TRANSEND

APPENDIX 14

Competition Economists Group, *Expected inflation methodology estimation,*

April 2008

TRANSEND

Expected inflation estimation methodology

A report for Transend

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1. Executive Summary

1. When applying the CAPM, regulators must estimate the real (inflation adjusted) return required by investors on a riskless asset. The standard procedure for doing this has, in the past, been to adopt the observed yield on inflation adjusted bonds issued by the Australian Commonwealth Government.

2. However, in recent years there is evidence that these bonds' yields tend to be biased downwards. This may be explained by falling supply of these bonds – leading to investors paying a scarcity premium for them. This has led to the need to estimate the real risk free rate by deducting a forecast of 10 year inflation from the observed yield on nominal bonds issued by the Australian Commonwealth Government.

3. In this report we survey expert opinions on the expected average rate of inflation over the next ten years. We conclude that the best estimate for this parameter is 2.54%.

2. Preliminaries

4. CEG has been commissioned by Transend to advise on the best approach to calculating expected inflation used to derive the real expected yield on a nominal Commonwealth Government Security (CGS) with a maturity of 10 years.

3. Analysis

3.1. AER's SP AusNet Decision

In its final decision for SP AusNet the AER concludes as follows on page 105.

"The AER's approach to forecasting inflation in this final decision has been in response to an acceptance that the previously ubiquitously used Fisher equation may not currently produce realistic inflation forecasts at this time, due to a bias in indexed CGS yields caused by the scarcity of these bonds. The AER considers that a market based estimate derived from a robust methodology would be preferred to any other alternative method, as the former typically results in a greater degree of certainty and objectivity, however, it is not possible to use such a method at this time. The AER will continue to review this issue in consultation with stakeholders, in the context of the forthcoming WACC review."

"In the draft decision the AER determined it would take account of the RBA's target inflation band and its outlook for inflation to establish its best estimate of inflation. The RBA is the most authoritative source of advice on expected inflation, if a general approach to forecasting inflation is to be used. For the purposes of this final decision the AER considers a general forecasting approach as the methodology likely to produce the best estimates of forecast inflation."

"In the draft decision the AER noted that the RBA's most recent views on inflation indicated that inflation was at the top of the target band and determined 3 per cent represented the current best estimate of inflation. Submissions indicated, however, that past regulatory practice, including by the ACCC/AER, was to use an implied 10 year inflation forecast consistent with other financial parameters used in the WACC. The AER has therefore considered the need to have an inflation forecast which extends beyond the inflation forecast period of two years used by the RBA. The AER accepts that while inflation forecasting over such a long period, and in the absence of a robust market-based approach, is problematic, the medium term inflation forecast is likely to be anchored by the RBA's target band and that appropriate weight also needs to be given to the outlook for inflation beyond the two year forecasting period. The AER considers this approach is likely to result in the best estimates of expected inflation."

"The AER has determined that a methodology that is likely to result in the best estimates of expected inflation is to reference the RBA's short term inflation forecasts, that currently extend out two years, and to adopt the mid-point of the RBA's target inflation band beyond that period (i.e. 2.5%). Averaging these individual year forecasts, an implied 10 year forecast has been derived, consistent with past regulatory practice, from the RBA's inflation forecasts for 2008 and 2009 and an assumption of the 2.5% mid point for a further 8 years. This produces a best estimate of 10 year forecast inflation of 2.59%, based on a simple average."

The AER sets out its forecast derived using this method on page 104

Table 5.3 AER's final decision – Forecast inflation

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Forecast inflation	3.00%	2.88%[106]	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.59%

Source: RBA, AER analysis

3.2. Evidence that indexed government bond yields are downward biased

5. We generally believe that the AER's approach is reasonable. The evidence that indexed government bond yields are downward biased is compelling and is summarised below:

   i. Analysis of the Reserve Bank of Australia (RBA) suggesting that indexed 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 indexed government bonds.

6. The RBA has repeatedly considered this issue in its quarterly Statements on Monetary Policy and has repeatedly reached the conclusion that indexed government bond 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)

7. 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]

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

9. 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.

10. 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%.

11. 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 indexed government bond 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 indexed government bond 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).

12. For the purpose of this report we have redone that later analysis. On 18 January 2008 the following indexed and nominal CGS yields were observed.

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

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

Table 1: 18 January indexed government bond and nominal CGS yields

Maturity	Indexed government bond	Nominal CGS	Implied annual inflation
August 2010	3.2%	6.4%	3.1%
August 2020	2.2%	5.8%*	3.5%

**Interpolated*

13. 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]

14. That is, if we adopt the indexed government bond yield as an unbiased estimate of the real risk free rate then we must simultaneously believe that the expected inflation rate is 3.9% for the ten years from 2010 to 2020.

15. 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 2.54% to 2.60%.

3.3. Expected inflation

16. Given the compelling evidence that indexed government bond yields are biased downward relative to nominal CGS yields, indexed government bond 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 previously outlined, we believe that the nominal CGS yield is itself a downward biased estimate of the nominal risk free rate.[4]

17. Thus, what is required is a methodology for estimating expected 10 year inflation that does not rely on indexed government bond 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

[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.

