CEG Asia Pacific
Suite 201, 111 Harrington Street
Sydney NSW 2000
Australia
T +61 2 9881 5754
www.ceg-ap.com

Memorandum

To:	ActewAGL Distribution
From:	Dr Tom Hird, CEG – Asia Pacific
Date:	19 June 2015
Subject:	**Application of AER criteria to methods for estimating efficient debt finance costs**

1 Purpose

1. The purpose of this memo is to provide a critique of the AER's application of its criteria to assess different methods for estimating efficient debt finance costs as set out on pages 3-157 to 3-180 of its "Final Decision ActewAGL Distribution determination, April 2015".

2 Overview

2. This memo traverses similar ground to other recent reports written by CEG. Rather than repeat all of the analysis previously provided, I will refer in this memo, as appropriate, to the relevant sections of our most recent report for the Jemena Electricity Networks (JEN)[1].

3. In its most recent final decision for ActewAGL's electricity distribution business the AER has analysed the comparative performance of different transition methodologies.[2] I have summarised the AER's conclusions in Table 1 below.

[1] CEG, Critique of the AER's JGN draft decision on the cost of debt, April 2015.

[2] See AER, Final Decision ActewAGL distribution determination, April 2015 pp. 3-157 to 3-180 and the summary tables Table 3-21 to Table 3-25 in those same pages.

Table 1 AER's assessment of financing practices

Criteria reference code	AER criteria	On-the-day approach	AER transition to trailing average	Hybrid transition	"Backwards looking"* trailing average
a.	Promotes efficient financing practices consistent with the principles of incentive based regulation	Yes	Yes	Yes	No*
b.	Provides a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs over the life of its assets	Yes	Yes	Base rate: Yes DRP: No	No
c.	Matches allowed return on debt with efficient financing cash flows regulatory period-by-period	Base rate: Yes DRP: Depends	Yes	Yes	Yes
d.	Avoids potential bias in regulatory decision making that can arise from choosing an approach that uses historical data after the results of that historical data is already known	Yes	Yes	Base rate: Yes DRP: No	No
e	Avoids practical difficulties with the use of historical data	Yes	Yes	Base rate: Yes DRP: No	No

* The AER's conclusion here is restricted to a "backwards looking trailing average" approach. However, given that the trailing average is by definition backward looking it is not obvious that the term "backwards looking" alters the meaning of "trailing average"

4. In my view there are a number of errors in the AER's position. In particular, following the same reference code in Table 1 above:

   a. Neither the on the day approach nor the AER transition to the trailing average are based on compensating for the costs of any practically implementable financing practices (let alone an efficient practice). By contrast, the trailing average, the hybrid transition or some combination of them do provide compensation based on an actual practically implementable financing strategy.

   b. Precisely because of my view expressed in "a" above, neither the on the day approach nor the AER transition can be presumed to provide a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs. By contrast, the trailing average, the hybrid transition or some combination of them can provide a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs. Exactly which of these options provides a reasonable opportunity to recover efficient financing cost depends on the assumed proportion of the base rate for the benchmark debt portfolio that it is assumed is efficient to be reset each regulatory period using interest rate swaps.

   c. Once more, precisely because of my view expressed in "a" above, neither the on the day approach nor the AER transition can be presumed to provide a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs. By contrast, the trailing average, the hybrid transition or some combination of them can provide a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs. Exactly which of these options provides a reasonable opportunity to recover efficient financing cost depends on the assumed proportion of the base rate for the benchmark debt portfolio that it is assumed is efficient to be reset each regulatory period using interest rate swaps.

   d. There is no potential bias that results from using historical data when trying to estimate the benchmark efficient debt financing costs. If debt was efficiently issued in the past then the efficient financing costs associated with that debt will reflect debt market conditions in the past. In order to compensate for these efficient costs historical data must be used. There is no bias associated with this, it is simply common sense that historical data must be used to estimate the efficient cost of debt issued in the past. In fact, a bias is introduced by failing to use historical data in circumstances where estimating efficient costs requires it.

   e. The AER's position that not using historical data "avoids practical difficulties with the use of historical data" is, in my view, nonsensical. Firstly, consistent with my views expressed in "d", if historical data is required to estimate efficient financing costs then nothing is gained in terms of 'avoiding practical difficulties', and much is lost, by using a data set that is not the correct dataset. Second, in a very important sense, the use of historical data is less problematic

than the use of data that is not yet known precisely because historical data is known and capable of being analysed today.

a. Compensation based on a practical debt management strategy

5. Clause 6.5.2.(c) of the National Electricity Rules (NER)[3] defines the allowed rate of return objective (ARORO) as:

> *The allowed rate of return objective is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services (the allowed rate of return objective).*

2.1.1 A benchmark debt management strategy must be defined

6. As described in section 2 of our report for JEN, the requirements of clause 6.5.2.(c) and clause 6.5.2 more generally suggest the need for a regulator to undertake two distinct steps when estimating the return on debt (cost of debt) for a 'benchmark efficient entity' (or any other entity):

   - Step 1: define a financing strategy for a "benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services"; then
   - Step 2: estimate the "efficient financing costs" of implementing that strategy.

7. Step 1 is a necessary step given that, before we attempt to measure the cost of something, we must define what that 'something' is. In this case, the 'something' in question is the benchmark efficient debt management strategy that the benchmark efficient entity referred to in clause 6.5.2.(c) would undertake.

8. Section 3 of our report for JEN describes the mechanics of two extreme debt management strategies:

   - one where 100% of base interest costs are reset at the beginning of each regulatory period using interest rate swaps but where the debt risk premium (DRP) is based on a trailing average of DRP relative to swap rates; and
   - one where there is 0% use of interest rate swaps so both the base rate of interest and the DRP reflect a trailing average;

[3] Throughout this memo, references to the NER and National Electricity Law (NEL) can be read as also referring to the NGR and the National Gas Law (NGL).

9. Of course, anything between these two extremes also reflects a replicable debt management strategy. For example, if interest rate swaps are used to hedge only x% of the base portfolio then the cost of debt will be a weighted average of the costs of the two extremes (x% of the costs associated with the 100% use of swaps and (1-x)% of the costs of the 0% use of swaps).

2.1.2 The AER's cost of debt transition does not define a feasible debt management strategy

10. As explained in detail in section 4 of our report for JEN, the AER's methodology for setting the cost of debt does not comply with clause 6.5.2.(c) because the AER does not define a debt management strategy that, if followed, would give rise to a cost of debt consistent with that calculated under its methodology. Indeed, there is no debt management strategy (efficient or otherwise) that would give rise to a cost of debt consistent with the AER methodology.

11. The reason is that the AER debt transition results in a value for the return on debt that would not realistically be achieved under any debt management strategy. That is, the cost of debt calculation undertaken by the AER is not replicable by a benchmark efficient business – either in practice or in theory.

b. Reasonable opportunity to recover efficient costs

12. The AER accepts that its methodology does not set an allowance that is based on the costs of a specific debt management strategy. This reflects the AER's interpretation that the NER and National Electricity Law (NEL) allow it to set the cost of debt allowance below efficient costs prospectively in order to offset the AER's retrospective view that past compensation was in excess of efficient costs, also referred to as 'windfall gains'.

