

The Allen Consulting Group

MEMORANDUM

To: Mr. Peter Rixson, Manager Projects, Economic Regulation Authority

From: The Allen Consulting Group

Date: 11 July, 2005

Re: AGN cost of debt margin

Conclusions and recommendations

- The Economic Regulation Authority (ERA) is currently assessing a cost of debt margin (exclusive of debt raising transaction costs) as part of its estimation of a cost of capital range for AlintGas Networks' (AGN) Mid-West and South-West Gas Distribution Systems. The ERA has requested independent advice from The Allen Consulting Group (ACG) to assess a submission from AGN on the cost of debt, which was supported by a research report by National Economic Research Associates (NERA).
- NERA has submitted that the methodology applied by CBA Spectrum to predict fair value yields is statistically biased with respect to long dated, low rated issues, and understates the cost of issuing this debt. NERA presented an analysis of why, on theoretical grounds, an underestimate may be expected given the current state of development of the Australian corporate bond market, as well as an empirical estimate of the likely size of the underestimate. ACG concurs with the theoretical assessment of CBA's methodology with respect to longer dated, lower rated bonds, and confirms its estimates of the likely size of the underestimate based on its own independent research. Like NERA, ACG recognises that CBASpectrum's methodology is likely to provide an accurate estimate of higher rated, shorter dated bonds, which is the main commercial use to which it is applied.
- Based on its time-series analysis of yields for corporate bonds over the last two years, NERA submits that 25.6 basis points should be added to the debt margin calculated by CBASpectrum. ACG has obtained a very similar result (23.7 basis points) with a slightly larger database than that used by NERA using more up-to-date data. Thus, we conclude that the CBASpectrum service is likely to underestimate the cost of 10 year BBB+ rated debt by an amount in the order of 25 basis points. Accordingly, this amount should be added to the CBASpectrum predicted yields in order to obtain a statistically unbiased estimate of the fair yield of 10 year BBB+ rated corporate bonds.
- We note, however, that the CBASpectrum estimates (as adjusted above) provide just one of the possible points of reference for the derivation of a benchmark cost of debt. An alternative service that provides predicted yields is Bloomberg. Its analysis differs to that employed by CBASpectrum, which NERA's analysis (with which we agree) suggests should provide unbiased estimates of the relevant yields (we note that extrapolation is required to derive a proxy for 10 year debt). A third potential data source is the all-up cost of issuing credit-wrapped debt, taking account of the observed yields on the relevant AAA-rated credit-wrapped bond issues and adding a likely cost associated with the wrapping service. The three

data sources suggest that the benchmark cost of issuing 10 year BBB+ debt is between 1.23 and 1.33 per cent over the 10 year bond yield.¹

- In the future, unless more BBB+ 10 year bonds are issued in Australia, Bloomberg will be likely to reduce its offering of fair yield estimates to 8 years and then 7 years. This could create future problems in estimating an accurate cost of debt in Australia. It is possible that CBASpectrum may in future truncate its offerings of fair yield estimates (as Bloomberg has done). If this is the case, it may in future be necessary to undertake a more complex ‘tailor made’ analysis to determine appropriate bond rates for BBB+ rated 10 year debt.

The brief

The ERA has requested that The Allen Consulting Group (ACG) provide a memorandum of advice responding to a recent submission on the cost of debt submitted by AGN with respect to proposed revisions to its Access Arrangement. It has been submitted by AGN that CBASpectrum, a data source that has been relied upon by the ERA, as well as other regulators, is likely to under-estimate the “prevailing conditions in the market for funds”, as required by the Gas Code.

AGN’s submission considers an adequate range for the cost of debt is between 100 and 121.4 basis points. In support of its submission, AGN has provided a research report by National Economic Research Associates (NERA), titled “Critique of available estimates of the credit spread on corporate bonds”.² The ERA has engaged ACG to:

- Respond to the matters raised by AGN in its submission;
- Respond to the matters raised in the NERA research report; and
- Bring to the ERA’s attention any additional and related matters that the Authority should take into account in the use of CBASpectrum and any other relevant data sources when making an estimate of the cost of debt for utility businesses such as AGN.

A. AGN’s AMENDED ACCESS ARRANGEMENT INFORMATION

AGN’s amended Access Arrangement Information (AAI) addresses the ERA’s Draft Decision, which relies on CBA Spectrum data on credit margins. AGN proposes that the CBA Spectrum model is based on inappropriate data inputs, and as a result, the debt margin of 100 basis points for 10 year BBB+ bonds estimated by the ERA is not appropriate as an upper bound of the cost of debt faced by businesses in the market

¹ Note that this assumes the 10 year bond yield applied is the Commonwealth Bond (mid-rate), known as the GACGB10 index on Bloomberg, measured over the 20 business days ending 30 May, 2005.

