COMPETITION ECONOMISTS GROUP

Response to Commerce Commission UCLL/UBA WACC consultation paper

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March 2014

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Executive summary

1. The New Zealand Commerce Commission ('the Commission') is currently conducting price reviews for the unbundled copper local loop (UCLL) and unbundled bitstream access (UBA) services. In the context of these reviews, the Commission is required to set cost-based prices using a TSLRIC methodology. One of the key inputs into this process is the weighted average cost of capital (WACC).

2. An important background to this process is the extensive consultation that the Commission has already given to WACC issues in its Input Methodologies (the IMs) for electricity distribution businesses (EDBs), gas pipeline businesses (GPBs) and airports. Its final IM decisions have been the subject of a merits review process by the High Court.

3. The FPP process is separate to the IMs, conducted under different legislation for a different sector and a different ultimate purpose. Despite these differences, the approach to WACC in the IMs does provide a starting point for examining the cost of capital that is applicable to the provision of UCLL and UBA in New Zealand.

4. The IMs represent the most recent and relevant regulatory precedent for the treatment of WACC issues. It is also natural to assume that the Commission would prefer, to the extent possible, to maintain some level of consistency in its approach to setting WACC across sectors. However, it would not be appropriate for the WACC approach in the IMs for EDBs, GPBs and airports to be adopted unchanged for the FPP process. This is because:

    a. The services that are regulated and have prices set under the FPP are provided different from those regulated under the IMs. Provision of these services would be expected to have different risks and a potentially a different WACC.

    b. Regulatory precedent should be capable of changing over time as new information comes to light, advances in theory are made and/or improvements in analytical techniques allow for better estimates.

5. Using the IMs for EDBs and GPBs as a starting point, I consider that there are a number of areas where parameters should be revised to more closely reflect circumstances relevant to Chorus and to providing the UCLL and UBA services. There are also departures from the estimation of the WACC under the current IMs that in my opinion would improve the accuracy of the WACC estimation and result in a better estimate of forward-looking costs. These changes are not changes that were considered by the High Court and are based on analysis and information that was not presented to the Commission or the High Court in the consideration of the IMs.

Parameter variances from the IMs

6. A number of WACC parameters set under the IMs are specific to the services and industries that are regulated in those processes. It is appropriate to revise these to ensure that they are consistent with the risks experienced by a business providing UCLL and UBA in New Zealand.

7. I consider parameters that need revising in this respect are to the benchmark:

   - asset/equity beta;
   - gearing; and
   - credit rating.

Asset and equity beta

8. I form a comparator sample of 31 firms operating fixed line telecommunications businesses in New Zealand, Australia, the United States and Europe. Following the process applied by the Commission in its IM Final Reasons Paper, I estimate four non-overlapping 5 year asset betas over a 20 year period to 13 March 2014 for each of these businesses. I calculate the average asset beta across this period for each firm and show the average asset beta across the entire sample to be 0.58.

9. This represents a lower bound for what is likely to be the systematic risk of providing UCLL and UBA in New Zealand. The data in the sample suggests that:

   - businesses operating fixed line only networks have higher asset beta than those that also operate mobile networks. The average asset beta of fixed line only businesses is 0.66; and
   - the closest comparator in the sample to Chorus with at least one 5 year asset beta estimate is BT Group – a business that is fixed line only and operates under broadly similar regulatory restrictions to Chorus. The average asset beta of BT Group is 0.76.

Gearing

10. I estimate a benchmark gearing for providing the UCLL and UBA services having regard to:

    - the gearing of businesses in the sample of comparators that I used to inform the equity beta estimate; and
    - the practice of regulators, such as the ACCC and Ofcom.

11. The average 5 year gearing of the businesses sampled to estimate asset beta is 36%. Of fixed line only businesses, the average gearing is 39% and BT Group's gearing is 38%.

12. The practice used by the ACCC and Ofcom in their most recent regulatory determinations has been to set benchmark gearing in the calculation of the WACC based upon the gearing of the regulated business. Chorus' average gearing in the period since it listed as a separate company has been 61%.

13. These considerations suggest that a benchmark gearing of 40% to 60% is likely to be appropriate to use in calculating WACC for the provision of UCLL and UBA in New Zealand.

Credit rating

14. I estimate a benchmark credit rating for providing the UCLL and UBA services have regard to:

    - the credit rating of businesses in the sample of comparators that I use to estimate the equity beta and gearing; and
    - the practice of regulators such as the ACCC and Ofcom.

15. The average credit rating with Standard & Poor's of the businesses sampled to estimate asset beta and gearing is BBB-. Of fixed line only businesses, the average credit rating is BB+ and BT Group's credit rating is BBB. I note that Standard & Poor's has by far the widest coverage in this sample but my conclusions are not materially affected if I also consider ratings from Moody's and/or Fitch.

16. ACCC and Ofcom have adopted a practice of setting a benchmark credit rating in line with the actual credit rating of the regulated company. Chorus' rating with Standard & Poor's is BBB (negative watch) and with Moody's it is Baa3 (equivalent to BBB-).

17. This suggests that a credit rating of BBB- is appropriate to use in calculating WACC for the provision of UCLL and UBA in New Zealand.

Methodological variances from the IMs

18. I consider that some methodological departures to the basis upon which the Commission estimated WACC in its IMs are appropriate. I have reached this conclusion on the basis of analysis and reasoning that was not before the Commission in considering its IMs, or before the High Court in the merits review process.

