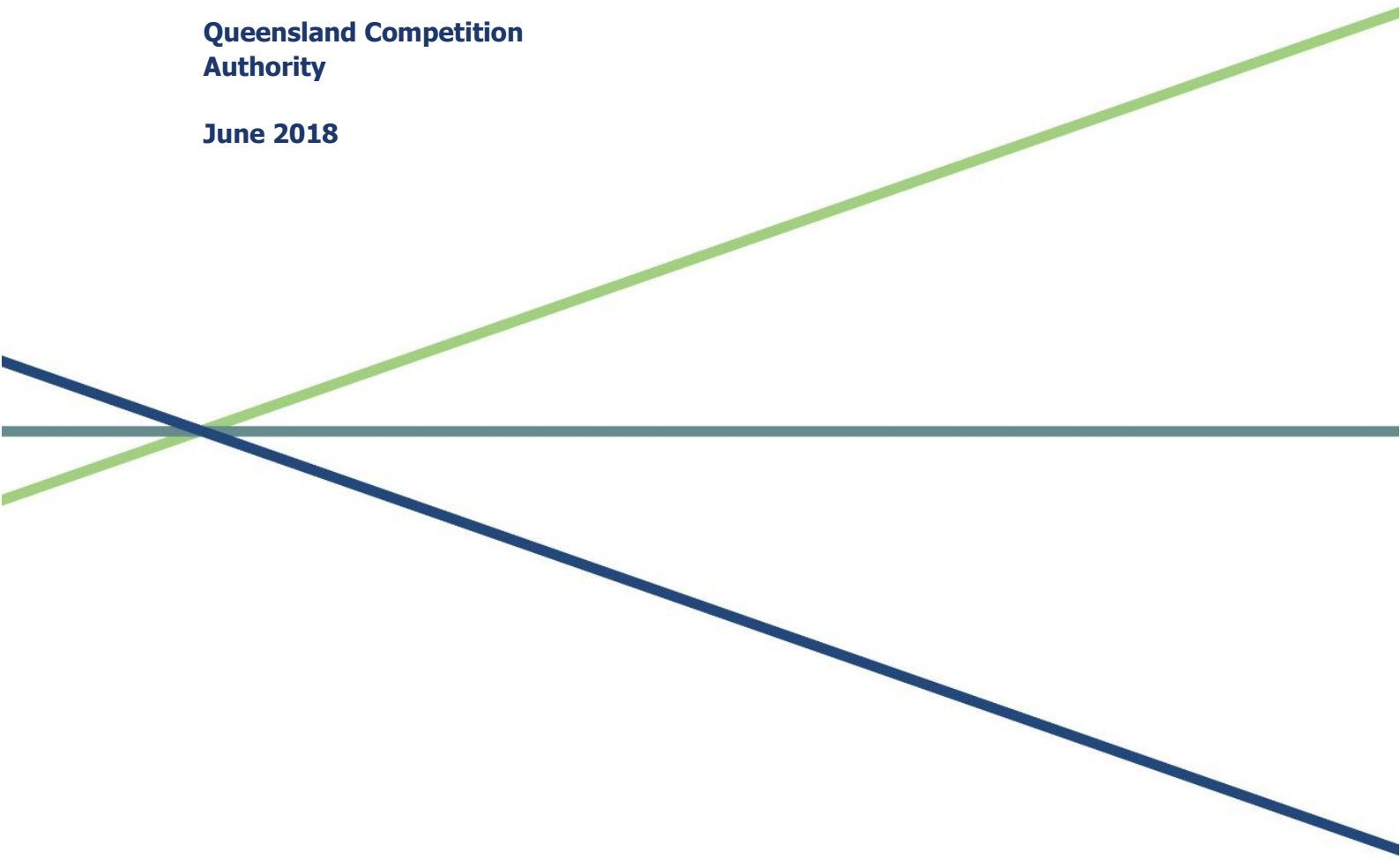
# Addressing responses to Incenta's debt risk premium estimate for the 2017 draft access undertaking

**Queensland Competition Authority**

**June 2018**



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ECONOMIC CONSULTING

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# 1. Introduction

On 15 December 2017, the QCA published its draft decision proposing to refuse to approve Aurizon Network's 2017 DAU. In response to the draft decision, the QCA received submissions from stakeholders on WACC-related matters. Aurizon Network's submission included as an appendix (G), a report by Competition Economists Group (CEG), dated March 2018, and titled "Debt risk premium for Aurizon" ("CEG Report").[1] In April, 2018, the QCA appointed Incenta to respond to a number of questions that it had constructed based on issues that had been raised in CEG's report. We provide our answers to each of the questions below, setting out in order: The QCA's question, and our response.

[1] CEG (March, 2018), *Debt risk premium estimate for Aurizon*.

# 2. Analysis

## 2.1 A- rated bond issued by Australia Pacific Airports Melbourne Pty Ltd

***Question 1: Why has Incenta included an A- rated bond issued by Australia Pacific Airports Melbourne Pty Ltd (UV87008012) in the domestic sample?***

**Box 1: QCA's Question 1**

*Why has Incenta included an A- rated bond issued by Australian Pacific Airports Melbourne Pty Ltd (UV8008012) in the domestic sample? As part of your response could you please outline whether the bond is callable and, if so, whether it is appropriate to include such a bond in the domestic sample given the search criteria applied (i.e. 'standard corporate bonds without special features such as call / put options attached').*

***Response***

In replicating Incenta's estimate of the BBB+ debt risk premium at 10 years over the 20-day period to 30 June, 2017, CEG noted that a callable bond was included in the sample when it should not have been.[2] This is an A- rated bond that was issued by Australia Pacific Airports Melbourne Pty Ltd (UV8008012 Corp).

The search criteria applied in Incenta's report followed the PwC (2013) approach of restricting the sample to domestic bonds that did not have special features such as call and put options. We find that in both the Standard & Poor's (S&P) and Moody's outputs our search identified the UV8008012 Corp bond as "callable." As such, it should not have been included in the sample, and its inclusion was an error on our part.

However, as reported in Table 1 below, excluding this bond from the sample did not have a perceptible impact on our preferred estimate of the BBB+ debt risk premium from the sample of bonds derived consistently with PwC (2013).

**Table 1: Domestic bond sample - impact of excluding the UV87008012 Corp bond**

| Sample | N | BBB+ Intercept | T-Stat. | Term (Slope) | T-Stat. | BBB intercept | T-Stat. | A- Intercept | T-Stat. | Predicted BBB+ DRP at 10 years |
|---|---|---|---|---|---|---|---|---|---|---|
| Incenta Report | 55 | 1.067 | 13.349 | 0.093 | 7.778 | 0.002 | 0.019 | -0.212 | -2.814 | 2.00 |
| Excluding MELAIR bond (UV87008012) | 54 | 1.066 | 13.207 | 0.093 | 7.696 | 0.002 | 0.019 | -0.212 | -2.771 | 2.00 |

*Source: Incenta (2017), p. 106, and Incenta analysis*

[2] CEG (March, 2018), p.10.