13. This leads the AER to set a cost of debt allowance in a manner that is not replicable (where a replicable allowance is based on the costs of a debt management strategy that is actually implementable). In our view, the economic basis for the AER's interpretation of the NER and NEL is not sound.

14. The previous 'on-the-day' approach to setting compensation for the cost of debt was flawed, including, in our view, being inconsistent with the newly formulated allowed rate of return objective. It did not reflect the costs of a viable debt management strategy and, every time a regulatory decision was made, a business and its customers were subject to what was, in effect, a roll of the dice.

15. All parties agree that a business' efficient debt costs are and were based, at least in part, on a trailing average of historical costs over a period of around 10 years (again see section 3 of our report for JEN). Yet, the regulatory allowance under the on-the-day approach, which was set for 5 years at a time, was based on a measurement of

debt costs over a period of days (up to 40 days) prior to the start of the regulatory period. There was no reason for allowed debt costs under this methodology to align with efficient debt costs within a regulatory period and no reason for them to align across regulatory periods.

16. Over a period of hundreds of years, or many tens of regulatory periods, one might expect that the average compensation for cost of debt determined under the on-the-day approach provides a close match to the average costs incurred. Over this time horizon the law of large numbers prevails and the average level of under or over compensation will be close to zero (assuming that the regulatory method for estimating the on the day cost of debt is itself unbiased).

17. Presumably this is the time frame over which the AER concludes the 'on the day' approach provides a benchmark efficient entity with a reasonable opportunity to recover efficient financing costs over the life of its assets. However, this is a horizon that is simply beyond any reasonable horizon of concern to investors. It assumes that, for example, three regulatory periods in a row of material under-compensation can be assumed to be offset by 3 periods of later material over-compensation. However, the corporate entity in question may well not exist if it is forced to absorb consecutive levels of under-compensation over 3 five year regulatory periods. Moreover, even if insolvency is avoided, the level of perceived risk of investment under a regime that has the potential to impose such losses will be elevated.

18. We do not consider that the reference, in the revenue and pricing principles, to "a reasonable opportunity to recover efficient costs" envisages the kind of 'on average over the very long run' context that the AER assumes is relevant.

19. The AER also appears to be arguing that 'the industry as a whole' has been overcompensated in the last regulatory period and that, therefore, it is appropriate for prospective under-compensation to be imposed on the industry.

> *Lally found a similar outcome from continuing with the on-the-day approach (Option 1) and from gradually transitioning to the trailing average approach (Option 2).544 These two scenarios result in an average 1.3 per cent estimated over recovery of the debt portfolio across all service providers, in present value terms. In contrast, adopting a backwards looking trailing average approach (Option 4) results in an average 3.4 per cent estimated over recovery of the debt portfolio across all service providers. Lally estimated this would result in approximately a $2.3 billion total of windfall gains across all service providers.* [4]

20. We have previously critiqued Lally's analysis and found it to be deeply flawed – even accepting the premise that it is relevant to try and asses the level of over

4 AER, Final Decision ActewAGL distribution determination, April 2015 pp. 3-166.

compensation for debt financing costs in the past.[5] Lally and the AER have responded and we address the response in Appendix B**Error! Reference source not found.**; where we clearly demonstrate that the errors identified in Lally's analysis stand.

21. However, Lally and the AER's premise that it is appropriate to perform an industry wide assessment of past "over-compensation" and, on this basis, impose prospective under-compensation on ActewAGL's gas distribution business. In our view, there is no reasonable basis for this. If past over-compensation justifies future under-compensation then the analysis should be performed on a bespoke basis for each individual firm.

c. Matches allowed return on debt with efficient financing cash flows regulatory period-by-period

22. Both the "on-the-day" approach and the AER transition to a trailing average initially give 100% weight to the cost of debt issued at the beginning of the next regulatory period. No weight is given to the cost of debt issued in the past but not yet matured. Given that it is agreed by all parties that it was efficient to issue debt in the past that has not yet matured, neither the "on-the-day" not the AER transition can accurately match the allowed return to the efficient financing costs over the next regulatory period.

23. The adoption of a simple trailing average benchmark as the most appropriate basis, under the NER and NEL[6], on which to compensate for the cost of debt was, in our view, correct. This will allow businesses to follow a debt management strategy that aligned their costs to the regulatory benchmark – removing an important source of discrepancy between actual costs and allowed revenues in regulatory decisions. Under a trailing average there is 0% use of interest rate swaps to reset base interest rates at the beginning of the regulatory period.

24. Alternatively, another replicable debt management strategy is the 100% use of swaps debt management strategy discussed above – which is in effect a simple trailing average debt issuance program with an interest rate swap overlay that has the effect of resetting base interest rates (but not risk premiums) at the beginning of each regulatory period. The combination of a prevailing base rate of interest with a trailing average DRP is sometimes referred to as a 'hybrid'. The AER has stated that

5 See CEG, Efficient debt financing costs, A report for ActewAGL, January 2015, section 5.3. See also our rebuttal to the AER and Lally's at appendix A.

6 And also under the NGR and National Gas Law (NGL).

it believes that this strategy was the uniquely efficient debt management strategy under the on-the-day approach.[7]

25. Equally, something in between the two extremes (0% use of swaps and 100% use of swaps) is also a replicable debt management strategy. In our view, to the extent that a single uniquely efficient debt management strategy must be defined then it would be one that hedged materially less than 100% of the base rate of interest using interest rate swaps. Based on analysis performed by CEG for Networks NSW we estimated that a 0% hedging strategy resulted in an actual cost of debt that was a better match to the regulatory allowance than a 100% hedging strategy.[8] This suggests an efficient debt management strategy would involve something materially less than 100% use of interest rate swaps.

26. We also note that this conclusion is consistent with the findings of the empirical finance literature, surveyed in Appendix A, to the effect that there is an inverse relationship between DRP and risk free rates. This inverse relationship creates a "natural hedge" under the on-the-day approach; such that when base rates of interest fall (rise) the regulatory allowance will tend to fall (rise) by less due to an offsetting move in the DRP. As is explained in a simple example in 0, in the presence of such a natural hedge the optimal use of interest rate swaps to hedge the base rate of interest will by less than 100%.

27. In any event, any transition that is consistent with the NER and NEL must be a transition between one efficient (and, by definition, replicable) debt management strategy and another efficient debt management strategy. Therefore, if the AER is correct[9] that the 100% swap debt management strategy was the efficient debt management strategy in the past then this would form the starting point for a transition to a trailing average.

28. By contrast, the transition imposed by the AER not only retains the worst aspects of the on-the-day approach – it intensifies these problems. This is because the weight given to the initial averaging period in the AER transition is higher than the weight given to the same period under a continuation of the on-the-day approach. The AER transition effectively rolls the on-the-day dice one final time. In doing so, the AER creates uncertainty about, and instability in, prices faced by customers.