19. My suggested departures to the IMs relate to:

- the estimation of the debt risk premium (DRP) at a point in time. I consider that more information and improved techniques can be used in the calculation of the DRP;
- the basis for estimating the cost of debt. The Commission should estimate a cost of debt that is consistent with efficient debt raising practice; and
- the need for consistency between the tax-adjusted market risk premium (TAMRP) and the risk free rate. The TAMRP is a function of the risk free rate. An estimate of the TAMRP at a point in time should be consistent with the estimate of the risk free rate that is used.

Estimating DRP

20. The IMs Final Reasons Paper contains a set of criteria specifying the bonds that are most comparable for the purposes of determining the DRP for EDBs and GPBs. These criteria place the greatest weight on bonds issued by privately owned businesses engaged in the same activities.

21. I consider that the IM methodology can be improved by broadening the focus from New Zealand currency bonds only. It is common practice for businesses to seek to raise debt overseas, particularly in Europe and United States where debt markets tend to be deeper. It is reasonable to suppose that businesses do this because they expect it to lower their overall financing costs relative to raising the same debt from New Zealand debt markets. This practice should be recognised in a methodology that seeks to estimate a DRP.

22. It is relevant to note that the only bond issued by Chorus is denominated in British pounds. It would, in my view, be inappropriate to determine the DRP for services provided by Chorus on the basis of criteria that exclude the only bond issued by Chorus.

23. Once swapped into New Zealand dollar terms, this bond (and another bond denominated in British pounds issued by Vector) have DRPs that are materially higher than others considered by the Commission – Chorus' is above 4%.

24. I also introduce two more quantitative methods of assessing a benchmark DRP at a given maturity and credit rating. I consider:

- a methodology used by the Reserve Bank of Australia which estimates a DRP for a target maturity by weighting DRPs on bonds according to their face value and a Gaussian kernel; and
- Nelsen-Siegel curve fitting, that seeks to fit a highly flexible functional form to the observed bond yield data.

25. Unlike the Commission's method used in its IMs, neither of these methodologies is capable of giving Chorus' bond issue any special weight. Consequently, both are

likely to produce estimates that are lower than if a criterion to give most weight to the Chorus bond were strictly adhered to.

26. Here I discuss the best method of estimating the DRP at a point in time. As I note below, the DRP estimated through this process is not necessarily the DRP that in my opinion should be used in the calculation of the WACC. Regard must be had to efficient financing practice of a business.

Defining an efficient debt management strategy

27. Any estimate of the cost of debt should reflect the costs of an efficient debt management strategy. An efficient debt management strategy is one that gives the lowest expected financing costs.

28. In practice, we observe that infrastructure businesses issue long term debt (i.e., around 10 year maturity) with a staggered maturity profile. This provides greater certainty in debt financing costs and reduces the exposure of the businesses to the potential to be forced to refinance large amounts of debt in unfavourable market conditions. It is reasonable to assume that this practice reflects efficient financing practice.

29. The current calculation of the cost of debt in the IMs, including the current structure of the term credit spread differential calculation, does not accurately reflect the costs associated with an efficient debt management strategy with staggered debt issuance.

30. I consider two possible definitions of a benchmark efficient debt management strategy with staggered debt issuance. The first assumes that no interest rate swaps or other derivatives are employed in the strategy – this gives rise to an efficient cost of debt equal to 10 year trailing average of fixed interest rates on 10 year debt. The second assumes a firm maintains a staggered portfolio of 10 year debt but enters into interest rate swaps such that the base rate of interest is reset at the beginning of every regulatory period. This second benchmark debt management strategy is associated with a regulatory allowance equal to:

    - the fixed swap rate at the beginning of the regulatory period for the same term as the regulatory period; plus
    - A 10 year trailing average of the DRP on 10 year debt.

31. I set out five criteria that I consider a benchmark efficient debt management strategy should satisfy. Against these criteria, I find that using a simple trailing average of debt costs performs better than including a swap overlay to reset base rates of interest at the beginning of the regulatory period. In particular, the volatility in cost of debt (and therefore prices) when using a swap overlay are a powerful reason not to use it.

Consistency between TAMRP and the risk free rate

32. I consider it reasonable that the TAMRP and the risk free rate be estimated concurrently, over the same time period and in the same market conditions. TAMRP is ultimately a function of the risk free rate. Consistency between them is required to arrive at a reasonable estimate of the cost of equity.

33. This is not necessarily inconsistent with the IMs. The IMs attempted to set a process for estimating the cost of equity where parameters, including the TAMRP, were locked in for a given period. This resulted in the Commission arriving at an estimate for the TAMRP in 2010 and holding it constant for the duration of the IMs. However, this does not mean that it is not appropriate to revisit the TAMRP as it applies in 2014.

34. I note that there is no theoretical or empirical support for a theory that TAMRP is fixed and that the market return on equity must move in lock step with the risk free rate.

35. More generally, we observe risk premiums rising as risk free rates fall, and vice versa. This is because it is normal to proxy risk free rates as yields on government bonds. However, during periods of financial distress, as asset prices fall and yields on risky assets rise, yields on government bonds may nonetheless fall in a "flight to safety". This illustrates the problems in adopting an estimate of the TAMRP that is not taken from the same market conditions under which the risk free rate is estimated.

