# APPENDIX C

## *Methodology to Estimate the Debt Risk Premium*

*April 2011*

# *Powerlink*

# Methodology to estimate the debt risk premium

*Report to Powerlink Queensland*

*April 2011*

# Contents

# Executive Summary

## The Brief

Powerlink is developing its Regulatory Revenue Proposal for the regulatory control period (2013-2017), which is to be submitted to the Australian Energy Regulator (AER) by the end of May 2011, and has engaged PricewaterhouseCoopers (PwC) to undertake analysis and provide advice and recommendations relating to a methodology for estimating the debt risk premium.

## Deriving a methodology for estimating the debt risk premium

CBASpectrum has now ceased publication of any relevant fair value yields applicable to that required for estimating the debt risk premium for a transmission network service provider (TNSP). Bloomberg publishes only a 7 year BBB fair value curve, and has ceased publication of a 10 year AAA fair value curve. Given these data limitations, Powerlink requested PwC to propose an alternative methodology for estimating the debt risk premium that best meets the legislative requirements.

We note that Powerlink's final debt risk premium will be determined during an averaging period that is closer to the time of its decision (expected to be approximately one year from the averaging period that has been used in this report). Limited trade in Australian corporate bonds, the small number of number of bonds on issue and the limited quantity of new bond issues (especially around the 10 year mark) continue to create a challenge for estimating the debt risk premium. However, these conditions in the Australian corporate bond market are expected to continue to improve. Importantly, as the quality of the market evidence improves, this will automatically be factored into the debt risk premium that is derived from applying the methodology proposed in this report.

### Background to the debt risk premium debate

A decade ago Australian regulators relied only on the CBASpectrum service when estimating the debt risk premium for a benchmark 10 year BBB+ rated bond. In 2004, the Queensland Competition Authority (QCA) first used the Bloomberg service's fair value yield to estimate a debt risk premium, which implied a slightly higher allowance than CBASpectrum, and awarded the higher amount to DBCT.[1] Subsequent investigations by regulators and regulated

[1] Queensland Competition Authority (October, 1924) *Draft Decision – Dalrymple Bay Coal Terminal: Draft Access Undertaking*, p. 190.

businesses found that the CBASpectrum fair value curve was systematically under-estimating the yield on longer dated, low rated (i.e., BBB+) Australian corporate bond yields. The Bloomberg service's fair value curve subsequently became the standard tool by which Australian regulators derived a debt risk premium for regulated businesses.

However, during the global financial crisis a material gap emerged between the CBASpectrum yields and those from Bloomberg, with CBASpectrum rising well above Bloomberg's yields. While the CBASpectrum service estimated a material increase in the cost of debt after the fall of Lehman Brothers in September 2008, the yields estimated by the Bloomberg service did not move materially compared with pre-September 2008 yields.

Regulated businesses were concerned that Bloomberg was under-estimating the yields implied by market opinion. This argument was rejected by the AER, which chose to continue using the Bloomberg service to estimate the benchmark cost of debt.[2]

PwC was engaged by the Victorian electricity businesses to investigate the performance of the Bloomberg service over the period of the global financial crisis.[3] We found that during the global financial crisis the dispersion in financial sector opinions on bond yields was high, making yield estimation highly uncertain. In addition, Bloomberg tended to choose bond yields from the bottom of the range of opinions, and then draw a fair value curve that did not reflect the central tendency of Bloomberg's chosen yields. Applying these tests, we found that by October 2009, the data difficulties and biases had disappeared, so that Bloomberg could be relied upon once more.

The AER's method involved selecting between the CBASpectrum and Bloomberg curves, which led it to change from preferring the Bloomberg curve to preferring the CBASpectrum curve at about the time that the Bloomberg curve rose above the CBASpectrum curve. Its method involved testing which curve provided the closest fit to the small sample of BBB+ fixed rate, generally short term Australian corporate bonds on issue, drawing opinions on the market yield of such bonds drawn from three sources – Bloomberg, CBASpectrum and UBS.[4] This methodology was heavily criticised by the businesses and their advisers, amongst other things because the AER's test relied upon very little information and ignored other evidence on prevailing yield for long dated bonds. The AER's approach was subsequently overturned by the Australian

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2 For example, see AER (11 April, 2008), *Final decision – ElectraNet transmission determination 2008-09 to 2012-13*, pp. 66-67; and AER (28 April, 2009) *Final Decision – Transend Transmission Determination 2009-10 to 2013-14*, pp. 71-79.

3 PricewaterhouseCoopers (November, 2009), *Victorian Distribution Businesses – Methodology to Estimate the Debt Risk Premium.*

4 AER (November, 2009), *Draft decision – ActewAGL distribution access arrangement proposal*; and AER (November, 2009), *Draft decision – Country Energy access arrangement proposal.*

Competition Tribunal (ACT or the Tribunal).[5] The Tribunal supported the use of a wider population of bonds than was being used by the AER to ascertain an appropriate debt risk premium for long dated, BBB+ bonds, in particular it supported the use of floating rate bonds adjusted to equivalent fixed rate yields. The Tribunal also concluded that useful information about the likely yields of long dated BBB+ bonds could be obtained by reviewing yields of bonds in credit rating bands around the BBB+ band. The Tribunal accepted the method proposed in that case to use the average of the Bloomberg and CBASpectrum curves. As Bloomberg had ceased providing yield estimates beyond 7 years from 18 August 2009, the Tribunal permitted the Bloomberg BBB curve to be extrapolated by adding on the change in the Bloomberg AAA curve between 7 and 10 years.

### The AER's final decision on the Victorian DNSPs

The AER's final decision on the Victorian electricity network distribution network service providers (DNSPs) was made in response to the Tribunal's criticisms, and is the first decision that has been delivered after CBASpectrum ceased (from 8 September, 2010) to publish fair value curves. CBASpectrum cited data difficulties arising from the global financial crisis as its main reason for discontinuing publication of fair value curves, but did not rule out resuming publication at some time in the future.

With very little discussion of its reasons for doing so, the AER decided to estimate the debt premium for a 10 year BBB+ bond by applying:

- 75 percent weight to the 7 year Bloomberg BBB debt risk premium extrapolated to 10 years using the rise in the Bloomberg AAA bond from 7 to 10 years (which, by that time, had ceased being published – and so the latest available figures were used); and
- 25 percent weight to the APT bond's debt risk premium.

In its decision the AER reaffirmed that the Bloomberg curve is 'a reasonable source of information' that can be used in setting the debt risk premium.[6] At the same time it argued that CBASpectrum's decision to discontinue publishing fair value curves raises concerns about placing sole or primary reliance on the Bloomberg service. The AER also considered that the 7 year BBB Bloomberg debt risk premium is likely to overstate the benchmark owing to the observation of a lower debt risk premium attaching to the recently issued Australian Pipeline Trust (APT) BBB rated 10 year bond.

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5 Application by ActewAGL Distribution [2010] ACompT4

6 Australian Energy Regulator (October, 2010), Final Decision - *Victorian electricity distribution network service providers, Distribution determination 2011 - 2015*, p.509.

## Errors with the AER's method

The AER decision to apply a 25 per cent weight to a single observation – namely the APT bond – was based upon a number of propositions, namely that:

- the APT bond is indicative of the debt risk premium for a BBB bond at 10 years, including that theory suggests that the debt risk premium may reduce with term for low rated debt (i.e. a declining or 'humped' relationship); and
- that APT is a particularly close proxy for the bonds that a benchmark distribution business would issue (including because the activities are similar).

We consider that the first of these justifications is incorrect and that the second argument is irrelevant.[7]

## Testing the rise implied by the APT bond

Given that the AER has placed 25 percent weight on the relatively low yield (and debt risk premium) APT bond, it is important to examine whether that bond is an outlier, or an observation that is reflective of a broader benchmark relationship between debt risk premium and term. Our inquiries among debt market practitioners indicated that the bond had been well timed and was 'eagerly chased' by buyers who required a certain amount of longer term debt in their asset portfolios.[8] Despite its BBB credit rating, APT was also considered to have a very strong business profile. We infer from these market responses that the APT bond's debt risk premium is considered not to be representative of a benchmark BBB or BBB+ debt risk premium (i.e. is an outlier).

For the reference period we have used, of which were the 40 business days from 7 February 2011 to 1 April 2011, the debt risk premium implied by the APT bond was 301 basis points. This figure is an average of the Bloomberg (295 basis points) and UBS (308 basis points) debt risk premiums. To test the reasonableness of the APT bond, we compared its debt average risk premium to observations of the BBB+ and A- credit bands. As displayed in Figure E.1 below, while the APT debt risk premium of 301 basis points lies above a linear regression of the Bloomberg A- debt risk premium to 10 years, it lies:

- Well below the Bloomberg BBB debt risk premiums at 5 and 7 years (339 and 412 basis points respectively); and

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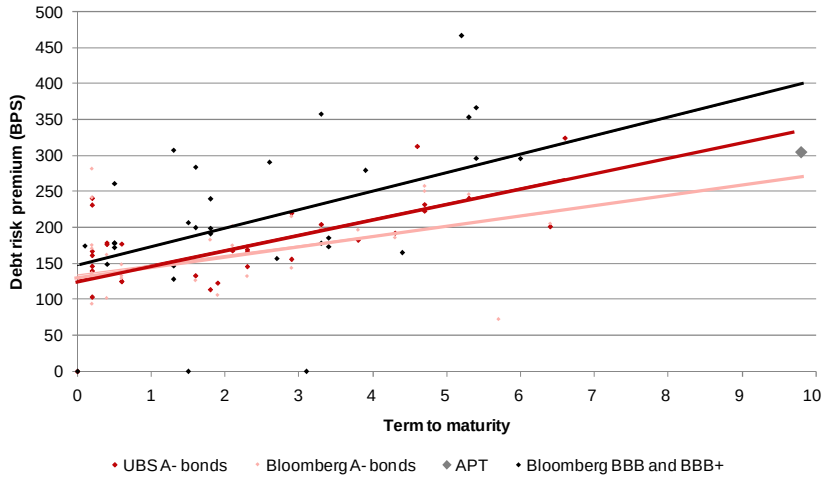
7 We note that in February, 2011, the AER released a draft decision on the access arrangements for Envestra's South Australian and Queensland gas networks, which applies a 50 percent weighting to the APT bond, justified only by its opinion that a recent rise in the Bloomberg fair value curve is not justified.