## 2.2 Coca-Cola Amatil bonds

**Box 2: QCA's Question 2**

*Why has Incenta excluded only those bonds issued by Coca-Cola Amatil that were issued into the European market? Please explain whether you consider it appropriate to exclude all bonds issued by Coca-Cola Amatil from the sample, including EJ4333419 Corp — a BBB+ rated bond issued by Coca-Cola Amatil. It is noted that Incenta in its report to the QCA stated*:

> *We concur with the ACCC, CEG, Bloomberg and the RBA regarding the exclusion of the Coca-Cola Amatil bonds from the BBB credit rating band. Having examined the yields of these bonds we believe they are so low for their credit rating as to not be comparable to other bonds in the rating band. In our view, their inclusion would have an artificially depressing effect on the estimates.*

***Response***

Yields on bonds with the same credit rating are expected to vary based on their specific risk characteristics, which raises the question of whether some bonds may be so different from their ostensible peers as to be considered outliers (and where removal of such bonds from the sample would improve the estimate of the debt risk premium for a benchmark bond). A number of bonds issued by Coca-Cola Amatil (Coca-Cola bonds) have been considered outliers and excluded by some parties, but have been included in bond samples by others:

- *Bloomberg* – in April 2014 the ACCC's Regulatory Unit considered the issue of bond outlier detection. It identified that a number of Coca-Cola bonds that were rated BBB+ by Standard & Poor's and issued in AUD in European markets were included in Bloomberg's BBB constituents, but had what appeared to be unusually low yields. In May 2014 Bloomberg advised the ACCC that it had removed the bonds from the BBB bond curve due to their low yields and stated that in future they would be found in the A rating category.[3] However, the ACCC has noted that Bloomberg does not currently use these bonds in the A category or the BBB category. CEG has stated that Bloomberg no longer includes any Coca-Cola bonds in either its broad BBB or broad A samples, which we confirm is the case.

- *ERAWA* – the ERAWA includes these Coca-Cola bonds in its BBB+ sample.

- *RBA* – the RBA includes these Coca-Cola bonds in its broad BBB sample. In our original report we erroneously referenced the RBA as having a policy of excluding Coca-Cola bonds (we observe that CEG's original submission also made the same error).[4]

- *PwC (2013)* – the PwC (2013) included the domestic Coca-Cola Medium Term Note (EJ4333419 Corp) in its sample, but did not turn its mind expressly to whether it was an outlier. However, that

[3] ACCC Regulatory Unit (August, 2014), Return on debt estimation: a review of the alternative third party series, p.32.

[4] In its previous report, CEG stated that "These bonds were, at one stage, included in both Bloomberg and the RBA's BBB sample but have since been removed and, at least in the case of Bloomberg, treated as A rated bonds in the construction of it's a curve." See CEG (November, 2016) *Debt risk premium of coal transporters, A report for Aurizon Network*, p.11

report was completed before the ACCC's discussion with Bloomberg about Coca-Cola bond outliers that was referred to above.

We excluded the international AUD-denominated Coca-Cola bonds from our expanded sample on grounds that many of the bonds had an unusually low yield that did not resemble other BBB+ bonds (and especially those with a longer term) and also because there were so many bonds from the one issuer (12 bonds from the one issuer). We remain of the view that it is appropriate to exclude these bonds from the expanded sample.

The situation regarding the single domestic BBB+ bond (EJ4333419 Corp) arguably is more complex because the degree of dispersion amongst the small number of BBB+ rated bonds made it less obvious that this bond was an outlier, and the fact that as this is a single bond means it would be expected to have a less material effect on results than is the case of the foreign issued bonds (albeit with the effect on results likely to depend on the estimation method applied). On balance we decided to retain it in the sample. However, we acknowledge that this bond could also have been excluded on grounds of being an outlier, and the fact that the foreign issued bonds were excluded creates a logic for doing so (i.e., the factors that have caused the foreign issued bonds to appear as outliers most likely would be equally present with the domestic issued bond). Excluding the Coca-Cola bond and the previously mentioned Australia-Pacific Airports bond from the domestic sample raises our best estimate of the BBB+ yield to **2.04 per cent** from the sample of bonds derived consistently with PwC (2013).

## 2.3 Search reference to 'Australian country risk'

**Box 3: QCA's Question 3**

*Why does Incenta consider that the bond search criterion 'issuance denominated in AUD by an entity with Australian country risk' is appropriate and does Incenta consider this criterion to be consistent with that stated previously by the PwC — 'Australian issuance by an Australian entity'?*

The PwC (2013) report did not specify how the concept of 'Australian issuance by an Australian entity' was intended to be operationalised in relation to the search criteria options provided by Bloomberg.

Our view is that defining the search as issuance in AUD by a company with "Australian country risk", a term used in Bloomberg's search criteria, is an appropriate means of operationalising the stated principle, and can be replicated by others easily. We observe that CEG does not appear to suggest that this is an inappropriate way to define the sample, or to suggest alternatives. In addition, we note that approach is largely consistent with the search method applied by the West Australian Economic Regulation Authority (ERAWA).[5]

[5] ERAWA (22 December, 2015), *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020, Appendix 4 Rate of Return*, Submitted by DBNGP (WA) Transmission Pty Limited, p.270.

## 2.4 Inclusion of bonds issued by real estate firms

**Box 4: QCA's Question 4**

*Why does Incenta consider that the inclusion of bonds issued by real estate firms in the sample is appropriate and does Incenta consider this criterion to be consistent with the sample methodology applied by PwC that stated that the benchmark should not include bonds issued by financial institutions, without any reference to real estate firms.*

***Response***

In footnote 48 of our report, we stated that:

> *We note that the PwC (2013) selection criteria excluded bonds classified as "Financial" by Bloomberg, but included bonds classified as "Real Estate", as these have never been excluded from samples that have applied the PwC (2013) approach.*

It was reasonably clear to us that the language used in the PwC (2013) report indicated that PwC would not have classified real estate businesses as "banks and finance companies", and would therefore not have excluded them from its sample:[6]

> *We conclude that industry membership is generally not important for estimating the debt risk premium, but single out the finance industry as an exception. Market participants consider that the yields of the bonds of banks and finance companies trade materially differently from operating non-financial businesses. Therefore, while a large number of bonds are issued by financial institutions, the benchmark should not include such bonds.*

However, the PwC (2013) report did not explicitly state whether or not it viewed real estate businesses as "finance companies", and did not publish its sample of bonds. To remove doubt, we requested that the QCA access its files and provide us with the list of the bonds that was used in the PwC (2013) analysis. The list of 70 PwC (2013) bonds that was provided to us included 12 bonds that Bloomberg classifies as belonging to the "real estate" industry, which were issued by 9 businesses.[7] This confirmed our belief that the text of the PwC (2013) report intended that real estate bonds be included in the sample, and that the excluded firms be restricted to those issued by financial institutions.

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6 PwC (June, 2013), p.9. In footnote 11 on that page, PwC noted that it had "interviewed Mr. Michael Bush, Head of Fixed Interest Securities at National Australia Bank, who confirmed that the industry practice is to remove the bonds of financial institutions when estimating FVCs for corporate bonds. Formal empirical analysis confirms this. See Edwin Elton, Martin J. Gruber, Deepak Agrawal, and Christopher Mann (February, 2001), 'Explaining the rate spread on corporate bonds', *Journal of Finance*, Vol. LVI, No. 1, p.253."