² NERA (May 2005), “Critique of available estimates of the credit spread on corporate bonds, A Report for the ENA. The report was co-authored by Dr. Tom Hird of NERA and Professor Bruce Grundy of the Melbourne Business School, and includes an appendix by Professor Kevin Davis of the University of Melbourne.

place. AGN submits that, while the ERA has maintained that the CBA Spectrum model:³

Provides the upper level for the cost of debt... this argument is fallacious as the Bloomberg model provides higher estimates and the CBA Spectrum model is clearly biased.

AGN submits that the Snowy Hydro bond was trading at 121.4 basis points over the 10 year bond rate at 15 March, 2005, and that, “an adequate range for the cost of debt is therefore between 100 [CBASpectrum estimate] and 121.4 basis points [Snowy Hydro]”.⁴

B. NERA’S CRITIQUE OF AVAILABLE ESTIMATES OF CREDIT SPREADS

NERA’s paper undertakes an analysis of the predictive ability of CBASpectrum fair yields and concludes that for 10 year BBB+ rated bonds, CBASpectrum is likely to underestimate the fair yield of an actual bond by 25.6 basis points. NERA also finds that the Bloomberg service predicted yields were 25.8 basis points higher than CBASpectrum for 10 year BBB+ rated bonds.

NERA’s conclusions

NERA concludes that, in order to reflect the latest market evidence available on the borrowing costs of an efficiently financed electricity distribution business, regulators should:

- Make an adjustment to CBASpectrum data low rated (A and below) bonds, by adding 25.6 basis points; or
- Apply Bloomberg yields – but since Bloomberg only produces 9 year fair yield estimates, NERA suggests adding the yield differential between 9 and 10 year Commonwealth Government Security (CGS) bonds to the Bloomberg fair yield for 9 year BBB+ bonds; or
- Develop a ‘tailor made’ and transparent technique for the estimation of the cost of debt on low rated corporate bonds.

Analysis of CBASpectrum’s fair yield estimation methodology

NERA’s paper begins with an analysis of the reasons why CBASpectrum would be expected to under-estimate the fair yields of long dated, low rated corporate bonds in Australia. To understand the CBASpectrum methodology, NERA obtained a copy of ‘Spectrum Re-built Analytics’, which outlines the estimation methodology applied by CBASpectrum. According to NERA, the main reasons that CBASpectrum underestimates yields on long-dated, low rated bonds are two-fold:

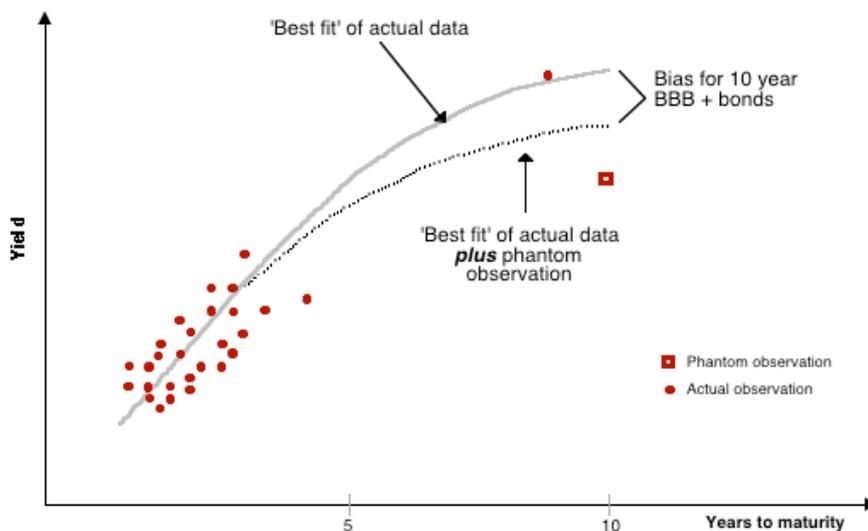
³ AGN (27 May 2005) *Amended Access Arrangement Information for the Mid-West and South-West Gas Distribution Systems*, p. 52.

⁴ AGN (27 May, 2005), p.52.