8 These comments about the APT bond were provided to PwC on a confidential basis, however upon request, we are able to provide their names to the AER (on a confidential basis).

- Generally below or is consistent with the 10 year value implied by a straight line regression based on debt risk premium observations for the A- rating band.

**Figure E.1 Linear regression of Bloomberg A- to BBB and UBS A- rated fixed and floating coupon bonds**




Source: Bloomberg and RBA for the 40 day reference period

We found no evidence of a declining or humped relationship in the Bloomberg BBB curve during the reference period, and CBASpectrum's BBB and BBB+ curves were always upward sloping (albeit at a declining rate). Almost without exception, the paired bonds analysis we conducted indicated a strong positive rise with term (see below). If the average rise of 16 basis points per annum were applied to the APT bond (which is a minimum estimate as the bonds were generally A rated), it would imply a BBB debt risk premium of 173 basis points at a term of 2 years, which is unreasonable. In fact, this value of 173 basis points is well below the observations of debt risk premiums for BBB, BBB+ and some A- bonds at a similar term.

Hence, it is most likely that the APT bond's relatively low debt risk premium is due to unique factors (such as timing, perceptions of an exceptionally strong business position, and a group of investors rolling over from positions in a previous APT bond), and the AER should not have accorded a 25 percent weighting to it in determining the benchmark debt risk premium for a 10 year BBB+ rated bond.

### AER's reliance on Merton's (1974) model

Without empirical support, the AER has chosen to justify the reasonableness of placing significant weight on the APT observation by reference to Merton's 1974 theory of bond pricing,[9] as well as a

9 Robert C. Merton (1974), 'On the pricing of corporate debt: The risk structure of interest rates,' *Journal of Finance*, Vol.29, pp.449-470

selective interpretation of US evidence relating to Merton's model. According to the AER, Merton's model implies that the 'credit spread for shorter maturity bonds is potentially wider than the credit spread on bonds with longer maturities.'[10] Merton proposed that since highly rated bonds have a very low default risk, their exposure to term provides for a significant rise in default risk, causing the debt risk premium to rise with term. Since low rated bonds already have a high default risk, the passage of time is more likely to improve this risk, and hence the required yield will decline with term. For bonds between these two extremes, the relationship may be 'humped'.

The AER's suggestion that the Merton model explains why the APT bond's debt risk premium might be expected to be low is heavily flawed. The intuitive description of Merton's model shows that it cannot be applied to regulated businesses. The underlying benchmark firm assumption for a regulated business is that a fixed gearing level will be maintained, and the firm will have a constant credit rating.

We considered the Merton model in previous papers examining the debt risk premium,[11] but this evidence has been ignored by the AER. Helweg and Turner (1999) found that only the most worthy firms in a credit rating band issue long dated debt, which may cause an observed 'hump,' but the relationship is overwhelmingly upward sloping for paired BBB bonds of the same firm. Other research has found a hump in project finance (where gearing reduces substantially with time), but an upward sloping straight line relationship for bonds.[12]

These and other researchers have questioned the Merton model for its underestimation of the rise in the debt risk premium. Even the research that the AER has highlighted as supporting its case for a humped relationship, actually contradicts its case.[13] The He, Hu and Lang study referenced by the AER found that the peak of the hump for BBB bonds occurs at 25.7 years, which implies that up to and well beyond 10 years the debt risk premium is rising, and is higher for lower credit rating bands.[14]

Finally, we note that market practitioners work within a paradigm that assumes a rising debt risk premium with term, based on the idea

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10 AER (October, 2010), p.507.

11 PricewaterhouseCoopers (March, 2010), *Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor*, pp.30-31.

12 Marco Sorge and Blaise Gadanecz (2008), 'The term structure of credit spreads in project finance,' *International Journal of Finance and Economics*, Vol. 13, p.80. Also see Edwin Elton, Martin J. Gruber, Deepak Agrawal, and Christopher Mann (2001), *Journal of Finance*, Vol. LVI, No. 1, February, pp. 247 -278. They found that for BBB rated bonds the debt risk premium is linearly related to systematic risk factors.

13 AER (October, 2010), p.506.

14 Jia He, Wenwei Hu and Larry H.P. Lang (11 August, 2000), 'Credit Spread Curves and Credit Ratings), *Working Paper*, Chinese University of Hong Kong.

that this 'reflects the changing probabilities of default for the corporation in future years.'[15]

## Our analysis of the available data sources

In order to derive a recommended methodology to estimate the 10 year BBB+ debt risk premium in current market circumstances, we believe it is important to be guided by legal requirements, in particular clause 6A.6.2(e) of the National Electricity Rules states that the objective is to derive the 'Australian benchmark corporate bond rate for corporate bonds', rather than the bond rate for a benchmark efficient electricity transmission business.[16] We also consider it important to be guided by the Tribunal's requirement that reliance is placed on a wider set of data, including yields on floating rate bonds (adjusted to fixed rate equivalents). The Tribunal has adopted this approach in light of the current market uncertainty about yields for long dated low rated bonds. There are no fixed coupon BBB+ rated bonds with greater than 6 year terms, and only one fixed coupon BBB rated bond with greater than a 6 year term. In these circumstances other available data sources should be investigated.

### Fixed rate bonds

For the 40 day reference period we found that the Bloomberg BBB fair value curve estimated a 5 year debt risk premium of 339 basis points, and a 7 year debt risk premium of 412 basis points.

In current market circumstances, with relatively few longer-dated low rated fixed rate bonds on issue, Bloomberg provides a BBB curve for and 7 year terms. These are the longest dated estimates of fair value yields provided by the Bloomberg service, which the AER Has acknowledged as a reputable source. Hence, we consider that these observations should form a basis for an estimate of the 10 year BBB+ debt risk premium.

In the absence of a current Bloomberg 10 year AAA debt risk premium, we adopt the convention of applying the last observed rise in the 7 to 10 and 5 to 10 year AAA debt risk premiums, which were 72 basis points and 44 basis points respectively.[17] Using these premiums we derive the following estimates of a 10 year BBB+ debt risk premium:

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15 Robert Litterman and Thomas Iben (1991), 'Corporate bond valuation and the term structure of credit spreads,' *Corporate Journal of Portfolio Management*, Spring, pp.52-54. The authors of this paper described the bond valuation model applied by Goldman Sachs & Co's New York office.

16 See National Electricity Rules (Version 41), Economic Regulation of Transmission Services, Chapter 6A.6.2 (e).

17 That is, the 40 trading day period up to and including 22 June, 2010, which was the last day that Bloomberg published a fair value yield for AAA fixed rate corporate bonds.

- 456 basis points applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 7 to 10 years) to the Bloomberg 7 year debt risk premium;
- 411 basis points applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 5 to 10 years) to the Bloomberg 5 year debt risk premium;
- 434 basis points taking an average of the 7 and 5 year debt risk premiums extrapolated to 10 years as described above.

One approach would be to adopt the higher estimate, based on a 7 year debt risk premium extrapolation, on grounds of conservatism in a period of uncertainty. However, the alternative extrapolation methodology, based on an extrapolation of the 5 year debt risk premium, is considerably lower (given a significant rise of 36 basis points per annum between the Bloomberg 5 and 7 year debt risk premium estimates). Hence, we are inclined to recommend taking the average of these extrapolations, **434** basis points, as a reasonable estimate of the 10 year BBB+ debt risk premium.

To test the reasonableness of this conclusion, we examined a number of alternative extrapolation methodologies adopting a broader sample of bonds, as recommended by the Australian Competition Tribunal.

### Alternative extrapolation methodologies

In this section we turn our attention to an analysis of alternative extrapolation methodologies that can be applied to derive a 10 year BBB+ debt risk premium. We have examined a number of alternative extrapolation methodologies, including the Bloomberg AAA debt risk premium, linear extrapolation of the Bloomberg fixed and floating debt risk premium data, and taking account of the debt risk premium rise implied in paired single issue bonds, including Telstra's 5 and 10 year term bonds. We have considered extrapolation based on the Bloomberg 5 and 7 year BBB debt risk premiums. These are approaches that have been based on regulatory precedent (for extrapolation of the Bloomberg BBB debt risk premium), and empirical analysis of historical relationships (in the case of straight line extrapolation).

#### Straight line extrapolation

We have previously argued that a straight line extrapolation of the debt risk premium using the 5 and 7 year Bloomberg estimates is justified on grounds that Standard and Poor's find the risk of default is linearly related to term.[18]

[18] PwC (November, 2009), pp. 32-34.

In an earlier study[19] we found that historically, applying the rise in the 7 to 10 year Bloomberg AAA debt risk premium has provided a reasonably close approximation to the 10 year Bloomberg BBB debt risk premium during the period of low market volatility after 2002 and prior to 2008. However, in the brief period of higher perceptions of market risk that characterised the period immediately after the September 11, 2001 terrorist attacks in New York, a straight line extrapolation (based on extrapolating the 5 and 7 year debt risk premiums) provided a better estimate of the 10 year debt risk premium.

The AER has maintained that the period of low market volatility, being the last period for which a Bloomberg 10 year BBB curve was available, is the best evidence to guide current applications.[20] We consider that the period of higher market risk (2001-02) is more relevant to today's conditions, as it represented a period of heightened perceptions of market risk in the wake of the terrorist attacks in the United States. By contrast, the period relied on for testing by the AER was the period with the lowest level of market volatility in several decades.

We have also recognised that at times of increased uncertainty in debt markets, reliance on a straight line extrapolation may be inaccurate, which means that supplementary information about the likely rise in the longer section of the curve should be examined for confirmatory evidence. This is because straight line extrapolation based upon the Bloomberg yield estimates at 5 and 7 years is sensitive to the slope of the Bloomberg curve between those points, which can be erratic and sensitive to the composition of bonds around those particular maturities.

