



A methodology for determining expected inflation

A report for ACTEW

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1. Preliminaries

1.1. Terms of reference

1. CEG has been commissioned by ACTEW to advise on the ICRC's approach to calculating the real expected yield on a nominal Commonwealth Government Security (CGS) with a maturity of 10 years as found in the ACTEW 2007 Draft Decision.



2. Analysis

2.1. ACTEW Draft Decision

The ICRC's sets out its analysis in relation to determining the real risk free rate on page 87 and 89 of its draft decision. The analysis is relatively brief and we repeat it here for the ease of the reader.

"The Commission intends to continue with the approach detailed above and prescribed in the Working Conclusions paper for determining the risk-free rate, the real risk-free rate and the CPI as parameters in the WACC determination. This does not imply that the Commission is unconcerned about potential biases in the risk-free rate and the real risk-free rate. The Commission's intention is to continue to examine this issue and to seek submissions from interested parties. The Commission is also aware that the Australian Energy Regulator in association with the Energy Regulators' Forum is also investigating this issue.

The Commission notes that the issue of whether there is a downward-bias in the yields on inflation-indexed bonds has been discussed and analysed at length by the ESC.⁴² In particular, in its recent Draft Decision on the Victorian distributors' Gas Access Arrangements, the ESC accepted that there was:

... evidence to suggest that the implied yields on real government bonds do not currently provide an unbiased estimate of the real risk-free rate.

The ESC's solution given it believed it could not rely on the observed yields on indexed CGS, was to observe the yields on 10 year nominal bonds to derive the nominal risk free rate and adjust the observed yields for forecast inflation to determine the real risk free rate. The forecast of inflation used is 3% which is the top of the RBA's target range for inflation.

The Commission is not convinced that this is a reasonable approach to adopt for determining the WACC. This approach substitutes a parameter whose value is determined through market forces, the real risk-free rate, for an arbitrarily determined CPI and a real risk-free rate calculated using the Fisher equation.

In the Commission's 2004 final decision the calculated CPI through the Fisher equation was 2.17%. If the Commission had adjusted the CPI to 2.5% the WACC would have fallen to 6.65% from the 7.0% the Commission granted and if the Commission had adopted a 3% CPI then the WACC would have been 6.14%. ACTEW would not have accepted an arbitrary determination of the CPI at 3% at that time. Both the risk-free rate and the real risk-free rate are currently determined from traded government securities and market forces determine the resulting rates. The Commission is aware that globally financial markets have been affected by subprime mortgage crisis in the United States. This has also had an effect on the returns to corporate bonds which has consequently



resulted in an increase in the debt margin. The Commission's view is that additional research needs to be performed to determine the extent of the bias in government securities, if it exists, and the best means to factor this into the determination of the WACC.

The Commission does not accept that this downward bias should be addressed by making compensatory adjustments in the values of the other WACC parameters as ACTEW suggested. This would be arbitrary and, as set out in the Working Conclusions paper, the Commission could end up overcompensating for a small bias if it accepted higher values for the other parameters for this reason only. In the Commission's view, the downward bias that appears to exist in the yields of indexed CGS should be corrected in the methodology used to determine the real risk free rate.

2. From the above we take away four key components of the ICRC's analysis and position.
 - I. The ICRC accepts that there is evidence that:
 - i. Inflation indexed Commonwealth Government bonds (TCIB) yields are a biased estimate of the real risk free rate used in the CAPM; and
 - ii. Consequently, the difference between TCIB and nominal CGS yields will overestimate expected inflation in financial markets.
 - II. The Commission believes that additional research needs to be performed to determine the extent of the bias in government securities, if it exists, and the best means to factor this into the determination of the WACC.
 - III. The ICRC considers that ACTEW is wrong to argue that this bias should be accounted for by taking a cautious approach with other WACC parameters (eg, equity beta). That is, the best estimate of the risk free rate should be adopted rather than adopting a flawed estimate and adjusting other parameters in response;
 - IV. The ICRC does not believe that an arbitrary approach should be adopted for estimating the real risk free rate. The ICRC is critical of the approach adopted by the Victorian Essential Services Commission as arbitrary.

