INCENTA
ECONOMIC CONSULTING

Memorandum

To:	Queensland Competition Authority
From:	Incenta Economic Consulting
Date:	9 May, 2016
Subject:	Benchmark BBB+ debt risk premium for 20 days to 12 April, 2016

1. Executive Summary

The Queensland Competition Authority (QCA) has engaged Incenta Economic Consulting (Incenta) to estimate the benchmark 10 year BBB+ debt risk premium in accordance with the QCA's preferred method (from PwC(2013)) for the 20 business days up to and including 12 April, 2016. In addition, we have been requested to estimate the 4 year Commonwealth bond rate for the same period. These two parameters will be used as inputs to the QCA's determination of a regulatory Weighted Average Cost of Capital (WACC) in relation to Queensland Rail's 2015 draft access undertaking.

Having reviewed the evidence, and applying the PwC(2013) methodology, we recommend that the benchmark 10 year BBB+ debt risk premium for the 20 business days up to and including 12 April, 2016 is 2.3 per cent. While this estimate is lower than the Bloomberg and RBA interpolated estimates of a 10 year BBB+ debt risk premium, we consider that the latter estimates are likely to be biased upwards due to the weighting of the 'broad A' credit rating bands for these sources actually falling half way between A and A-.

Relying on the Reserve Bank of Australia's (RBA) data for Commonwealth bond yields, we estimate a 4 year risk free rate of 2.00 per cent for the 20 business days up to and including 12 April.

2. Estimation method and data

Estimation method

Consistent with the QCA's policy document on the cost of debt,[1] we have applied the PwC (2013) econometric method to estimate the BBB+ debt risk premium.[2] This requires a linear regression to be applied to a pooled sample of domestically issued BBB, BBB+ and A- credit rated bonds that satisfy a number of selection criteria. We note, however, that the PwC (2013) report recommended the use of UBS bond yield data in addition to Bloomberg data (and averaging these when both were available). PwC also applied UBS estimates of the current fixed coupon equivalent yield for the floating rate bonds in the sample. Recent changes in UBS policy on the distribution of its rate sheets has made this data source inaccessible to all but certain UBS clients, which reduces transparency. As a result, we

1 QCA (August, 2014), *Final decision, Cost of debt estimation methodology*.
2 PwC (June, 2013), A cost of debt estimation methodology for businesses regulated by the Queensland Competition Authority.

have depended only on Bloomberg data, which we note, is derived from the inputs of a number of finance industry sources.

Data

We began with a sample of 226 bonds in the BBB to A- credit rating bands, which are Australian issued, denominated in Australian dollars, and have been rated by one of Standard & Poor's, Moody's or Fitch. Eliminating bonds issued by finance businesses, not having more than a year to maturity, and not being senior securities, resulted in a final sample of 76 bonds. Each bond was allocated to a credit rating by adopting the predominant credit rating if there were three credit ratings, adopting the lower credit rating band if there were two divergent ratings one notch apart, and averaging the credit ratings if the divergence was more than one notch. This resulted in the following distribution of credit ratings.

Table 1: Distribution of credit ratings for the bond sample

Credit rating band	Value	Number of bonds	Product
A-	1	34	34
BBB+	2	17	34
BBB	3	25	75
Total		76	143
Weighted average			1.88

Source: Bloomberg and Incenta analysis

Applying values of 1, 2 and 3 to bonds with credit ratings of A-, BBB+ and BBB respectively resulted in a weighted average credit rating of 1.88, which is 94 per cent of a BBB+ credit rating (value of 2). This suggests that there may be a slight bias toward the A- credit rating. We also note that the sample of 76 bonds includes 67 fixed rate bonds, and 9 floating rate bonds.

We estimated the risk free rate applicable to each term to maturity for the sample bonds by linear interpolation between Commonwealth Government bonds on either side of the date in question, which we obtained from the RBA website's interest rate statistics tables.

Finally, for the 20 days of the averaging period, we obtained the Bloomberg and RBA fair value estimates of a 10 year BBB rated bond and a 10 year A rated bond, and interpolated to obtain an implied Bloomberg and RBA debt risk premium estimate for a BBB+ rated bond. Implicit in this interpolation is an assumption that the 'BBB' curve is representative of a BBB bond, the 'A' curve is representative of an A bond, and each notch in between causes the same change in the debt risk premium.

3. Cost of debt estimates for 20 business days to 12 April, 2016

Estimate of 10 year BBB+ debt risk premium

The results of the pooled regression are displayed in Table 2 below.