36. I have conducted an empirical analysis of the market return on equity implied by current and previous analyst consensus forecasts of dividends. The application of this dividend growth model (DGM) methodology to the NZX 50 suggests that the current TAMRP is elevated relative to the 7% assumption used in the Commission's IMs. On this basis, it would be problematic to estimate a cost of equity combining the IMs TAMRP with current risk free rate since this would underestimate the cost of equity in current market conditions.

Accounting for asymmetry and uncertainty

37. Finally, I also consider how the Commission can best account for the distinction issues associated with:

    - asymmetrical risks to cash-flows to a UCLL/UBA provider; and
    - uncertainty in the WACC parameter estimates.

Accounting for asymmetric risk

38. I explain that it is critical that the Commission separately address the appropriate allowance for the expected cost of asymmetric risks to cash flows. Chorus, or a hypothetical UCLL/UBA service provider, faces potential asymmetric risks to cash-flows from a range of sources (e.g., natural disasters such as earthquakes, technological obsolescence and regulatory stranding). These need to be quantified but the quantification will depend critically on the Commissions proposed approach to TSLRIC regulation (i.e., the Commission's approach could reduce or increase the exposure to these risks). These risks are, at least in the first instance, cash-flow risks and not risks that should be compensated for in the cost of capital.

39. I therefore recommend that the Commission begin a separate process aimed at quantifying these risks and, in so doing, clearly stating its policy for how it will respond to future events that are relevant to a quantification of asymmetric risk. I recommend that the Commission begin this process first in order to ensure that, as it makes decisions on other elements of its regulatory approach, it clearly has in mind the impact of these decisions on the level of asymmetric risk.

Accounting for uncertainty in WACC parameters (75th percentile)

40. A separate issue to asymmetric risk is how to account for uncertainty in WACC parameters. Professor Grundy, in a separate report, explains that, even if there is no asymmetric risk, setting the regulatory WACC at the midpoint estimate will only result in positive incentives for investment around half of the time. It is my view that setting the cost of capital above the midpoint WACC estimate is required in order to ensure an efficiently managed regulatory regime. If the cost of capital is set at the midpoint WACC then the regulator must lean hard on penalties and coercion and, ultimately, the threat of stranding of sunk assets in order to engender efficient levels of investment. This may be possible in some circumstances but, ultimately, is likely to lead to perverse and inefficient results. The Commission's use of the 75th percentile is a reasonable response to the problem it faces although I note that the optimal adjustment poses a difficult, and therefore open, question.

1 Introduction

41. The New Zealand Commerce Commission is currently conducting price reviews for the unbundled copper local loop (UCLL) and unbundled bitstream access (UBA) services. In the context of these reviews, the Commission is required to set cost-based prices using a TSLRIC methodology. One of the key inputs into this process is the cost of capital, or WACC.

42. CEG have been commissioned by Chorus to provide a report in response to the Commission's consultation paper where it makes the following invitation

> *In response to this paper, we invite submissions, supported by evidence, on:*
>
> > *the approach to estimating, and specific values for, asset beta, leverage and the implied long-term credit rating for the UCLL and UBA price reviews;*
> >
> > *whether we should set WACC above or below the mid-point estimate for UCLL and UBA (and if so, to what extent); and*
> >
> > *whether we should apply a term credit spread differential (TCSD) allowance when determining the cost of capital for UCLL and UBA.*
>
> *As noted in paragraph 11 above, parameters such as the risk-free rate, tax-adjusted market risk premium (TAMRP) and debt issuance costs, apply across sectors. We intend to use the methodology and/or values specified in the IMs when estimating these parameters. If you disagree with this approach, we expect submissions to propose alternative approaches and parameter values, and explain in detail why the proposed alternative is more suited to the telecommunications sector.*

43. Sections 2 and 3 respond to the Commission's invitation in relation to asset beta, leverage and credit rating.

44. Section 4 suggests how the Commission might go about estimating a DRP for a UCLL/UBA provider. I note that this was not specifically addressed in the consultation paper but I believe it needs to be.

45. Section 5 responds to the Commission's invitation in relation to the use of a TCSD. This section covers considerable ground and suggests a conceptual framework not just for considering the TCSD but for defining what is being measured when estimating the cost of debt.

46. Section 6 responds to the Commission's request that, if any variation to the use of a IM based TAMRP is proposed then the superiority of this approach should be explained in detail.

47. Section 7 responds to the Commission's invitation in relation to the use of a mid-point WACC.

48. I have been assisted in the preparation of this report by Daniel Young and Johanna Hansson in CEG's Sydney office. However, the opinions set out in this report are my own.

2 Asset and equity beta

49. Equity beta is an estimate of the degree of exposure to systematic risk faced by a firm. Asset beta is an estimate of an equity beta for an ungeared (zero debt) firm – the asset beta is intended to be a measure of risk that can be compared across firms in a manner that is unaffected by their specific financing strategy. In the simplified Brennan-Lally CAPM, beta is an important input to estimating the cost of equity.

50. In the capital asset pricing model (CAPM), systematic risk is measured as the *expected* covariance between a firm's stock performance and the performance of the market portfolio divided by the *expected* variance in the market portfolio. In essence, if the value of a firm's equity is expected to rise when the value of the market portfolio rises (and fall when the market portfolio falls) then it will have a positive beta. If a firm's equity value is expected to rise by more than the market portfolio when the market portfolio rises (and fall faster when the market portfolio falls) then it will have a beta of greater than 1.0 (and vice versa).