- *Regression technique* - The CBASpectrum methodology departs from the standard regression technique, which estimates a function that minimises the sum of the squared deviations from the actual observations. Instead, CBASpectrum takes account of the fair value yield for the next highest credit rating at 10 years to maturity, and the CBASpectrum estimate for CGS and BBB- bonds at 1 year maturity. NERA argues that this “introduces for each credit rating, one ‘phantom’ observation of a 10 year corporate bond with a credit spread that is the same as that predicted for the next highest rated bond of 10 years”.⁵ This effectively introduces a ‘phantom’ observation of a 10 year corporate bond with the next highest credit rating.

CBASpectrum’s methodology will not introduce significant statistical bias where there are many actual observations. However, in the case of low rated, long dated bonds, the introduction of the ‘phantom’ observation, will have the effect of biasing estimates of the fair yield downward. For example, in the case of BBB+ rated bonds, above 5 years there is only one observation (Snowy Hydro) around an 8 year maturity, and none at 10 years, so that the ‘phantom’ observation will have the effect of dragging the estimate of a 10 year BBB+ rated bond to approximately half way between the two observations in order to minimise the sum of the squared deviations. This is demonstrated by NERA with a chart that has been reproduced below.

CHART 1: ‘FAIR YIELD’ ON BBB+



Source: NERA (May 2005), p.6

- *Constraining the functional form* – CBASpectrum constrains the functional form of the fair yield curves it estimates, as it seeks to estimate all the yield curves simultaneously. One reason it may wish to apply such a constraint is that it does

⁵ NERA (May 2005), *Critique of available estimates of the credit spread on corporate bonds: A Report for the ENA*, p. 5.

not wish the yield curves of different ratings to cross. NERA concludes that, “this restriction means that changes in maturity must have identical proportional impacts on credit spreads for all bonds – irrespective of their credit rating”.⁶ Thus, if the bond market is of the view that the default risk of bonds increases with maturity, and as the bond’s credit rating falls, the spread between AAA and BBB rated bonds can be expected to widen with increasing maturity. By constraining the yield curves of differently rated bonds to have the same shape, the CBASpectrum approach is likely to overestimate yields on long-term bonds, and under-estimate yields on low-rated bonds. NERA holds that the financial economics literature does not support the constraining of functional form in the way that it has been imposed by CBASpectrum.

Analysis of Bloomberg’s fair yield methodology

NERA also analysed Bloomberg’s fair yield prediction methodology, and concluded that it does not exhibit the biasing influences found in the CBASpectrum approach.

- *Regression technique* – Unlike CBASpectrum, Bloomberg applies a standard regression technique, and there are no ‘phantom’ observations, which could bias the results downward if there are insufficient actual observations.
- *Unconstrained functional form* – Unlike CBASpectrum, Bloomberg does not apply constraints on the functional form to estimate its predicted fair yields – it simply applies the form that minimises the sum of the squared deviations between actual observed yields and its predicted ‘fair yields’. This means that yield curves will potentially rise and fall at different maturities rather than describe a smooth shape.

On the basis of these observations about the estimation methodologies applied by Bloomberg compared with CBA Spectrum, NERA concludes that it would expect estimates generated by the former to more closely approximate actual observations in the bond market. Another important observation made by NERA is the fact that all of the actual BBB bonds relied on by Bloomberg in the post June 2003 period are in fact BBB+ rated bonds. Therefore, since the actuals relied upon by the least squares regression estimates are BBB+ rated, the resulting predictions are in fact BBB+, and not BBB.⁷

NERA’s analysis of Bloomberg vs CBASpectrum predictions

NERA concludes that over the period 30 June, 2003 to 20 October, 2004 (when Bloomberg ceased providing fair yield estimates for BBB+ bonds), CBASpectrum underestimated Bloomberg by 25.6 basis points.

NERA submits that a differential of 25.76 basis points accords with its own view of CBA Spectrum’s likely under-estimation of a 10 year BBB+ bond based on its review of 7 bonds over the period 30 June 2003 to 10 May 2005. NERA also undertakes a

⁶ NERA (May 2005), p.15.

⁷ NERA (May, 2005), p.12. ACG has not confirmed this point by examination of Bloomberg’s full data base.

regression analysis, which predicts a 25.6 basis points excess over the CBASpectrum margin at 10 years. In other words, the margin predicted by CBASpectrum's methodology is expected to under-estimate the required margin by 25.6 basis points for a 10 year bond.

