discount rates into the long-term discount rate.

1.2.2. As a result of the consultation with stakeholders, in-depth comment was received from the Treasury forecasters, the Accident Compensation Corporation (ACC), the National Provident Fund and the Government Superannuation Fund (GSF). The actuaries to the Earthquake Commission commented that long-term assumptions did not have any significant impact on their work.

2. Long-term real risk-free discount rates

2.1. Introduction

2.1.1. This section sets out the review of the long-term real risk-free rate.

2.1.2. The long-term real risk-free rate is considered first because this is the primary driver of the value of cash flows that are inflated. In addition, it is reasonable to expect the real return to be robust to changes in long-term inflation outlook.

2.1.3. The real risk-free interest rate is the theoretical rate of return of an investment with zero risk, after taking into account the effects of inflation. The real risk-free rate represents the real return an investor would expect from an absolutely risk-free investment over a given period of time.

2.1.4. It was concluded in the Methodology report that the most suitable proxy for risk-free rates in New Zealand is the yield on government stock. Therefore, in the long-term context, it is consistent that the resulting risk-free rate assumed is cross-checked against available market data of long-term real returns on government bonds in New Zealand.

2.2. Summary

2.2.1. In the absence of any long-duration market data in New Zealand judgment is requirement in selecting the rate. Recent historical real risk-free returns, returns on long-term New Zealand index-linked bonds (if any), returns on relevant offshore index linked bonds and economic theory are all relevant to selecting the long-term real risk-free discount rate.

2.2.2. The Methodology report concluded that the long-term real return for New Zealand is in the range of between 3.0% pa and 4.0% pa, and selected 3.5% pa, being the mid-point of the range.

2.2.3. Recent market developments raise considerable uncertainty in the future outlook and suggest that the bottom of the range has dropped, and a revised range is now 2.5% to 4.0%.

2.2.4. In summary:

- The difference between 5 to 10 year forward rates on New Zealand government stock and CPI has generally been in the range of 3% pa to 4% pa for the last 11 years. There has been significant volatility around the average throughout the period investigated, and the extent to which the most recently calculable gap is below the trend is not unusual.

- Market yields since late 2011 imply a gap between forward rates and CPI of 2.5% to 3.0%, and there continues to be downward pressure on rates.

- The New Zealand index linked stock no longer provides any useful information about longer term real yields as the duration of this stock is now only 4 years.

- US index linked stock suggests a long-term real rate on a hypothetical 30 year inflation linked New Zealand government stock of approximately 2.5% pa to

3.0% pa currently, or a range for a hypothetical 20 year stock of 2.0% to 4.0% since 2004.

- If world market rates continue at their current level then it will be necessary to reduce the long-term assumption at some stage.

- Much of the movement in rates is driven by a global flight to quality; there is some evidence that a scarcity premium could be applied to interest rates. This will also impact on short-term nominal rates as well. The possibility of short-term rates being understated is another argument for not overreacting on reducing the long-term rate

2.2.5. The market data presented below would suggest a long-term assumption of 3.0%, the current assumption is 3.5% and the Treasury view for the purposes of fiscal forecasts is that there is no need to change the assumption at this stage.

2.2.6. In our view the evidence is not yet compelling that there has been a fundamental change in very long term outlook. A possible response would be to reduce the assumption to 3.25% for 30 June 2012 valuations and continue to review it every six months.

2.2.7. Whether to reduce the assumption fundamentally comes back to the philosophy of a long-term rate, the whole purpose of a long-term rate is undermined if there is too frequent a review.

2.2.8. It is our view and the view of the majority of stakeholders there is as yet insufficient evidence to reduce the assumption. Consequently we continue to recommend a long-term real return assumption of 3.5% pa.

2.2.9. The assumption will need to be reassessed every 6 months as the situation unfolds. This does not need to be a complete review, but the judgements made above need to be reassessed in light of an extra six months of market data.

2.3. Analysis

2.3.1. The analysis of the long-term real rate of return is summarised beneath the following three headings; historical rates, indexed linked stock and comments from stakeholders.

Historical rates

New Zealand government bond rates compared to inflation

2.3.2. In reviewing the historical real risk-free rate we have looked at the difference between interest rates and inflation rates in the past. There are a number of ways of considering this. The first is to look at 1 year interest rates compared to inflation expectations for the following year. Data on inflation expectations is not readily available, so instead we have performed this analysis retrospectively using actual inflation data compared to 1 year interest rates as at the start of that year. Because of this lag the graph only goes to December 2010.

2.3.3. The following graph shows the historical difference between 1 year forward rates at the start of the year for New Zealand government stock and actual inflation for that year, as measured by CPI.

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Figure 1 – 1 year bond (forward rate) less inflation (next year)

Historical gap between 1 year government bond yield and 1 year average forward CPI inflation

- - - 3 yr average of gap
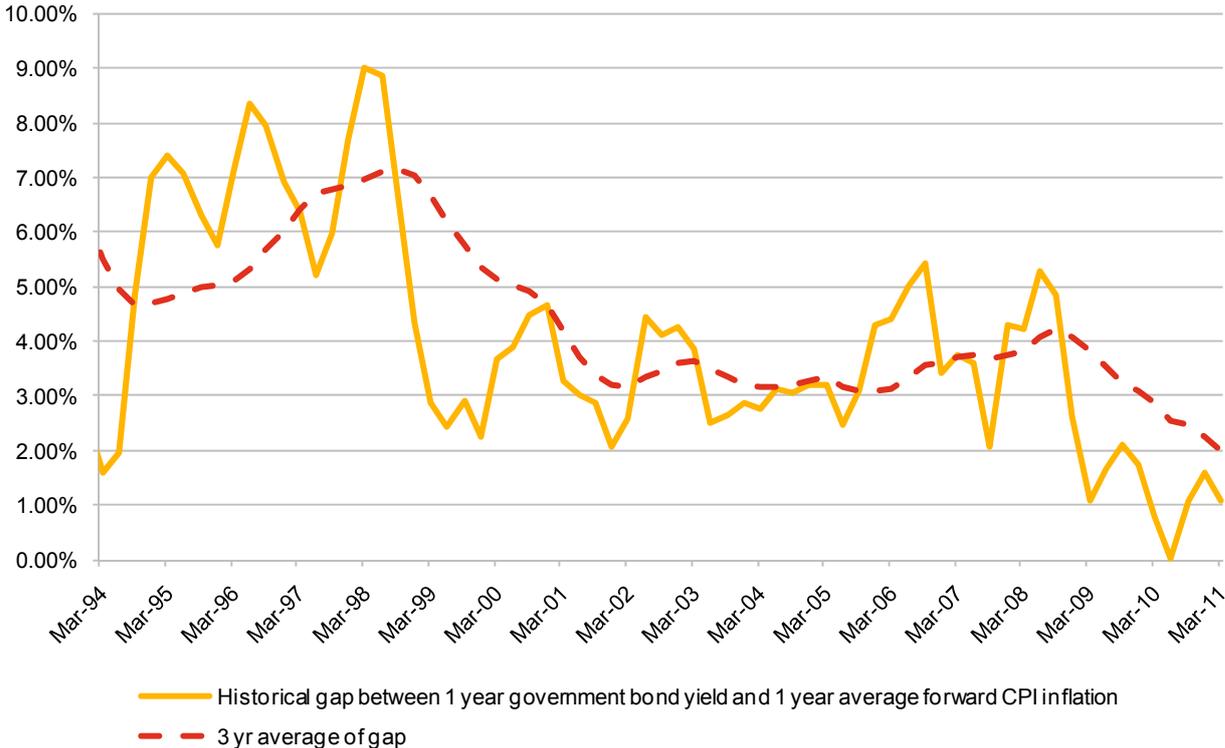
2.3.4.   The graph shows that interest rates on 1 year government stock have been between 3% pa and 4% pa higher than CPI inflation over the period 1999 to 2008. Since then, the observed gap has narrowed significantly, due to the dramatic drop in short-term interest rates. At March 2011 it was 1.08% pa above inflation.