51. It is important to emphasise the use of the term "*expected*" in the above description. What matters to investors when they are assessing an investment is the *expected* value of beta that will apply over their investment horizon. It is difficult to measure the expected value of beta across all the different investors in the market. It is, however, possible to measure the *ex post* historical value of beta using publicly available stock price information and this is common practice.[1] However, it is important to keep in mind that unless investors expect the future market conditions to be the same as the market conditions in the estimation period, historical betas are only an imperfect proxy for the forward looking beta that investors will perceive.

52. Those caveats aside, it is common practice to estimate the equity beta for a traded stock as the slope coefficient for a simple linear regression of its returns against the returns on the stock market index that it trades in.

53. I am assessing the WACC faced by a fixed line provider of UCLL and UBA in New Zealand. The asset and equity beta estimated should be specific to providing these services in this context. It is not appropriate to simply adopt the asset betas estimated by the Commission for EDBs and GPBs in its IM Final Reasons Paper, because those betas are specific to the electricity and gas network industries and services provided using those networks. I do, however, follow closely the methodology employed by the Commission to estimate asset and equity betas in its IM Final Reasons Paper.

[1] Even this is imperfect as a measure of the historical beta because, in the construction of the CAPM, the market portfolio includes all assets – including assets not traded on the stock market. This includes housing, commercial real-estate, privately held farmland, debt instruments, human capital etc. The movement in the true market portfolio may not be the same as the movement in the stock market portfolio.

54. In this section I determine a sample of 26 firms from New Zealand, Australia, United States and Europe that are engaged (or have, over the measurement period, been engaged) in providing fixed line telecommunications services, including providing UCLL and UBA equivalents. I discuss later in this section a number of reasons why the context of providing broadband services in New Zealand may not be the same as many of the firms in my sample. Specifically, I consider that the risks faced by Chorus in providing fixed line broadband services in this context may have similarities with the risks faced by:

- firms engaged in the construction and operation of entirely new telecommunication networks, i.e., fibre networks; and
- firms engaged in the construction industry, particularly in the construction of utility assets but also civil engineering works more generally.

2.1 Overview of methodology

55. In its IM Final Reasons Paper, the Commission described its analysis of asset and equity betas as having six steps:[2]

- Step 1: identify a sample of relevant comparator firms. This includes:
  - New Zealand firms from the service in question;
  - New Zealand firms from industries with a similar risk profile;
  - overseas firms from the service in question; and
  - overseas firms from industries with a similar risk profile.
- Step 2: estimate the equity beta for each firm in the sample;
- Step 3: de-lever each equity beta estimate to get an estimated asset beta for each firm in the sample;
- Step 4: calculate an average asset beta for the sample;
- Step 5: apply any adjustments for regulatory differences or differences in systematic risk across services to the average asset beta for the sample;
- Step 6: re-lever the average asset beta for the sample to an equity beta estimate using the Commission's assumed notional leverage.

56. I agree with the general characterisation of the necessary steps in the analysis as described by the Commission. This set of steps provides a helpful structure for the remainder of this section.

[2] Commerce Commission, *Input Methodologies (EDBs & GPBs) Reasons Paper*, 22 December 2010, p. 510

2.2 Constructing a sample of comparable businesses

57. I have identified firms that own and operate fixed line businesses in New Zealand, Australia, the United States and Europe.

58. In its IM Final Reasons Paper, the Commission constructed a sample of 54 comparator firms from New Zealand, Australia, the United Kingdom and the United States. These firms were all identified by Bloomberg as operating electric or gas utility businesses.

59. For the telecommunications industry there has not proved to be a straightforward method of identifying comparable firms. Principally this is because there is no industry classification that clearly delineates network owners/operators from access seekers or other participants in the telecommunications industry.

60. I have constructed my sample based on the following steps:

- sourcing businesses identified by Bloomberg as being engaged in "wireline" telecommunications;
- reviewing short descriptions of these businesses' activities supplied by Bloomberg and eliminating those that do not appear to be network owners; and
- reviewing more closely the remaining businesses with basic internet research to identify whether they are comparable.

61. Using this method, I have sourced a sample of 31 firms from New Zealand, Australia, United States and Europe that are engaged (or have been engaged) in providing fixed line telecommunications services. This sample includes Chorus and Telecom New Zealand. Prior to November 2011, Telecom operated a fixed line copper network in New Zealand and therefore its equity beta provides relevant comparison of a business providing the relevant services over these periods.

62. The firms in this sample of fixed line copper businesses are set out in Table 1 below.

Table 1: Sample of fixed line businesses

AT&T, United States	Frontier, United States	Telecom, New Zealand
Belgacom, Belgium	Hawaiian Telecom, United States	Telefonica, Spain
BT Group, United Kingdom	Hellenic Telecom, Greece	Telekom Austria, Austria
Centurylink, United States	Iliad, France	Telenor, Norway
Chorus, New Zealand	KPN, Netherlands	Teliasonera, Sweden
Cincinnati Bell, United States	Lumos Networks, United States	Telstra, Australia
Cogent Communications, United States	Orange, France	TW Telecom, United States
Colt Group, United Kingdom	Portugal Telecom, Portugal	Verizon, United States
Deutsche Telekom, Germany	Swisscom, Switzerland	Windstream, United States
Elisa OYJ, Finland	TDC, Denmark	
Fairpoint, United States	Telecom Italia, Italy	