3. We discuss each of these below.

2.2. Evidence that TCIB yields are downward biased

4. The evidence that TCIB yields are downward biased is summarised below:
 - i. Analysis of the Reserve Bank of Australia (RBA) suggesting that TCIB yields underestimated the truly expected real return on nominal Commonwealth Government securities;



- ii. Analysis of the Commonwealth Government Treasury reaching the same conclusion as the RBA; and
 - iii. Empirical analysis of Professor Bruce Grundy and Dr Tom Hird analysing several different market data sources all supporting the RBA and treasury conclusions;
 - iv. Conceptual analysis of Professor Bruce Grundy and Dr Tom Hird explaining why this is consistent with the predictions of Finance theory;
 - v. *All credible professional forecasters of long-term inflation predicting real yields on long-term nominal CGS that exceed yields on TCIBs.*
5. The RBA has repeatedly considered this issue in its quarterly Statements on Monetary Policy and has repeatedly reached the conclusion that TCIB yields are downward biased and that they underestimate the true expected real return on nominal CGS. For example, in the May 2006 Statement on Monetary Policy the RBA states:

“The implied medium-term inflationary expectations of financial market participants have traditionally been calculated as the difference between nominal and indexed bond yields. This measure has continued to edge higher since the February Statement, to be around 3.2 per cent in early May. However, this rise in part reflects developments in the indexed bond market that are unrelated to inflation expectations. In particular, the limited supply of indexed securities and increasing institutional demand for these securities has pushed down their yields relative to those on conventional bonds.” (Page 58)

6. The RBA has also specifically advised the ACCC on the implications for this in setting the real risk free rate.

“Given inflation expectations have been firmly anchored by the Bank’s inflation-target regime for some time, a rough estimate of a real risk-free rate would be the nominal government bond yield less the centre of the inflation target band (ie the nominal yield less 2½ per cent).”¹

7. This observation is also entirely borne out by what we have observed over the last 10 years. That is, inflation over the last ten years has sometimes been above and sometimes below the RBA’s target band but has averaged nearly exactly 2.5%. The Commonwealth Treasury has also provided the same advice to the ACCC.

“We therefore recommend that the ACCC uses the mid-point of the RBA’s target band for inflation (that is, 2.5 per cent per annum) as the best estimate of inflation.

¹ Letter dated 9 August 2007 from Assistant RBA Governor, Mr Guy Debelle, to ACCC Executive General Manager Mr Joe Dimasi.



Since the independence of the Reserve Bank board in conducting monetary policy was formalized in 1996, annual inflation has averaged 2.5%.²

8. This is a relevant observation because a rational investor will have regard to past experience when forming expectations about the future. In particular, a rational investor will have regard to past experience when determining whether the RBA can credibly be expected to determine monetary policy in a manner consistent with its inflation targets.
9. We agree with the Treasury's advice. In the absence of any information to the contrary the best estimate of average long term inflation is 2.5%. Specifically, unless there is reason to believe that the RBA's operation of monetary policy will fail to work in the future as it has in the past, the best estimate of medium to longer term inflation is 2.5%.
10. Professor Grundy and Dr Hird have analysed both Government and corporate bond data and have concluded that in late 2004 and 2005 a clear bias in TCIB yields developed (see section 2.4 of Grundy and Hird *Bias in Indexed CGS Yields as a Proxy for the CAPM Risk Free Rate*, a NERA report for the ENA, March 2007). Grundy and Hird also established that if TCIB yields were assumed to be an accurate estimate of the risk free rate then a necessary corollary would be an unrealistic pattern on expected inflation – with expected inflation expected to start outside the RBA's target band and escalate into the long-term (see table 2.1 on page 10 of the above Grundy/Hird report).
11. For the purpose of this report we have redone that later analysis. On 18 January 2008 the following YCIB and nominal CGS yields were observed.

Table 1: 18 January TCIB and Nominal CGS yields

| Maturity | TCIB | Nom CGS | Implied annual inflation |
|-------------|------|---------|--------------------------|
| August 2010 | 3.2% | 6.4% | 3.1% |
| August 2020 | 2.2% | 5.8%* | 3.5% |

*Interpolated

12. From the above table we see that the implied inflation rate (using the Fisher equation) from January 2008 to August 2020 is 3.5%. However, the implied inflation rate from January 2008 to August 2010 is only 3.1%. This means that the implied inflation rate between August 2010 and August 2020 must be higher than 3.5%. In fact, the implied inflation rate must be 3.9%.³

² Letter dated 7 August 2007 from Treasury Executive Director, Mr Jim Murphy, to ACCC Executive General Manager Mr Joe Dimasi.

³ This is calculated by solving for X in the following equation $(1+3.1\%)^{2.6} + (1+X\%)^{10} = (1+3.5\%)^{12.6}$. That is, adding 3.1%pa inflation for the next 2.6 years inflation and X% pa for the next ten years must give the same answer as 3.5% for 12.6 years.