2.3.5.   This comparison of 1 year rates is affected significantly by monetary policy either tightening or loosening and does not allow for the difference between 1 year yields and long-term yields.

2.3.6.   It is more relevant to look at the difference between long-term rates and inflation. The following graph shows the difference between 10 year forward rates on New Zealand government stock at the start of the year and the average inflation experienced over the following ten years.

Figure 2 – 10 year bond less average inflation in following years

Legend:
— Historical gap between 10 year government bond yield and 10 year average forward CPI inflation
······ Historical gap between 10 year government bond yield and x year average forward CPI inflation
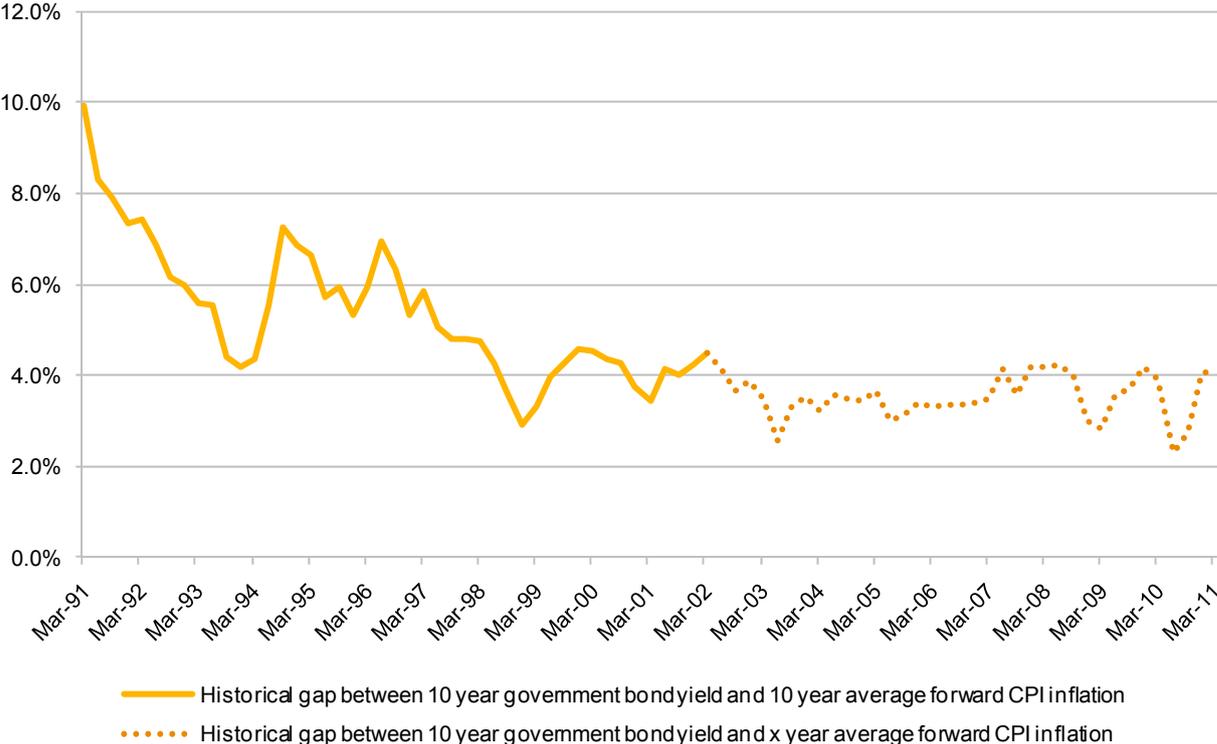
2.3.7. For up to March 2002, the gap has been calculated as the difference between the 10 year government bond yield and the average annual CPI inflation over the following 10 years.

2.3.8. From March 2003 (inclusive) and onwards, the number of years over which the CPI inflation is averaged is reduced by one as each year passes, as we only have historical data for CPI inflation up to March 2012. For example, for the data point March 2010, this is the 10 yield government bond yield at the end of the month, less the average CPI inflation over the following two years.

2.3.9. The 3 year average gap has been between 3% pa and 4% pa for the last 8 years, indicating that the difference between 10 year forward rates on New Zealand government stock and CPI has generally been in the range of 3% pa to 4% pa for the last 11 years.

2.3.10. There has been significant volatility around the average throughout the period investigated, and the extent to which the most recently calculable gap is below the trend is not unusual.

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New Zealand index linked stock

2.3.11. Inflation linked stock can be useful evidence of the market's view of real rates of return. In New Zealand, there is only one index linked stock on issue, issued in November 1995 and maturing in 2016. The history of this stock is shown in the graph below. The duration of this stock has become progressively shorter, from 20 years in 1995 to 4 years now.

Figure 3 – Real and nominal government bond yield history
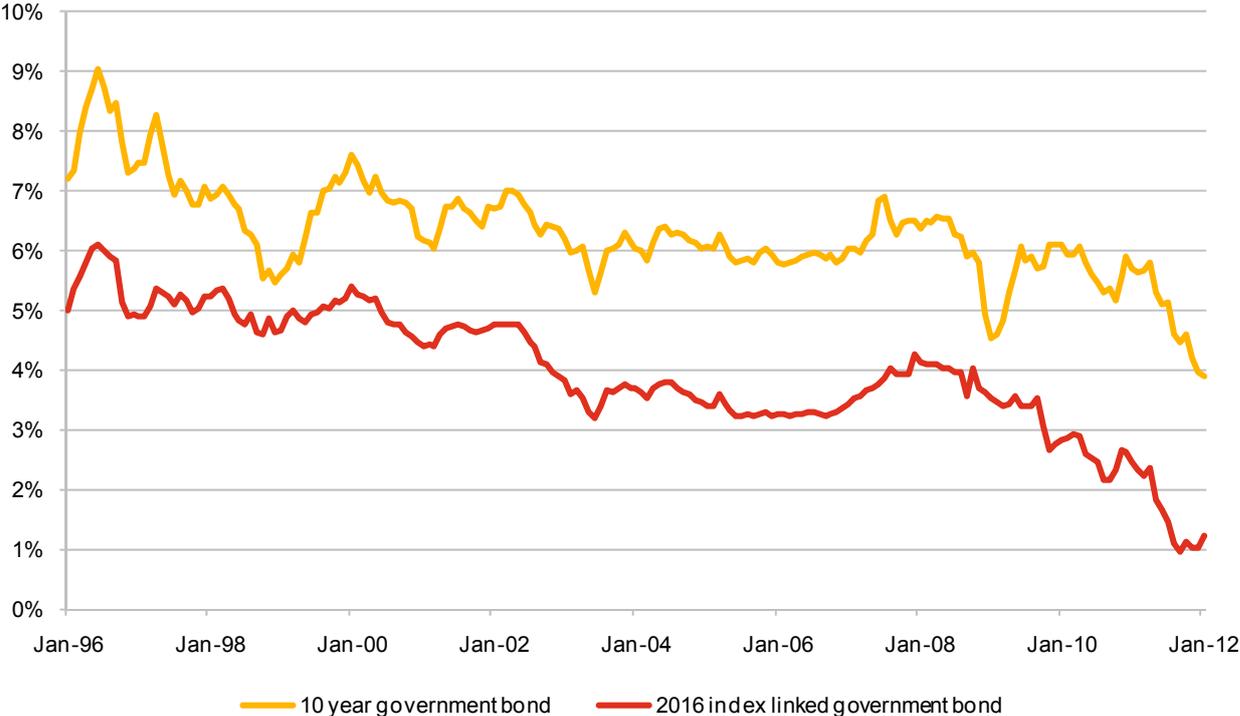
2.3.12. For the eight years between 2002 and 2010, the index linked stock has been trading to yield between 3% pa and 4% pa. Since then, the drop in yield has been driven mainly by the drop in short-term interest rates now that the duration of this stock is getting much shorter. The underlying inflation rate implied by the yield of the stock continues to be around 2.5%. As the duration of this stock is now only 4 years, it no longer provides any useful information about longer term real yields.