63. Of these 31 firms, 4 United States businesses and 7 European businesses were considered by Ofcom's consultant The Brattle Group in its estimate of equity beta.[3] I consider that the larger sample formed in Table 1 is likely to be a more robust basis upon which to determine asset and equity betas for a UCLL/UBA provider. In addition to incumbent fixed line operators it also includes a number of fixed line entrants with investments in fibre networks.[4]

64. Many of the businesses identified in Table 1 above may not have risk profiles that are very comparable to Chorus or a hypothetical UCLL/UBA provider in New Zealand in a number of respects:

- Chorus is a network-only telecommunications infrastructure operator without a retail presence. There are no businesses in the sample at Table 1 that are not vertically integrated into retail.
- Chorus does not operate a mobile telecommunications network. Most of the major fixed line businesses operated across Australia, the United States and Europe have a significant presence in the mobile sector.
- Chorus faces significant regulatory risks since its most important income streams are subject to regulatory price controls with uncertain outcomes. While other businesses in the sample face regulatory risks, not all face these to the same extent that Chorus does.
- Chorus and other LFCs are engaged in the roll-out of fibre to the premises to the majority of New Zealanders that has been promoted by government policy.

3 The Brattle Group, *Estimate of BT's Equity Beta*, April 2013. Available at http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/annexes/Brattle_BT_Equity.pdf

4 Cogent Communications, Colt Group, Iliad, Lumos Networks and TW Telecom.

65. I discuss these issues in more detail below. I believe that, taken together, these issues mean that there are no businesses that are 'like-for-like' comparators in the sample for Chorus as the actual UCLL/UBA provider or a hypothetical provider. However, in my view BT Group is likely to be the single most comparable firm to Chorus, because it operates a fixed line only network without any mobile ownership and because it faces a similar regulatory risk profile to Chorus. Other firms in the sample may be less comparable to Chorus due to differences in their business activities or differences in their profile of regulatory risk.

2.2.1 Chorus has no retail presence

66. Chorus is unusual by international standards for being a listed owner and operator of a vertically separated telecommunications network business. All telecommunications businesses that I have sourced provide integrated fixed line services and many also provide mobile services as well.

67. This tends to point towards Chorus being its own best comparator. However, there are important reasons why it may not be reasonable simply to use the beta estimated from Chorus' own financial data directly in an estimate of its WACC.

68. Having regard to only a single observation for Chorus' beta may be unbiased but is likely to provide a very imprecise estimate. Beta estimates for a single firm exhibit significant variability depending on the vagaries of the data. Random movements in a firms' share price on days of particularly large market shifts may have significant effects on its estimated beta.

69. In light of this, forming a sample of businesses that undertake comparable activities is likely to assist in estimating a more precise estimate of beta.

2.2.2 Chorus has no mobile businesses

70. In addition to this, many businesses active in fixed line telecommunications provide not just fixed line services but also mobile services. Chorus is unusual as a fixed line network provider that is not active in related industries.

71. Of the 31 businesses in Table 1, only BT Group, Centurylink, Chorus, Cogent Communications, Colt Group, Fairpoint, Frontier, Hawaiian Telecom, Lumos Networks, TW Telecom and Windstream and engaged mostly or wholly in providing fixed line services. The other businesses also operate mobile networks in addition to their fixed line businesses.

2.2.3 Regulatory risk

72. Chorus faces significant risks caused by its exposure to uncertain regulatory outcomes. The products responsible for its most important copper income streams

are the subject of regulation under the FPP. Prices for its fibre products are set until 2020 and are then also subject to uncertain regulatory treatment.

73. By comparison, many of the businesses in Table 1 do not face this level of regulation. The new entrant businesses are largely unregulated. United States fixed line incumbent local exchange businesses experience a less restrictive form of regulation that requires them to allow unbundling but does not require them to offer a wholesale broadband service or any equivalent.[5] In Australia Telstra has only recently been obliged to offer this service.

74. In Europe, where most incumbent fixed line businesses do face a more intrusive level of regulation, all but one have effectively spread this risk by diversifying into mobile network businesses, as discussed above.

75. I note that these regulatory risks are real and are factored into market prices. As discussed in section 4, the risk premium on Chorus' debt relative to the benchmark spiked immediately subsequent to the Commission's final decision on benchmarking the UBA price on 5 November 2013 and has been elevated by around 1% ever since. This is an example of debt markets responding to regulatory risks. It is difficult to believe that a 1% increase in the market determined required yield on Chorus' debt has not been associated with an increase in the required return demanded by equity investors in Chorus.

2.2.4 Fibre roll-out

76. In setting copper prices, an important source of risk to Chorus (and perhaps to a hypothetical provider of UCLL/UBA services) is that it will not be able to recover its efficient costs. These risks are not limited to its copper assets but also include risks associated with its fibre assets. In effect, by setting prices on a product that competes with fibre-based broadband services, the Commission is also heavily influencing the volumes and revenues that Chorus can expect to earn on its fibre network.