During the reference period, we found that linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums resulted in a 10 year BBB+ debt risk premium of **521** basis points, as shown in Figure E.2 below. While in the past the straight line extrapolation methodology has, *on average*, been found to perform well as a predictor of the Bloomberg 10 year BBB debt risk premium, there have been times when it has not performed well. Currently, the result obtained by straight-line extrapolation is found to be somewhat higher than using alternative approaches (see below).

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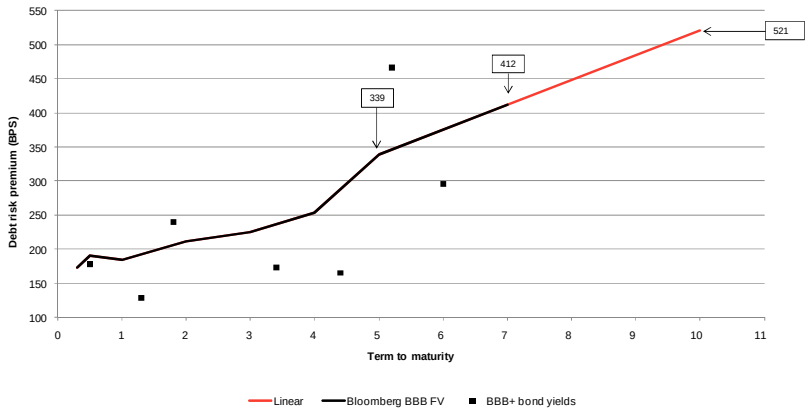
19 PwC (28 April, 2010), *Update of cost of debt methodology analysis in light of the AER's ActewAGL decision*, letter to Sandra Gamble, Group Manager Regulation, Jemena Gas Networks.

20 AER (June, 2010), *Final decision – Jemena Gas Networks: Access arrangements proposal for the NSW gas networks*, 1 July 2010 – 30 June 2015, p. 187.

**Figure E.2 Straight line extrapolation of Bloomberg 5 and 7 year BBB fair value debt risk premiums and Bloomberg BBB+ fixed rate bonds**




Source: Bloomberg and RBA

## Linear regression

One way of testing the reasonableness of linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums is to undertake regression analysis of all available yield data with a BBB+ credit rating. We have tested both linear and curvilinear regression functions based on fixed, floating and both fixed and floating rate data. We found that curvilinear terms were either not statistically significant, or provided convex results that were not realistic. Therefore, we have only reported the results of linear regression.[21]

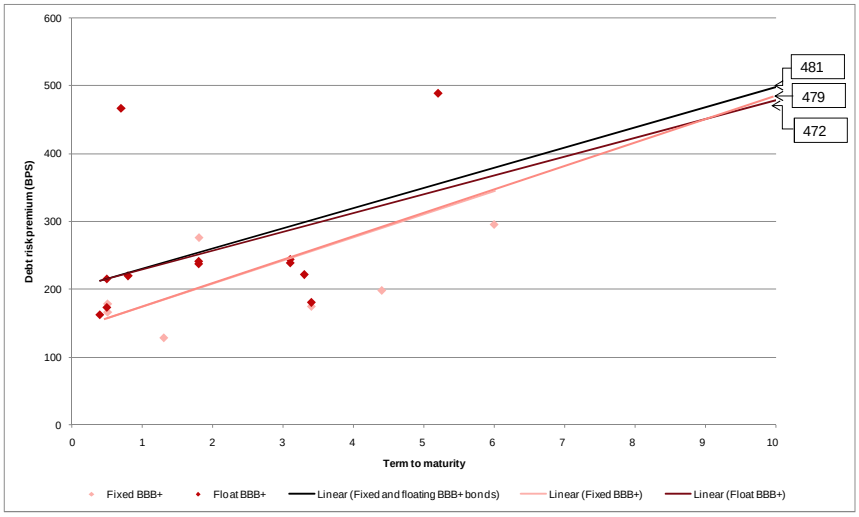
The results of our linear regressions indicate a 10 year BBB+ debt risk premium of:

- **479** basis points based on Bloomberg BBB+ floating rate bonds;
- **472** basis points based on Bloomberg BBB+ fixed and floating rate bonds; and
- **481** basis points based on Bloomberg BBB+ fixed rate bonds.

The 10 year BBB+ debt risk premiums suggested by these linear regressions appear high. The average rise in the debt risk premium implied by these regressions of approximately 30 basis points per annum appears high relative to the market evidence of the rise for paired bond data (see below).

[21] We note that we are aware of one market practitioner, Mr Terry Toohey, of Australian Indices, who undertakes benchmarking of bond yields by a group of banks, has historically applied linear extrapolation to estimate a 10 year debt risk premium.

**Figure E.3 Straight line regressions using fixed and floating rate BBB+ bonds**




Source: Bloomberg and RBA

## Rise in debt risk premium implied by issuers of multiple bonds

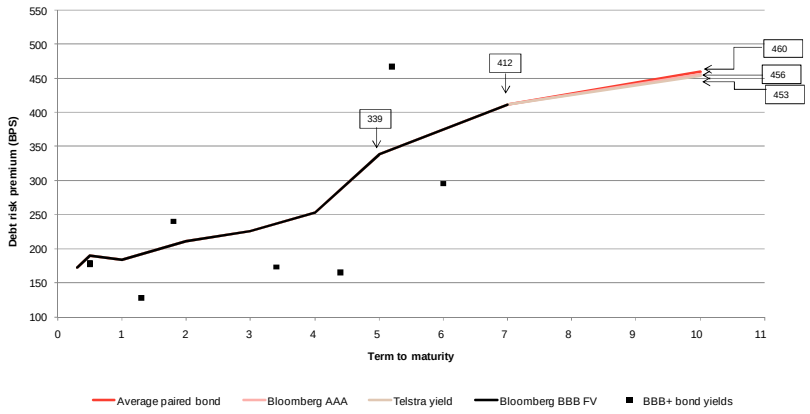
Another approach that can be used to cross-check the reasonableness of the rise in the debt risk premium over the long end of the term spectrum, is to examine the rise implied by two bonds issued by the same business, where the only differentiating feature is the term. Such an example is provided by the 5 and 10 year term bonds issued by Telstra (A rated). These bonds currently imply a rise of 73 basis points (or an approximately 14 basis points per annum rise). This would suggest that on average, a higher rise should be observed in the BBB+ ratings band, since the movement in the probability of default for a given change in term will be higher in the lower band, compared with the probability of default for a higher ratings band.

The results of extrapolation from the 7 year Bloomberg BBB debt risk premium using paired bond data indicate 10 year BBB+ debt risk premiums of:

- **453** basis points extrapolating using the rise in the Telstra bonds; and
- **460** basis points extrapolating using the average rise in a portfolio of 16 paired bonds (for 8 companies).

As shown in Figure E.4 below, this range encapsulates the extrapolation for the 7 year BBB bond using the rise in the Bloomberg AAA curve (**456** basis points).

## Figure E.4 Extrapolation of Bloomberg 7 year BBB fair value debt risk premium using alternative approaches



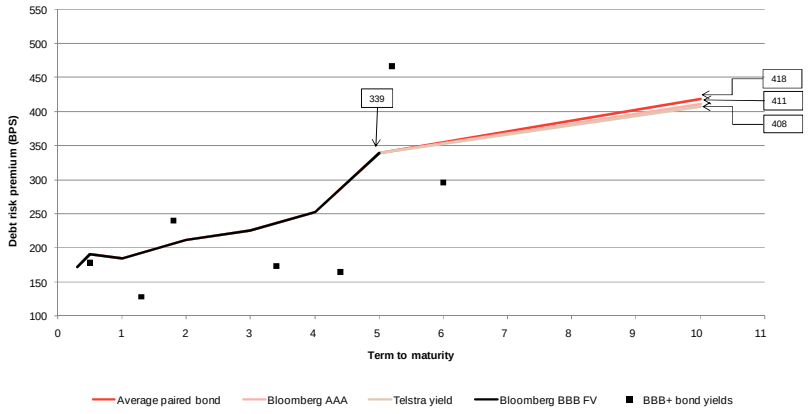

Source: Bloomberg and RBA

The results of extrapolation from the 5 year Bloomberg BBB debt risk premium using paired bond data indicate 10 year BBB+ debt risk premiums of:

- **408** basis points extrapolating using the rise in the Telstra bonds; and
- **418** basis points extrapolating using the average rise in a portfolio of 16 paired bonds (for 8 companies).

As shown in Figure 4 below, this range encapsulates the extrapolation for the 5 year BBB bond using the rise in the Bloomberg AAA curve (**411** basis points).

## Figure E.5 Extrapolation of Bloomberg 5 year BBB fair value debt risk premium using alternative approaches




Source: Bloomberg and RBA

In summary, using a paired bond analysis to extrapolate from the Bloomberg 7 year debt risk premium generates a 10 year BBB+ debt risk premium range of 453 to 460 basis points. Using the rise of paired bonds to extrapolate from the Bloomberg 5 year BBB debt risk premium results in a significantly lower estimate in the range of 408 to 418 basis points. This range of observations encapsulates

the range that we derived by extrapolating the 5 and 7 year Bloomberg BBB debt risk premiums using the respective rises in the Bloomberg AAA debt risk premium curves. The range supports our central estimate of a 434 basis point debt risk premium.

## Methodology for estimating the debt risk premium

Based on the analysis presented in this report, we conclude that in current circumstances it is necessary to undertake the following steps when estimating the debt risk premium:

- **Step 1**: Obtain Bloomberg estimates of the 5 and 7 year term BBB debt risk premiums.
- **Step 2:** Obtain an estimate of the debt risk premium for a 10 year BBB+ corporate bond by adding the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 7 to 10 years) to the Bloomberg 7 year debt risk premium. Obtain an estimate of the 10 year BBB+ corporate bond by applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 5 to 10 years) to the Bloomberg 5 year debt risk premium. Obtain a central estimate of the 10 year BBB+ bond by taking a simple average of the 7 and 5 year extrapolations.
- **Step 3:** Test whether the central estimate of the 10 year BBB+ debt risk premium obtained in step 2 is reasonable using broader bond information and alternative approaches, including:
    - longer dated fixed and floating rate bonds (adjusted to fixed rate equivalents) that are available in the BBB, and A credit rating bands;
    - linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums; and
    - linear regression using available data for Bloomberg fixed and floating bonds (adjusted to fixed bond equivalents).