2.3.13. New issues of longer dated indexed stock, particularly longer than ten years, will provide additional information on longer term real yields. The New Zealand government announced in the 2012 Budget its intention to issue $2 billion of inflation-linked bonds in each of the 2012/13 and 2013/14 fiscal years.

2.3.14. If longer dated indexed stock were to become available, then how the yield at which they trade is incorporated into determining the expected long-term real risk-free discount rates will largely be a matter of judgement. Factors to be considered will be the duration of the stock, supply and demand pressures, as well as market factors for nominal stock.

2.3.15. The US Treasury quotes a 30 year index linked bond price. The return on this bond fell significantly in August 2011 to around 1.0% pa, and fell again in October 2011 to below 1.0% pa. Over the first three months of 2012, it has traded at a yield of 0.8% pa on average.

Figure 4 – US 30 yr index linked bond yields

2.3.16. Data for 30 year indexed bonds is not available further back than this. The graph below for 20 year bonds is reasonably comparable up until mid 2011 when short-term negative real returns have reduced the 20 year rate more than the 30 year rate.

Figure 5 – US 20 yr index linked bond yields

2.3.17. As discussed in 3.4.4, the long-term forward rates implied by US Treasury bonds are have averaged around 4.0% pa for the last 6 months. After allowing for a long-term US inflation outlook of between 2.0% pa to 2.5% pa, this implies a long-term real return of 1.5% pa to 2.0% pa. This can be put into a New Zealand context by adding a risk premium to reflect the extra risk of investing in New Zealand. The Treasury's assessment of this country risk premium, as discussed in the previous Methodology report is 1% pa.

2.3.18. This suggests a long-term real rate on a hypothetical 30 year inflation linked New Zealand government stock of approximately 2.5% pa to 3.0% pa currently or a range between 2.5% pa and 4.0% pa, since 2004.

Comments from stakeholders

The Treasury fiscal forecasts

2.3.19. The Treasury forecasts the New Zealand government fiscal position over the short term (1 to 5 years). In addition projections are provided for the medium and long term:

- medium term, 5 to 15 years

- long term, 15 to 40 years.

2.3.20. Relevant key inputs into these forecasts include:

- inflation rates (CPI and AWE)

- yield on 10 year government stock.

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2.3.21. The short term forecasts use the rates implied by the current government stock yield curve and short term inflation forecasts. The long-term forecasts use 6.0% pa yield on government stock, a CPI of 2.0% pa, and an AWE of 3.5% pa. There has been no change to the Treasury's long-term expectations following the European debt crisis. The Treasury economists expect rates to revert to the long-term "normal" and therefore have made no change to the assumptions that we compared to 2 years ago.

2.3.22. The only inconsistency in assumptions is the rate used for CPI, both PwC and the Treasury are comfortable with this difference as the assumptions are used for different purposes. The Treasury assumption of 2.0% pa is the mid-point of the RBNZ range of 1% pa to 3% pa. This reflects no bias in either direction in meeting this policy objective; the Treasury's assumption involves the simplest interpretation of this policy, i.e. the middle of this band.

2.4. International developments

2.4.1. Since the Methodology report in 2010, the European Insurance and Occupational Pensions Authority (EIOPA, formally CEIOPS) has published further guidance on the methodology to be used for setting discount rates for the purposes of Solvency II returns.

2.4.2. This methodology is very similar to the Treasury methodology, although some of the judgements that have been made are different. The methodology uses forward rates derived from the market yield curves up to the end of the yield curve. The rates are then extrapolated to an "Ultimate Forward Rate", which should be stable over time. The Ultimate Forward Rate has been determined by considering real returns first and then adding the real return to inflation expectations. The selected real return is 2.2% pa, which when added to inflation of 2.0% pa results in an Ultimate Forward Rate of 4.2%. As with US rate, a country risk premium would need to added to this to give a rate comparable to a New Zealand rate. If we used 1% then this would imply a real return of 3.2%.

2.4.3. This work was done before the major market movements in the second half of 2011. As far as we are aware, the Ultimate Forward Rates are not being reviewed as a result of the market movements.

3. Long-term nominal risk-free discount rates

3.1. Introduction

3.1.1. This section sets out the review of the long-term nominal risk-free rate. In this context long-term rates are rates for durations longer than the market yield curves available.

3.1.2. It is important that the nominal risk-free rate is a robust stand-alone assumption. This is important because the accounting standards place the most emphasis on the nominal risk-free rate. The standards require that the nominal risk-free rate is extrapolated from available market date. Minimal guidance is given on real rates of return and inflation assumptions in the standards.

3.1.3. The methodology is to determine the long-term nominal risk-free discount rate from available historical government bond yield and other available data.

3.2. Summary

3.2.1. Market data indicates:

- the forward yield curve for New Zealand government bonds currently indicates a long-term rate of less than 6% pa. This has been the case since August 2011, where long-term market forward rates have ranged between 5% pa and 6% pa with an average around 5.5% pa.

- The implied annual forward rate on the US bonds from 20 to 30 years is approximately 4.0% pa. New Zealand long-term bond rates have historically been around 2.0% pa higher than US rates, indicating a rate of about 6.0% pa. Alternately a country risk premium of 1.0% implies a rate of 5.0%.

- The forward rates implied by the longer term New Zealand SWAP rates (10 and 12 years) are around 0.3% higher than the forward rates at the end of the government stock yield curve.

3.2.2. The data overall indicates a nominal rate of 5.5%. The real, nominal and inflation rate need to be consistent. There is no reason to change the inflation rate of 2.5% and the nominal rate should be set at 2.5% plus the real return.

3.2.3. The judgement in Section 2.2 is to keep the real return at 3.5%, implying a nominal rate of 6.0%.

3.2.4. If the market yield curve continues to maintain the low current levels, the long-term rate may need to be reduced in the future.

3.3. Historical market yields on long-term New Zealand Government stock

3.3.1. The following graph shows the historical market yields on 10 year New Zealand government stock. The graph shows the monthly average of 10 year nominal stock from the RBNZ website, with the yields annualised. The graph also shows (pink line) the implied forward rate between the 5 and 10 year stocks. This line departs from the market rate as the yield curve becomes steeper, either positively or negatively.

Figure 6 – 10 year Government stock to April 2012

Legend: 10 year — 5 to 10 yr forward rate — 10 to 12 year forward

3.3.2. The significant drop in rates in August 2011, has seen the long-term forward rates in a range of 5% pa to 6% pa since, averaging around 5.5% pa. The further drop in the ten year spot rates since August 2011 has largely been driven by lower short-term rates.