77. The fact that this occurs in a process that may have no regard to the significant costs that Chorus is incurring on rolling out its fibre network gives Chorus a unique risk profile that is unlike many of the businesses in Table 1. Specifically, although Chorus is engaged in a massive construction task to roll out this network, the regulatory framework in New Zealand:

- provides no assurance to Chorus that its expected costs of achieving this can be recovered in current or future prices; and

5 http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-36A1.doc

- provides no assurance to Chorus that cost overruns relative to preliminary expectations, which could be significant in this type of build, could be recovered in current or future prices.

78. A potential proxy for an industry facing this type of risk may be construction businesses, including those that build assets for the telecommunications sector or related industries.[6] In Appendix F I form a sample of businesses engaged in construction and civil engineering works in New Zealand and Australia, as well as internationally, and examine their asset betas.

2.3 Estimating asset and equity betas

79. In its IM Final Reasons Paper, the Commission estimated 5 year weekly and monthly asset and equity betas on overlapping five year periods beginning from the five years to 31 May 1995. The Commission sourced its beta estimates from Bloomberg.

80. The High Court appeared to accept a critique by Vector that the Commission's use of overlapping periods lead to higher weighting being given to betas estimated in some periods over others. However, the Court found that this did not make any difference to the Commission's estimate of beta.[7]

81. In this section I estimate asset and equity betas following the methodology introduced by the Commission and taking into account the comments made by the High Court.

2.3.1 Raw equity betas

82. I have sourced 5 year raw daily betas from Bloomberg for each of the firms listed at Table 1, above for four non-overlapping periods covering a 20-year span, being:

- the 5 years to 13 March 1999;
- the 5 years to 13 March 2004;
- the 5 years to 13 March 2009; and
- the 5 years to 13 March 2014.

83. I note that the sourcing of daily betas is not identical to the Commission's method in its IM Final Reasons Paper. The Commission did not examine daily betas, preferring to use weekly and monthly betas.

6 We note that construction businesses may face fixed price contracts in some cases, but also would expect to be able to pass on some part of cost overruns.

7 Wellington International Airport Ltd and others v Commerce Commission [2013] NZHC 3289 (11 December 2013), paras. 1506-1510

84. The use of daily betas in this report is due to the limited time available in its preparation. Weekly and monthly betas may have a high degree of variability associated with them depending on how they are measured – e.g., Monday betas may be very different to Friday betas, etc. I consider that weekly and monthly betas are best used in a context where such variation is estimated and taken into account to ensure that a representative basis has been used to estimate beta.

85. Without sufficient time to conduct this investigation, I have sourced daily raw betas for which there is no equivalent variability – i.e., for a particular five year period there is a unique daily beta. I consider that a daily beta is likely to be a very close proxy for a weekly or monthly beta once variability from different sampling intervals in the latter measurements is accounted for.

2.3.2 Asset betas

86. I de-lever (and re-lever) betas following the approach used in the Commission's IM Final Reasons Paper, based on the simple formula:

$$\beta_a = (1 - g) \times \beta_e + (g)\beta_d$$

87. Where the debt beta is assumed to be zero, this becomes even simpler:

$$\beta_a = (1 - g) \times \beta_e$$

88. I source data for gearing from Bloomberg using its NET_DEBT and CUR_MKT_CAP fields. To de-lever each five year estimate of raw equity beta, I calculate an average over five years of daily observations for each series, and calculate gearing as:

$$\frac{NET\_DEBT}{NET\_DEBT + CUR\_MKT\_CAP}$$

89. The asset betas calculated using this approach are shown in Table 2 below. Gaps in the table indicate where there was not enough data to estimate a 5 year beta.

Table 2: Estimated five year daily asset betas

Firm	Asset beta, 5 years ending 13 March 1999	Asset beta, 5 years ending 13 March 2004	Asset beta, 5 years ending 13 March 2009	Asset beta, 5 years ending 13 March 2014
AT&T	0.646	0.712	0.693	0.463
Belgacom				0.418
BT Group	0.894	0.979	0.542	0.612
Centurylink	0.423	0.490	0.464	0.370
Chorus				
Cincinnati Bell	0.431	0.762	0.378	0.259
Cogent Communications			1.133	1.059
Colt Group			0.762	0.814
Deutsche Telekom		0.837	0.379	0.288
Elisa OYJ			0.644	0.391
Fairpoint				
Frontier		0.317	0.441	0.335
Hawaiian Telecom				
Hellenic Telecom		0.693	0.561	0.378
Iliad			0.662	0.350
KPN		0.646	0.376	0.244
Lumos Networks				
Orange		0.890	0.365	0.376
Portugal Telecom		1.249	0.695	0.449
Swisscom		0.448	0.454	0.322
TDC		0.869	0.090	0.121
Telecom New Zealand			1.134	1.244
Telecom Italia		0.374	0.466	0.276
Telefonica		0.996	0.569	0.475
Telekom Austria			0.521	0.353
Telenor			0.570	0.649
Teliasonera			0.670	0.540
Telstra		0.728	0.337	0.310
TW Telecom			0.831	0.816
Verizon	0.508	0.565	0.601	0.406
Windstream				0.330

Source: Bloomberg, CEG analysis

90. While all businesses in the table have some share price data available, not all had enough to provide even a single estimate of a 5 year asset beta. Businesses that did not have enough data to generate a 5 year asset beta were Chorus, Fairpoint, Hawaiian Telecom and Lumos Networks. I note for completeness that Chorus' daily asset beta since listing is 0.431.