## Summary of findings

Table 1 provides a summary of our estimates of the 10 year BBB+ debt risk premium. The highest estimate of 521 basis points we discount. Linear regressions using combinations of fixed and floating rate bonds provide a range of values from 472 basis points to 481 basis points.

**Table 1 Summary of estimates of the 10 year BBB+ debt risk premium (basis points)**

| | Straight line | Regression | Bloomberg | | |
|---|---|---|---|---|---|
| **Base for extrapolation** | | | **7 year DRP** | **Central estimate (average)** | **5 year DRP** |
| Straight line (extrapolation) | 521 | | | | |
| Floating bonds | | 479 | | | |
| Floating & Fixed | | 472 | | | |
| Fixed coupon bonds | | 481 | | | |
| 16 Paired bonds | | | 460 | 439 | 418 |
| **Base Case** | | | 456 | **434** | 411 |
| Telstra bond | | | 453 | 431 | 408 |

Source: Bloomberg and RBA for the 40 day reference period from 7 February 2011 to 1 April 2011.

We recommend a 10 year BBB+ debt risk premium of **434** basis points based on the average of:

- An upper value of **456** basis points - the 7 year debt Bloomberg BBB debt risk premium extrapolated to 10 years using the most recent data for the rise of the Bloomberg AAA debt risk premium between 7 and 10 years; and
- A lower value of **411** basis points - the 5 year Bloomberg BBB debt risk premium extrapolated to 10 years using the most recent data for the rise of the Bloomberg AAA debt risk premium between 5 and 10 years.

We find that straight line extrapolations using the Bloomberg BBB 5 and 7 year debt risk premiums using the rise in the debt risk premium for 5 and 10 year Telstra bonds, and using the rise in 16 paired bonds provide average values of 431 basis points and 439 basis points respectively, which are close to our preferred value of 434 basis points. These cross-checks provide us with greater confidence that an estimate of 434 basis points is reasonable for the 40 day reference period from 7 February 2011 to 1 April 2011.

# 1 The Brief and outline of report

## 1.1 The Brief

Powerlink is currently in the process of developing its Regulatory Revenue Proposal for the regulatory control period (2013-2017), which is to be submitted to the Australian Energy Regulator (AER) by the end of May 2011. In preparing its proposal, Powerlink engaged PricewaterhouseCoopers (PwC) to undertake research and provide advice and recommendations relating to the estimation of the debt risk premium.

CBASpectrum has now ceased publication of any relevant fair value yields applicable to that required for estimating the debt risk premium for a transmission network service provider (TNSP). Bloomberg publishes only a 7 year BBB fair value curve, and has ceased publication of a 10 year AAA fair value curve. Powerlink has requested PwC to propose an alternative methodology for estimating the debt risk premium that best meets the legislative requirements.

## 1.2 Outline of report

This report is structured as follows:

- Chapter 2 provides the background to the estimation of the debt risk premium, which has been subject to increased scrutiny since the onset of the global financial crisis in 2007-08. We also critique the AER's recent final decision on the Victorian electricity distribution network service providers (DNSPs), and analyse the APT bond.
- Chapter 3 presents our empirical analysis of the debt risk premium in Australia. First, we examine the alternative data sources, including Bloomberg and UBS fixed and floating rate fair value bond yields. Next, we assess alternative extrapolation approaches, and finally, we present a suggested debt risk premium estimation methodology.

# 2 The AER's decision on the debt risk premium in context

## 2.1 Introduction

In this chapter we review the context surrounding the estimation of the debt risk premium by regulators in Australia. Next, we critique the most recent decision of the AER with respect to the debt risk premium for the Victorian DNSPs.

## 2.2 Background to the debt risk premium

In the early years of economic regulation in Australia, regulators had relied on the CBASpectrum service when estimating the debt risk premium for a benchmark 10 year BBB+ rated bond. In 2004 the Queensland Competition Authority (QCA) introduced evidence from the Bloomberg service that implied a slightly higher allowance, and awarded the higher amount to DBCT.[22] Subsequent investigations by regulators and regulated businesses found that CBASpectrum was systematically under-estimating Bloomberg bond yields by approximately 20 to 25 basis points.

During the global financial crisis, CBASpectrum's yields began to rise well above Bloomberg's yields, and Bloomberg ceased to provide an estimate of the 10 year fair value curve on 9 October, 2007. The AER's response was to extrapolate the 7 year Bloomberg BBB curve by the rise in the Bloomberg AAA curve between 7 and 10 years.

Regulated businesses were concerned that Bloomberg was under-estimating the yields implied by market opinion, and appointed PwC to investigate this issue. We applied three tests to examine whether Bloomberg fair value curves are likely to provide appropriate estimates of the cost of debt in the market for funds:[23]

- **Test 1** – was the data that Bloomberg relied upon, being the bond yield input feeds of a number of financial institutions, sufficiently uniform for Bloomberg to be able to derive a reasonable estimate of the market rate?
- **Test 2** – was Bloomberg's own estimate of the yields of bonds in its sample a statistically unbiased reflection of the bank feeds provided to it?

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22 Queensland Competition Authority (October, 1924) *Draft Decision – Dalrymple Bay Coal Terminal: Draft Access Undertaking*, p. 190.

23 PricewaterhouseCoopers (November, 2009), *Victorian Distribution Businesses – Methodology to Estimate the Debt Risk Premium.*

- **Test 3** – did Bloomberg's fair value curve pass through the centre of its own yield estimates?

We found that during the global financial crisis the dispersion in financial sector opinions on bond yields was high, making yield estimation highly uncertain. In addition, Bloomberg tended to choose bond yields from the bottom of the range of opinions, and then draw a fair value curve that did not reflect the central tendency of Bloomberg's chosen yields. Applying these tests, we found that by October 2009, the data difficulties and biases had disappeared, so that Bloomberg could be relied upon once more.

The AER developed a methodology to choose between the Bloomberg and CBASpectrum fair value curves, which was based on their goodness of fit relative to bond yield opinions drawn from three sources – Bloomberg, CBASpectrum and UBS. This methodology was criticised by the businesses and their advisers.

PwC noted that while the AER's sum of squared errors test could provide information on whether a curve provides a relatively good fit to the yield observations, it cannot provide information on whether the curve systematically under- or over-states the yield observations. This is important for a regulator, as systematic understatement by a curve could result in the adoption of a debt risk premium that is too low, which would not allow regulated firms to earn a return that is commensurate with the cost of funds in the market. We suggested that that an additional 'average error test' be applied to test whether there is any systematic under- or over-estimation of yields.[24]

In addition, we found that the number of fixed coupon bonds that were being examined by the AER was very low, and while the difference between the Bloomberg and CBASpectrum curves using the AER's test was marginal, the difference in the implied 10 year BBB+ debt risk premium was substantial. Importantly,

Subsequently the AER's approach was criticised by the Australian Competition Tribunal (ACT or 'the Tribunal').[25] The Tribunal concluded that:[26]

> The AER is seeking to select a curve on the basis of how close the observed yields lie to the curves, closeness being measured by the weighted sum of squared differences. There is not sufficient information to conclude that because the shape and position of a curve up to six years provides a better fit, the same curve will provide a better estimate for greater terms to maturity.

The Tribunal supported the use of a wider population of bonds than was being used by the AER, in particular it supported the use of floating rate bonds adjusted to equivalent fixed rate yields. The

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24 PricewaterhouseCoopers (March 2010), *Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor*, pp.28-29.

25 Application by ActewAGL Distribution [2010] ACompT4

26 Application by ActewAGL Distribution [2010] ACompT4, par. 39.

Tribunal also concluded that useful information about the likely yields of long dated BBB+ bonds could be obtained by reviewing yields of bonds in credit rating bands around the BBB+ band.

## 2.3 The AER's Victorian DNSPs decision

In October 2010 the AER published its final decision on the Victorian electricity network distribution network service providers (DNSPs). Its decision was made after the Tribunal's criticisms of its earlier approach, and it is the first decision that has been delivered after CBASpectrum ceased (from 8 September, 2010) to publish fair value curves. CBASpectrum cited data difficulties arising from the global financial crisis as its main reason for discontinuing publication of fair value curves, but did not rule out resuming publication at some time in the future:[27]

> Access to fair-value yield curves previously published on CBASpectrum has been suspended following a recent review of performance in the wake of the global financial crisis.
>
> Sparse and heterogenic data have always made it difficult to produce a broad range of reliable credit curves in Australia. CBASpectrum has sought to overcome this problem in the past through the use of a number of econometric variables and assumptions that take account of additional information such as implied default rates, sector composition, historical relativities and spread performance of other rating bands. However, disparity of the data has increased and many of these relationships have changed over the past few years, meaning that reliability of the models designed to indicate where various credits should trade has receded. Users have also tended to confuse these fair value estimates with alternative models estimating where generic credit curves have actually traded and used the data for purposes other than relative value analysis.
>
> Commonwealth Bank of Australia is currently conducting research and development into the identification of alternative methods that can group the Australian bond market according to systematic risk profiles. Additional, novel and unique features available in the forthcoming enhanced CBASpectrum product are expected to allow users to create fair value curves and analyse data using these new profiles.

In response to the Tribunal's critique of its previous approach, and given the fact that the CBASpectrum service is no longer publishing a fair value curve estimate, for the Victorian DNSPs decision the AER developed a new approach to estimating the debt risk premium. The new AER approach estimates the debt premium for a 10 year BBB+ bond by applying:

- 75 percent weight to the 7 year Bloomberg BBB debt risk premium extrapolated to 10 years using the rise in the Bloomberg AAA bond from 7 to 10 years; and

[27] CBASpectrum website, accessed 8 September, 2010.

- 25 percent weight to the APT bond's debt risk premium.