7 Stockland Trust had 3 bonds in the sample and QIC Shopping Centre Fund had 2 bonds, while another 7 businesses had one bond each.

## 2.5 Nine additional bonds identified by CEG for the expanded sample

**Box 5: QCA's Question 5**

*In its report, CEG identified nine additional bonds that were not included in Incenta's expanded sample. Could you please review these 9 bonds (see Table 4.1 of the CEG report) and outline whether you consider it appropriate to include these bonds in the expanded sample?*

In the discussion above we conceded that the Australia Pacific Airports Melbourne Pty Ltd (UV8008012 Corp), and Coca-Cola Amatil (EJ4333419 Corp) bonds should not have been included in the domestic sample. As discussed further below, we examined an expanded sample that included international bonds and bonds with options attached as an additional cross-check, amongst other things in response to submissions by Aurizon Network and CEG. For the same reasons as above, we accept that the Coca-Cola Amatil bond should also have been excluded from the expanded sample.[8] In addition, in re-checking the expanded sample data, we found that we had transposed two WSO Finance (A-) bonds, including one that we intended to exclude, and excluding one that we intended to include. Inserting the correct WSO bond did not make a perceptible difference to the predicted BBB+ debt risk premium relative to the findings we previously reported. Excluding Coca-Cola Amatil results in an estimate of the debt risk premium based on only BBB+ bonds of **2.04 per cent** (from 2.05 per cent) and an estimate of **2.00 per cent** (from 1.99 per cent) from the estimate based on the whole of the expanded sample with dummy variables applying to the intercepts. These changes are assumed to have been made in the discussion below.

In our previous report, we did identify each of the 9 bonds that CEG has referenced, and consciously excluded them from our sample. Having reassessed these bonds, we still consider that three of the bonds did not meet our criteria for inclusion, but 6 should have been included. Our reasons are as follows:

- The Aurizon bond (AN7512055) was issued on 21/06/2017, which was half way through the relevant 20-day averaging period that ended on 30 June 2017. As it did not have a full period of observations, it was excluded. This is a BBB+ bond.

- The two fixed rate bonds (AN89778743 Corp, and AN8979139 Corp) had only 12 valid daily yield observations for the period, and so were also excluded for the same reason as the bond above. These are BBB+ bonds.

- Six bonds in CEG's Table 4-1 are callable floating rate bonds. We identified but excluded these bonds because we were advised by a Bloomberg representative (erroneously or through a misunderstanding) that it does not mechanistically provide the equivalent fixed rate yields for such bonds. We have subsequently observed that these yields are available, and so acknowledge that these bonds should have been included. Three of these bonds are BBB and three are A-.

[8] The Australia Pacific Airports Melbourne Pty Ltd (UV8008012 Corp) bond is validly included in the expanded sample as the expanded sample includes bonds with embedded options.

Whether or not the six valid observations are included in the sample obviously does not affect the estimated 10-year BBB+ debt risk premium obtained from only BBB+ bonds (i.e., **2.04 per cent**) because none of these bonds have this rating. In addition, the inclusion of these bonds does not have a perceptible effect on the estimate obtained from the regression that includes all bonds and intercept dummies (i.e., the estimated debt risk premium remains at **2.00 per cent**).

In relation to the remaining three bonds, while we note that these bonds were validly excluded based on our criteria for inclusion, we observe that their presence does not have a material effect on the estimated 10-year BBB+ debt risk premium:[9]

- the debt risk premium based on BBB+ only bonds increases from 2.04 per cent to 2.05 per cent; and
- the debt risk premium estimated based on the full sample and intercept dummies remains at **2.00 per cent**.

The full results summarised above are set out in Table 2 below.

**Table 2: Domestic and expanded bond sample sensitivities – debt risk premium for 20 business days to 30 June, 2017**

| Eq. | Sample | N | BBB+ intercept | T-Stat. | Term (Slope) | T-Stat | BBB Intercept delta | T-Stat. | A- Intercept delta | T-Stat | Predicted BBB+ DRP at 10 years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Domestic sample:** | | | | | | | | | | |
| 1 | Incenta report | 55 | 1.067 | 10.401 | 0.093 | 6.772 | 0.002 | 0.015 | -0.212 | -2.420 | **2.00** |
| 2 | Eq 1 & exclude MELAIR bond UV87008012 Corp | 54 | 1.066 | 10.370 | 0.093 | 6.698 | 0.002 | 0.016 | -0.212 | -2.406 | **2.00** |
| 3 | Eq 2 change & exclude Coca-Cola bond | 53 | 1.122 | 10.868 | 0.091 | 6.657 | -0.049 | -0.494 | -0.260 | -3.047 | **2.04** |
| | **Expanded sample:** | | | | | | | | | | |
| | ***a) BBB+ bonds only*** | | | | | | | | | | |
| 4 | Incenta report BBB+ bonds only | 38 | 1.043 | 17.344 | 0.101 | 10.445 | | | | | **2.05** |
| 5 | Eq 4 less Coca-Cola bond | 37 | 1.070 | 18.446 | 9.721 | 10.389 | | | | | **2.04** |
| 6 | Eq 5 change plus 3 additional BBB+ bonds with incomplete data | 40 | 1.071 | 19.061 | 0.098 | 10.574 | | | | | **2.05** |
| | ***b) All bonds with intercept dummies*** | | | | | | | | | | |
| 7 | Incenta report | 146 | 1.109 | 26.452 | 0.089 | 15.368 | 0.083 | 1.923 | -0.213 | -6.610 | **1.99** |
| 8 | Adjust WSO Finance AM6441365 Corp | 146 | 1.111 | 26.699 | 0.088 | 15.511 | 0.083 | 1.919 | -0.215 | -6.676 | **1.99** |
| 9 | Eq 8 change & exclude Coca-Cola bond | 145 | 1.126 | 27.718 | 0.087 | 15.478 | 0.074 | 1.733 | -0.002 | -7.129 | **2.00** |
| 10 | Eq 8 & 9 changes & include 6 callable foreign issued bonds | 151 | 1.128 | 27.770 | 0.087 | 15.384 | 0.096 | 2.218 | -0.222 | -7.158 | **2.00** |
| 11 | Eq 8, 9 & 10 changes & include 3 bonds with incomplete data | 154 | 1.130 | 28.692 | 0.087 | 15.461 | 0.093 | 2.194 | -0.225 | -7.563 | **2.00** |

9 We also note that CEG removed one bond from our sample (Goodman Funding EI4595803 Corp) on account of a negative spread using Bloomberg's OAS function. We also obtained the negative spread when re-running the function, but have retained the historical observation because this problem was not apparent when we ran it for our original report.