91. It is also interesting to note that the number of asset beta observations increases over time, from 9 in 1999, to 25 in 2004, to 35 in 2009 and 42 in 2014. The Commission's approach in its IM Final Reasons paper is to average asset betas across time periods for each business and then to calculate an average asset beta across the sample. Applying this methodology will give greater weight to more recent observations of beta because there are more observed betas in this time period. Nonetheless, I apply the Commission's methodology and calculate average 5 year daily asset betas by sample in Table 3 below.

92. Table 3 shows the average 5 year daily asset beta across the entire sample, excepting those four which did not have enough data to estimate a 5 year beta. It also shows the average asset beta for fixed line businesses only, and for BT Group by itself, which I consider the closest comparator to Chorus in the sample.

Table 3: Average 5 year daily asset betas by sample

Sample	Number of businesses in sample	Average 5 year daily asset beta across businesses in sample
All businesses	27	0.58
Fixed line businesses only	7	0.66
BT Group	1	0.76

Source: Bloomberg, CEG analysis

93. I note that the asset betas of fixed line only businesses appear to be higher than those of businesses that operate across both fixed and mobile technologies. BT Group, which I consider to be Chorus' closest comparator in the sample, has an average asset beta that is higher still.

94. On the basis of the analysis in this section and the data in Table 2 and Table 3 above, an estimate bounded from below by 0.58 would appear to be appropriate. That said, further inspection of weekly and monthly beta estimates may also be of interest in arriving at a point estimate.

3 Benchmark gearing and credit rating

3.1 Gearing

95. The estimates of gearing for the firms in my sample are shown in Table 4 below. I note that on a number of occasions, a negative gearing is calculated. This occurs when a firm's cash balance is greater than its gross debt outstanding, giving it a negative value of net debt.

Table 4: Comparator gearing

Firm	Gearing, 5 years ending 13 March 2014	Firm	Gearing, 5 years ending 13 March 2014
AT&T	27%	Portugal Telecom	47%
Belgacom	22%	TDC	17%
BT Group	45%	Telenor	49%
Centurylink	45%	Teliasonera	68%
Cincinnati Bell	77%	Swisscom	38%
Cogent Communications	15%	Telecom New Zealand	26%
Colt Group	-32%	Telecom Italia	51%
Deutsche Telekom	32%	Telefonica	28%
Elisa OYJ	52%	Telekom Austria	31%
Hellenic Telecom	46%	Telstra	22%
Frontier	58%	TW Telecom	23%
Iliad	13%	Verizon	31%
KPN	17%	Windstream	58%
Orange	0%		

Source: Bloomberg, CEG analysis

96. These data are summarised at Table 5 below where I also include Chorus' gearing since demerger. I note that there is a very wide range of gearings in the sample, including as low as -32%.

Table 5: Average 5 year gearing by sample

Sample	Number of businesses in sample	Average 5 year gearing
All businesses	27	36%
Fixed line businesses only	7	29%
BT Group	1	38%
Chorus	1	61%

Source: Bloomberg, CEG analysis

97. It is appropriate to have regard to how international regulators have considered the benchmark level of gearing. I note that both the ACCC and Ofcom seek to determine gearing based principally on the gearing of the regulated business itself.

98. The ACCC's determined a gearing for Telstra of 40% based largely on this principle:[8]

99. Similarly, Ofcom stated that the gearing used in its WACC calculation should reflect BT's actual level of gearing:[9]

> *We propose to continue to estimate the gearing based on BT's actual gearing, using an average over a period consistent with the beta estimation period in order to de-lever the equity beta and to calculate the WACC.*
>
> *In addition, we propose to continue to use this current gearing as a proxy for the forward looking gearing over the period of the charge control.*

100. I note that Chorus' average gearing since listing has been over 60% and has been higher recently.

101. Based on the information above, I consider that a benchmark gearing of 40% to 60% is a reasonable reflection of the relevant comparators' gearing and Chorus' own gearing.

3.2 Credit rating

102. In its IM Final Reasons Paper, the Commission determined the credit rating for determining the debt risk premium having regard to the considerations of the AER and Ofgem for electricity and gas businesses in Australia and the United Kingdom respectively.[10]

103. In addition to this, I consider that it is also relevant to examine the set of comparators used for the purposes of determining equity beta and gearing.

104. Both the ACCC in Australia and Ofcom in the United Kingdom have in recent determinations set the debt risk premium with reference to the actual credit rating of the incumbent telecommunications providers; Telstra and BT respectively.

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8 http://www.accc.gov.au/system/files/Discussion%20paper%20-%20FADs%20for%20fixed%20line%20services%20-%20public%20version.pdf

9 http://stakeholders.ofcom.org.uk/consultations/llu-wlr-cc-13/

10 Commerce Commission, *Input Methodologies (EDBs & GPBs) Reasons Paper*, 22 December 2010, pp. 456-459

105. In Australia, the ACCC used a benchmark A-rated bond to estimate the efficient the efficient cost of debt of an A-rated telecommunications business. In the absence of such a bond, the ACCC decided to use a long-term A- rated Telstra bond as a proxy for a benchmark bond when calculating the DRP. In this process, Telstra proposed that the credit rating used to estimate the DRP should be Telstra's credit rating from Standard & Poor's observed over the same averaging period used to estimate the risk free rate (A-rated).[11]

106. In the United Kingdom, Ofcom considered that BT's current estimate of debt was a good proxy for the efficiently incurred forward looking cost of debt to be included in the WACC estimate in its 'Fixed access market reviews: Approach to setting LLU and WLR Charge Controls'.[12] At the time of the decision in mid-2013, BT's credit rating was BBB.