C. ACG'S RESEARCH ON CURRENT CBA SPECTRUM AND BLOOMBERG DEBT MARGINS

Analysis of CBASpectrum and Bloomberg

NERA's analysis was based on time series data relating to CBASpectrum, and Bloomberg fair value yields on the one hand, and actual yields of trading bonds on the other. The Allen Consulting Group has also investigated this issue, and has undertaken a cross-sectional analysis based on data relating to the 20 day period ending 30 May, 2005. Different results can be obtained depending on the Commonwealth Bond rate that the margins are referenced from. However, if a consistent government bond rate is applied, the results will be consistent with respect to the estimated differential to the CBASpectrum estimated margin.⁸

The CBASpectrum service predicted an average debt margin of 106.3 basis points for a 10 year BBB+ bond over the Commonwealth Bond mid-rate (known as the GACGB10 index on Bloomberg) for the 20 business days ending 30 May, 2005. Thus, NERA would predict a 131.9 basis point margin (106.3 plus 25.6). This is based on an average Commonwealth Bond rate (mid-rate) of 5.29% for the 20 day period to 30 May, 2005. In sections C to E below, we undertake several cross-sectional tests of the NERA findings.

Tables 1 and 2 below show the spread over the Commonwealth Bond rate for various terms to maturity from 5 to 10 years, and for four different Standard and Poor's credit ratings. In order to minimise the effects of short-term volatility, the margins have been calculated as averages of 20 days of margins ending on 30 May, 2005.

Both the CBASpectrum and Bloomberg fair yield services have approximately the same margin for 5 year maturity A+ rated bonds. However, as the term to maturity lengthens to 10 years, for an A+ rated bond Bloomberg predicts a margin 30 bps higher. By contrast, CBASpectrum adds only approximately 6 bps to its predicted yield for a 10 year A+ rated bond.

While CBASpectrum's predicted 'fair value' margin increases by 22.9 bps in moving from an A+ to BBB+ rated 5 year bond, Bloomberg's 'fair value' margin increases by only 17.3 bps. At the longer dated end of the curve, the margins for CBASpectrum and Bloomberg expand by approximately 24 bps and 28 bps respectively. The result is that Bloomberg has a more steeply rising margin with respect both to increasing time to maturity, and to reduced credit rating.

⁸ One issue that should be noted is that in a longitudinal study, such as that undertaken by NERA, different 10 year bonds (for example) must be referenced or weighted, in order to maintain a consistent 10 year bond estimate.

Table 1. CBASpectrum Fair Yields: Margin over Commonwealth Bond (mid-rate), 20-days average to 30 May, 2005

| Credit Rating | 5 year | 6 year | 7 year | 8 year | 9 year | 10 year |
|---------------|--------|--------|--------|--------|--------|---------|
| BBB+ | 98.8 | 101.6 | 103.2 | 104.2 | 105.3 | 106.3 |
| A- | 90.5 | 93.1 | 94.6 | 95.5 | 96.6 | 97.5 |
| A | 82.9 | 85.3 | 86.8 | 87.6 | 88.6 | 89.4 |
| A+ | 75.9 | 78.2 | 79.5 | 80.3 | 81.2 | 82.0 |

Source: CBASpectrum, Bloomberg

Table 2. Bloomberg Fair Yields: Margin over Commonwealth Bond (mid-rate), 20-days average to 30 May, 2005

| Credit Rating | 5 year | 6 year | 7 year | 8 year | 9 year | 10 year |
|---------------|--------|--------|--------|--------|--------|---------|
| BBB+ | 97.8 | 99.9 | 101.8 | 128.4 | 132.8 | |
| A- | 93.3 | 96.5 | 99.3 | 114.8 | 120.5 | |
| A | 88.8 | 93.0 | 96.8 | 101.3 | 108.3 | 115.2 |
| A+ | 80.5 | 87.6 | 94.4 | 97.9 | 104.5 | 110.5 |

Source: Bloomberg

ACG collected yield margin data for 8 Australian Medium Term Notes (MTNs), which:

- have been issued without credit wrapping;
- are rated at between A+ and BBB+;
- are fixed coupon securities that are priced in the market; and
- have a term to maturity of between 5 and 10 years.