*Source: Bloomberg, RBA, CEG and Incenta analysis. Note: Robust Standard Errors have been used to calculate T-Statistics.*

## 2.6 Robustness of functional form with intercept dummy variables

**Box 6: QCA's Question 6**

*Please explain whether Incenta considers that the dummy variables regression provides a robust estimate of Aurizon Network's DRP, given the shortcomings observed by CEG in its submission. In particular, could you please address two claims made by CEG in relation to Incenta's application of dummy variables approach, specifically:*

*(a) The sample of bonds used by Incenta shows that the dummy variable model assumption of the DRP curves having the same slope across all credit ratings is false. As a result, the dummy variable regression approach is biased downwards by the smaller slope coefficient of the A- bonds. CEG submitted that Incenta has previously noted that such asymmetry could result in biased estimates for the pooled regression with dummy variables, as the dummy variables only accommodate differences in levels but not differences in slopes.*

*(b) The dummy variable estimates show that the difference between BBB and BBB+ DRPs is only 0.2 basis points.*

***Response***

Under the PwC (2013) approach there are three methods that can be applied:

- Own credit rating band regression – this method was rejected because there were only 7 BBB+ bonds available in the PwC (2013) sample (which now reduces to 6 with the domestic Coca-Cola bond removed)

- Pooling of neighbouring credit rating bands – this method was rejected because there was a much larger sample of lower yielding A- bonds (32) compared with BBB+ bonds (7) and BBB bonds (16), which we concluded would have the potential to cause a downward biased estimate of the BBB+ debt risk premium, and

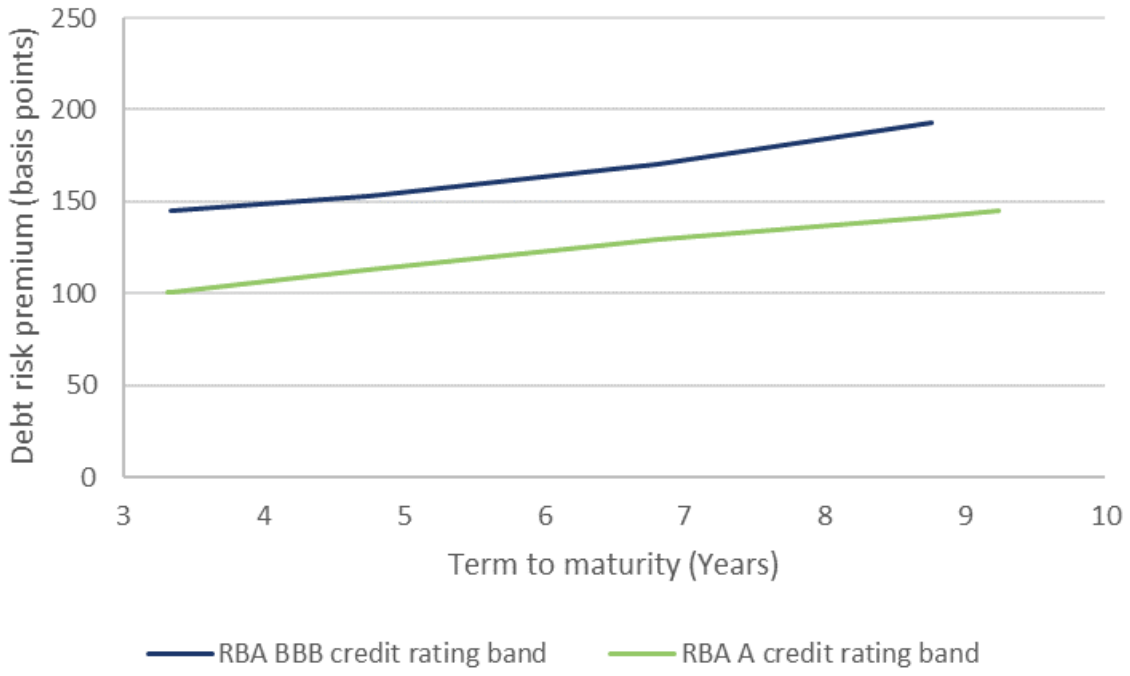
- Dummy variables regression – this approach was applied, with the constraint placed on the estimation that the A-, BBB+ and BBB debt risk premium functions have the same shape with respect to term, and with the expected differential in the debt risk premiums being manifest in a vertical movement in the curves (i.e., which is given effect through the use of dummy variables for the intercept in a regression).

We remain of the view that the regression equation that we have specified for obtaining an estimate of the BBB+ debt risk premium from the sample consistent with the PwC (2013) report is the most appropriate.

While theory provides relatively little consistent guidance on the relationships of the debt risk premiums of different credit rating bands with respect to term, there has been a consistency in

empirical findings indicating the same or very similar slopes for different credit rating bands. Our *a priori* expectation of the same slope for the debt risk premiums of BBB, BBB+ and A- bonds with respect to term is based on our experience, and observation of the behaviour of bond data. For instance, during Aurizon Network's averaging period (June 2017), we observe in Figure 1 below that the broad BBB band and broad A band estimates derived by the RBA using its Gaussian Kernel method imply almost parallel linear functions for the broad BBB and broad A credit rating bands.[10]

**Figure 1: BBB and A debt risk premium functions implied by the RBA's data for June, 2017**

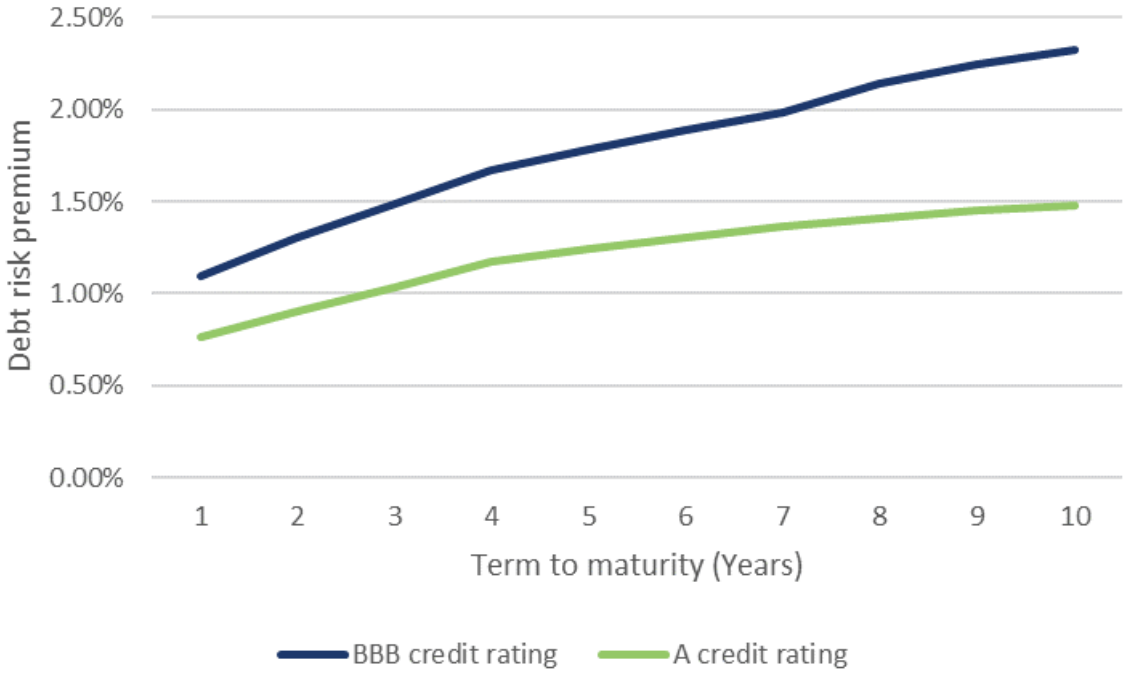



*Source: RBA (Table F3, RBA website) and Incenta analysis*

During the Aurizon Network averaging period Bloomberg's estimates for the broad BBB and broad A credit rating bands, shown in Figure 2 below, indicate a greater slope for BBB bonds. However, when the composition of the Bloomberg sample during the averaging period is examined more closely, we find that the average "weighting" of bonds with terms less than 3 years was BBB, while every bond with a term greater than 3 years was a BBB- bond. This would suggest that at the lower end of Bloomberg's estimated function a BBB debt risk premium is indicated, while at terms close to 10 years a BBB- debt risk premium is estimated, the combination of which would be expected to lead to an upward bias in the slope of Bloomberg's BBB fair value curve. Hence, we think that little reliance should be placed on the shape of Bloomberg's estimated BBB function.