[4] 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).

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.[5]

18. Table 2 below provides a detailed survey of available estimates of expected inflation from these sources going out 10 years.

[5] 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	3.5	3.25	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	3.1	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, 14 January 2007 (for 2008 and 2009). Consensus Economics, Long Term Consensus Forecasts, 8 October 2007 (for beyond 2009).

19. 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 22 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	2.56	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	2.88	2.87	2.82	2.80
Mean of observations from 2010 to 2018	2.51	2.46	2.52	2.45
Weighted average of short and long term forecasts	**2.59**	**2.54**	**2.58**	**2.52**

20. Focussing on the first column of numbers, these show that the mean forecast for all observations listed in Table 2is 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 3.6 below. This is not just the opinion of CEG but also of BIS Shrapnel itself.

21. 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 22. 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.[6]

[6] We note that ideally one would take account of the fact that the nominal Government bond the AER 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 22) expectations over the next 10 years (where those expectations are available) is 2.54% (see second column bottom row of Table 3).

22. 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.

23. It is also relevant to note that Table 22 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 22.[7]

24. It is also possible to divide the above set of forecasts into government, banks and professional economic forecasters (BIS Shrapnel, Econtech and Access Economics).[8] 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%

25. 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 2 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.

[7] 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 22 because it is possible that Consensus were able to use estimates of inflation that were not directly available to us in preparing this report.

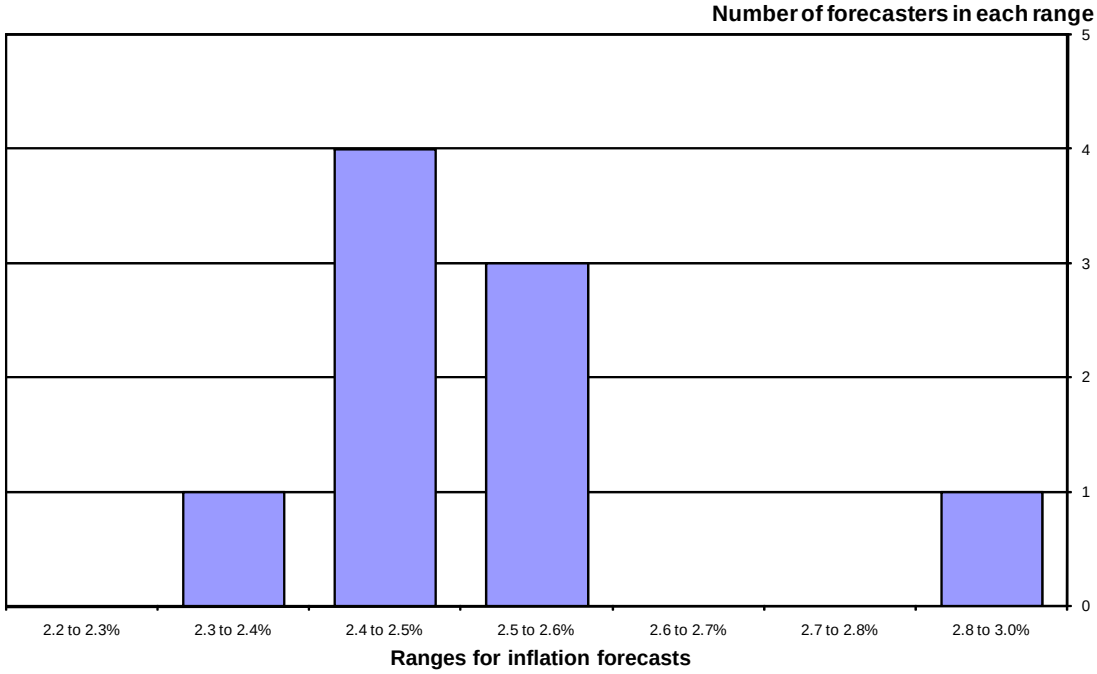
[8] Consensus Economics is excluded from this sample as it provides a summary across all these institutions.

26. 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%

3.4. Best estimate of expected inflation over 10 years

27. 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 33). The relevant estimate is the weighted average mean of forecasters' short and long term expectations (2.54%). 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 1 below (with the BIS estimate being the outlier).

Figure 1: Distribution of Forecasts



28. We note that this methodology arrives at an estimate of 2.54% 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).”[9]

“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%.”[10]

29. It is our view that the methodology used in our paper, of surveying a wide range of professional forecasters, 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.

3.5. Comparison with the AER’s approach in SP AusNet

30. 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%)[11] and then has adopted the midpoint of the RBA’s range (2.5%) for all years beyond that date. This gave rise to a 2.59% average inflation rate over 10 years. However, the RBA has since increased its short term inflation forecasts and reapplying the same approach results in an average expected inflation of 2.68%. The logic of adopting the midpoint of the RBA’s range is identical to that outlined above.