3.3.3. The following graph shows similar information as Figure 6, but over the last 26 years.

Figure 7 – 10 year Government stock to April 2012

Legend: 10 year — 5 to 10 yr forward rate

3.3.4. The table below shows the average 10 year stock yields as well as comparative CPI, real and GDP figures for various periods through to 14 May 2012.
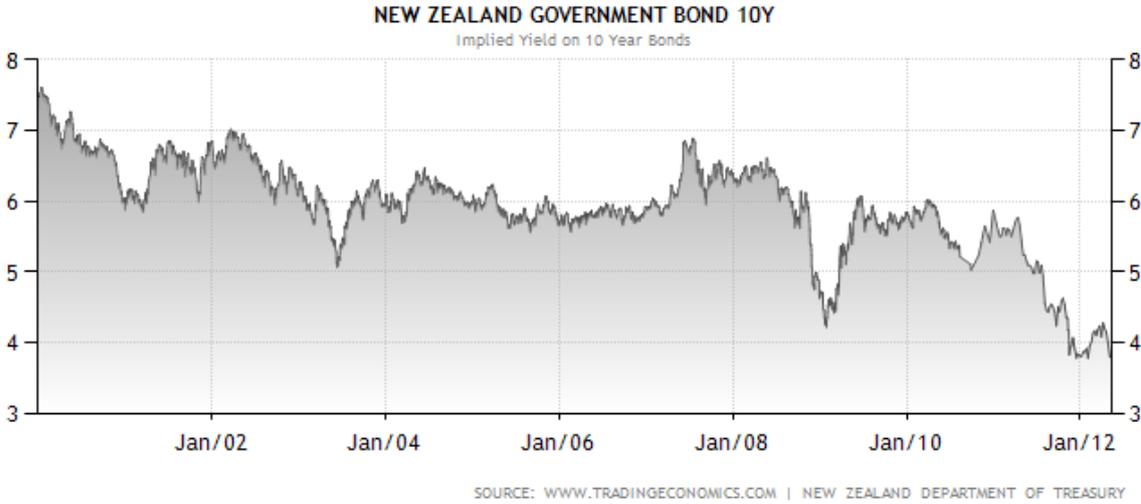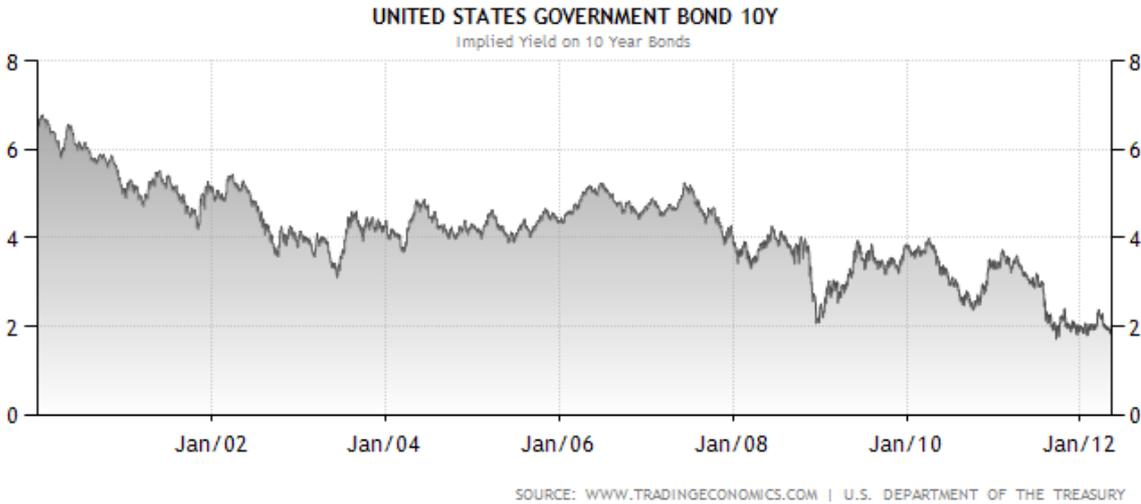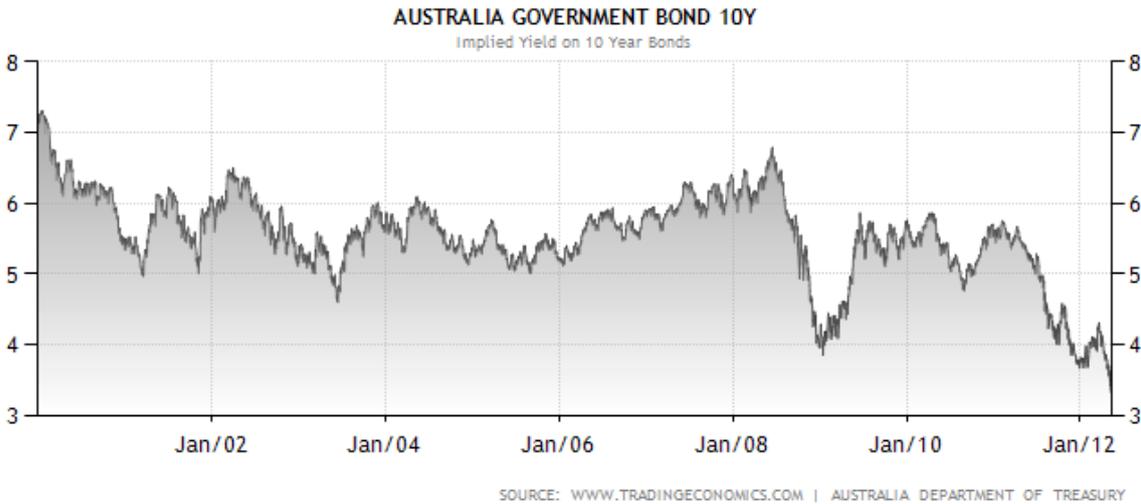
Averages	5 year	10 year	15 year	20 year
10 yr stock	5.5%	5.8%	6.0%	6.4%
5 to 10 year forward	6.1%	6.1%	6.3%	6.7%
CPI	2.9%	2.7%	2.4%	2.3%
Implied real return	2.6%	3.1%	3.6%	4.1%
GDP growth	0.6%	2.2%	2.4%	2.7%

3.3.5. Over the last ten years, the 10 year stock rate has averaged 5.8%, 3.1% greater than inflation over the same period. The 5 to 10 year forward rates have averaged above 6% for all periods. The drop in average 10 year stock rates has been exacerbated by significantly lower short-term rates in the last three years as well as the lower long-term rates over the last 8 months.

3.4. International observations

3.4.1. In reviewing the long-term nominal risk-free rate, it is appropriate to look at Australia and US bond rates to test the reasonableness of our assumption. The following graphs compare Australia, US and New Zealand bond rates.

Figure 8 – Comparisons to Australia and United States 10 year bond yields

AUSTRALIA GOVERNMENT BOND 10Y
Implied Yield on 10 Year Bonds

SOURCE: WWW.TRADINGECONOMICS.COM | AUSTRALIA DEPARTMENT OF TREASURY

UNITED STATES GOVERNMENT BOND 10Y
Implied Yield on 10 Year Bonds

SOURCE: WWW.TRADINGECONOMICS.COM | U.S. DEPARTMENT OF THE TREASURY

NEW ZEALAND GOVERNMENT BOND 10Y
Implied Yield on 10 Year Bonds

SOURCE: WWW.TRADINGECONOMICS.COM | NEW ZEALAND DEPARTMENT OF TREASURY

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3.4.2. The graph below shows the US Treasury long bond rates by duration for the last 12 years.