---

7 AER, Draft decision for Jemena Gas Networks, Attachment 3, p. 113. The AER states: "*We consider an efficient financing practice of the benchmark efficient entity under the on-the-day approach would have been to borrow long term and stagger the borrowing so that only a small proportion of the debt matured each year. We consider the benchmark efficient entity would have combined this practice with interest rate swap contracts to match the risk free rate component of its return on debt to the on-the-day rate.*"

8 CEG, Efficient debt financing costs, A report for Networks NSW, January 2015, section 4.5.

9 We do not accept that this is correct but for the purpose of logical argument we consider the implications if it were correct.

29. We address the AER's reasoning in defence of its proposed transition in more detail in section 4 of our report for JEN.

d. Avoids potential bias in using historical data

30. The AER argues that the use of historical data creates the potential for regulatory bias on the grounds that:

> *If an averaging period is chosen after the nominated period has occurred, the knowledge of the return on debt at any past point of time may influence the choice. It would not matter if the period were chosen by the AER, the service provider, a user or consumer, the Australian Competition Tribunal or another stakeholder. We made this clear in the Guideline when we specified the importance of determining an averaging period in advance.*[568] *In particular, we specified that if a service provider could select an averaging period by looking at historical yields, it could introduce an upward bias.*[10]

31. The AER considers that this is a ground for adopting an averaging period that is in the future. In my view, no such ground exists. As already summarised, given that debt was efficiently issued in the past then the efficient financing costs associated with that debt must reflect debt market conditions in the past. In order to compensate for these efficient costs historical data must be used. There is no bias associated with this; it simply follows inexorably from the fact that it is efficient to maintain a staggered debt portfolio. In fact, a bias is introduced by failing to use historical data in circumstances where estimating efficient costs requires it.

32. Moreover, the AER's argument is facile. All parties now, including the AER, agree? that its proposed transition, using only prospective data, is almost certain to result in a lower cost of debt than either immediate adoption of a trailing average of transition from a 'hybrid' (100% swap) strategy. This is because the prevailing base rates of interest and DRP are both currently much lower than their trailing average values. Barring a radical change in market conditions, such as a repeat of the global financial crisis, this is unlikely to change over the next year (the period that is relevant to ActewAGL).

33. Therefore, it is disingenuous of the AER to argue that it does not propose to use historical data because it, or other stakeholders, might be tempted to choose an averaging period with a view to having an effect on the cost of debt estimated. By restricting itself to a prospective period the AER is almost certainly restricting its allowance to a lower level than if it had regard to historic data – as it should do given that the benchmark business will fund itself over the next regulatory period using, in part, debt issued in the past.

---

10 See AER, Final Decision ActewAGL distribution determination, April 2015 pp. 3-175.

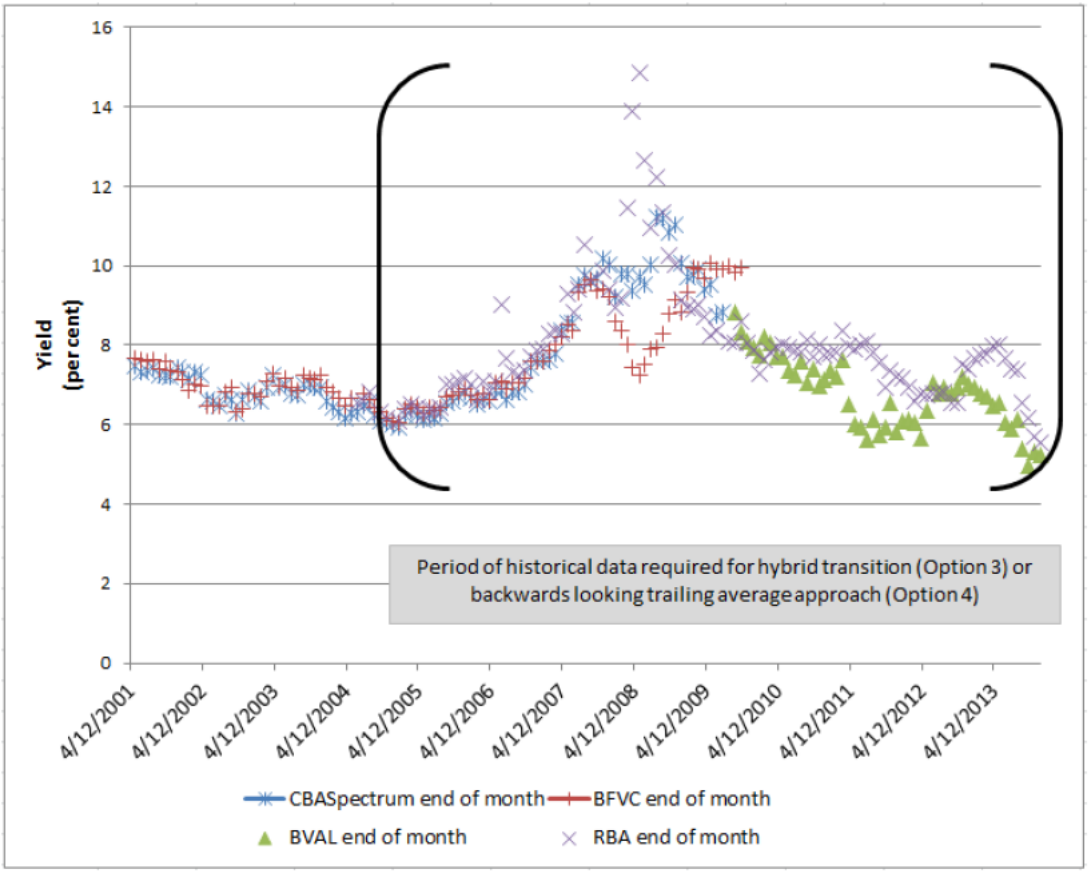
34. To the extent that the AER's fear is that a business/customers will argue that the benchmark efficient entity only ever issued debt historically in months where the cost of debt (or DRP) was high/low then there is a simple solution to such gaming. This is to simply assume that the benchmark efficient entity issued debt at the average level of costs over the relevant historic period (which is 10 years for a business issuing 10 year debt).

e. Avoids "practical difficulties" with the use of historical data

35. The AER's position that not using historical data "avoids practical difficulties with the use of historical data" is, in my view, nonsensical. Consistent with my views expressed in the previous section, if historical data is required to estimate efficient financing costs then nothing is gained in terms of 'avoiding practical difficulties', and much is lost, by using a data set that is not the correct dataset. Second, in a very important sense, the use of historical data is less problematic than the use of data that is not yet known precisely because historical data is known and capable of being analysed today.

36. The AER provides the following figure showing that, over some periods, different data sources had different estimates of the BB cost of debt.

Figure 3-15 Comparison of BBB rated return on debt data series over time



Source: CBA Spectrum, Bloomberg, RBA, AER analysis

37. The AER argues that estimating the cost of debt over this historic period will be "contentious" and contrasts this with a prospective period, which by definition has not occurred but which the AER believes will be less contentious.