[10] We refer to the RBA's "implied functions", because this is the line that is obtained by joining the single estimates that the RBA estimates for "target" terms of 3, 5, 7 and 10 years, although the "effective terms" determined by the data are generally less than the target terms. See Arsov, I., M. Brooks and M. Kosev (December, 2013) "New Measures of Australian Corporate Credit Spreads", *Bulletin*, December Quarter.

**Figure 2: Bloomberg's BBB and A debt risk premium functions for June, 2017**




*Source: Bloomberg and Incenta analysis*

Having greater confidence that the weightings in the larger RBA sample are not consistently biased in the manner we have observed for the Bloomberg BBB curve, we examined the RBA data further. We obtained the monthly term and debt risk premium data published by the RBA for the broad BBB and A credit rating bands, and applied regression analysis to estimate the intercept and slopes in the manner advocated by the Queensland Treasury Corporation (QTC).[11] The results for the period from January, 2010 to April, 2018 are displayed in Table 2 below. They show that on average over this period, the slopes of the RBA's broad A and BBB curves were approximately the same, with the A curve having a slightly higher, but not statistically significantly higher, slope. By contrast, the intercept of the BBB curve is found to have been statistically significantly higher than the intercept of the A curve.

**Table 3: Slope (basis points per annum) and intercept (basis points) estimates for debt risk premiums, RBA A and BBB credit rating bands, monthly data from January, 2010 to April, 2018**

| | A slope | BBB Slope | A Intercept | BBB Intercept |
|---|---|---|---|---|
| Average | 10.1 | 9.5 | 99 | 184 |
| Median | 9.8 | 8.6 | 90 | 169 |

[11] See QTC (September, 2014), *Extrapolating the RBA BBB curve to a 10-year tenor*. The QTC's conclusion was that using "the RBA's BBB swap spreads for target tenors of 3,5,7 and 10 years, and the associated effective tenors, to estimate the slope of the BBB swap spread function" will produce "the more robust and realistic estimates of the slope of the BBB swap spread curve" in comparison to alternative methods.

*Source: RBA and Incenta analysis. Note: Based on spread to Commonwealth Government bonds.*

We interpret these findings as providing support for our *a priori* assumptions underpinning our model specification, which uses intercept dummy variables. We also observe that the *a priori* assumption we have applied is consistent with views that CEG has previously expressed:[12]

> *However, by allowing $\beta_{1,rank}$ to vary across credit ratings, I effectively assume that the shape of the curve is the same for all credit ratings but the level of the curve is different.*
>
> *I consider that this is a reasonable assumption – especially for credit ratings that are similar to each other. That is, I consider that it is reasonable to assume that the underlying shape of the A- and BBB fair value curves is very similar to that of the BBB+ curve. By fitting a different value for $\beta_{1,rank}$ for each credit rating, I am able to use the data from A- to BBB to inform the shape of the BBB+ yield curve.*

We also note that CEG's (2013) report informed the New Zealand Commerce Commission (NZCC). Citing CEG, when estimating the debt risk premium the NZCC adopted a functional form that applied intercept dummies to determine and guide its regulatory decisions in its recently completed review of its Input Methodologies.[13] That is, the NZCC's estimation method uses bonds from across a range of credit rating bands and assumes a vertical shift between credit ratings.

We note that a key benefit from a specification that assumes the shape of the debt risk premium functions are the same with respect to term is that all of the available information about the behaviour of debt risk premiums at longer terms is used directly in the estimation, which is also a point that CEG has advanced previously.[14] In practical terms, using the available information about the behaviour of debt risk premiums at longer terms necessarily requires the information that is provided by A- bonds to be harnessed. This is because, in the domestic bond sample in question, there are no BBB+ or BBB bonds with a term of more than 7 years (and only 3 with terms between 5 and 7 years), whereas there are 4 A- bonds with terms between 8 and 10 years. As a contrast, and taking as an example the propositions that CEG put forward in its recent report for Aurizon Network, ignoring the A- credit rating altogether, or constraining the BBB/BBB+ and A- bonds to have the same intercept – but allowing the slopes of the relevant functions to vary – are methods that do not allow the long dated A- bonds to exert an influence on the predicted BBB+ function at the longer terms.

In relation to the question of whether there is statistical evidence that the slope of BBB (and BBB+) bonds is materially higher with respect to term than that of the A- bonds, we do not think the statistical evidence presented is convincing. We note the small size and idiosyncratic nature of the bonds being analysed. As we observe in the next section, CEG's finding that the slope of BBB and BBB+ bonds with respect to term is greater than A- bonds would appear to be sensitive to (and a function of) the behaviour of bonds with short terms to maturity. For example, if the (short term) domestic Coca-Cola bond is removed from the sample (as discussed in section 2.7, and as CEG appeared to advocate) the differences in the slopes between credit ratings are no longer statistically significant. Similarly, if all bonds with a term of less than two years are removed (i.e., following the criteria applied by the ERAWA), then again the differences in the slopes between credit ratings are no longer statistically significant. The result that is reached in each of these scenarios is that there is no

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12 CEG (June, 2013), Estimating the debt risk premium, p.41.

13 NZCC (20 December, 2016), *Input methodologies review decisions, Topic paper 4: Cost of capital issues*, pp.249-250.

14 CEG (June, 2013), *Estimating the debt risk premium*, p.41.

evidence that either the slopes or intercepts between credit ratings are different by an amount that is statistically significant. We do not think this result should be unexpected given the small sample size of bonds that is being analysed.

We agree that the finding of a 0.02 basis point differential between the BBB and BBB+ functions in our preferred model is anomalous on *a priori* grounds. We again think this is most likely due to the small size and idiosyncratic nature of the bonds being analysed. With a relatively small sample, the idiosyncratic factors of each bond are not likely to cancel each other out in the way that ordinarily occurs with larger samples. Therefore, in our view, the statistical finding of a 0.02 basis point differential between the BBB and BBB+ functions does not provide a strong reason for changing the model specification, for example, by removing the intercept dummy variable that permits the BBB and BBB+ debt risk premium to differ. *A priori* we would expect that, other things being equal, BBB bonds would require a higher yield than BBB+ bonds as the former have a greater risk of default. As discussed above, we think *a priori* reasoning should be the primary driver of model specification.