Figure 9 – US Treasury Nominal Rates by Duration
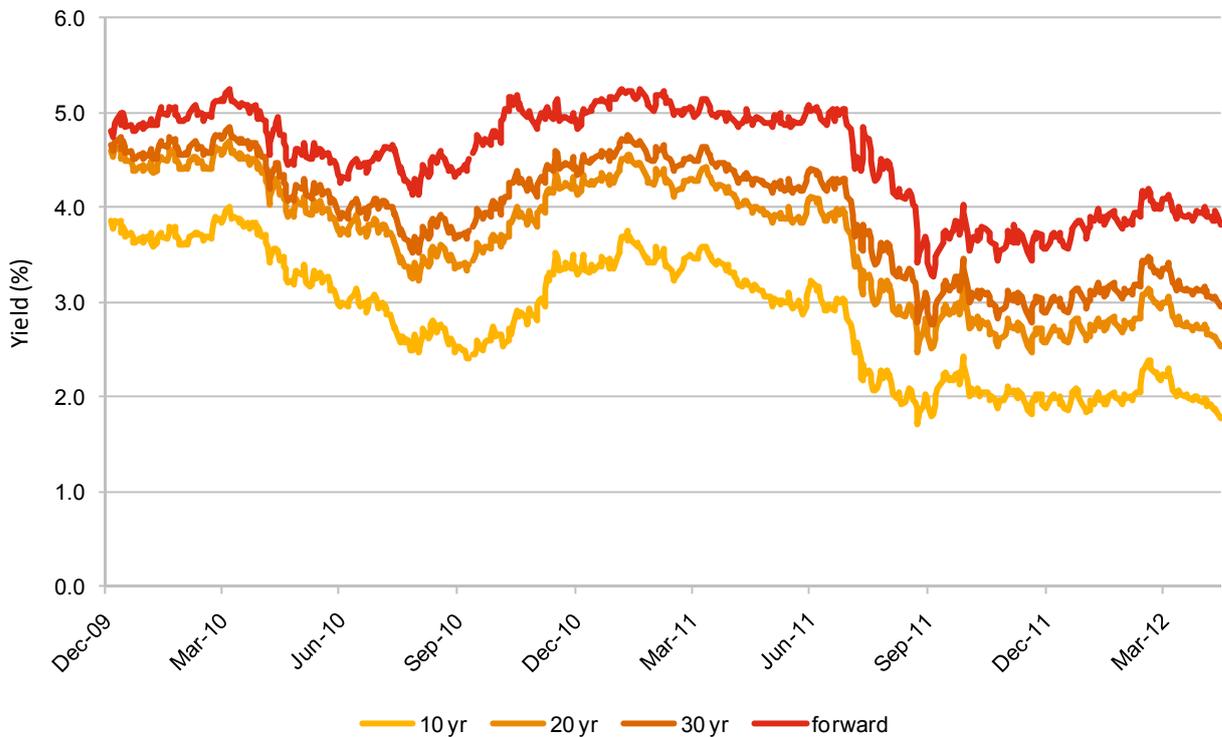
3.4.3. In order to compare international rates, and test the reasonableness of our assumption, there needs to be some consistency between the inflation environments. The current US nominal and real rates imply an inflation outlook of 2.0% to 2.5% pa.

3.4.4. The implied annual forward rate on the US bonds from 20 to 30 years is currently approximately 4.0% pa. New Zealand long-term bond rates have historically been around 2.0% pa higher than US rates.

3.5. Comparison to bank swap yields

3.5.1. As mentioned in the Methodology report, there are two viable options for obtaining market data on risk-free rates. The first option is to use government bonds plus a scarcity adjustment, and the second option is to use bank SWAPS less a risk adjustment. The SWAP spread is a good measure of the sum of the upwards adjustment to government bonds (the scarcity adjustment) and the downwards adjustment to bank SWAP rates (the risk adjustment).

3.5.2. The following graph shows the SWAP spread over the last three years.

Figure 10 – 10 year bank swap spread
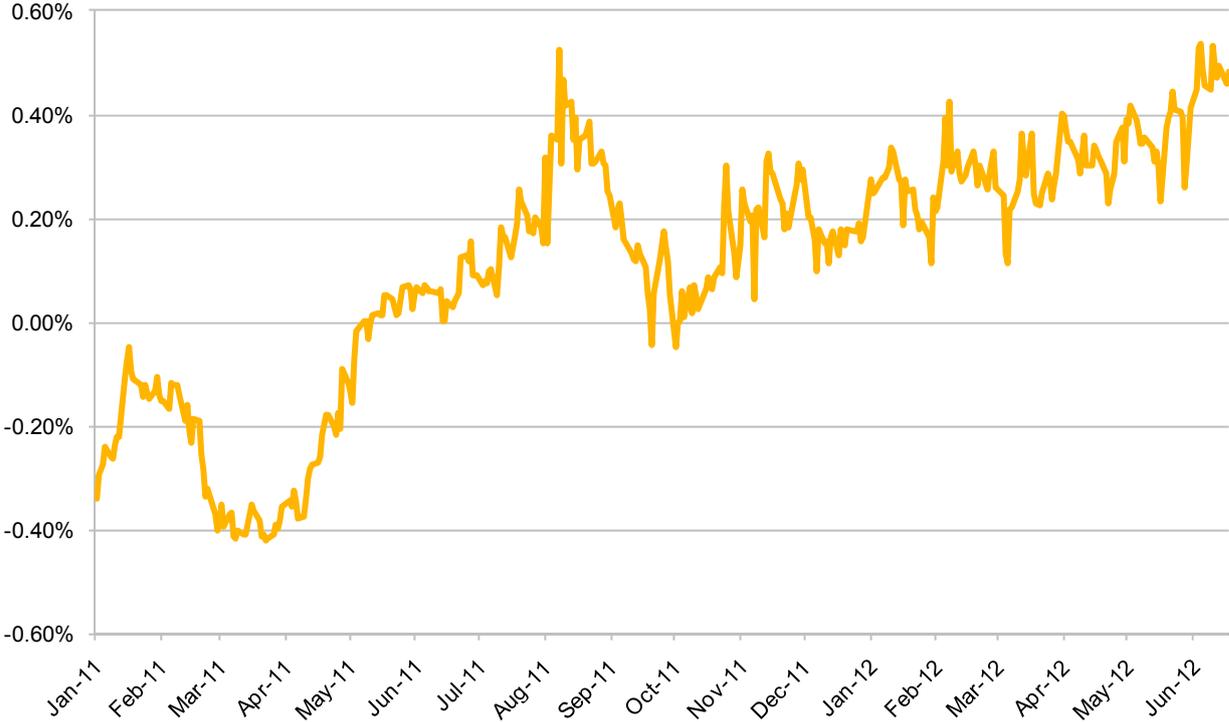
3.5.3. From August 2010 to May 2011, the swap spread was below zero, i.e. the 10 year government bond was trading at above the 10 year bank swap. The spread has progressively risen from June 2011, and is currently at around 0.3% pa. This potentially indicates that there is a scarcity premium being paid for New Zealand Government Stock. This is consistent with anecdotal evidence of a scarcity premium being paid for Australian government stock. International trading in New Zealand government stock follows closely to Australia and it is not unreasonable for there to be some scarcity premium on New Zealand Government Stock as well.

3.5.4. The forward rates implied by the longer term bank SWAP rates (15 and 20 years) are similar to the forward rates at the end of the government stock yield curve. There are three alternative explanations for this, firstly the SWAP spread reduces at long durations, second the underlying forward rates reduce at lower durations, and thirdly the market in SWAPS at longer durations is not particularly liquid, and therefore the yields may not be very reliable.

It is difficult to obtain meaningful data on the liquidity of SWAPS trading in New Zealand. The following graph shows the percentage of Australian market SWAPS by duration.