The terms and average actual yields based on the last 20 trading days to 30 May, 2005, are shown in Table 3 below. The actual yields lie above or below the yields predicted by CBASpectrum and Bloomberg. For bond maturities of 6.5 years or less, the predictions of CBASpectrum are reasonably accurate compared with Bloomberg. However, for bond maturities of 8 to 10 years, the CBA Spectrum predictions are on average 19.2 basis points less than actual observations of bond yields. This result is very similar to the 17.1 basis points differential NERA obtains for bonds in its sample

over the period 30 June 2003 to 10 May 2005, which were for durations of 6 years or more.⁹

Table 3: Australian corporate fixed rate bonds: current trading margins over Commonwealth Bond (mid-rate), 20-days average to 30 May, 2005

| Corporate bond | Years to maturity | Credit Rating | Actual margin to Bond (bps) | Bloomberg Differential (bps) | CBA Spectrum Differential (bps) |
|--|-------------------|---------------|-----------------------------|------------------------------|---------------------------------|
| Westfield | 5 | A- | 91.9 | 1.4 | -1.5 |
| Gandel | 5.5 | A | 90.2 | 0.7 | -6.1 |
| TABCORP | 6.5 | BBB+ | 86.5 | 4.5 | -7.6 |
| SPI PowerNet | 6.5 | A+ | 100.5 | 0.3 | 1.9 |
| Snowy Hydro | 8 | BBB+ | 122.7 | 5.7 | -18.5 |
| Stockland | 8 | A- | 108.4 | 6.4 | -12.9 |
| Gandel | 9.5 | A | 110.7 | 1.1 | -21.7 |
| Telstra | 10 | A+ | 105.8 | 4.8 | -23.8 |
| Average – All bonds | | | | 3.1 | -11.3 |
| Average – Bonds with more than 8 years to maturity | | | | 4.5 | -19.2 |

Source: Bloomberg

Accordingly, we conclude from the results presented above that:

- NERA’s theoretical proposition that the CBASpectrum predicted yields tend to understate the true yields for long-dated, low rated Australian corporate bonds is consistent with the available data on bond yields;
- The extent of understatement of the CBASpectrum yields that NERA found is consistent with our analysis (note, however, that NERA suggested that the degree of understatement depended upon the term of the corporate bond – this matter is addressed below); and
- The difference between the Bloomberg predicted yields and the observed yields for Australian corporate bonds is very small – and is consistent with the theoretical proposition that the Bloomberg method should produce statistically unbiased yield predictions.

⁹ NERA (May 2005), p.9.

CBASpectrum Understatement for 10 year bonds

The analysis presented above suggested that the understatement in the CBASpectrum predicted yields tends to rise with the term of the bond. As the ERA's stated objective is to derive the margin on corporate debt with a remaining term of 10 years, the relevant issue is the extent of understatement of 10 year debt.

NERA undertook a standard regression analysis to predict the CBASpectrum understatement for bonds with a 10 year remaining term. Table 4 below shows the results of NERA's regression equation, compared with a similar equation estimated on the basis of a different (but mostly overlapping) sample of bond issues examined as at a point in time (20 day average) by ACG. ACG's sample of bond issues spans a longer period of years to maturity than NERA's sample.

Table 4: Regression results: dependent variable – Debt Margin (over mid-rate Commonwealth Bond rate) excess to CBA Spectrum (basis points)

| Research (period) | No. | Intercept term | Years to Maturity coefficient | Adj. R ² | Predicted Excess over CBA Spectrum at 10 yrs |
|-------------------|-----|----------------|-------------------------------|---------------------|--|
| NERA (2 years) | 7 | -23.355 | 4.898*** | .55 | 25.62 |
| ACG (20 days) | 8 | -23.617** | 4.731* | .78 | 23.69 |

Note: * statistically significant at 99% confidence level ** statistically significant at 98% confidence level *** statistically significant at 95% confidence level

Examination of the table shows that ACG's regression has higher overall explanatory power (R square of 0.78 compared with 0.55) and the coefficients are more highly statistically significant. However, examination of the table shows that the predicted excess of an actual bond yield over the CBASpectrum predicted yield at a 10 year maturity is strikingly similar between the two analyses, with the ACG estimate of 23.69 only 2 basis points lower than NERA's estimate of 25.62, which is neither statistically nor economically significant. The regression equations above implicitly assume that all credit ratings have the same slope coefficient with respect to underestimation. This need not be the case, but there are too few observations to test alternative propositions.

Accordingly, the analysis presented above provides very similar results to NERA's estimates of the understatement of predicted yields by the CBASpectrum service. Using the CBASpectrum predicted yields as the basis for setting the benchmark debt margin and adjusting for the expected understatement yields a benchmark debt margin (as at 30 May 2005) of:

- 132 basis points using NERA's estimates; and
- 130 basis points using the ACG estimates.