In summary, we consider that the intercept dummies model specification that we have applied is justified on *a priori* grounds, and this generates a robust BBB+ debt risk premium estimate of **2.04 per cent**. Having said that, the small sample of bonds that are available from the Australian market, the idiosyncratic nature of some of those bonds and the materially different interpretations of that evidence depending on the choices that are made with respect to model specification, highlights the importance of drawing upon additional information where possible to road-test the results. We address this further in the next section.

## 2.7 CEG's preferred estimation method

**Box 7: QCA's Question 7**

*In response to the QCA's draft decision, CEG stated that the A- slope is statistically significantly different to that of the pooled BBB and BBB+ regression, while the A- intercept dummy is not. Under the circumstances, please explain whether Incenta considers that a dummy variable regression approach that omits the A- intercept dummy but instead introduces an A- slope dummy variable is appropriate for estimating Aurizon Network's DRP.*

*In your consideration, please refer to the evidence presented by CEG in support of such an approach.*

***Response***

### Observations about CEG's econometric/statistical approach

The core of CEG's estimation approach is as follows.

- First, CEG estimates a system of equations for a sample comprising the A-, BBB+ and BBB bonds that applies dummy variables that permit the intercept for the function for each credit rating to differ, and that also permits the slope for each function to differ. This is done to permit a test of whether the intercepts or slopes are statistically significantly different from zero (CEG notes that

estimating a system of equations in this manner is equivalent to estimating each function independently).[15]

  - The result of this step is that the only dummy variable that is found to be statistically different from the BBB+ bonds intercept and slope coefficients in CEG's equation 1 is the dummy variable for the slope of the A- function. CEG concludes from this that it is essential for the specification of the regression equation to allow the slope of the A- function to differ from the slope of the BBB and BBB+ functions.

- Secondly, applying the conclusion reached above, CEG then presents estimates for a variety of regression specifications that all have the common characteristic of either:

  - including a dummy variable that permits the slope on the A- function to differ from the BBB+ and BBB function(s), or

  - excluding the A- bonds from the sample.

We do not think that the regression specifications that CEG has applied are the most appropriate specifications for interpreting the bond sample that is consistent with PwC (2013). The concerns that we have with CEG's proposed approach are as follows.

First, as noted in section 2.6 above, we do not think it is appropriate or best practice to select variables for empirical exercises based purely on their statistical significance rather than on *a priori* hypothesis formulation, particularly where the analysis is being performed on small samples. Selecting the empirical specification based solely on statistical significance creates the potential for an incorrect specification of the model to be selected, with the resulting potential for error.

Secondly, the practical consequence of CEG excluding the A- intercept dummy and including only a dummy variable for the slope of A- bonds, or excluding the A- bonds from the sample altogether, is that the A- bonds have little (or no) influence on the slope of the BBB+ and BBB functions. As we discussed in the previous section, there are few long dated BBB and BBB+ bonds (and none with a term of more than 7 years), which means that an estimate of a 10 year BBB+ debt risk premium that considers only these bonds implies a material extrapolation is being made from the range of the data being considered. In contrast, as we discussed in the previous section, our preferred specification (i.e., one that includes intercept dummies and estimates the slope for the pooled A-, BBB+ and BBB bonds) harnesses the much greater information available from the A- bonds as to the debt risk premium for long term bonds.

Thirdly, we do not think that the statistical evidence that CEG identifies for the slope of the A- function being different to the slope of the BBB+ and BBB functions is convincing. Rather, on our analysis, we think the results are sensitive to (and a function of) the behaviour of bonds with short terms to maturity. Table 4 replicates CEG's results with respect to the system of equations with the full suite of dummy variables,[16] with the relevant row identified (i.e., with the coefficient and

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15 It is noted that the statistical significance in this specification tests whether the coefficients of other intercept and slope dummy variables (i.e. for BBB and A- bonds) are statistically significantly different from the BBB+ intercept and slope coefficients.

16 These estimates are very close, but CEG has used one additional observation in its domestic sample (56 observations compared with our 55 observations).

associated t-statistic). This shows that, while CEG's results are (approximately) reproduced when our full original sample is applied:

- the statistical significance of the A- slope dummy disappears when the Coca-Cola bond is removed (as CEG appears to advocate), and
- the statistical significance of the difference reduces further if all bonds with a term of less than two years are excluded (which is consistent with the ERAWA practice), which demonstrates the sensitivity of CEG's results to the position of bonds with short terms (and which bonds have very little relevance for the target, i.e., a 10 year BBB+ bond).

**Table 4 Statistical significance of A- slope coefficient - sensitivity of CEG's findings to sample composition**

| | All Observations | | Exclude Coca-Cola & MELAIR bonds | | Minimum term at 2 years | |
|---|---|---|---|---|---|---|
| | *Parameter* | *T-statistic* | *Parameter* | *T-statistic* | *Parameter* | *T-statistic* |
| Intercept | 0.79% | 4.30 | 0.91% | 3.97 | 1.17% | 3.94 |
| Term | 0.17% | 3.26 | 0.15% | 2.61 | 0.09% | 1.67 |
| A- intercept | 0.12% | 0.65 | 0.01% | 0.04 | -0.20% | -0.65 |
| BBB intercept | 0.11% | 0.44 | -0.01% | -0.03 | -0.16% | -0.51 |
| **A- slope** | **-0.09%** | **-1.72** | **-0.07%** | **-1.21** | **-0.02%** | **-0.40** |
| BBB slope | -0.03% | -0.39 | 0.00% | -0.07 | 0.03% | 0.41 |
| Sample size | 55 | | 53 | | 44 | |
| Degrees of freedom | 49 | | 47 | | 38 | |
| R2 | 62% | | 63% | | 57% | |
| Adjusted R2 | **58%** | | **59%** | | **52%** | |
| 10 year BBB+ DRP | **2.50%** | | **2.39%** | | **2.09%** | |

*Source: Bloomberg and Incenta analysis. Note: Robust Standard Errors have been applied to calculate T-statistics*

Indeed, the logic that CEG applied would suggest that the above results (i.e., none of the dummy variables found to be statistically significant) justify applying a pooled sample with no dummy variables (i.e., the approach that yields a BBB+ estimate of 1.80 per cent). However, as discussed above, we think that *a priori* considerations warrant including dummy variables for the intercepts, irrespective of whether coefficients in CEG's "screening" regression are found to be statistically significant.

### Cross-checking CEG's findings to the data

As noted in the previous section, the small sample of bonds that is available from the Australian market, the idiosyncratic nature of some of those bonds and the materially different interpretations of that evidence depending on the choices that are made with respect to estimation technique, highlights the importance of drawing upon additional information where possible to road-test the results. We discuss further this evidence here.[17]

One indicator of reasonableness that we have considered is the difference between BBB+ and A- yields for a 10 year bond that is implied by CEG's estimates. CEG's estimate (2.32) implies a 60 basis

[17] In our original report we also discussed cross-checks based on third party sources (RBA and Bloomberg) and using the Nelson-Siegel and Nelson-Siegel-Svensson functional forms. We do not repeat those findings here.

point difference between its BBB+ estimate and its estimate for an A- bond.[18] This difference is materially greater than what could reasonably be expected during the period of analysis.