Figure 11 – Australian SWAPS Market – percent of outstanding by duration
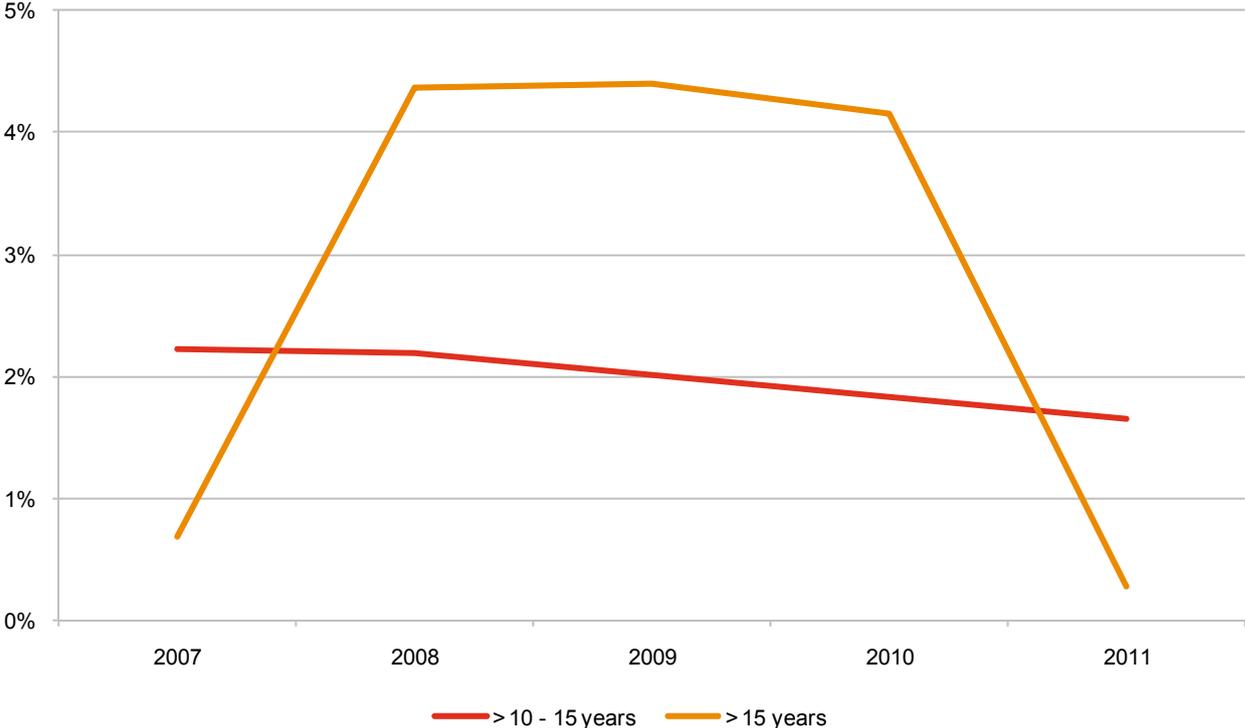
3.5.5. The volume of SWAPS traded in Australia at the longer durations is small and the greater than 15 year volumes have dropped significantly in the 2011 financial year. We have not been able to obtain reliable statistics for the New Zealand market, which is substantially smaller. Anecdotal evidence of the New Zealand market is that trading is reasonable at 10 year durations, there is some trading at 12 year durations and that trading is almost non-existent at 15 to 20 year durations.

3.5.6. There is not enough evidence of a scarcity premium to warrant an adjustment of the short end of the yield curve, however in our view it is a factor to take account of in considering the long-term rate.

4. Bridging the yield curve to the long-term rate

4.1. Introduction

4.1.1. At the time the original risk-free rate methodology was set, there were several options considered for smoothing the forward rates at the end of the yield curve into the long-term rate. The conclusion at the time was that two options, corresponding to Option 4 and Option 5 in the Methodology report, were the most appropriate:

- interpolation (or 'smoothing') to a fixed date i.e. smoothing over a fixed number of years (currently five years) from the end of the yield curve (Option 4)

- interpolation using a fixed or maximum slope (Option 5).

4.1.2. The selection of either the period or the slope is a matter of judgement. A shorter period was seen as having advantages because of the importance of real risk-free rates. The real rates are the primary driver of the liability so an "odd" shape of the nominal rate curve can be acceptable if the real rates are still reasonable. For this reason smoothing to a date five years after the maturity date for the longest dated Government Stock was chosen (end of yield curve).

4.2. Summary

4.2.1. A review of this approach is required because there is currently a significant difference between the forward rates at the end of the yield curve (4.4%) and the 6% long-term assumption. It was never envisaged that the end of the yield curve would be as far away as it currently is. Currently the slope of the smoothing is steep because 1.6% is spread over five years.

4.2.2. Setting a maximum slope instead would have addressed this as the smoothing period would automatically lengthen in extreme circumstances.

4.2.3. In our view, it is reasonable to retain a smoothing period of five years, subject to a maximum slope of 0.15%. For the May 2012 yield curve, the maximum slope applies. This is equivalent to a smoothing period of 10.67 years compared to five years under the original approach.

4.3. Analysis

4.3.1. The graph below shows the forward rates under three bases, smoothing over 5, 10 or 15 years.

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Figure 12 – Yield curve as at 31 May 2012 with different periods of smoothing into the long-term rate of 6.0%pa
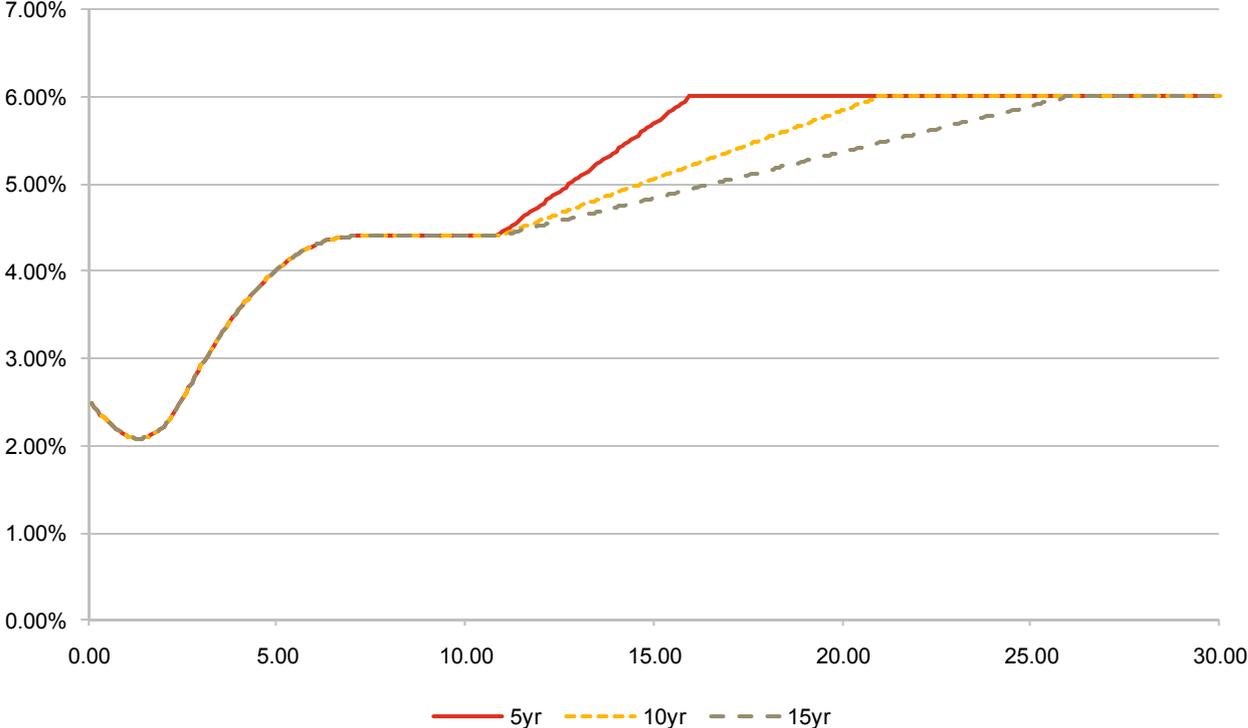
4.3.2. The slope of the smoothed portion is 0.32%pa, 0.16% pa and 0.11%pa respectively.