While the AER reaffirmed that the Bloomberg curve is 'a reasonable source of information' that can be used in setting the debt risk premium,[28] it noted that CBASpectrum's decision to discontinue publishing fair value curves raises concerns about placing sole or primary reliance on the Bloomberg service. The AER also considered that the 7 year BBB Bloomberg debt risk premium is likely to overstate the benchmark owing to the observation of a lower debt risk premium attaching to the recently issued Australian Pipeline Trust (APT) BBB rated 10 year bond.

PwC's critique:

The AER applied a 75/25 percent weighting to the Bloomberg curve and the APT bond respectively with very little justification. No reasons have been given by the AER for the 75/25 percent weighting ratio, although the AER does argue that the APT bond deserves greater weight given that the underlying business includes regulated activities. Since the Bloomberg curve is derived using observations for a number of fixed coupon bonds, and there is further evidence from floating rate bonds and bonds in other rating bands, the 25 percent weighting given to the single APT observation appears disproportionate.

We are not aware of any Australian regulatory precedents for this type of approach. In the UK judgements about the debt risk premium have been made by regulators based on a much larger data base of bonds. We are unaware of any regulatory judgements where 25 percent of the outcome has been determined by a single observation.

The AER has commented that it considers the 7 year Bloomberg debt risk premium is likely to overstate the benchmark, but the only evidence that it offers is that the BBB-rate APT bond lies below the Bloomberg 7 year debt risk premium. The AER has not presented evidence to show that it has undertaken tests of whether the Bloomberg 7 year debt risk premium is not appropriate when referenced to a wider body of data relating to floating rate bonds and bonds in other rating categories (as suggested by the Australian Competition Tribunal).

We also note in the context of the AER's Victorian decision that we have provided a response to a report that was prepared by Mr Bruce Mountain of Carbon Market Economics (Mountain Report).[29] The Mountain Report stated that recent utility floating rate issues implied an average debt risk premium of either 36 basis points or 137 basis

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28 Australian Energy Regulator (October, 2010), Final Decision - *Victorian electricity distribution network service providers, Distribution determination 2011 - 2015*, p.509.

29 PwC (22 September, 2010), *Review of the Debt Risk Premium Estimates in the Mountain Report,* letter to Mr Jeremy Rothfield, Economist and Regulatory Analyst, United Energy Distribution and Multinet Gas.

points. In our review we found that the same debt raisings actually implied an average debt risk premium of 298 basis points, and were issued for terms of 2 to 5.5 years (with a median of 3 years).

## 2.4 AER's reliance on Merton's (1974) model

The AER noted the apparent inconsistency of evidence showing much higher debt risk premiums for lower maturity BBB and BBB+ rated bonds than the APT bond, but relied on Merton's 1974 theory of bond pricing,[30] which implied that the 'credit spread for shorter maturity bonds is potentially wider than the credit spread on bonds with longer maturities.'[31] Merton proposed that since highly rated bonds have a very low default risk, their exposure to term provides for a significant rise in default risk, causing the debt risk premium to rise with term. Since very low rated bonds already have a high default risk, the passage of time is more likely to improve this risk, and hence the required yield will decline with term.

Merton's theory suggests that some bonds that fall between the two extremes described above can initially have a rising, then falling relationship between risk premium and term.

Having described the theory, the AER drew attention to the empirical evidence, stating that:[32]

> In support of this, further, further empirical evidence found 'hump-shaped spread curves for double A to single B bonds.' Figure 11.4 provides a graphical representation of this finding.

The 'further empirical evidence' referred to was from a working paper by He Jia, Wenwei Hu and H.P. Lang posted in 2000,[33] and Figure 11.4 in the AER's decision.[34] This figure was derived from Pitts and Selby's 1983 graphical interpretation of Merton's analysis, and appears to show the peaks of the humps (in graphs 2 and 3) occurring before a 1 period time to maturity (i.e. early in the span of potential times to maturity).[35]

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30 Robert C. Merton (1974), 'On the pricing of corporate debt: The risk structure of interest rates,' *Journal of Finance*, Vol.29, pp.449-470

31 AER (October, 2010), p.507.

32 AER (October, 2010), p.506.

33 Jia He, Wenwei Hu, and Larry H.P. Lang (August 11, 2000), 'Credit Spread Curves and Credit Ratings', Working Paper, Chinese University of Hong Kong.

34 AER (October, 2010), p.507.

35 C.G.C. Pitts, and M.J.P. Selby (September, 1983), 'The Pricing of Corporate Debt: A Further Note,' *The Journal of Finance*, Vol. 38, pp.1311-3.

PwC's critique:

We have raised the issue of empirical tests of Merton's theory in previous papers examining the debt risk premium,[36] but our arguments and the significant evidence now available that qualify and dispute Merton's theory have been ignored by the AER, which chose to present only the evidence that it considered supported its case.

We have, for example, previously raised the findings of Helweg and Turner (1999), who noted that bond market practitioners working in the market every day 'typically do not view the slope of the curve facing high-yield issuers as negative,' and provided evidence supporting the viewpoint of practitioners. This evidence controlled for differences in credit worthiness within a rating band, noting that the tendency for only the most worthy firms in the band to issue long dated debt was causing any observed 'humped' relationship, which was a downward biased estimate of the true underlying (benchmark) relationship. Other highly respected research by Elton et al demonstrated that for the BBB rating band in the US, the debt risk premium attributed to systematic risk factors was linearly related to term.[37]

Even the research that the AER has identified as supporting its case with respect to the humped relationship does the opposite on closer examination. He, Hu and Lang's study - the study primarily relied on by the AER – was undertaken using a paired bonds approach (like Helweg and Turner) for US data over the period from 1993 to 1997. Their results (summarised in their Table 9) showed that the peak of the hump for BBB bonds occurred at a median term of 25.7 years, and that, as might be expected, the median credit spread at the peak was higher for lower rated bonds.[38] In other words, at a term of 10 years no hump was seen in the US data, and lower rated bonds had progressively higher credit spreads. This is in stark contrast to the graph presented by the AER, which suggests to the reader that the peak of the hump occurs within a term of a year or two.

Market practitioners work within a paradigm that assumes a rising debt risk premium with term. As stated by Robert Litterman and Thomas Iben of Goldman Sachs & Co's New York office, the logic underpinning a rising premium with term is that this 'variation reflects the changing probabilities of default for the corporation in future years...' since '... the market values bonds as if corporations have a probability of defaulting each year into the future.' Hence: [39]

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36 PricewaterhouseCoopers (March, 2010), *Jemena Gas Networks (NSW) – The benchmark cost of debt for a gas distributor*, pp.30-31.

37 Edwin Elton, Martin J. Gruber, Deepak Agrawal, and Christopher Mann (2001), *Journal of Finance*, Vol. LVI, No. 1, February, pp. 247 -278.

38 Jia He, Wenwei Hu, and Larry H.P. Lang (August 11, 2000), p.18 and Table 9.

39 Robert Litterman and Thomas Iben (1991), 'Corporate bond valuation and the term structure of credit spreads,' *Corporate Journal of Portfolio Management*, Spring, p. 52-54.

> ...the term structure of corporate spreads is generally upward sloping, indicating a market perception of higher probabilities of default in the more distant future.'

Research showing a rising and linear relationship between the debt risk premium and term was not referenced by the AER. To explain the APT bond's apparently anomalous (i.e. relatively low) debt risk premium, the AER relied solely on its presentation of a one-sided discussion of Merton's model, and presentation of only what it considered to be supporting research. The Merton model has been criticised as under-estimating the rise in the debt risk premium that is observed in practice (this is obvious from examination of the AER's Figure 11.4).[40] Other research testing the Merton hypothesis relying on non-US data has found that while the humped relationship holds for project finance loans (which is held to be due to specific characteristics such as declining gearing levels over time), it does not hold for bank loans and bonds. While Sorge and Gadanecz (2008) could not find a hump in the loans/bonds data, they found the debt risk premium to rise linearly with term:[41]

> ...The term structure of bond spreads as estimated in regression (4a) can be fitted by an upward-sloping regression line with an $R^2$ exceeding 0.95 (i.e. it is essentially linear).

### 2.4.1 Testing the APT bond

The AER stated that it had found no evidence to suggest that the APT bond's relatively low debt risk premium was due to unusual factors. However, the AER did not provide evidence that it had discussed the APT bond's pricing with market participants, and provided no detailed analysis of the APT bond's relative debt risk premium compared with other long and shorter term A/A-/BBB/BBB+ bonds, as required by the Tribunal's decision.

Given that the AER has placed 25 percent weight on the relatively low yield (and debt risk premium) APT bond, it is important to examine whether that bond is an outlier, or an observation that is reflective of a broader benchmark relationship between debt risk premium and term.

Our inquiries among debt market practitioners indicated that the bond had been well timed and was 'eagerly chased' by buyers who required a certain amount of longer term debt in their asset portfolios. The APT business was also considered to have a very strong business profile, and there was a group of investors who were eager to roll-over a previous investment in APT bonds that was maturing at the same time. We infer from these market responses

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40 M. Bendendo, L. Cathcart and L.El-jahel (2004), 'The shape of the term structure of credit spreads: An empirical investigation,' London: Tanaka Business School Discussion Papers: TBS/DP04/11, p.18.

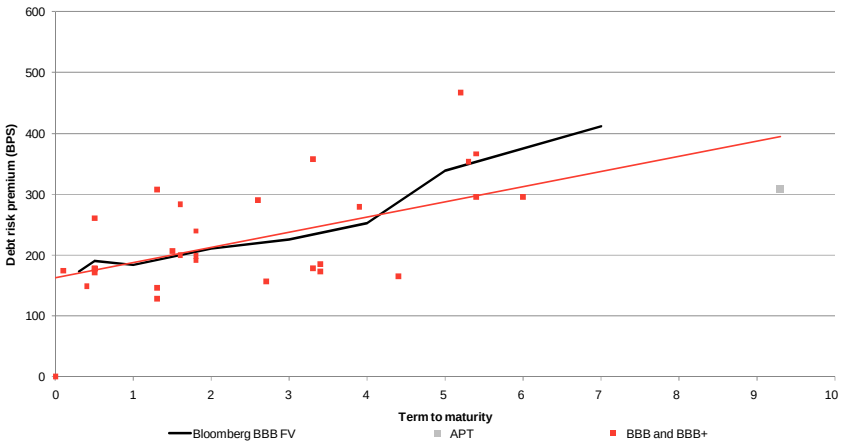
41 Marco Sorge and Blaise Gadanecz (2008), 'The term structure of credit spreads in project finance,' *International Journal of Finance and Economics*, Vol. 13, p.80.

that the APT bond's debt risk premium is an outlier (i.e. not representative of a benchmark BBB or BBB+ debt risk premium).