13. That is, if we adopt the TCIB yield as an unbiased estimate of the real risk free rate then we must simultaneously believe that the expected inflation rate for the ten years from 2010 to 2020 will be 3.9%.
14. This appears to be at odds with credible forecasts by the RBA and all other macro-economic experts. As we see in the following section, this is precisely the view of professional forecasters whose average long term (10 year) inflation forecast is in the range of 2.53% to 2.60%.
15. It is worth noting the above evidence has led both the Australian Energy Regulator (AER) and the Victorian Essential services Commission (ESCV) to conclude that a bias exists.

2.3. Need for further research

16. The ICRC states that it believes that additional research needs to be performed to determine the extent of the bias in government securities, if it exists, and the best means to factor this into the determination of the WACC.
17. In our opinion, there is compelling evidence of a bias in indexed bond yields. The ICRC would need very strong grounds to form a view that no bias exists in direct conflict with the views of:
 - a) The Reserve Bank of Australia and the Australian Commonwealth Treasury;
 - b) The findings of the Finance literature as summarised by Grundy and Hird ;
 - c) The empirical findings of Grundy and Hird;
 - d) Professional economic forecasters (such as Econtech and Access Economics) and financial institutions (such as the major Australian banks) who all forecast expected inflation over the next ten years at less than 3;
 - e) The conclusions of the AER and the ESCV who, consistent with the above, find that a bias exists.
18. However, we agree with the ICRC that careful thought is required with regard to how the real risk free rate should be set when TCIB yields can no longer be adopted as an estimate of the real risk free rate.
19. In this paper we propose what we consider is the best approach for setting the real risk free rate.



2.4. The problem should be fixed directly not indirectly

20. The ICRC states that if TCIB's give a biased estimate of the real risk free rate this problem should be addressed by establishing a better estimate of the real risk free rate rather than by being conservative with other parameter values. We agree that this is a reasonable position for the ICRC to take.
21. Of course, having taken this position the ICRC must not use the TCIB yield as the risk free rate if there is sufficient evidence to suggest it is biased. That is, it only follows that one should not fix the problem indirectly if one actually does fix the problem directly.

2.5. The real risk free rate must not be set in an arbitrary manner

22. The ICRC argues that the real risk free rate must not be set in an arbitrary manner. The ICRC is critical of the approach taken by the ESCV in this regard. The ESCV simply assumed 10 year expected inflation was at the top of the RBA's target range (3%) and used this to calculate an estimate of the real risk free rate using the Fisher equation and the yield on 10 year CGS as the nominal risk free rate.
23. We agree with the ICRC that any approach to setting the real risk free rate must not be arbitrary. We also agree with the ICRC that the approach adopted by ESCV was arbitrary.⁴
24. However, it is important to understand that simply adopting the TCIB yield as the real risk free rate is also arbitrary. In fact, it is more arbitrary than the approach adopted by the ESCV. The approach adopted by the ESCV recognises a problem with TCIB yields and make an adjustment to their methodology – albeit an adjustment that we believe is arbitrary and still tends to underestimate the true risk free rate.
25. By contrast, recognising that TCIB are biased but still using them as the estimate of the real risk free rate is not only arbitrary but *must* result in an underestimate of the true risk free rate.

2.6. A non-arbitrary process for estimating the 10 year real risk free rate

26. Given the compelling evidence that TCIB yields are biased downward relative to nominal CGS yields TCIB yields cannot reasonably be used as a proxy for the real risk free rate. This means that the natural place to start is the nominal yield on CGS (which can be observed) and to deduct an estimate of expected inflation (which must be derived). We note that this is a conservative approach because, as

⁴ For a critique of the ESCV approach see Hird, *A methodology for estimating expected inflation* 26 October 2007 (a report for the three Victorian gas distribution businesses).



previously outlined, we believe that the nominal CGS yield is itself a downward biased estimate of the nominal risk free rate.⁵

27. Thus, what is required is a methodology for estimating expected 10 year inflation that does not rely on TCIB yields. There is significant information available on which to base the best estimate of expected long-term inflation. Specifically, there are professional inflation forecasting agencies who provide forecasts of inflation. Given that CPI forecasts depend on the complex interaction of national and international macro-economic variables we have restricted our forecasters to include Government agencies with responsibility for macro-economic ('whole of economy') activity (such as the RBA, Commonwealth Treasury and, internationally, the OECD), financial market institutions (such as the major banks) and recognised private sector macro-economic forecasters.⁶
28. Table 2 below provides a detailed survey of available estimates of expected inflation from these sources going out 10 years.