4.3.3. The corresponding spot rates are shown below; note yield curves are generally shown as spot rates:

Figure 13 – Spot rates as at 31 May 2012 with different periods of smoothing into the long-term forward rate of 6.0% pa
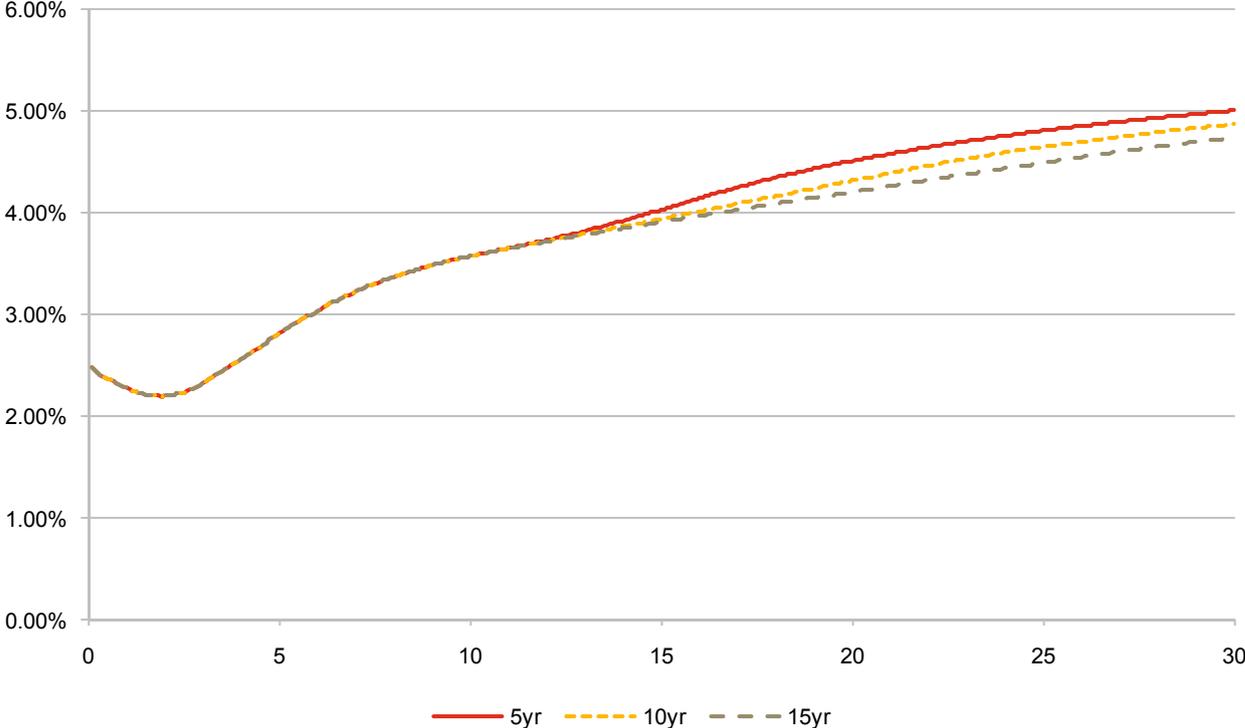
4.3.4. The slope of the bridging section is arguably too great using a five year smoothing period. For this reason we recommend that this is addressed directly by adding a maximum slope criteria rather than arbitrarily changing the smoothing period. This also has the advantage that it automatically adjusts in extreme circumstances.

4.3.5. A judgement needs to be made as to what the maximum slope should be. Referring back to the graphs above, both the 10 and 15 year smoothing options look reasonable. The corresponding growth rates are 0.16% and 0.11%. Rounding these growth rates to 0.15% and 0.10% is equivalent to a 10.7 and 16 year smoothing period on current rates.

4.3.6. The selection of the maximum slope is going to be arbitrary, as there is no New Zealand market data available at these durations. Considering the nominal rates in isolation, a reasonable maximum slope with no spurious accuracy is 0.10%. However, in our view it is also desirable to get to the long-term real return as early as possible. The stability of results was an important factor in the original methodology and this is driven by how early a duration we get to a constant real return.

4.3.7. After considering real returns, the 0.10% is low and 0.15% would give a more reasonable outcome.

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5. Long-term inflation

5.1. Introduction

5.1.1. Long-term inflation is the third step of the three connected components. The long-term inflation is determined as the long-term risk-free rate less the nominal risk-free rate. Consequently, a single long-term inflation assumption is derived for accounting valuations.

5.1.2. In this section we update the historical analysis in the context of New Zealand's economic environment.

5.1.3. Many of the Crown's obligations or assets valued using estimated future cash payments and receipts are sensitive to various inflation assumptions, including CPI. This is particularly true for estimated future cash flows over long durations, such as the Crown's ACC claims liabilities and GSF pension obligations, which are just as sensitive to inflation rates as they are to discount rates, because of the compounding nature of both. Below is a summary and analysis of our view of an appropriate long-term CPI assumption for accounting valuations reported to the Treasury.

5.2. Summary

5.2.1. There is no reason to change the existing 2.5% pa assumption for accounting valuation purpose.

5.2.2. This assumption is consistent with historic levels of CPI inflation and the historic relationship between CPI inflation and the RBNZ inflation targets.

5.2.3. As discussed in the Methodology report, our methodology differs from how the Treasury sets inflation assumptions for medium-term and long-term fiscal projections. The Treasury's long-term assumption is 2% pa, and is based on the rationale that the RBNZ is currently required to target achieving inflation between 1% pa and 3% pa. To assume no bias in either direction in meeting this policy objective; the Treasury's assumption involves the simplest interpretation of this policy, i.e. the middle of this band.

5.2.4. The historical analysis shows that CPI inflation has exhibited a long-term pattern of exceeding the mid-point of the RBNZ's target range. Since the range has been set to be between 1% pa and 3% pa, the average annual CPI has been 2.6%, 0.6% above the mid-point of the range.

5.2.5. Whilst the rate in this methodology is not exactly the same as the 2% pa the Treasury uses for long-term projections, the difference is understandable. The accounting and actuarial standards put more weight on the observable and verifiable data at valuation date for determining assumptions and less on policy intentions of governments.

5.3. Analysis

Inflation over the last 20 years

5.3.1. CPI inflation in New Zealand has been relatively stable since the introduction of the Reserve Bank Act with inflation targets (1989/90). CPI inflation has been impacted by the introduction of GST in 1986, subsequent increase from 10% to 12.5% (1989) and then further increase from 12.5% to 15% (2010).