> *The choice of data series to calculate the return on debt has been considerably less contentious in the current regulatory processes, than in previous regulatory processes. For Options 1 or 2, data is only required for the 2014–15 or 2015–16 regulatory year onwards, depending on the service provider. For these years, most service providers agree with our position of taking a simple average of the RBA and BVAL data series.* [11]

38. Our core criticism of this position is that, even if the AER were correct that future measurement of the cost of issuing BBB debt will not be contentious, this is not a reason to measure the wrong cost of debt (one that gives zero weight to historic

[11] See AER, Final Decision ActewAGL distribution determination, April 2015 pp. 3-179.

costs). The best estimate of efficient costs is required and the fact that this might be contentious is not a basis for not estimating efficient costs.

39. In any event, the AER's basis for concluding that future estimates of the cost of debt will not be contentious is flawed. It is one thing for (some) stakeholders to agree in principle that a simple average of RBA and Bloomberg published estimates is an appropriate starting point for the Guidelines. However, it is quite another thing for stakeholders to accept that this is correct in circumstances where there is material difference between these estimates and there is evidence that the stakeholder believes supports one estimate over the other. Indeed, JEN has explicitly anticipated this possibility and proposed a test to select the most accurate curve in circumstances where they are materially different.

40. The AER simply has no reason to believe that prospective averaging periods will be less contentious than historical periods. Indeed, CEG's report for JEN noted that the historical average Bloomberg and RBA figures are very similar on average (depart being materially different in some periods). Thus, nothing very much turns on the selection of a single data source historically (or, indeed, an average of data sources).

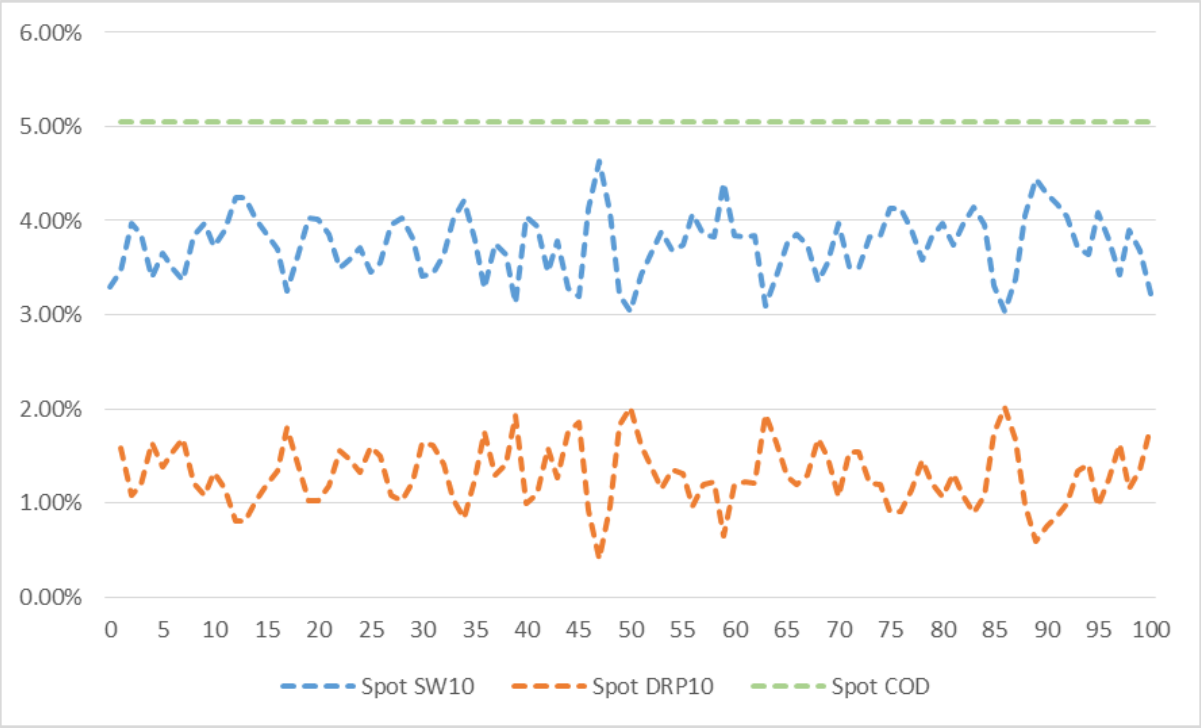
41. By contrast, and as already noted above, the transition imposed by the AER it intensifies the potential for disputes between stakeholders. This is because the weight given to the initial averaging period in the AER transition is higher than the weight given to the same period under a continuation of the on-the-day approach. The AER transition effectively rolls the on-the-day dice one final time. In doing so, the AER creates precisely the potential for disputation of the cost of debt estimate in the initial averaging period; because much more is 'riding on' this measurement for stakeholders under the AER transition. By contrast, every historical month in a 10 year trailing average receives only around 1/120th of the weight given to the initial averaging period in the AER's proposed transition.

Appendix A: Relationship between DRP and risk free rates

42. In the presence of negative correlation between risk free rates and the DRP, leaving *at least some* of the base rate of interest unhedged will be the most efficient strategy for hedging the cost of debt to the regulatory allowance – which is comprised of both the base rate of interest and the DRP.

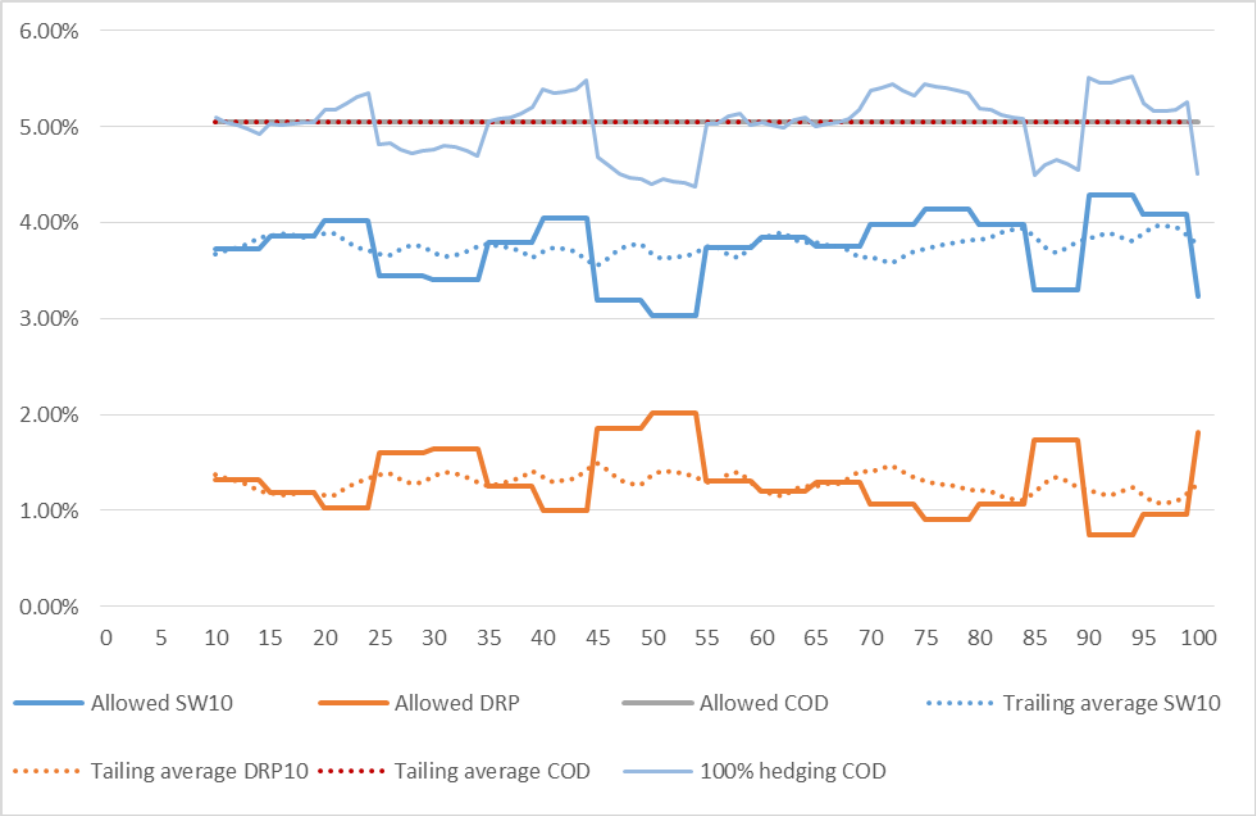
43. The intuitive basis for this conclusion can be illustrated with an extreme example. Imagine that the prevailing DRP (measured relative to swap rates) always moved in an exactly offsetting way to movements in swap rates – such that the cost of debt was constant. Such a scenario is depicted in Figure 1which shows a variable swap rate series and a DRP series with an exactly offsetting pattern – such that the prevailing cost of debt (COD) is constant.