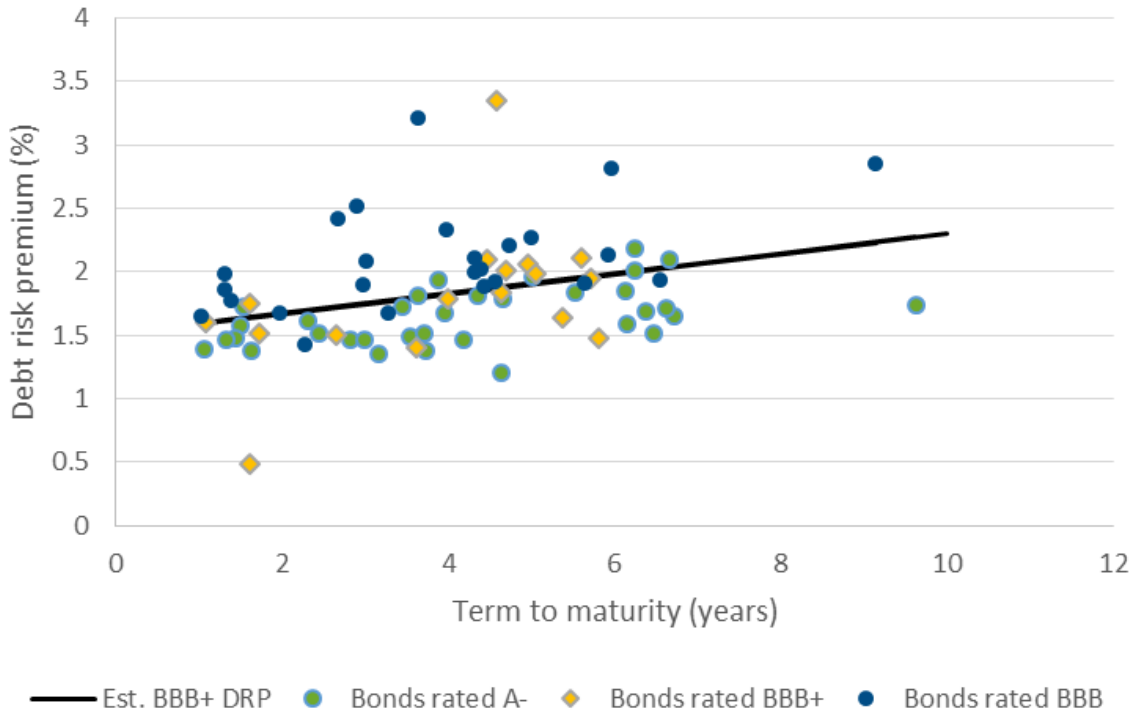
Table 2: Results of regression analysis estimating the BBB+ debt risk premium for 20 days to 12 April 2016

	Intercept	T-statistic	Term coefficient	T-statistic	Adj. R-squared	Predicted DRP at 10 years
All bonds	1.51	13.72	0.08	3.18	0.11	2.30

Source: Bloomberg and Incenta analysis

The spread of bond yields for the current averaging period are displayed in Figure 1 below.

Figure 1: Pooled regression line and scatter of debt risk premiums (20 days to 12 April, 2016)



Source: Bloomberg and Incenta analysis

These results indicate an estimate of the 10 year debt risk premium of 2.30 per cent.[3] A concern that could be raised is that our estimate is biased downward because the average credit rating of bonds in our sample is above BBB+. We therefore looked at the average deviations (residuals) from the pooled regression line, which were as follows:

- For the 25 BBB bonds — 28.6 basis points;
- For the 17 BBB+ bonds — was 2.6 basis points (i.e. actuals slightly below the estimate); and
- For the 34 A- bonds — 19.8 basis points.

[3] We estimated the 10 year risk free rate to be 2.55 per cent.

The middle results suggests that any bias is not material. Indeed, the fitted regression line on average lies above the BBB+ bonds in the sample, but only by a small amount. Another way of testing for possible bias is to undertake a dummy regression, which uses all the bond observations, but assigns dummy variables to separate the individual credit ratings.[4] The results of this analysis are shown in Table 3 below, together with the findings of the pooled regression. Using the dummy variables method we find the estimate of the 10 year BBB+ debt risk premium is only 2 basis points higher (2.32 per cent) than using the pooled regression approach. Similarly, the estimates of the 10 year BBB and A- debt risk premiums are relatively close to one another (i.e. within 5 basis points).

Table 3: Comparison of pooled and dummy variable regressions (20 days to 12 April, 2016) (per cent)

Number of bonds	Credit rating	Pooled regression	Dummy variables
27	BBB	2.59	2.64
17	BBB+	2.30	2.32
34	A-	2.10	2.15

Source: Bloomberg and Incenta analysis

In summary, the additional evidence suggests a 10 year BBB+ debt risk premium of 2.3 per cent obtained by applying the QCA's preferred method remains appropriate, notwithstanding the slight weighting of the sample above BBB+ (i.e. slightly weighted towards A-).

Cross-check to Bloomberg fair value curve

The QCA's statement on cost of debt estimation recommends that the estimate obtained using the PwC(2013) method should be cross-checked against the fair value yield data published by Bloomberg and the RBA. We interpolated the daily yield estimates for the months of March and April 2016 using RBA extrapolated month end 10 year BBB and A credit rating band yields for February, March and April, and extracted daily (annualised) yields for the 20 business days to 12 April, 2016. We downloaded daily (annualised) Bloomberg 10 year yield data for the BBB and A credit rating bands for the same 20 business day period to 12 April, 2016. Finally, we calculated the average 10 year debt risk premiums for the BBB and A credit rating bands for this period by subtracting the average 10 year risk free rate of 2.55 per cent. The results are shown in Table 4.