⁵ See Hird and Grundy op cit. See also Hird and Grundy, *Choosing a proxy for the nominal risk free rate*, 26 October 2007 (A report for the 3 Victorian gas distribution businesses).

⁶ We have not included CPI forecasts based on consumer sentiment surveys (such as the Melbourne Institute Survey of Consumer Inflationary Expectations), accounting firms, or made by sectoral specific analysts (such as ABARE or Macromonitor). We do not believe that such sources of forecasts can credibly be believed to reflect the expectations of, nor influence the expectations of, financial market investors. See our prior report for the Victorian gas distribution businesses "A methodology for estimating expected inflation", 26 October 2006.



Table 2: Summary of Available Inflation Forecasts – year ended June

| Forecaster | Date | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|-----------------------|------------|------|------|------|------|------|------|------|------|------|------|
| Econtech | Dec-07 | 3.1 | 2.8 | 1.9 | 1.9 | 2.3 | 2.5 | 2.4 | 2.5 | | |
| Access Economics | Dec-07 | 2.8 | 2.8 | 2.1 | 2.4 | 2.8 | 2.5 | 2.0 | 2.0 | 2.5 | 2.6 |
| BIS Shrapnel | Aug-07 | 3.0 | 2.9 | 2.3 | 2.9 | 3.2 | 3.2 | 2.7 | 2.5 | 3.2 | 3.6 |
| ANZ | Jan-08 | 3.4 | 2.8 | 2.6 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Westpac | Sep-07 | 2.9 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Commonwealth Bank | Sep/Dec-07 | 2.7 | 2.6 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| NAB* | Jul-07 | 2.5 | | | | | | | | | |
| RBA (underlying) | Aug/Nov-07 | 3.3 | 2.9 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Commonwealth Treasury | Aug/Oct-07 | 2.8 | 2.8 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| OECD | Dec-07 | 3.2 | 2.7 | | | | | | | | |
| Consensus Economics | Oct/Dec-07 | 2.8 | 2.7 | 2.6 | 2.5 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 |

* We have been unable to update the NAB forecast from this July forecast. It is, therefore, the oldest forecast in the table and therefore somewhat less reliable as a predictor of 2008 inflation. However, because this is only one observation in 90 its inclusion has an insignificant impact on mean estimates. We include it in the table for completeness.

Sources: Econtech, Australian National, State and Industry Outlook, 21 December 2007. Access Economics, Business Outlook December 2007. BIS Shrapnel, Outlook for Labour Markets and Costs to 2016/17: Electricity, Gas and Water Sector, April 2007. Advice direct from ANZ to CECG provided by email 9 January 2008. Westpac, CPI Forecast and Comment dated 18 September 2007. Commonwealth Bank of Australia, Economic Forecasts, 9 December 2007. Commonwealth Bank of Australia, CBA's Inflation Forecasts, 26 September 2007. NAB, Australian Outlook, July 2007. RBA, November Statement on Monetary Policy, 12 November 2007. RBA letter dated 9 August 2007 to Joe Dimasi at the ACCC. Commonwealth Treasury, Pre-election Economic and Fiscal Outlook, 23 October 2007. Commonwealth Treasury letter dated 7 August 2007 to Joe Dimasi at the ACCC. OECD, OECD Economic Outlook No. 82 - Australia, 6 December 2007. Consensus Economics, Asia Pacific Consensus Forecasts, 10 December 2007. Consensus Economics, Asia Pacific Consensus Forecasts, 8 October 2007.



29. Examination of the above table suggests that most forecasters believe that both short and long term inflation will be below 3%. In this regard, it is instructive to examine the summary statistics associated with the raw data detailed in Table above.

Table 3: Summary Statistics

| Statistic | Equal weight to all forecasters | BIS Shrapnel excluded | Government forecasters excluded | Government and BIS Shrapnel excluded |
|--|--|------------------------------|--|---|
| Mean of all observations | 2.60% | 2.55% | 2.59% | 2.53% |
| Median of all observations | 2.50% | 2.50% | 2.50% | 2.50% |
| Forecasters with mean forecasts equal or greater than 3% | None | None | None | None |
| Mean of observations from 2008 to 2009 | 2.84% | 2.83% | 2.81% | 2.79% |
| Mean of observations from 2010 to 2018 | 2.51% | 2.46% | 2.52% | 2.45% |
| Weighted average of short and long term forecasts | 2.58% | 2.53% | 2.58% | 2.52% |