5.3.2. The RBNZ inflation targets have been:

- from March 1990   0% pa to 2% pa,   mid-point 1.0% pa

- from Sept 1996   0% pa to 3% pa,   mid-point 1.5% pa

- from Dec 2002   1% pa to 3% pa,   mid-point 2.0% pa

5.3.3. When doing analysis on inflation, the effect of a GST change should be backed out of the analysis. It is generally accepted that GST is a step change and is unlikely to impact on longer term inflation expectations. In the following analysis, we have removed the 2% impact of GST on CPI inflation due to the increase in GST from 12.5% to 15% in October 2010. The earlier GST rate increase (in 1986) does not impact the analysis as it was made before RBNZ established inflation targets.

5.3.4. The actual average CPI in periods to December 2011, compared to the mid-point of the RBNZ range, have been:

	5 year	10 year	15 year	20 year
CPI	2.9%	2.7%	2.3%	2.3%
RBNZ mid	2.0%	1.9%	1.8%	1.6%
Difference	0.9%	0.8%	0.5%	0.7%

5.3.5. The table above shows that the average inflation has consistently exceeded the mid-point.

5.3.6. The graph below shows the year-by-year progression of annual CPI plotted next to the target mid-point.

Figure 14 – CPI compared to target midpoint
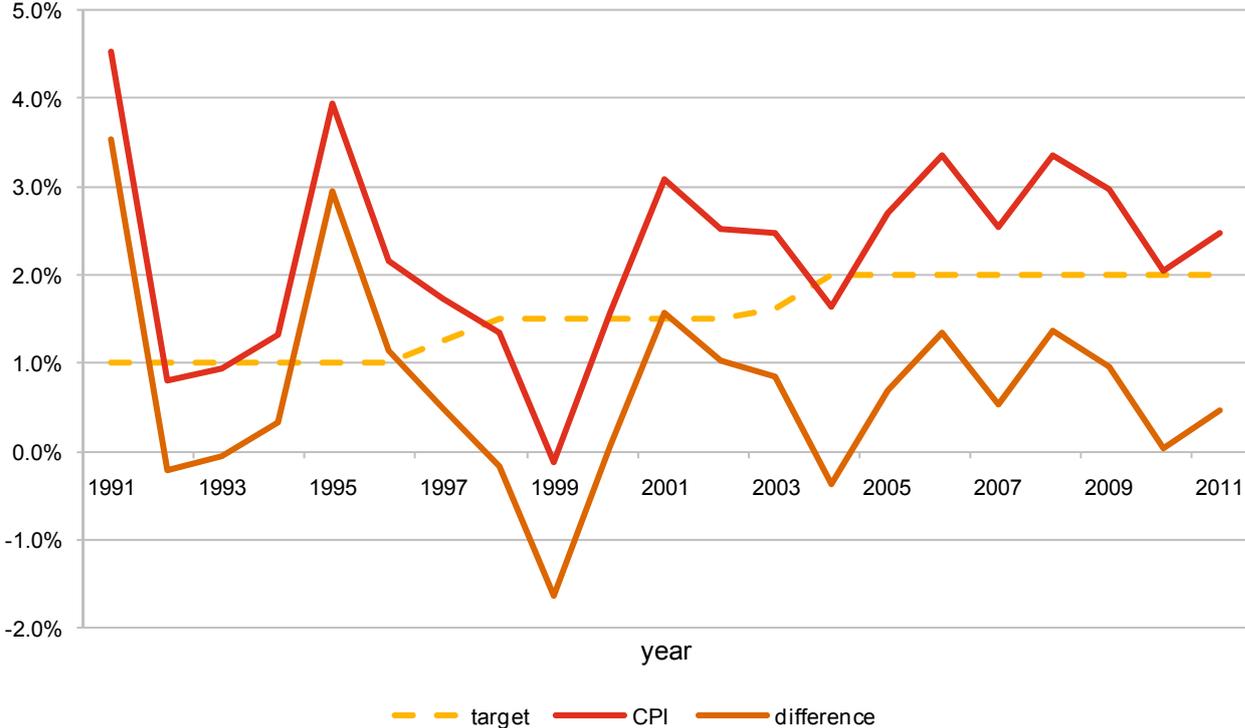
5.3.7. The actual inflation has more often been above the mid-point than below, being below only five times in the last 20 years.

5.3.8. The following histogram shows the historical inflation rates, as measured by CPI, since March 2003. This is after the last inflation target revision to a target of between 1% pa and 3% pa. The inflation rates are annual rates for each quarter during this period.

Figure 15 – Annual Inflation History
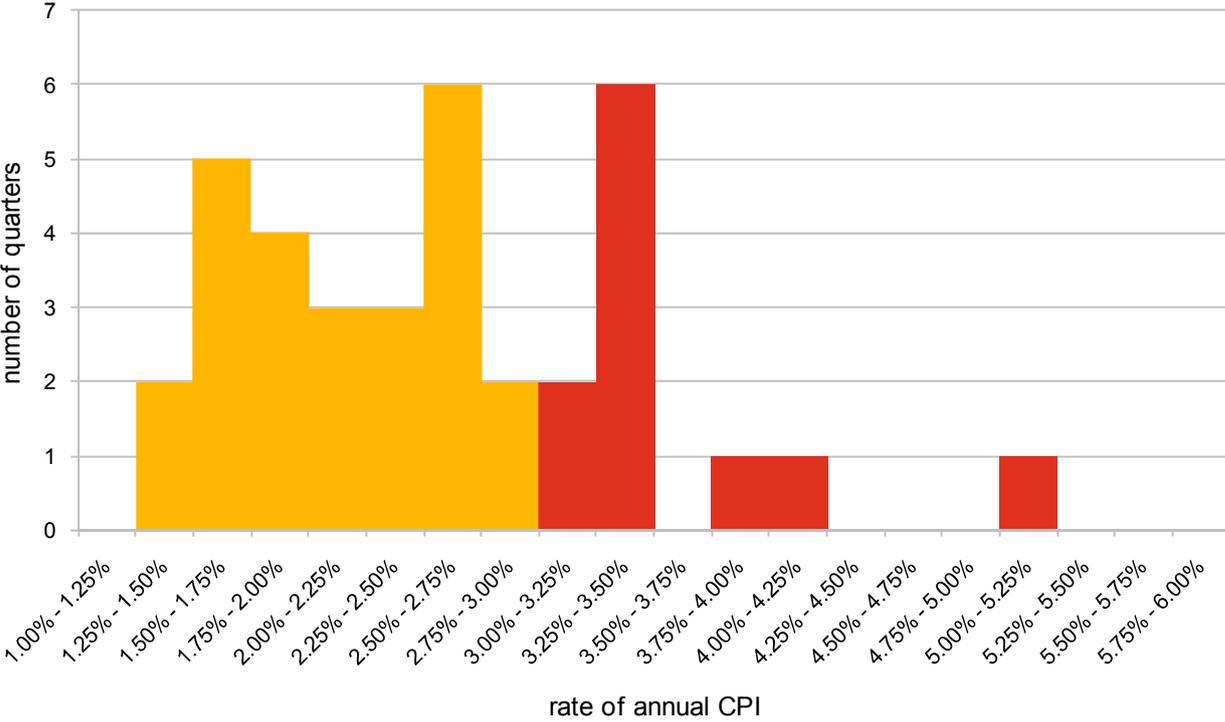
5.3.9. The bars in yellow represent the times when the annual inflation was within the target range. The red bars represent the times that the target has been outside of the range.

5.3.10. It is clear from the graph, that the distribution is skewed to the right i.e. when the target is not met; it is when inflation is higher than the target range. Since March 2003, the average annual CPI has averaged 2.6%, 0.6% above the mid-point of the target range.

5.3.11. Overall, we consider that 2.5% pa as a long-term inflation assumption is still reasonable.