Figure 1: Variable base rate of interest with perfect offsetting variation in DRP



44. Under the on the day approach, the cost of debt allowance is set equal to the prevailing cost of debt at the beginning of a five year regulatory cycle (which is why the data is broken into 5 year blocks on the horizontal axis). The allowed cost of debt in each five year period is represented in Figure 2 by the grey line – which is by construction constant. Superimposed on this is the trailing average cost of debt (with 0% use of swap rates) which is also constant by construction (given that it is simply a trailing average of the constant prevailing cost of debt).

Figure 2: Trailing average and 100% swap strategy with perfect offsetting variation in swap rates and DRP



45. By contrast the cost of debt associated with a 100% swap strategy is not constant but, rather, has much the same variability as the swap rate at the beginning of the regulatory period (which is locked in under the 100% swap strategy). It does not have exactly the same volatility as the prevailing swap rate because the trailing average DRP, which is a component of the costs for both strategies, has low, but non zero, variability.

46. It can be seen that, despite the 100% swap strategy 'locking in' the prevailing swap rate used by the regulator, it provides a worse hedge to the total regulatory allowance because the swap contracts undo (or double up) on a natural hedge that already existed. Specifically, variability in the swap rates was dampened (in this example perfectly dampened) by offsetting variability in the DRP (a negative correlation). By entering into 100% swap contracts, the business made the actual cost of debt more volatile than the regulatory allowance because it failed to take into account the existence of a natural hedge.

47. There are a number of academic studies that examine the relationship between the DRP and risk free rates (with the latter used as independent explanatory variables in explaining changes in the former). A summary of the coefficients on the risk-free rate explanatory variable as estimated in various empirical studies is shown in Table

2 along with the explanatory variables used in each respective model. These results show that a change in the risk-free rate is typically associated with a negative change in the DRP, and this observation holds across almost all credit ratings, maturities, and leverage values.

Table 2: Summary of empirical estimates in literature

	Coefficient of the risk-free rate	Category	Explanatory variables
Longstaff and Schwartz (1995)	-0.184	Baa utilities	• Change in Treasury bond yield • Return on stock index
Duffee (1998)	-0.424	Baa non-callable bonds with long maturities (15 to 30 years)	• Change in 3-month Treasury bill yield • Change in slope of the Treasury term structure (difference between 30-year and 3-month Treasury bill yield)
Collin-Dugresene et al (2001)	-0.211	Bonds with >55% leverage and time to maturity exceeding 12 years	• Change in firm leverage ratio • Change in yield on 10-year Treasury • Squared change in yield on 10-year Treasury • Change in 10-year minus 2-year Treasury yields • Change in implied volatility of S&P 500 • Return on S&P 500 • Change in slope of Volatility Smirk
Huang and Kong (2003)	-22.4 (bp)	BBB-A bonds with maturities exceeding 15 years	• Changes in yield of Merrill Lynch Treasury Master Index • Changes in yield of Merrill Lynch 15+ years Treasury Index minus yield of Merrill Lynch 1-3-year Treasury Index • Changes in historical volatility of Merrill Lynch Treasury Master Index yields
Landschoot (2008)	-0.40	US BBB bonds	• Default risk factors (interest rate and stock market variables) • Liquidity risk factors • Credit cycle • Taxation
Lepone and Wong (2009)	-16.44 (bp)	BBB Australian Corporate bonds	• Changes in the 10 year government bond yield • Changes in the squared value of the 10 year government bond yield • Changes in the yield of 10 year government bonds minus the yield of 3 year government bonds • Changes in the volatility implied by options on 3 year government bond futures • Changes in the leverage ratio of banks and financial institutions • Returns on SPI 200™ Index Futures • Changes in the volatility implied by options on SPI 200™ Index futures • Changes in the dollar value of outstanding corporate bonds • Changes in the total net fund flow to bond mutual funds, standardised by net assets
QTC (2012)	-0.4 (correlation coefficient)		• The correlation between the DRP from the Bloomberg 7-year BBB Fair Value Curve and the 7 year risk-free rate from 2001 onwards

Longstaff and Schwartz (1995)[12]

48. Longstaff and Schwartz (1995) carried out an empirical study using monthly data from Moody's corporate bond yield indexes, as well as the yields of 10-year and 30-year Treasury bonds. The corporate bonds consisted of utilities, industrials, and railroads, each with credit ratings ranging from Baa to Aaa (except railroads, which did not have any Aaa-rated bonds). Based on this data, credit spreads could then be computed as the difference between the yields of corporate bond and Treasury bonds.

49. In order to determine the impact of interest rates on credit spreads, Longstaff and Schwartz (1995) used a linear regression with the change in credit spread as the dependent variable, while the explanatory variables consisted of the return on the corresponding index and the change in the 30-year Treasury yield.

50. The coefficient of the 30-year Treasury yield was negative for all 11 categories of bonds investigated, ranging from -0.044 for Aaa utilities to -0.823 for Baa railroads. The coefficient for Baa utilities was -0.184, which meant that a 100-basis-point increase in the 30-year Treasury yield led to an 18-basis-point fall in Baa-utility credit spreads. The estimates were statistically significant for 10 of the 11 categories, and generally became more negative for bonds with lower credit ratings.

Lepone and Wong (2009)[13]

51. Lepone and Wong (2009) carried out an empirical study of the determinants of credit spread changes of Australian corporate bonds, using weekly data during the period 29 June 2003 through 2 March 2007.

52. Data on bond index levels and their corresponding yields were obtained from the Australian Financial Markets Association Services (AFMA), while the yield on the 10-year government bond rate was used as a proxy for the risk-free rate. In addition, similar to Collin-Dufresne et al (2001), the squared value of the 10-year government bond rate was also included to account for non-linear effects.