30. Focussing on the first column of numbers, these show that the mean forecast for all observations listed in Table 2 is 2.60%. That is, if each annual CPI forecast for each forecaster is given equal weight (whether it be long or short term) the average is 2.60%. Similarly, the median forecast is 2.50% on the same basis. That is, there are the same (or more) number of annual forecasts at or below 2.50% as there are above 2.50%. None of the forecasters has an average inflation forecast (ie, the mean of all years that they forecast) that is equal to or above 3%. Moreover, the forecaster with the highest forecast, BIS Shrapnel, should be given little weight in the current context for the reasons set out in section 2.7 below. This is not just the opinion of CEG but also of BIS Shrapnel itself.

31. The averages discussed above give all annual estimates the same weight. This may be problematic because there are more short term than long term forecasts listed in Table 2. As a consequence, this equal weighting approach will tend to result in a biased estimate of long term inflation if the short term forecasts are different to the long term forecasts. To check whether this is a relevant concern we need to separate out short and long term inflation expectations and give them the appropriate weights. Because we are interested in average inflation over 10 years the relevant weights are 20% to the first two years and 80% to the last eight years.⁷

⁷ We note that ideally one would take account of the fact that the nominal Government bond the ICRC is using as its starting point is not a zero coupon bond. This means that not all of the income from the bond will be received at the time it matures. Consideration of this fact would lead to a higher weight being given to short term inflation than we



When this is done the average of all forecasters' (listed in Table 3) expectations over the next 10 years (where those expectations are available) is 2.58%.

32. For completeness we have also reported in Table 3 the results if the Government forecasts of inflation (Treasury, RBA and OECD) are excluded. We do not propose that they should be but this is merely reported to illustrate that there is no material difference between government and private sector forecasts of inflation.
33. It is also relevant to note that Table 2 includes forecasts from Consensus Economics. These forecasts are the result of surveys that Consensus Economics carries out of other forecasters' short term inflation expectations. That is, Consensus Economics does not carry out its own forecasts. As such, there is an element of double counting in the Consensus Economics forecasts as these include some of the other forecasters separately detailed in Table 2.⁸
34. It is also possible to divide the above set of forecasts into government, banks and professional economic forecasters (BIS Shrapnel, Econtech and Access Economics).⁹ Unlike the banks, these forecasters do not tend to simply adopt a 2.5% forecast in the medium to long-term. Rather, they employ a range of assumptions and proprietary modelling techniques in an attempt to model annual variations in inflation into the long-term. Nonetheless, they still arrive at a forecast that is anchored around 2.5%.

Table 4: Further Summary Statistics

| Statistic | Government | Banks | Economic forecasters | Economic forecasters (excl BIS) |
|--------------------------|-------------------|--------------|-----------------------------|--|
| Mean of all observations | 2.61% | 2.55% | 2.62% | 2.44% |

35. CEG believes that the approaches taken by the banks and economic forecasters are equally valid and the fact that they arrive at similar answers confirms the logic described in the previous section and the advice to the ACCC from the RBA and Commonwealth Treasury.

describe above. Against that consideration is the fact that the 2008 financial year is more than part way through and the forecasts listed in Table for 2008 include some actual inflation that has already occurred – suggesting a lower weight on 2008 forecasts. Given that the average for short term inflation is close to the average for long term inflation any such adjustments to weights would produce an immaterial impact on the weighted average.

⁸ We note that it is not clear which entities have provided these long term forecasts to Consensus Economics. The short term forecasts published by Consensus Economics include forecasts provided by BIS Shrapnel, Access Economics, ANZ, CBA, Westpac and NAB. The suppliers of long term forecasts are not listed. We have included these forecasts in Table 2 because it is possible that Consensus were able to use estimates of inflation that were not directly available to us in preparing this report.

⁹ Consensus Economics is excluded from this sample as it provides a summary across all these institutions.