For the reference period the debt risk premium implied by the APT bond was 301 basis points. This figure is an average of the Bloomberg (295 basis points) and UBS (308 basis points) debt risk premiums. However, it should be noted that Bloomberg has never included the APT bond in its estimate of the BBB rating fair value curve, which may indicate that it considers the yield of the APT bond to be an outlier.[42]

To test the reasonableness of the APT bond, we compared its average debt risk premium to observations of the BBB and A- credit bands. This is done in Figures 2.1 and 22. In Figure 2.1 we find that the Bloomberg debt risk premium curve, the regression line based on BBB and BBB+ observations, and the position of shorter term bonds all suggest that the APT bond's low debt risk premium is exceptional.

**Figure 2.1 Bloomberg BBB and BBB+ rated fixed and floating coupon bonds and the APT bond**

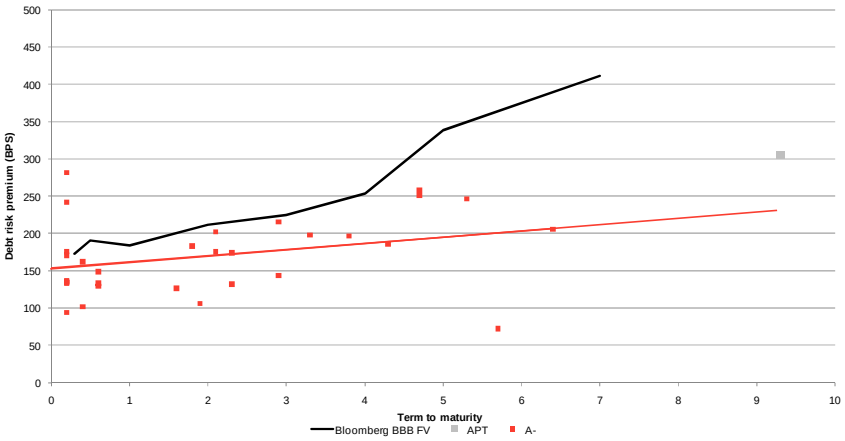



Source: Bloomberg and RBA

In Figure 2.2 we find that the position of the APT bond looks much more consistent with an A- credit rating rather than being representative of a benchmark BBB rating, albeit on the higher side of the A- rating band based on a linear regression of the floating and fixed rate bonds reported by Bloomberg.

42 We note that the AER considered that Bloomberg's inclusion of the DBCT bond for only 4 of the 16 days of an earlier reference period 'highlights weaknesses in PwC's testing method and suggests that it cannot be relied upon', while the AER has place 25 percent weight on a bond that is not included at all by Bloomberg. See AER (October, 2010), pp.500-501.

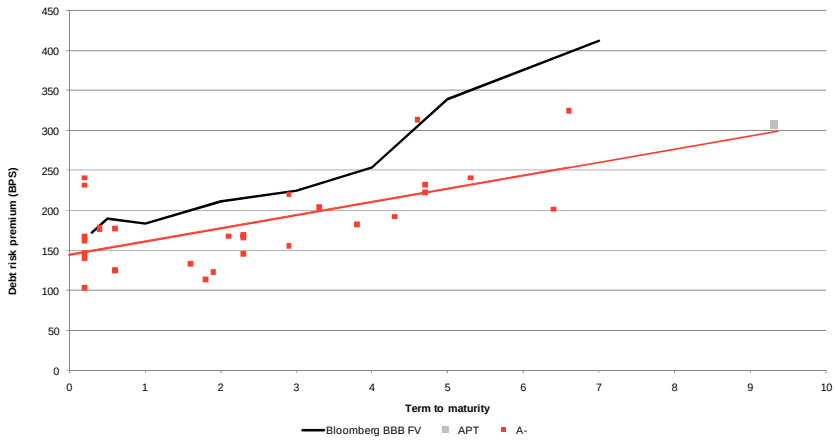
**Figure 2.2 Bloomberg A- rated fixed and floating coupon bonds and the APT bond**




Source: Bloomberg and RBA

In Figure 2.3 we show the APT bond relative to the fixed and floating rate A- rated bonds reported by UBS.

**Figure 2.3 UBS A- rated fixed and floating coupon bonds and the APT bond**




Source: UBS, Bloomberg and RBA

Hence, we can conclude that whilst the APT debt risk premium of 301 basis points lies not far above a linear extrapolation of the Bloomberg A debt risk premium to 10 years, it lies:

- Well below the Bloomberg BBB debt risk premiums at 5 and 7 years (339 and 412 basis points respectively); and
- Generally below, or is consistent with the 10 year value implied by a straight line regression based on debt risk premium observations for bonds in the A- rating band.

We found no sign of a humped relationship in the BBB curve. Almost without exception, the paired bonds analysis we conducted (see below) indicated a strong positive rise with term. If the average rise of 16 basis points per annum were applied to the APT bond (which is a minimum estimate as the bonds were generally A rated), it would

imply a BBB debt risk premium of 173 basis points at a term of 2 years, which is unreasonable. In fact, this value of 173 basis points is below the observations of debt risk premiums for BBB, BBB+ and even some A- bonds at a similar term.

We conclude it is most likely that the APT bond's relatively low debt risk premium is due to unique factors, and as such, the APT bond should not be accorded a 25 percent weighting in determining the benchmark debt risk premium for a 10 year BBB+ rated bond.

## 2.5 AER's reliance on the National Electricity Rules

The AER appears to agree with the position put by the DNSPs, that clause 6.5.2(e) of the National Electricity Rules (NER) requires that the objective is to derive the 'Australian benchmark corporate bond rate for corporate bonds', rather than the bond rate for a benchmark efficient DNSP.[43] However, the AER has justified using its discretion to place disproportionate weight on the single APT observation because it has taken into account what it considers the rate of return is designed to achieve under the NER, namely clause 6.5.2(b), which states that:

> ...the cost of capital as measured by the return required by investors in a commercial enterprise with a similar nature and degree of non-diversifiable risk as that faced by the distribution business of the provider.

### PwC's critique:

The fact that this clause of the NER (for distribution businesses) is a reference to non-diversifiable (equity) risk, rather than the cost of debt, has not been considered by the AER. Instead, it has placed disproportionate reliance on the APT bond due to it having some regulated energy network operations with 'a similar nature and degree of non-diversifiable risk as that faced by the distribution business of the provider.'

Clause 6A.6.2(e) of the National Electricity Rules also states that the objective is to derive the 'Australian benchmark corporate bond rate for corporate bonds', rather than the bond rate for a benchmark efficient electricity transmission business.[44] The Rules for transmission businesses are clear in requiring a focus on the 'Australian benchmark corporate bond rate.'

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43 AER (October, 2010), pp.496-497.

44 See National Electricity Rules (Version 41), Economic Regulation of Transmission Services, Chapter 6A.6.2 (e).

## 2.6 Conclusions

Having analysed the AER's Victorian DNSPs final decision on the debt risk premium we find that it is based on a number of flawed assumptions. The AER has not explained the basis for allocating a 25 percent weighting to the single APT bond. Instead, the AER has relied on the Merton (1974) theory to suggest an imagined 'humped' relationship between term and the debt risk premium, which might explain the anomalous position of the APT bond relative to all other evidence.

We have shown that in a range of studies of international data the Merton theory of a humped relationship is not supported by empirical evidence for anything but very long terms of over 20 years. At a term of up to 10 years, the wider empirical evidence (for all but project finance deals) and practitioners' views are that there is an upward sloping debt risk premium, which rises with reductions in credit quality. In fact, there is evidence for bond data suggesting a strictly linear upward rising debt risk premium with term.

# 3 The Debt Risk Premium – empirical analysis

## 3.1 Introduction

In order to derive a recommended methodology to estimate the 10 year BBB+ debt risk premium for Powerlink in current market circumstances, we believe it is important to be guided by legal requirements, in particular clause 6A.6.2(e) of the National Electricity Rules, and the Tribunal's requirement that reliance is placed on a wider set of data, including yields on floating rate bonds (adjusted to fixed rate equivalents).

## 3.2 Alternative data sources

### *3.2.1 Fixed rate bonds*

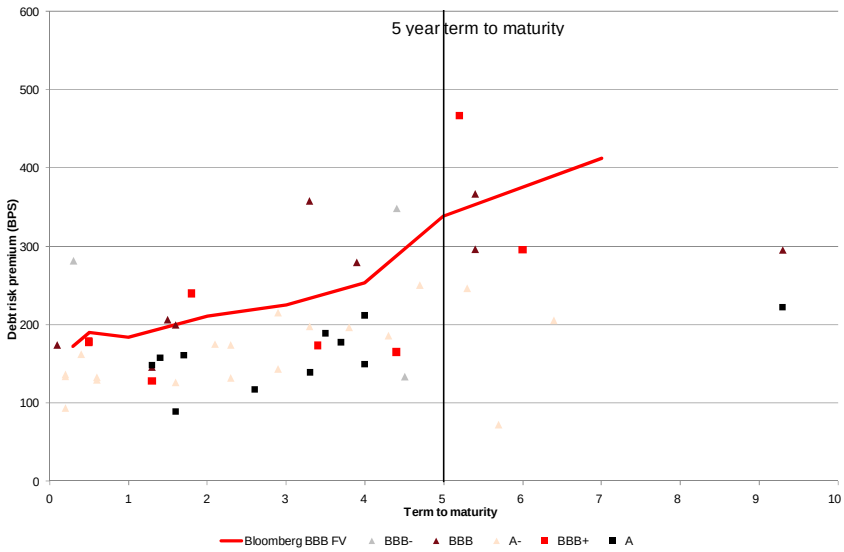
For the 40 day reference period from 7 February 2011 to 1 April 2011, we found that the Bloomberg BBB fair value curve predicts a 5 year debt risk premium of 339 basis points, and a 7 year debt risk premium of 412 basis points.