53. The model had the change in credit spreads as the dependent variable, along with the following explanatory variables:

    a. Changes in the 10-year government bond yield;

    b. Changes in the squared value of the 10-year government bond yield;

---

12 Longstaff and Schwartz (1995), "Valuing credit derivatives", *Journal of Fixed Income*, 5, pg 6-12.

13 Lepone and Wong (2009), "Determinants of Credit Spread Changes: Evidence from the Australian Bond Market", *Australasian Accounting, Business and Finance Journal*, 3(2).

c. Changes in the yield of 10-year government bonds minus the yield of 3-year government bonds;

d. Changes in the volatility implied by options on 3-year government bond futures;

e. Changes in the leverage ratio of banks and financial institutions;

f. Returns on SPI 200™ Index Futures;

g. Changes in the volatility implied by options on SPI 200™ Index Futures;

h. Changes in the dollar value of outstanding corporate bonds; and

i. Changes in the total net fund flow to bond mutual funds, standardised by net assets.

54. The authors analysed eight different credit spread changes, corresponding to four different credit ratings and four different maturity ranges. Of these, six categories had negative coefficients on both the change in 10-year government bond yield and the change in squared value of the 10-year government bond yield. The remaining two categories corresponded to the BBB credit rating and 5-7 years maturity categories.

55. The BBB credit rating category had a coefficient of -16.44 on the change in 10-year government bond yield, which was significant at the 1% level. Its coefficient on the change in squared government bond yield was 5.02, but this was insignificant even at the 10% level.

56. With the 5-7 years maturity category, the coefficient on the change in government bond yield was 0.53, while the coefficient on the change in squared government bond yield was -15.04. Both coefficients were insignificant.

Duffee (1998)[14]

57. Duffee carried out a study on the relation between yields on non-callable Treasury bonds and spreads of corporate bond yields over Treasury yields. He did so using a model similar to Longstaff and Schwartz (1995), but distinguished between callable and non-callable corporate bonds.

58. This study was motivated by the observation that higher prices of non-callable Treasury bonds were associated with higher values of call options, and that this relation should also be reflected in the relation between Treasury yields and non-callable corporate bond yields. Specifically, Duffee argued that the relation between Treasury yields and yield spreads of callable corporate bonds should be more

14 Duffee (1998), "The relation between treasury yields and corporate bond yield spreads", *Journal of Finance*, 53, pg 2225-2241.

negative than the relation between Treasury yields and non-callable corporate bonds.

59. Duffee obtained month-end data for non-callable bonds using the University of Houston's Fixed Income Database for the period January 1985 through March 1995. The data was separated into 48 different time series indexes, consisting of:

- four business-sector categories (all sectors' bonds, industrial-sector bonds, utility-sector bonds, and financial-sector bonds);
- four Moody's rating categories (Aaa, Aa, A, and Baa); and
- three bands of remaining maturities (2-7 years, 7-15 years, and 15-30 years).

60. Duffee's model involved a regression of the monthly change in spreads, with the change in three-month Treasury yields and the change in slope of the Treasury yield (defined as the spread between the 30-year and three-month Treasury yields) as explanatory variables.

61. The model found that an increase in the three-month bill yield was associated with a decline in yield spreads, and that this relation applied to all combinations of maturity and credit rating. The relation was weaker for Aaa-rated bonds and stronger for bonds of lower credit quality. In addition, the relation tended to be stronger for bonds for higher maturities.

62. In particular, the coefficient for short-term Aaa bonds was -0.103, which meant that an increase in the Treasury yield by 10 basis points was associated with a decrease in yield spreads by 1.03 basis points. On the other hand the coefficient for long-term Baa bonds was -0.424, such that the same increase in the Treasury yield resulted in a 4.24 basis points reduction in yield spreads.

63. Duffee did not present the regression results for the callable bonds in his dataset, but stated that the coefficients for indexes containing both callable and non-callable bonds were far more negative than the corresponding coefficients in the regression with non-callable bonds alone. For example, the coefficient for the Aaa Industrials Index was roughly eight times the corresponding estimate for non-callable bonds. This observation was further confirmed with estimates using a different dataset constructed with Lehman Brothers Corporate Bond Indexes.

Collin-Dugresene, Goldstein and Martin (2001)[15]

64. Collin-Dusgresene et al (2001) examined the determinants of credit spread changes, with the primary conclusion being that the monthly credit spread changes in the

[15] Collin-Dufresne, Goldstein, and Martin (2001), "The determinants of credit spread changes", *Journal of Finance*, 56(6), pg 2177-2207.

corporate bond market were predominantly driven by local supply/demand shocks that were independent of changes in credit risk and other measures of liquidity.

65. While the study did not focus specifically on the relationship between credit spreads and the risk-free rate as proxied by Treasury yields, the model nevertheless concurred with Longstaff and Schwartz (1995) and Duffee (1998) that an increase in the risk-free rate lowered the credit spreads for all bonds.

66. The dataset was obtained from a range of sources:

- **Credit spreads**: Corporate bond data was obtained from Lehman Brothers via the Fixed Income (or Warga) Database. Monthly bond data was obtained from July 1988 to December 1997. The risk-free rate was obtained using Benchmark Treasury rates from Datastream, with the yield curve estimated based on a linear interpolation of rates at 3, 5, 7, 10, and 30 years maturity. The credit spread was then defined as the difference between the yield of bond i and the yield of the Treasury curve at the same maturity.
- **Treasury rate level**: Obtained from Datastream's monthly series of 10-year Benchmark Treasury rates.
- **Slope of the yield curve**: Defined as the difference between Datastream's 10-year and 2-year Benchmark Treasury yields.
- **Firm leverage**: Quarterly data was obtained from COMPUSTAT and linear interpolation was used to estimate monthly debt figures. Firm leverage was calculated according to the formula:

$$Firm\ leverage\ = \frac{Book\ value\ of\ debt}{Market\ value\ of\ equity + Book\ value\ of\ debt}$$

  For robustness, each firm's monthly equity return was also obtained from CRSP and used as an explanatory variable.
- **Volatility**: Since most of the investigated firms did not have publicly traded options, the authors used changes in the VIX index provided by the Chicago Board Options Exchange as a measure of volatility. This index corresponds to a weighted average of eight implied volatilities of near-the-money options on the OEX (S&P 100) index.
- **Jump magnitudes and probabilities**: Obtained based on changes in the slope of the "smirk" of implied volatilities of options on S&P 500 futures. Options and futures prices were obtained from Bridge using the shortest maturity on the nearby S&P 500 futures contract. The jump magnitude was then calculated from implied volatilities and a linear-quadratic regression.
- **Changes in business climate**: Obtained using monthly S&P 500 returns from CRSP.

67. The model grouped the bonds according to leverage ratios and then regressed the monthly change in credit spreads against the following explanatory variables:

- Change in firm leverage ratio;
- Change in yield on 10-year Treasury bonds;
- Square of the change in yield on 10-year Treasury bonds;
- Change in 10-year minus 2-year Treasury yields;
- Change in implied volatility of S&P 500;
- Return on S&P 500; and
- Change in slope of Volatility Smirk.