36. Clearly, based on any view of the consensus amongst all of these organisations the best estimate of long term expected inflation is centred around 2.5% and does not extend materially beyond 2.6%
37. That is not to say that these professional forecasting bodies will not be wrong. However, unless the ICRC has reason to believe that it is better informed on matters of inflation forecasting than these professional bodies it should, in our opinion, defer to them. If the ICRC does have reason to believe it can more accurately forecast inflation than the organisations listed in 2 it would appear reasonable to expect the ICRC to describe the basis for this opinion.
38. In this regard we note that regulators have recently engaged the services of both Access Economics and Econtech to forecast inflation in wages growth in the Australian economy. In this situation the regulator has relied on the internal expertise of these forecasters and, implicitly, on their economic models of the Australian economy. In our opinion this has been an appropriate strategy for the regulators reflecting the superior expertise of Access Economics and Econtech in forecasting inflation in wages growth.
39. However, precisely the same rationale would suggest reliance on their services in the current (and likely more complicated) context of forecasting movements in all prices in the economy (rather than just electricity sector wages) over a longer time period. If the ICRC relies on Econtech's expertise in this area it will estimate average 10 year inflation of 2.43% pa. Alternatively, if the ICRC relies on Access Economics' advice it will estimate average 10 year inflation of 2.45% pa.

2.7. Why BIS Shrapnel forecasts should be excluded

40. In our opinion the shaded column of numbers in Table 3 above is the most reliable summary of forecasts for the purpose at hand. This column excludes the forecasts of BIS Shrapnel. The basis for this exclusion is that we are informed that BIS Shrapnel's forecast is an estimate of the mode and not the mean of inflation outcomes.¹⁰ We are further informed that BIS Shrapnel believes that the mean forecast lies below the mode forecast.

¹⁰ See 19 October 2007 letter from BIS to SP AusNet where BIS state:

"Over the five year period 2008-2013, we estimate that headline inflation will average 2.9%.

"We consider these forecasts to be the 'most likely' outcomes, given our assessment of the outlook for a range of macroeconomic variables. While we expect labour markets to remain tight, a moderation in demand over the period, along with a pick up in productivity, will provide some relief for price pressures.

"However, we believe the Reserve Bank will act to prevent CPI inflation running at over 3.0% for long periods. Accordingly, a 'mean' of a range of alternative scenarios would be less than our 'most likely' 2.9% figure. Therefore, with regard to the second point raised in your letter, yes, we expect that the probability distribution of possible inflation outcomes has a shorter tail above 3 per cent."



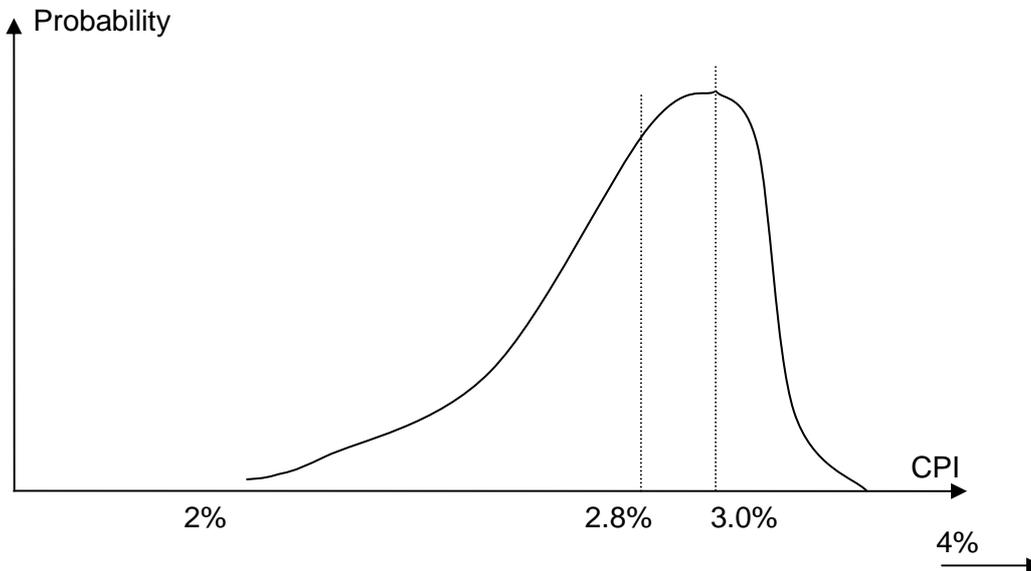
41. This is relevant in the current context because from an investor's perspective, it is the mean inflation forecast – not the mode forecast – that determines the expected real return on holding a nominal government bond. This is because the mode gives 100% weight to the forecast that has the greatest likelihood of occurring – even if there are other inflation outcomes that have a positive probability of occurring instead. By contrast, the mean forecast gives weight to all possible outcomes according to their probability.
42. To see the importance of this consider the example where an investor has the following probability distribution for inflation outcomes.