Figure 3.1 below shows that there are relatively few fixed coupon bond observations with terms above 5 years around the BBB+ credit rating[45]. These observations have widely varying debt risk premiums for a given term, indicating a high degree of uncertainty associated with predictions about the 5 and 7 year debt risk premiums.

In current market circumstances, with relatively few longer-dated low rated fixed rate bonds on issue, Bloomberg provides a BBB curve for and 7 year terms. These are the longest dated estimates of fair value yields provided by the Bloomberg service, which the AER Has acknowledged as a reputable source. Hence, we consider that these observations should form a basis for an estimate of the 10 year BBB+ debt risk premium.

[45] We have only used corporate bonds that were considered representative of their credit rating. Bonds which are issued by financial institutions, or have a yield which is significantly different from others within its credit rating are removed.

**Figure 3.1 Bloomberg BBB fair value debt risk premium and Bloomberg A to BBB- rated fixed coupon bonds**




Source: Bloomberg and RBA

In the absence of a current Bloomberg 10 year AAA debt risk premium, we adopt the convention of applying the last observed rise in the 7 to 10 and 5 to 10 year AAA debt risk premiums, which were 72 basis points and 44 basis points respectively.[46] Using these premiums we derive the following estimates of a 10 year BBB+ debt risk premium:

- 456 basis points applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 7 to 10 years) to the Bloomberg 7 year debt risk premium;
- 411 basis points applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 5 to 10 years) to the Bloomberg 5 year debt risk premium;
- 434 basis points taking an average of the 7 and 5 year debt risk premiums extrapolated to 10 years.

One approach would be to adopt the higher estimate, based on a 7 year debt risk premium extrapolation, on grounds of conservatism in a period of uncertainty. However, the alternative extrapolation methodology, based on an extrapolation of the 5 year debt risk premium, is considerably lower (given a significant rise of 37 basis points per annum between the Bloomberg 5 and 7 year debt risk premium estimates). Hence, we are inclined to recommend taking the average of these extrapolations, **434** basis points, as the estimate of the 10 year BBB+ debt risk premium.

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46 That is, the 40 trading day period up to and including 22 June, 2010, which was the last day that Bloomberg published a fair value yield for AAA fixed rate corporate bonds.

To test the reasonableness of this conclusion, we examined a number of alternative extrapolation methodologies adopting a broader sample of bonds, as recommended by the Australian Competition Tribunal.

## 3.3 Alternative extrapolation methodologies

### 3.3.1 Introduction

In this section we turn our attention to an analysis of alternative extrapolation methodologies that can be applied to derive a 10 year BBB+ debt risk premium. Alternative extrapolation methodologies include linear extrapolation of the Bloomberg fixed and floating debt risk premium data, and taking account of the debt risk premium rise implied in paired single issue bonds, including Telstra's 5 and 10 year term bonds.

### 3.3.2 Straight line extrapolation

We have previously argued that a straight line extrapolation of the debt risk premium using the 5 and 7 year Bloomberg estimates is justified on grounds that Standard and Poor's find the risk of default is linearly related to term. We have also noted above that there is international empirical evidence showing a straight line rising relationship between the debt risk premium and term for bonds.[47]

In an earlier study we found that historically, applying the rise in the 7 to 10 year Bloomberg AAA debt risk premium has provided a reasonably close approximation to the 10 year Bloomberg BBB debt risk premium during the period of low market volatility after 2002 and prior to 2008.[48] However, in the brief period of higher perceptions of market risk that characterised the period immediately after the September 11, 2001 terrorist attacks in New York, a straight-line extrapolation (based on extrapolating the 5 and 7 year debt risk premiums) provided a better estimate of the 10 year debt risk premium. The AER maintained that the period of low market volatility, being the last period for which a Bloomberg 10 year BBB curve was available, is the best evidence to guide current applications.[49] We consider that the period of higher market risk (2001-02) is more relevant to today's conditions. These results are summarised in Table 3.2 below.

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47 Marco Sorge and Blaise Gadanecz (2008), p.80.

48 PwC (28 April, 2010), 'Update of cost of debt methodology analysis in light of the AER's ActewAGL decision, Letter to Ms Sandra Gamble of Jemena Gas Networks (NSW) Ltd.

49 AER (June, 2010), Final decision – Public, Jemena Gas Networks Access arrangement for the NSW gas networks, 1 July 2010 – 30 June, 2015, p.187.

**Table 3.2 Results of testing extrapolation methods – replication and extension of AER's approach (basis points)**

| Table heading | Period | Debt risk premium | Total Yield | | | |
|---|---|---|---|---|---|---|
| years | | 5-7 | 5-7 | 7-10 | 7-10 | 7-10 |
| | | Bloomberg BBB linear extrapolated (PwC) | Bloomberg BBB linear extrapolated (PwC) | Bloomberg AAA yield difference | Swap rate difference | CGS yield difference |
| **Average Squared Error** | 1 | 427.4 | 841.2 | 878.9 | 501.0 | 1221.8 |
| | 2 | 517.8 | 952.6 | 89.6 | 101.2 | 114.2 |
| | 3 | 375.5 | 132.4 | 27.2 | 50.1 | 43.4 |
| | 1-3 | 434.6 | 504.4 | 116.6 | 104.4 | 161.0 |
| **Average Error** | 1 | -14.5 | 23.6 | -28.1 | -21.1 | -34.0 |
| | 2 | 21.9 | 29.8 | -3.0 | -6.7 | -8.5 |
| | 3 | 13.7 | 4.7 | -0.3 | -4.1 | -3.0 |
| | 1-3 | 14.7 | 15.9 | -3.5 | -6.4 | -7.5 |

Source: Bloomberg and CBA Spectrum Note: Period 1 is 4 December 2001 to 14 March 2002, Period 2 is 11 June 2003 to 20 October 2004, Period 3 is 10 November 2005 to 9 October, 2007.

During the reference period, we found that linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums resulted in a 10 year BBB+ debt risk premium of **521** basis points.

However, we have also recognised that at times of increased uncertainty in debt markets, reliance on a straight line extrapolation may be inaccurate, which means that supplementary information about the likely rise in the longer section of the curve should be examined for confirmatory evidence.

### *3.3.3 Linear regression*

One way of testing the reasonableness of linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums is to undertake regression analysis of all available yield data with a BBB+ credit rating. We have tested both linear and curvilinear regression functions based on fixed, floating and both fixed and floating rate data. We note that we are aware of one market practitioner, Mr Terry Toohey, who undertakes benchmarking of bond yields by a group of banks, has historically applied linear extrapolation.[50] We have only reported the results of linear regression, which we believe is justified based on the observation of a linear relationship between risk of default and term.

The results of our linear regressions indicate a 10 year BBB+ debt risk premium of:

- **481** basis points based on fixed rate bonds;

[50] For example, see Mr Terry Toohey's report, attached as Appendix D to PwC (19 July, 2010), *Methodology for calculating the debt risk premium*, Letter to Mr Mark de Villiers of Citipower & Powercor Australia.

- **479** basis points based on floating rate bonds; and
- **472** basis points based on both fixed and floating rate bonds.

### 3.3.4 Rise in debt risk premium implied by multiple issuer bonds

Another approach that can be used as a cross-check of the reasonableness of the rise in the debt risk premium over the long end of the term spectrum, is to examine the rise implied by two bonds issued by the same business, where the only differentiating feature is the term. Such an example is provided by the 5 and 10 year term bonds issued by Telstra (A rated). These bonds currently imply a rise of 73 basis points.[51] This would suggest that on average, a higher rise should be observed in the BBB+ ratings band, since the movement in the probability of default for a given change in term will be higher in the lower band, compared with the probability of default for a higher ratings band.

In Table 3.3 we find that the average rise in the debt risk premium for an average term between 1.8 and 5.0 years is 16 basis points for the 8 out of 9 paired bond combinations that had a positive change with term. If the Commonwealth Property Trust is included, then the average rise falls to 13. While the average span of terms is lower than would be desired, this corresponds approximately to the views of market participants, who currently use a rough rule of thumb that each year of term requires a 20 to 25 basis points rise in the debt risk premium. We should expect a greater rise for BBB+ bonds compared with the average rating of the bonds in Table 3.3, which was A-.

The results of extrapolation from the Bloomberg 7 year BBB debt risk premium using paired bond data indicate a 10 year BBB+ debt risk premium of:

- **453** basis points extrapolating the Bloomberg BBB 7 year debt risk premium using the rise in the Telstra bonds; and
- **460** basis points extrapolating the Bloomberg BBB 7 year debt risk premium using the average rise in a portfolio of 16 paired bonds (for 8 companies).

[51] We have been advised by market participants that the Telstra bonds are likely to provide a reasonable estimate of the rise in the A credit rating band since they are more likely to have liquidity.

**Table 3.3 Rise in debt risk premium for paired bonds**

| Bond | Credit rating | Term of first bond | Term of second bond | Rise in DRP (bppa) |
|---|---|---|---|---|
| CFS Property Trust | A | 1.4 | 3.7 | 9 |
| Telstra | A | 4 | 9.3 | 14 |
| Australia Pacific Airports | A- | 3.3 | 5.3 | 24 |
| Commonwealth Property Trust | A- | 0.2 | 5.7 | -11 |
| SPI Electricity & Gas | A- | 0.6 | 6.4 | 13 |
| Stockland Property Trust | A- | 0.2 | 3.8 | 17 |
| Transurban | A- | 0.4 | 2.9 | 21 |
| Volkswagen | A- | 0.2 | 2.9 | 18 |
| Mirvac | BBB | 3.9 | 5.4 | 11 |
| Average | | 1.6 | 5.2 | 13 |
| **Average (excl. CPT)** | | **1.8** | **5.0** | **16** |

Source: Bloomberg and RBA

Applying extrapolation from the Bloomberg 5 year BBB debt risk premium, we derived estimates of:

- **408** basis points extrapolating the Bloomberg BBB 5 year debt risk premium using the rise in the Telstra bonds, and
- **418** basis points extrapolating the Bloomberg BBB 5 year debt risk premium using the average rise in a portfolio of 16 paired bonds (for 8 companies),

## 3.4 Recommended approach for estimating a debt risk premium

As discussed above, current market conditions mean that the debt risk premium for a 10 year BBB+ rated bond can only be estimated with a wide margin of error. Based on the analysis presented in this report, we conclude that it is necessary to undertake the following steps when estimating the debt risk premium:

- **Step 1**: Obtain Bloomberg estimates of the 5 and 7 year term BBB debt risk premiums.