D. ALTERNATIVE SOURCES OF EVIDENCE FOR THE DEBT MARGIN

Bloomberg Predicted Yields

The analysis presented above suggested that the predicted yields provided by the Bloomberg service provide an alternative means of deriving a benchmark debt margin. In particular, it was concluded that there were no strong theoretical grounds for considering that the Bloomberg predictions would be statistically biased, which was supported by the analysis of actual yields for Australian corporate bonds.

The difficulty with using the Bloomberg service, however, is that it does not provide predicted yields beyond 9 years. An approximation for a 10 year corporate bond can be derived by taking a linear extrapolation from the predicted margins for 8 and 9 year bonds – which would imply a margin of 137.2 basis points as at 30 May 2005. However, given that this is a straight-line extrapolation, 26.4 basis points could be considered an overestimate given the general tendency for yield curves to flatten with years to maturity.

Australian AAA Credit Wrapped Corporate Bond Issues

Another approach to estimate the cost of debt for Australian infrastructure issuers, which was not undertaken by NERA, is to estimate the cost of debt for AAA-rated credit wrapped domestic MTN issues, and add a margin for the cost of credit wrapping. One difficulty with this approach is that although the trading margins for AAA credit wrapped issues may be readily observed, the credit-wrapping fee is not publicly available, and must therefore be estimated.

Credit-wrapping fees lie in the region of 20-60 bps, but market participants indicate that most credit wrapping is being done at approximately 30 bps. In the US the differential between 10 year AAA and BBB+ corporate bonds is currently approximately 35 bps, which provides another indication that a range of 30 to 40 bps could be an approximate range of credit wrapping fees.¹⁰

Table 5: Australian AAA credit wrapped MTNs, margins over Commonwealth Government Bonds (mid-rate), 20-days average to 30 May, 2005

| | Lane Cove Tunnel | Envestra |
|-------------|------------------|------------|
| Maturity | 8.5 years* | 10.5 years |
| Margin bps | 85.7 | 93.8 |
| Fee:+30 bps | 115.7 | 123.8 |
| Fee:+40bps | 125.7 | 133.8 |

Source: Bloomberg * Note: Whilst the Lane Cove Tunnel bond has a maturity at 9/12/2015, it is callable at 9/12/2011 and is priced like an 8.5 year bond.

¹⁰ If credit wrapping fees were higher than this spread we would not expect to see any credit wrapping occurring.

Table 5 indicates that the cost of 10 year debt to an infrastructure business with a BBB+ rating would be likely to be in the range of 123 to 133 bps, depending on whether a 30 bps or 40 bps credit wrapping fee was assumed.¹¹ This range suggests that a BBB+ rated business may be able to debt fund at a lower cost through credit wrapping than by issuing BBB+ rated debt for 10 years. If this were the case, we should not expect to observe BBB+ rated 10 year debt issued in Australia. Of the two observations, we would recommend placing greater weight upon Envestra given that it has a remaining term that is closer to 10 years and its activities are most similar to those of AGN.

E. OTHER RELEVANT ISSUES

In future it may prove more difficult to assess the appropriate bond margin for 10 year BBB+ bonds, since the only long term bond in that credit rating, Snowy Hydro, is reducing its time to maturity. It may be that in October, 2005, Bloomberg will cease to produce an estimate for 9 year BBB+ rated bonds in the same way that it ceased providing 10 year bonds in October 2004. In that event longer extrapolations would need to be undertaken on the basis of current data.

Recently in the bond market there was hope that when UBS included BBB rated bonds in its bond index, financial institutions tracking the index would have a demand for these bonds. However, the supply of these bonds must come from corporate issuers, and it is likely that what we observe in the market (i.e. the lack of 10 year BBB+ issues) demonstrates that the lowest cost of funding is not obtained by issuing long dated BBB+ bonds in Australia. Instead, it would appear that Australian corporate issuers are doing the following:

- Issuing 7 year AAA credit wrapped bonds in Australia, and more rarely 10 year AAA credit wrapped domestic bonds; or,
- Issuing 10 year (or longer) bonds in the US private placement market, mostly credit wrapped to AAA, but sometimes at BBB+ or lower ratings.

It is also possible that CBA Spectrum may in future truncate its fair yield estimates where there are insufficient actual observations in certain categories (in the same way that Bloomberg does). Again this would leave less information for estimating bond yields in the long maturity/low credit rating category.

¹¹ We have rounded down from Envestra's estimated range of 123.8 to 133.8 to account for the fact that the Envestra bond's time to maturity is 10.5 years rather than 10 years.