Table 5: Illustrative Example of a Probability Distribution

| Potential Inflation Outcome | Probability of each outcome | Probability weighted outcome |
|----------------------------------|-----------------------------|------------------------------|
| 3.0% | 40% | 1.2 |
| 2.8% | 30% | 0.8 |
| 2.5% | 30% | 0.8 |
| Expected inflation (mean) | | 2.8% |

43. In the above example the most likely (mode) outcome is that inflation will be 3.0%. However, the mean outcome is less than this (2.8%) because there is a material probability (60%) that inflation will be lower than 3.0% and no probability (in this example) that inflation will be higher than 3.0%. Faced with the above probability distribution a rational investor would not use an inflation forecast of 3.0% when attempting to calculate the real return on a nominal bond. To do so would be to give zero weight to the higher real returns that will occur if inflation is less than 3.0% (for which there is a 60% probability). A rational investor would give weight to all possible outcomes equal to the probability of their outcomes.
44. The above example is very simplistic with only three discrete outcomes for inflation. In reality, investors are likely to have a continuous probability distribution for expected inflation. However, the potential difference between mean and mode forecasts can be illustrated, with the help of a diagram, using a continuous probability distribution.
45. Consider the probability distribution drawn below for inflation over a five year forecast period. As drawn, the most likely inflation outcome is 3% (the highest point on the probability distribution). This is consistent with a scenario where inflationary pressures are expected to be relatively high over the next five years. However, the mean of all possible outcomes is 2.8% because the tail of the distribution above 3% is shorter than the tail of the distribution below 3%.

Figure 1: Probability Distribution for Average Inflation over a Five Year Period



46. We understand that, in general terms, this is the shape of the probability distribution that underlies BIS Shrapnel's forecasts. The reason for this is that BIS Shrapnel believes that if inflation goes above the top of the RBA's target range of 2-3% the RBA will actively use monetary policy (raise interest rates) to reduce inflation.¹¹ However, BIS believes that the RBA will not actively seek to increase inflation unless inflation is approaching the bottom of its target range. The combination of these facts mean that when inflationary pressures are high – with inflation nearer the top than the bottom of the RBA's target range – the distribution of expected inflation is likely to be skewed to the left (and vice versa when inflation pressures are low). Specifically, BIS state:

“However, we believe the Reserve Bank will act to prevent CPI inflation running at over 3.0% for long periods. Accordingly, a ‘mean’ of a range of alternative scenarios would be less than our ‘most likely’ 2.9% figure. Therefore, with regard to the second point raised in your letter, yes, we expect that the probability distribution of possible inflation outcomes has a shorter tail above 3 per cent.”¹²

47. We find BIS Shrapnel's analysis of this matter compelling. In our opinion, it is an accurate reflection of the operation of Australian (and international) monetary policy. It relies on a simple and, to our knowledge, widely accepted assumption.

¹¹ Letter dated 19 October 2007 BIS Shrapnel Senior Economist Mr Richard Robinson, to SP AusNet Manager (Distribution Regulation) Mr Rob Amphlett Lewis.

¹² Ibid, p.1



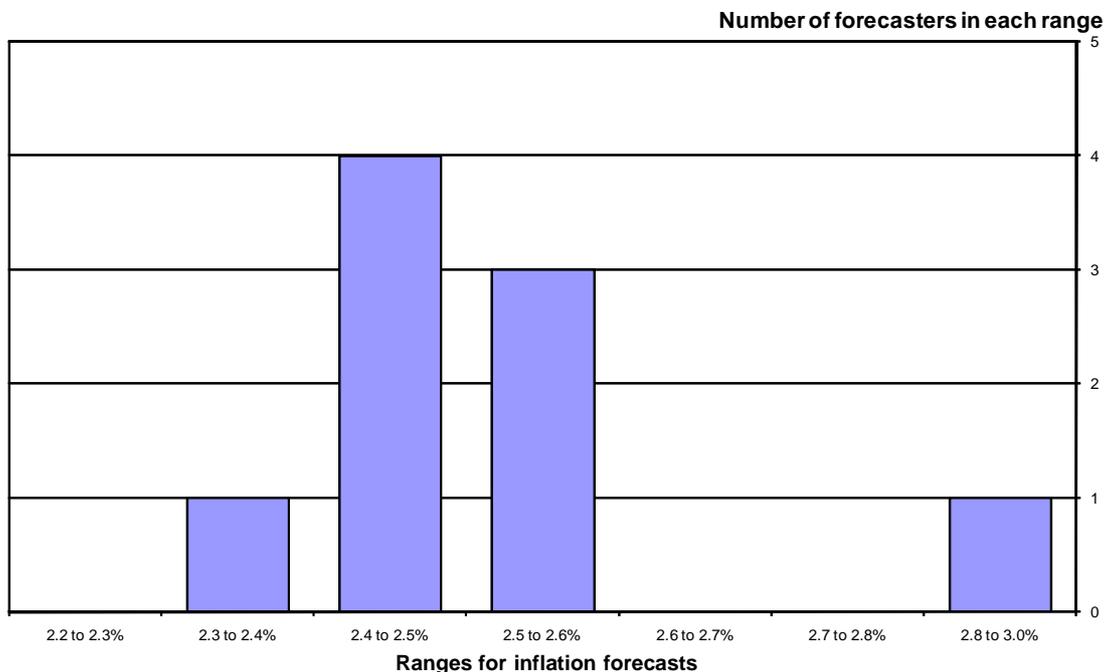
Namely, that inflation moving outside the central bank's target range will more quickly trigger a vigorous monetary policy response than inflation movements within the central bank's target range.