- **Step 2:** Obtain an estimate of the debt risk premium for a 10 year BBB+ corporate bond by adding the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 7 to 10 years) to the Bloomberg 7 year debt risk premium. Obtain an estimate of the 10 year BBB+ corporate bond by applying the rise in the last recorded 10 year Bloomberg AAA debt risk premium (from 5 to 10 years) to the Bloomberg 5 year debt risk premium. Obtain a central estimate of the 10 year BBB+ bond by taking a simple average of the 7 and 5 year extrapolations.

- **Step 3:** Test whether the central estimate of the 10 year BBB+ debt risk premium obtained in step 2 is reasonable using broader bond information and alternative approaches, including:

    - longer dated fixed and floating rate bonds (adjusted to fixed rate equivalents) that are available in the BBB, and A credit rating bands;

    - linear extrapolation of the Bloomberg 5 and 7 year BBB debt risk premiums; and

    - linear regression using available data for Bloomberg fixed and floating bonds (adjusted to fixed bond equivalents).

## 3.5 Summary of findings

Table 3.4 provides a summary of our estimates of the 10 year BBB+ debt risk premium. The highest estimate of 521 basis points we discount. Linear regressions using combinations of fixed and floating rate bonds provide a range of values from 472 basis points to 481 basis points.

We recommend a 10 year BBB+ debt risk premium of **434** basis points based on the average of:

- An upper value of **456** basis points - the 7 year debt Bloomberg BBB debt risk premium extrapolated to 10 years using the most recent data for the rise of the Bloomberg AAA debt risk premium between 7 and 10 years; and

  A lower value of **411** basis points - the 5 year Bloomberg BBB debt risk premium extrapolated to 10 years using the most recent data for the rise of the Bloomberg AAA debt risk premium between 5 and 10 years.

**Table 3.4 Summary of estimates of the 10 year BBB+ debt risk premium (basis points)**

| | Straight line | Regression | Bloomberg | | |
|---|---|---|---|---|---|
| **Base for extrapolation** | | | **7 year DRP** | **Central estimate (average)** | **5 year DRP** |
| Straight line (extrapolation) | 521 | | | | |
| Floating bonds | | 479 | | | |
| Floating & Fixed | | 472 | | | |
| Fixed coupon bonds | | 481 | | | |
| 16 Paired bonds | | | 460 | 439 | 418 |
| **Base Case** | | | 456 | **434** | 411 |
| Telstra bond | | | 453 | 431 | 408 |

Source: Bloomberg and RBA for the 40 day reference period from 7 October 2010 to 1 December 2010.

We find that straight line extrapolations using the Bloomberg BBB 5 and 7 year debt risk premiums using the rise in the debt risk premium for 5 and 10 year Telstra bonds, and using the rise in 16 paired bonds provide average values of 431 basis points and 439 basis points respectively, which are close to our preferred value of 434 basis points. These cross-checks provide us with greater confidence that an estimate of 434 basis points for the 10 year BBB+ debt risk premium is reasonable for the 40 day reference period from 7 February 2011 to 1 April 2011.

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# Jeff Balchin

## Principal

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Jeff is an economist in the PwC Economics team. Jeff has over 17 years of experience in relation to economic regulation issues across the electricity, gas, airports, ports and water industries in Australia and New Zealand. He has advised governments, regulators and major corporations on issues including the development of regulatory frameworks, regulatory price reviews, licensing and franchise bidding and market design. Jeff has also undertaken a number of expert witness assignments. His particular specialities have been on the application of finance principles to economic regulation, the design of incentive compatible regulation and the drafting and economic interpretation of regulatory instruments. His experience is outlined below in more detail.

Prior to joining PwC Jeff was a Director with the Allen Consulting Group, where he built a consulting practice with a strong specialisation in the economic regulation of price and service and prior to that he held a number of policy positions in the Commonwealth Government.

### Qualifications and professional/business associations

- Bachelor Economics (First Class Honours) University of Adelaide

### Relevant Experience

- *Strategic advisor to regulators and regulated businesses* – he has been a strategic adviser on economic regulation issues to regulators during a number of major price reviews, including the Victorian 2008, 2003 and 1998 gas distribution price reviews, the Victorian 2006 and 2001 electricity distribution price reviews, the South Australian 2006 gas distribution price review and the South Australian 2005 electricity distribution price review. He has also been retained by regulated businesses to provide strategic advice during major regulatory reviews, including to the electricity transmission businesses during the AEMC review of the revenue setting rules (2005/6), Jemena during its current gas and electricity reviews and a major NZ energy business and airport.
- *Finance issues* – he has provided advice on a range of finance issues to regulators and regulated businesses, including a major review of equity betas for the ACCC in 2001, a further study for the Victorian ESC in 2008 and then for the network industry associations in 2008/9. He has also advised on benchmark cost of debt and credit rating issues for regulated entities. He has provided extensive advice to NZ utilities in relation to deriving an allowance for taxation that is consistent with the various 'benchmark' assumptions made by the regulator. He has also provided substantial advice in relation to regulatory asset valuation and depreciation issues. He has also advised in relation to cost allocation issues (and the related issue of treatment of related party arrangements) to regulators and regulated businesses.
- *Cost benefit studies* – he has advised in relation to methodological issues in quantifying the economic costs and benefits of electricity transmission investment during applications for conversion of unregulated transmission interconnectors, and more recently advised the AEMC on how the CPRS and expanded RET should be treated when assessing the costs and benefits of projects. He has also advised in relation to the economic benefits of IT projects to make expanded use of advanced metering infrastructure.
- *Incentive regimes* – he has advised on the design of incentives for regulated businesses to minimise cost, undertake efficient service improvement and on the design of price controls (an objective of which is to create an incentive for firms to structure prices efficiently).

# Matthew Santoro

## Principal

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Matthew has over 20 years of corporate and institutional banking experience, including 12 years at Deutsche Bank and eight years at Citibank. At Deutsche Bank he held various senior banking positions covering the origination, structuring and syndication of debt facilities.

Matthew is experienced in a wide range of financing and fundraising transactions, in particular in the area of acquisition financing, leverage financing, re-financings, project and property financing and procurement of debt capital markets instruments across the Australian, European and USA markets. His experience includes dealings with credit rating agencies such as Standard & Poor's and Moody's

Prior to joining PwC, Matthew jointly established and was Joint National Head of KPMG's debt advisory practice for a period of five years. During that time, Matthew advised numerous companies on their debt and capital management needs, including the procurement of debt across a very broad industry sector. Client list includes CSL, David Jones, Boom Logistics, Pacific Brands, Healthscope, Hastings Funds Management, Future Fund, Australian Super, Deutsche Asset Management, SE Water, Computershare, ORIX Corporation, Toll Holdings, and Tabcorp

Matthew's experience covers capital management and financing applications for a wide range of structures, asset types and industries. Matthew has over 20 years of debt markets experience with extensive dealings and established relationships with key participants in the capital markets such as banks, borrowers, fund and fixed interest managers, private equity investors, credit rating agencies, legal firms, etc.

### Qualifications and professional/business associations

- Bachelor Economics, University of Adelaide
- Affiliate, Institute of Chartered Accountants

### Relevant Experience

- Bachelor Economics, University of Adelaide
- Debt structuring, arranging and procurement, onshore and offshore
- US Private Placement, Australian and European Bond markets
- Capital management
- Credit rating agencies

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## Director

Michael is a Director in PricewaterhouseCoopers' (Australia) Economics group, within the firm's Advisory practice.

Michael was a director of the Allen Consulting Group from 2005 to 2008, and advised regulators, governments and businesses on a wide range of issues. Prior to that he was a director-corporate finance in ANZ Investment Bank, and ANZ Securities. As an investment banker over 15 years Michael was involved in numerous corporate advisory assignments for government, regulator, GBE and corporate clients. He advised on over $10 billion of bids in the Australian energy and transport sectors.

## Qualifications and professional/business associations

- Bachelor Economics (Honours), Ph.D., University of Adelaide
- Fellow, Australian Society of Certified Practicing Accountants
- Adjunct Professor, Faculty of Business, La Trobe University

## Relevant Experience

- *Advisor to regulators and regulated businesses* – he has been a strategic adviser on economic regulation issues to regulators during a number of major price reviews, including the Victorian 2008, gas distribution price review, the Victorian 2006 and 2001 electricity distribution price reviews, the South Australian 2006 gas distribution price review and the South Australian 2005 electricity distribution price review. He advised the Queensland Competition Authority in relation to a number of regulatory price reviews, including the Dalrymple Bay Coal Terminal, Queensland Rail (Coal), and the Gladstone Area Water Board. He has also advised regulated businesses during major regulatory reviews, including Jemena during its gas and electricity reviews and a major NZ airport and airport association.
- *Finance issues* – he has provided advice on a range of finance issues to regulators and regulated businesses, including a major review of equity betas for the Victorian ESC in 2008 and then for the network industry associations in 2008/9. He has also advised on benchmark cost of debt and credit rating issues for regulated entities. He has also provided advice in relation to regulatory asset valuation issues.
- *Capital structure reviews* – he has advised a number of non-government and government business enterprises, and government departments on capital structure issues. Clients have included SA Water and Melbourne Water.
- *Capital market raisings* – he has advised governments on share market floats in privatisations, and companies on capital market issues, including an on-market share buy-back, and hybrid securities.