The principal indicator of reasonableness that we have considered are the results obtained from an examination of the expanded sample. The results that are obtained from the expanded sample are as follows:

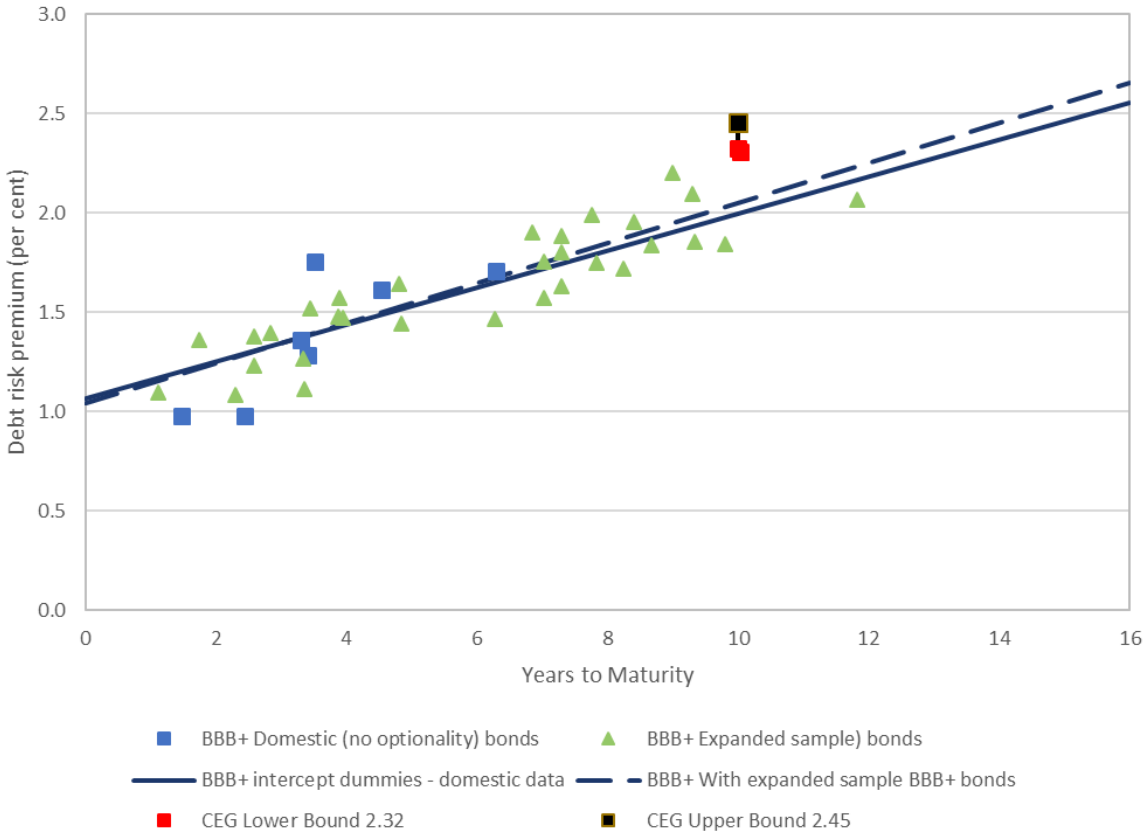
- A regression on just the BBB+ bonds yields a 10 year debt risk premium of 2.04 per cent, after excluding the domestic Coca-Cola bond (see Table 2 above, in the discussion on section 2.2).

- A regression on the whole of the expanded sample with intercept dummies is 2.0 per cent, after excluding the Coca-Cola bond and including the six additional bonds identified in section 2.5 are included. The estimate remains at 2.0 per cent if the three BBB+ bonds with partial observations are included.

It is clear from these results that the expanded sample is more consistent with our analysis of the available data than is CEG's. Figure 2 explores this issue further. It shows CEG's estimates, as well as our domestic estimate and the estimate from the expanded sample (namely the estimate that reflects only the BBB+ bonds), and plots over these functions the BBB+ bond observations in the expanded sample. This figure shows that our functions are more reflective of the bond observations than CEG's resulting estimate of 2.32 per cent.

[18] The estimate that we attribute to CEG for A- bonds is the estimate provided by its equation number 6, which is 1.72 per cent. This estimate for A- bonds is consistent with our own estimate for A- bonds (a simple regression on just A- bonds yields an estimate of 1.70 per cent).

**Figure 2: BBB+ debt risk premium estimates: Incenta and CEG using domestic bonds and expanded bond samples, 20 days to 30 June, 2017**




*Source: Bloomberg, RBA, CEG and Incenta analysis*

## 2.8 Consistency with PwC's (2013) position on use of the BBB BVAL curve as an estimate of the BBB+ rating target

**Box 8: QCA's Question 8**

*Please outline whether you consider that Incenta's position that 'failing to adjust the Bloomberg BBB BVAL curve for a BBB+ rating target is flawed' is inconsistent with positions outlined in PwC (2003)[1]. In doing so, please consider the following quote from PwC (2003, p.42):*

> *As noted previously, the extrapolated 10 year Bloomberg BBB FVC estimate (which by convention has been accepted as the BBB+ estimate) is 325 basis points.*

*In your response, please outline whether Incenta maintains that it is appropriate to adjust the Bloomberg BBB BVAL curve for a BBB+ target credit rating.*

***Response***

Under its section 6 titled "Cross checks" the CEG report stated the following:

> *We note as well that the discussion in section 3.3.2 shows that PwC (2013) opted to refer to the Bloomberg BBB BFV curve (since replaced with the Bloomberg BBB BVAL curve) since it was accepted as referring to a BBB+ estimate by convention. Since the Bloomberg BBB BFV curve has now been replaced with the BBB BVAL curve, while the RBA BBB curve has also started to be used as part of regulatory decisions, both the BVAL BBB and RBA BBB curves should thus also be used without making credit rating adjustments.*

In other words, CEG considers our approach to be inconsistent with its interpretation of the PwC (2013) method.

In our view, CEG is reading too much into the statements in PwC (2013) about the Bloomberg curve (let alone the RBA curve, which PwC (2013) pre-dated), and we do not think that report can be read as saying that the Bloomberg BBB fair value curve provides an acceptable estimate of the BBB+ debt risk premium.

The actual statement in PwC's (2013) report was as follows:[19]

> *As noted previously, the extrapolated 10 year Bloomberg BBB FVC estimate (which by convention has been accepted as the BBB+ estimate) is 325 basis points.*

It is clear from the PwC (2013) report that this statement was a summary of the Australian Energy Regulator's (AER) method of deriving an estimate of the 10-year BBB+. It did not in itself contain an endorsement of the AER's method, let alone an endorsement of the Bloomberg curve for all time irrespective of how the method that Bloomberg applies to fit the curve, or the composition of the sample that is used to fit the curve, may change.

[19] PwC (June, 2013), p.42.