- 48. Given that the BIS Shrapnel forecast used in Table above is higher than their mean forecast, we recommend that this be excluded from the sample (or at least given lower weight). However, we also note that including the BIS Shrapnel forecast does not have a significant impact on the mean forecast (raising it 0.05% from 2.53% to 2.58%)

2.8. Best estimate of expected inflation over 10 years

- 49. On the basis of the above we recommend that the best estimate of expected (mean) inflation over a 10 year period is obtained when excluding BIS Shrapnel's forecast (shaded column in Table 3). The relevant estimate is the weighted average mean of forecasters' short and long term expectations (2.53%). This estimate is not materially different to the median forecast or to the mean forecast including BIS Shrapnel. It is also in the middle of a quite narrow distribution of forecasts as illustrated in Figure 2 below (with the BIS estimate being the outlier).

Figure 2: Distribution of Forecasts





50. We note that selecting an estimate of 2.53% for expected inflation is also consistent with the written advice of both the RBA and the Commonwealth Treasury who have separately noted that:

“Given inflation expectations have been firmly anchored by the Bank’s inflation-target regime for some time, a rough estimate of a real risk-free rate would be the nominal government bond yield less the centre of the inflation target band (ie the nominal yield less 2½ per cent).”¹³

“The Australian Government’s suspension of issuance of these inflation-linked bonds, as well as increased demand for this asset class, is likely to cause market-implied inflation estimates to exceed consensus forecasts of inflation over the medium term. We therefore recommend that the ACCC uses the mid-point of the RBA’s target band for inflation (that is, 2.5 per cent per annum) as the best estimate of inflation. Since the independence of the Reserve Bank board in conducting monetary policy was formalized in 1996, annual inflation has averaged 2.5%.”¹⁴

51. Therefore, it is our view that 2.53% represents the best estimate of expected inflation for the purposes of calculating the real expected yield on a nominal CGS with a maturity of 10 years.

2.9. Precedent from the AER

52. The AER, in its final decision for SP AusNet has adopted a similar approach to that proposed in this report. It has adopted the RBA’s forecasts for inflation for 2008 (3.0%) and 2009 (3.88%)¹⁵ and then has adopted the midpoint of the RBA’s range (2.5%) for all years beyond that date. This gives rise to a 2.59% average inflation rate over 10 years. The logic of adopting the midpoint of the RBA’s range is identical to that outlined above.

53. The approach in this report results in adopting a 2.53% 10 year forecast (0.06% lower than the AER’s forecast). Our approach and the AER’s start from the same premise – that in the longer term the RBA can be expected to use monetary policy in such a fashion as to ensure inflation averages around 2.5%. This is in contrast to the ESCV’s (draft) approach that arbitrarily (ie, without justification) assumes that inflation will be at the top of the RBA’s range in the long term.

54. Thus, we believe that the AER’s approach provides strong regulatory precedent for the acceptance of our basic premise. However, we believe that our approach, of

¹³ Letter dated 9 August 2007 from Assistant RBA Governor, Mr Guy Debelle, to ACCC Executive General Manager Mr Joe Dimasi.

¹⁴ Letter dated 7 August 2007 from Treasury Executive Director, Mr Jim Murphy, to ACCC Executive General Manager Mr Joe Dimasi.

¹⁵ Taking the mid-point of the RBA’s forecast for 2009.



widely surveying credible forecasters is less arbitrary and more appropriate than simply adopting the mid-point of the RBA's range after two years.