68. The coefficient of the change in yield on 10-year Treasury bonds was negative for all leverage groups, and this observation also applied when the data was further separated into bonds with short maturities and bonds with long maturities. In particular, when firm leverage (D/E) is assumed to be above 55% (implies D/(E+D)>35%), the coefficient of the change in Treasury yields is -0.342 for all maturities, -0.414 for short maturities, and -0.211 for long maturities. This implies that a 10 basis points increase in the Treasury yields will result in a reduction of the credit spread by 3.42, 4.14, and 2.11 basis points respectively in the three datasets.

Huang and Kong (2003)[16]

69. Similar to Collin-Dugresene et al (2001), Huang and Kong (2003) examined the determinants of credit spread changes, but with additional macroeconomic factors as explanatory variables.

70. Specifically, the authors constructed sets of explanatory variables that characterised:

- The realised overall default rate in the U.S. corporate bond market;
- The dynamics of the risk-free interest rate;
- U.S. equity market factors such as return and volatility;
- Liquidity indicators from corporate bond mutual funds; and
- State of the U.S. economy.

71. Unlike other empirical studies that used the three-month or ten-year Treasury yield curve as measures of the general interest rate level, the authors argued that a Treasury yield index was a more appropriate proxy. As such, the Merrill Lynch

[16] Huang and Kong (2003), "Explaining credit spread changes: New evidence from option-adjusted bond indexes", *Journal of Derivatives*, Fall 2003, pg 30-44.

Treasury Master Index was used as a measure of the general interest rate level, while the difference between the Merrill Lynch 15+ year Treasury index yield and the 1- to 3-year yield was used as a measure of the yield curve slope.

72. The paper carried out regressions at two levels. First, group-level regressions were used to examine the explanatory power of individual sets of variables, separated into variables that captured the realised default rates, interest rates, equity market factors, liquidity indicators, and macroeconomic indicators. These group-level regressions served to identify which sets of explanatory variables had the highest influence on credit spread movements. It was found that interest rate dynamics, equity market returns and volatility, and the general state of the economy had the largest explanatory power.

73. The explanatory variables in the group-level interest rate model were:

    a. Changes in yield of Merrill Lynch Treasury Master Index;

    b. Changes in yield of Merrill Lynch 15+ years Treasury Index minus yield of Merrill Lynch 1-3-year Treasury Index; and

    c. Changes in historical volatility of Merrill Lynch Treasury Master Index yields.

74. The coefficients for the changes in Treasury index yields were negative across all of the credit ratings investigated, and were generally higher for bonds of lower credit rating, with a coefficient of -7.14 for AA-AAA bonds with 1-10-year maturities and -21.92 for BBB-A bonds with 1-10-year maturities. There was no obvious trend for bonds with different maturities in the same credit rating. For example, the coefficients were -14.18 and -22.4 for BBB-A bonds with 10-15-year maturities and >15-year maturities respectively.

75. Alternative model specifications were also tested using:

    - option-implied interest rate volatility instead of the historical volatility of Treasury Indexes; and
    - combined regression specifications.

76. Under these specifications the coefficients were still generally negative but were not as negative as in the previous specifications and were sometimes positive.

Landschoot (2008)[17]

77. Landschoot (2008) compared the determinants of Euro and US dollar yield spread dynamics using a dataset of bonds identified from the Merrill Lynch Euro and US dollar Corporate Broad Market Indices, with the price data obtained using

[17] Landschoot (2008), "Determinants of yield spread dynamics: Euro versus US dollar corporate bonds", *Journal of Banking and Finance*, 32, pg 2597-2605.

Bloomberg Generic (BGN) prices. The 3 month Euribor and US Treasury bill rates were used as proxies of the Euro and US dollar default-free rates. In addition, the model also included other explanatory variables that accounted for liquidity risk factors, the credit cycle, and differences in taxation systems.

78. The study concluded that US yield spreads were more sensitive to interest rate variables than Euro yield spreads, which was explained by the fact that financial sector bonds – which were less sensitive to interest rate changes – dominated the Euro sample. In addition, the Euro yield spreads were significantly affected by the level and slope of US interest rates instead of Euro interest rates.

79. The coefficient of the change in US interest rate level was negative for both Euro and US bonds at all credit ratings. Euro and US AA-rated bonds had coefficients of -0.03 and -0.15 respectively, while the corresponding coefficients for A rated bonds were -0.11 and -0.18. For BBB rated bonds, the coefficients were -0.22 and -0.40.

80. Analysing the dataset by sector produced the same observations. For the financial sector, the coefficients of the change in US interest rate level for Euro and US bonds were -0.05 and -0.18 respectively, while the industrial sector had coefficients of -0.19 and -0.18.

Queensland Treasury Corporation (2012)[18]

81. In its submission into the Productivity Commission's inquiry regarding Electricity Network Regulation, the Queensland Treasury Corporation (QTC) submitted that several interrelationships between WACC parameters needed to be recognised, including a negative relationship between the DRP and the risk-free rate.

82. The QTC further stated that the correlation between the DRP from the Bloomberg 7-year BBB Fair Value Curve and the 7 year risk-free rate was -0.4 based on monthly data from 2001 onwards.[19]

[18] Queensland Treasury Corporation, "QTC Submission to the AEMC Directions Paper on Economic Regulation of Network Service Providers", Attachment 1 – Response to the AEMC Directions Paper, April 2012

[19] Ibid, p 4.

COMPETITION ECONOMISTS GROUP

Appendix B: Lally estimates of "overcompensation"

83. We have been asked to provide a critique of Lally's response to CEG criticism that the Lally analysis of over-compensation is incorrect - and Lally's statement that he drew the figures from CEG material (Lally, 2015 p. 54).[20]

84. The relevant context is analysis in Lally (Nov 2014) in which he presented analysis to suggest that NSW businesses received compensation for a DRP of 4.1% (which he measured relative to CGS) despite having a trailing average DRP of only 2.2%.[21] It is important to note that Lally justified a focus on DRP only on the following basis:

> *Under the on-the-day approach previously adopted by the AER the issue does not arise in respect of the risk free rate component of the cost of debt because the risk-free rate allowed under that regime is that prevailing at the beginning of the regulatory cycle and the same rate is effectively paid by businesses due to using (or being able to use) interest rate swap contracts to effectively align their borrowing terms to the regulatory cycle (as discussed in section 4).*[22]

85. CEG critiqued this calculation on the following basis.

> *Lally's estimate of 4.1% is based on his view of the prevailing DRP immediately prior to the regulatory period (i.e., June 2009). In fact, the DRP on which the NNSW businesses were compensated was set in an averaging period from 18 August to 5 September 2008. The AER's allowed cost of debt for the NSW businesses in that period was set at 8.82% based on the estimated cost of debt during the period 18 August 2008 to 5 September 2008. The prevailing annualised 5 year swap rate, which is the rate that both Lally and the AER assume could and would have been 'locked in' by a business using the hybrid debt management strategy, was 6.79%. This leaves a DRP component of just 2.03%.*[23]

86. This passage, especially when read in the context of section 2.1 of the same report (Mechanics of the trailing average approach) is following precisely the logic of Lally and assuming that the benchmark efficient entity uses swaps in such a way that its costs are equal to:

- the prevailing 5 year swap rate in the averaging period; plus

---

20 Lally, Review of submissions on the cost of debt, April 2015.

21 The average of the values over the 2009/14 regulatory period from the "Paid" column in Lally's Table 2 on page 19 of his November report.