Table 4: Interpolated BBB+ debt risk premiums at 10 years, Bloomberg / RBA data (per cent)

	Bloomberg	Bloomberg Adjusted	RBA	RBA Adjusted
10 year DRP 'BBB' credit rating	2.83		2.84	
10 year DRP - interpolated BBB+ credit rating	2.46	2.39	2.70	2.68
10 year DRP 'A' credit rating	1.71		2.42	
Average 'score' for sample of 'BBB' rated bonds	2.03		2.02	
Average 'score' for sample of 'A' rated bonds	2.53		2.49	

Source: Bloomberg, RBA and Incenta analysis. Note: BBB+ is 1, BBB is 2, BBB- is 3 and BB+ is 4; A+ is 1, A is 2 and A- is 3.

[4] This assumes a set of parallel functions for each credit rating band.

Interpolation of the Bloomberg BBB and A credit rating estimates provides an estimated 10 year BBB+ debt risk premium of 2.46 per cent, which is 16 basis points higher than the BBB+ debt risk premium we have recommended based on applying the pooled regression method. The RBA interpolated BBB+ 10 year debt risk premium estimate is 2.7 per cent, which is 40 basis points above the estimate using pooled regression. However, these estimates are likely to be affected by material bias in the weightings of the 'A' credit rating band in both the Bloomberg and RBA data.

On average, we find that the weighted average 'score' for both the Bloomberg and RBA samples of broad BBB rated bonds is close to 2 (i.e. the value assigned to a BBB rated bond). However, we also find that for both the Bloomberg and RBA bond samples the 'broad A' credit rating is half way between A and A- (rather than close to A as assumed). This means that the Bloomberg interpolated BBB+ debt risk premium is likely to be indicative of a credit rating that is lower than A.[5] This would cause the interpolated debt risk premium to overstate the debt risk premium for a BBB+ bond. The RBA sample has almost the same strong degree of composition bias (i.e. an average credit rating that is half way between A and A-). One way of compensating for this compositional bias is to weight the interpolated BBB+ based on a notional credit rating that is half way between A and A-. When this is done the Bloomberg Adjusted and RBA Adjusted interpolated BBB+ estimates shown in Table 4 are 2.39 per cent and 2.68 per cent respectively. That is, the Bloomberg Adjusted interpolated BBB+ estimate is now only 9 basis points above the estimate using the pooled regression approach.

At 2.68 per cent, the RBA Adjusted interpolated BBB+ debt risk premium estimate is still materially higher than the pooled regression estimate of 2.3 per cent, which is a concern. It is also of concern that the RBA's estimated debt risk premium for a broad A credit rating (2.42 per cent) is so much higher than Bloomberg's estimate (1.71 per cent). These materially different estimates of the debt risk premium for a 10 year A rated bond are the major reason for divergence in the respective estimates of an interpolated BBB+ debt risk premium, which caused us to undertake further analysis of the matter.

We compared the differentials between the Bloomberg and RBA BBB and A curve estimates over the maximum period of data availability (from April 2015), and found that while the Bloomberg BBB/A differential has ranged from 40 basis points to 120 basis points, the RBA's BBB/A differential has ranged from 5 basis points (which is implausibly low), to a high of 62 basis points. While the difference between the Bloomberg and RBA BBB/A differential was only 16 basis points up to October 2015, since November 2015 it has averaged at 86 basis points, due at times to an implausibly low RBA BBB/A differential. We concluded that the RBA A credit rating band debt risk premium estimates are relatively volatile, which causes us to discount the interpolated BBB+ debt risk premium that is obtained using RBA data.

On balance, we consider that while the 10 year BBB+ debt risk premium of 2.3 per cent estimated using the pooled regression method is appropriate. While the pooled regression estimate is slightly lower than the 2.39 per cent estimated using the Bloomberg Adjusted interpolation (i.e. after correcting for composition bias), it is corroborated using the dummy variables approach. Given the observed erratic relativity of the RBA's A curve to its BBB curve, we are not concerned that the preferred estimate is materially lower than the RBA's interpolated BBB+ debt risk premium.

[5] Out of a sample of 20 bonds, Bloomberg includes only one A+ rated bond in its 'broad A' credit rating band estimate.

Estimate of 4 year risk free rate

We estimate the 4 year risk free rate at 2.00 per cent for the 20 business day period up to 12 April, 2016. This estimate was derived by undertaking a linear interpolation of the two Commonwealth bonds maturing on either side of the target maturity dates (14 March to 12 April, 2020).[6]

[6] These Commonwealth bonds (identifiers) mature on 21 October, 1919 (FCMYOCT19D) and 15 April, 2020 (FCMYAPR20D).