31. The approach in this report resulted in adopting a 2.54% 10 year forecast (0.14% 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%. It is not surprising that the two approaches give very similar results.

32. However, the AER’s approach is akin to giving 100% weight to the RBA’s short term forecasts and zero weight to all other forecasts. It just so happens that the RBA’s short term forecasts are the highest of all forecasters surveyed by us. We note that the RBA is well aware that its forecasts of expected inflation are an important signal to the community in general, and policy makers in particular, of the threat of inflation. In particular, the higher is the RBA’s short-term inflation forecast

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

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

[11] Taking the mid-point of the RBA’s forecast for 2009.

the greater is the pressure on Governments to reign in potentially inflationary spending.

33. In this context, the RBA may have an incentive to err on the side of overestimating expected inflation (ie, to ensure that it does not underestimate the inflationary threat). Partly on this basis, and partly as a general principle, a large sample size is generally better than a small sample size, we believe that our approach of widely sampling of economic forecasters is superior to the AER's approach or relying solely on RBA forecasts.

34. In any event, we believe that any use of RBA inflation forecasts must be done with care. To understand why this is the case note that the accepted purpose of estimating inflation over ten years is to estimate the required *real* return on a 10 year nominal Commonwealth Government bond. It follows that the relevant forecast of inflation must be taken from during the sampling period over which we are sampling the nominal bond returns. That is, we are asking ourselves "what real return do/did investors expect to receive on the nominal bonds that they were purchasing during the relevant sampling period".

35. This is an inherently forward looking concept. That is, the investors buying nominal bonds were paying with nominal money cash during that sampling. Any inflation that had previously occurred up-to the time they purchased the bond is irrelevant to them – when buying a bond they only care about the compensation the bond provides for future expected compensation.

36. However, because of the lag between when inflation occurs and when it is measured by the ABS, many 'forecasts' of inflation are actually, at least partially, estimates of inflation that has already occurred (but is yet to be measured). Some of the RBA's forecasts fall into this category. The most appropriate forecasts of inflation to be used in the PTRM cover one year from the current date (rather than one year from the last published CPI figure).

37. In conclusion, while the AER's methodology is not unreasonable, in our opinion, a superior estimate of expected inflation can be derived by surveying more widely the opinions of professional forecasters.

3.6. Why BIS Shrapnel forecasts should be excluded

38. 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.[12] We are further informed that BIS Shrapnel believes that the mean forecast lies below the mode forecast.

39. 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 occuring – 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.

40. 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%**

41. 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

[12] 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.

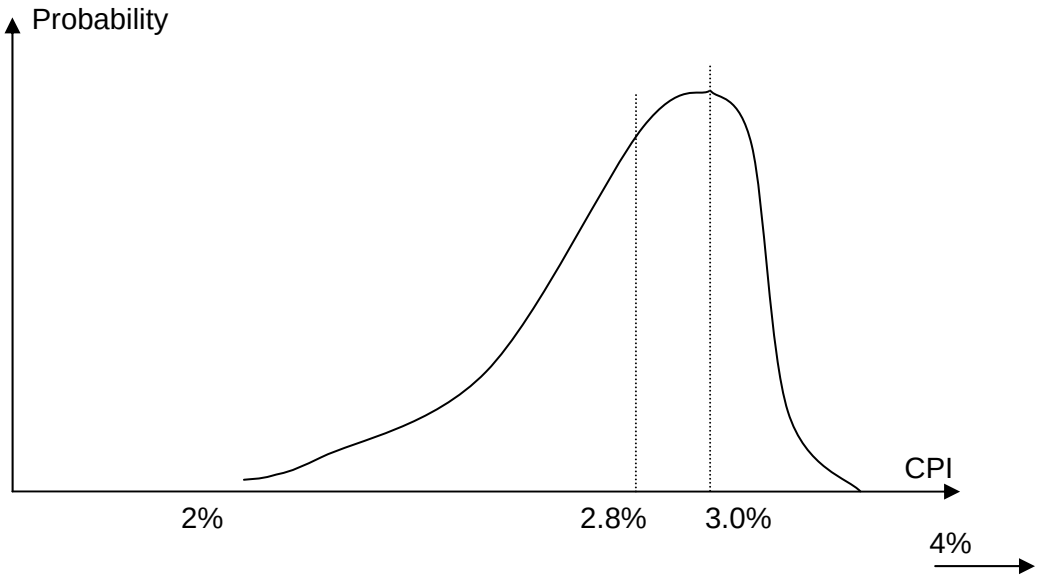
"However, we believe the Reserve Bank will act to prevent CPI inflation running at over 3.0% for long periods. Accordingly, a 'mean' of a range of alternative scenarios would be less than our 'most likely' 2.9% figure. Therefore, with regard to the second point raised in your letter, yes, we expect that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

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.

42. 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.

43. 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 2: Probability Distribution for Average Inflation over a Five Year Period



44. 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.[13] However, BIS believes that the RBA will not actively seek to increase

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

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."[14]

45. 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. 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.

46. Given that the BIS Shrapnel forecast used in Table 3 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%)

[14] Ibid, p.1