22 Lally, Transitional Arrangements For The Cost Of Debt, November 2014, p. 17, FN 5.

23 CEG, Efficient debt financing costs, Report for Networks NSW, May 2005, p. 34.

- the historical average DRP measured relative to swaps.

87. Therefore, if one is just to compare allowed and actual DRPs as Lally proposes, it is critical that they be defined relative to the relevant swap rates. Put simply, the amount 'left over' in the regulatory allowance after compensating for the 5 year swap rate is the compensation available to fund the business's DRP costs – costs which are themselves measured relative to swap rates. The calculations in the CEG report are based on this correct comparison.

88. Using 5 and 10 year swaps in this analysis will give rise to precisely the same results as if the comparisons are made relative to the total cost of debt. The same is not true if DRPs are only measured relative to 10 year CGS because businesses do not enter into swap contracts in the averaging period based on the yield on 10 year CGS. They enter into those swap contracts at yields based on 5 year swaps.

89. Instead of dealing with the substance of this criticism Lally provides the following set of non-sequiturs which have the appearance of obfuscation.

> *However, the DRP results presented in Lally (2014a, Table 2) are drawn from a CEG report in which the DRP is defined relative to the ten-year CGS rather than the five-year swap rate and therefore derivation of a DRP from an allowed cost of debt would have to deduct the ten-year CGS. Over the period 18.8.2008 to 5.9.2008, this is 5.75% (data from the RBA), yielding an implied DRP of 3.08%. Furthermore, since this implied DRP is for 27.8.2008 (the mid-point of the averaging period), it would have to be compared to the DRP value in Lally's Table 2 for the same point in time and interpolating over the values of 3.2% for mid 2008 and 4.1% for mid 2009 yields a figure of 3.34% for 27.8.2008. This figure differs from CEG's implied DRP of 3.08% by only 0.26% rather than the difference of 2.03% claimed by CEG.*[24]

90. In the first sentence, there are two unreasonable positions. First, the fact that CEG has reported DRP's relative to CGS in the past and that Lally has used these, does not mean that it is correct to measure DRP's relative to CGS in all analysis no matter the context. In the current context, the only correct approach is to use DRPs measured relative to swaps or, what amounts to the same thing, to compare the total cost of debt. Secondly, Lally appears to be arguing that he is constrained by his dataset to use spreads to 10 year CGS. This in an inappropriate response, the correct response is to stop using an inappropriate dataset.

91. In the second sentence Lally is again arguing that the correct approach is to arrive at an estimate of the DRP in the Networks NSW averaging period by interpolating within his (flawed) dataset rather than use the precise numbers we gathered from Bloomberg and RBA for that period. Once more, the correct response is to stop using an inappropriate dataset.

[24] Lally, Review of submissions on the cost of debt, April 2015, p.54.

92. Lally goes on, in the next paragraph, to argue that our analysis of accumulated under-compensation for Networks NSW over the two most recent regulatory periods is flawed.

> *CEG (2015, section 5.3.2) analyses the windfall gain issue for businesses with cycles commencing in mid 2005, mid 2009, etc and this suggests that the accumulated windfall up to mid 2014 was -4.2% rather than the figure of 9.53% in Lally (2014a, Table 2). However, the details of CEG's analysis are insufficiently clear to check it at all points. Nevertheless, CEG's analysis incorporates within it the alleged DRP compensation of 2.03% for the 2009-2014 period referred to in the previous paragraph and therefore inherits all of the errors in that analysis as described. Furthermore, the figure of -4.2% includes an allowance of 0.30% for swap costs but these have no relevance to the DRP component of the cost of debt (they relate only to the base rate component).* [25]

93. However, Lally's reasoning for rejecting CEG's analysis (and not amending his own) is that the CEG analysis is in error. For the reasons set out above, it is Lally's analysis that is in error. In this regard, it is worth noting that, Chairmont correctly follows CEG's conceptual framework/methodology in its report. [26,27] Therefore, to the extent that Lally's critique of CEG was in any way valid, then this critique would apply equally to Chairmont.

94. On the other hand, to the extent that CEG and Chairmont's analysis is found to be correct, then the AER's conclusion below would also be in error because it relies on the same statements as Lally makes in response:

> *We disagree. The proposition that Lally's analysis makes a serious error is unfounded because:*
>
> - *CEG appears to not compare like with like. CEG's averaging period is different from Lally's.*
> - *Lally based his calculation on an averaging period mid-year as close as possible to the start of the regulatory period consistent with our policy.*
> - *Whereas CEG applied the averaging period determined by the Tribunal for the NSW network service providers (18 August 2008 to 5 September 2008).*

25 Lally, Review of submissions on the cost of debt, April 2015, p.54.

26 Chairmont (Jan 2015), *Cost of debt: Transitional analysis,* p41 and 42.

27 Analysis for a Super BEE considers the worst case scenario in which a group of large BEEs (such as the NSW DNSPs) have to be active in the market at similar times.

- *The correct approach would have been for CEG to compare its numbers with Lally's at the same point in time.*

- *CEG defined its measure of the debt risk premium relative to the 5 year swap rate. Whereas Lally's measure is relative to the 10 year CGS.*
  - *We note that Lally's calculations are based on data provided by CEG in its initial report (submitted as part of the businesses' regulatory proposal). CEG used this dataset in its initial report. At the time, it did not have an issue with the measure of the debt risk premium relative to 10 year CGS.*

In addition, Lally revised his calculations adjusting for CEG's averaging period. Lally's revised analysis shows that the alleged 'error' falls away.[28]

95. Notably, the argument in the first dot point (that Lally was not in error for using an averaging period that differed from the period actually used to set the cost of debt allowance) is peculiar. First, it is inconsistent with Lally's newly stated position when critiquing CEG for arguing that ActewAGL's allowed DRP could be thought of as relative to the 5 year swap rate in its proposed averaging period (to the extent that it would have hedged in that period). Lally states:

> *However, the averaging period proposed by ActewAGL is irrelevant; any base rate deducted from the allowed cost of debt of 7.78% must be for the same averaging period as that underlying the allowed cost of debt to produce a meaningful DRP estimate.* [29]

96. Finally, the AER is in effect saying that an analysis of overcompensation must ignore the actual cost of debt allowance that was set (upon which our estimates are based) and instead *assume* that the cost of debt allowance was set at another date and at a different level (which is what Lally's analysis does). This is a completely hypothetical concept of 'overcompensation' and it appears to be based on a hypothetical 'as if' the Tribunal's overturning of its 2009 averaging period never happened.

:

[28] Final Decision ActewAGL distribution determination, April 2015 p. 3517.

[29] Lally, Review of submissions on the cost of debt, April 2015, p.55.