We observe that the Bloomberg curve for many years was accepted by a number of regulators and practitioners as providing an acceptable estimate of the debt risk premium for a 10 year BBB+ bond. This initially reflected the fact that, for the period prior to the global financial crisis, the composition of Bloomberg's broad BBB sample was comprised wholly or substantially of BBB+ bonds. For example, NERA (2005) stated that between 2003 and 2005 all of Bloomberg's sample that it used to estimate the broad BBB fair value yield were BBB+ bonds.[20] Moreover, even after the composition of the curve became more weighted towards a BBB rating, other factors caused the curve to be depressed at longer terms (i.e., around 10 years) and so caused the estimate to be pushed towards a BBB+ (the main such factor was the need to extrapolate the curve, which tended to cause the BBB curve to be made flatter for longer terms).

However, since the PwC (2013) report, the Bloomberg curve has changed materially. Bloomberg resumed publishing a 10-year broad BBB fair value curve in 2014, which has removed the "flattening" of the curve at the long end that was noted above. Bloomberg has also fundamentally changed its method of fitting its fair value curve compared to the method that was applied at the time of the PwC (2013) report. As noted in section 2.6 above, during the averaging period the composition of the curve had an average credit rating weighted towards BBB-. Thus, in summary, the curve that exists now is materially different to the curve that gave rise to the convention to which PwC (2013) referred.

Indeed, we note that the degree of acceptance of the curve by the AER has also evolved. Whilst the AER has continued to apply the Bloomberg broad BBB debt risk premium as its estimate for BBB+ rated businesses, it has stressed that it does not consider this to be its estimate of the BBB+ yield, but rather is an expedient that facilitates the practical implementation of its trailing average debt approach. In a recent decision the AER commented as follows:[21]

> *We adopt a benchmark credit rating of BBB+ but estimate the return on debt using the 'broad-BBB' rated curves published by the RBA and Bloomberg. This means that these curves are estimated based on a bond sample that includes lower rated BBB and BBB– rated bonds. To the extent that the estimates produced by these curves reflect those lower rated bonds, this would similarly introduce an upward bias.*

It is our view that if the benchmark credit rating is BBB+, it is necessary to estimate the BBB+ debt risk premium, and not a debt risk premium that includes bias from other credit rating bands. It is therefore not appropriate to apply the RBA's broad BBB debt risk premium to Aurizon Network as an estimate of the BBB+ debt risk premium, since this is likely to introduce upward bias. Neither is it appropriate to pool the BBB and BBB+ bonds, as this approach also has the potential to introduce upward bias.

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[20] NERA (May, 2005), *Critique of available estimates of the credit spread on corporate bonds: A Report for the ENA*, p.12.

[21] AER (July, 2016) *DRAFT DECISION, AusNet Services transmission determination 2017-18 to 2021-22, Attachment 3 – Rate of return*, p.3-117.

## 2.9 Adjustment of the RBA third party yield estimate to match the 10-year target tenor

**Box 9: QCA's Question 9**

*In its report to the QCA, please explain whether Incenta adjusted the RBA third-party estimates to account the fact that the effective tenor is generally materially shorter than the 10-year target tenor? If not, does please explain whether Incenta considers it appropriate to do so, providing updated third-party estimates if necessary.*

***Response***

We did adjust the RBA's third-party estimates of "effective 10-year yields" for the BBB and AAA credit rating bands to the "target tenor" of 10 years using the Lally extrapolation method that is applied by the AER.[22] For example, during the relevant month ends of May and June 2017, the "effective tenor" of the RBA's BBB sample averaged at 8.76 years, and needed to be extrapolated by 1.24 years to term of 10 years. On average that extrapolation added 10.8 basis points per annum to the yield, which was then raised further by conversion of the semi-annual rates to effective annual rates.[23]

## 2.10 Bloomberg's Option Adjusted Spread (OAS) function

**Box 10: QCA's Question 10**

*Incenta proposed the use of Bloomberg's option adjusted spreads (OAS) function to remove the impact of options on observed DRPs and the use of cross-currency swaps to adjust foreign currency DRPs into AUD DRPs. Please explain whether Incenta considers Bloomberg's OAS feature will provide reliable estimates of the impact of optionality on bond yields. As part of your response, please outline whether there has been a comprehensive analysis of the accuracy of the Bloomberg's OAS feature.*

***Response***

We have not tested whether Bloomberg's OAS feature provides a reliable estimate of the impact of optionality on bond yields, nor are we aware of any tests of the accuracy of this Bloomberg feature. We do know that the ERAWA and Bloomberg apply the OAS feature to adjust the yields of callable bonds in their samples, and that CEG also applies it in its own work and has been a consistent proponent of the use of bonds with embedded options (and the Bloomberg OAS estimates to derive their yields). For example, in its November, 2016 advice to Aurizon Network, CEG suggested that:

22 Lally, M. (20 November, 2014), *Implementation issues for the cost of debt*, 20 November 2014, pp. 38–44.

23 The final step in deriving the "target tenor" 10-year yield was interpolation of the yields to account for the fact that there were more than 20 trading days between the end of May and end of June, 2017.

> *Given the potential concerns with application of the PwC/Incenta method with a small sample size, we consider that some consideration should be given to the inclusion of bonds issued in foreign currencies (swapped back into AUD) and bonds issued with options (but with DRPs adjusted using ERA's methodology as cited in section 3.3.2).*

CEG's advice was accepted by Aurizon Network, which in its own submission wrote:[24]

> *Aurizon Network also submits that the sample of bonds should be broadened to include foreign bonds issued by Australian entities, as well as bonds with optionality (applying the adjustments for optionality consistent with the ERA).*

We also note that CEG in its previous report has specifically endorsed the proposition that a benchmark firm should be assumed to issue bonds with embedded options (although its more recent report appears to take a contrary position – see p.24):[25]

> *That report concluded that the RBA curve was superior to the Bloomberg and Reuters curves in terms of being based on a dataset that matches the characteristics of debts issued by a BEE* [Benchmark Efficient Entity], *since it is the only one of the three that includes: foreign currency bonds; multiple long term bonds with residual maturities exceeding 8 years; and bonds with optionality.*

In our report, we agreed with these submissions from Aurizon Network and CEG, and as an additional cross-check we expanded the sample to include foreign bonds and bonds with options, and used the ERAWA's adjustment methods. We similarly followed Aurizon Network's and CEG's views that reliance should be placed on Bloomberg's OAS feature. Consistent with the PwC (2013) findings, we found that the 10-year BBB+ estimate using the expanded sample was relatively close to the primary estimate obtained using the domestic bond sample when our preferred estimation technique was applied (i.e., in the case of the current period, the use of intercept dummy variables rather than a simple pooled regression).[26]

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[24] Aurizon Network (30 November, 2016), *Aurizon Network Submission, 2017 Draft Access Undertaking*, p. 277.

[25] CEG (21 September, 2016), *AusNet Transmission Group Pty Ltd, Transmission Revenue Review 2017-2022, Revised Revenue Proposal, Appendix 6E: Review of AER Position on Curve Selection*, p.14, which references CEG, (January, 2016) *Criteria for assessing fair value curves*, p. 27.

[26] CEG did not mention that another reason that PwC (2013) recommended against the use of the "complex portfolio" was that the debt risk premium estimate it obtained by doing so was not materially different from the estimate obtained using the domestic portfolio.