107. Current credit ratings for firms in my equity beta and gearing sample are set out in Table 6 below.

[11] http://www.accc.gov.au/system/files/Discussion%20paper%20-%20FADs%20for%20fixed%20line%20services%20-%20public%20version.pdf

[12] http://stakeholders.ofcom.org.uk/consultations/llu-wlr-cc-13/

Table 6: Current credit ratings for comparator firms

Firm	Standard & Poor's	Moody's	Fitch
Chorus	BBB	Baa3	
AT&T	A-		A
Belgacom	A		
BT Group	BBB		BBB
Centurylink	BB		BB+
Cincinnati Bell	B		
Cogent Communications	B+		
Colt Group	BB		
Deutsche Telekom	BBB+		BBB+
Elisa OYJ	BBB	Baa2	
Fairpoint	B		
Frontier	BB-		BB
Hawaiian Telecom	B		
Hellenic Telecom	BB-		
Iliad			
KPN	BBB-		BBB-
Lumos Networks			
Orange	BBB+	Baa1	BBB+
Portugal Telecom	BB		BBB-
Swisscom	A	A2	
TDC	BBB	Baa2	BBB
Telecom New Zealand	A-	A3	
Telecom Italia	BB+		BBB-
Telefonica	BBB		BBB+
Telekom Austria	BBB-	Baa2	
Telenor	A-		
Teliasonera	A-		A-
Telstra	A	A2	A
TW Telecom	BB		
Verizon	BBB+	Baa1	A-
Windstream	BB-		

Source: Bloomberg, CEG analysis

108. Table 6 indicates that Standard & Poor's ratings have by far the greatest coverage over the firms in the sample. There are no firms that have a Moody's or Fitch rating but not a Standard & Poor's rating.

109. I note that Chorus is one of a few firms for which its Moody's credit rating is different from its Standard & Poor's credit rating. Chorus is rated BBB with Standard & Poor's but one notch lower with Moody's at Baa3, the equivalent of BBB-. This may reflect different assessments of regulatory uncertainty or may

simply reflect a temporary difference (noting that S&P has Chorus on 'negative watch').

110. Table 7 shows summary statistics for these ratings calculated on the basis of the Standard & Poor's credit ratings.

Table 7: Average Standard & Poor's credit rating by sample

Sample	Number of businesses in sample	Average S&P credit rating
All businesses	31	BBB-
All businesses with 5 year data	27	BBB-
Fixed line businesses only	7	BB+
BT Group	1	BBB

Source: Bloomberg, CEG analysis

111. Having regard to regulatory precedent and the tables above, I consider that it is reasonable to set a benchmark credit rating for a UCLL/UBA provider of BBB-. I note in the next section that I can only locate one bond with pricing that is rated the equivalent of BBB- or lower. This is a bond issued by Chorus who Moody's has downgraded to Baa3 (the equivalent of BBB-). This may simply reflect the fact that issuing debt at low credit ratings is costly and so is avoided by New Zealand corporates.

4 Measuring the yield on BBB rated debt

112. The purpose of this section is not to arrive at a definitive estimate of the prevailing DRP for a UCLL/UBA provider. Rather, I present analysis and data in this section in an attempt to assist and inform the Commission's analysis of this issue.

4.1 Departure from the IMs

113. In this section I propose a departure from the methodology set out in the IMs for EDBs and GPBs so that they are fit for purpose in estimating the cost of debt allowance for Chorus as the UCLL/UBA provider.

114. My proposal involves widening the sample of data that is analysed when estimating the cost of debt to include bonds issued by New Zealand corporations into foreign currencies and to include bonds that do not have credit ratings (assigning these bonds the same credit rating as their issuer or the ultimate parent company (if the issuer is a wholly owned subsidiary)).

115. I note that the second amendment appears to have been the *de facto* practice of the Commission in applying the IM's in recent cost of capital decisions. That is, the Commission's practice has been to have regard to bonds that do not have their own credit rating.[13]

116. The first amendment is necessary in order to capture the single most relevant bond on issue for determining Chorus' cost of debt allowance as the UCLL/UBA provider, namely, Chorus' only bond on issue. This bond is issued in British Pounds. This is in fact the only bond on issue by a UCLL/UBA provider in New Zealand.

117. Even putting this fact aside, I consider that the exclusion of bonds issued by New Zealand companies in foreign currencies inappropriately fails to have regard to a relevant source of information on the cost of corporate debt.

118. Issuing bonds in foreign currencies is common practice by large businesses in New Zealand, because it enables them to access deeper and more liquid international markets. The deepest and most liquid markets are in the US and in Europe, and businesses with significant debt and refinancing requirements can be expected to derive liquidity advantages by maintaining a presence in these markets. Issuing

[13] For example, in the Maui Electricity decision from January 2014, the Commission included six bonds which do not have a bond-specific credit rating according to Bloomberg from any of S&P, Moody or Fitch. These bonds were issued by Genesis (exp. 1/11/2019), Wellington International Airport (exp. 11/6/2020), Contact Energy (exp. 27/5/2020), two bonds issued by TCNZ Finance (exp. 15/6/2015) and Christchurch International Airport (exp. 4/10/2021).

debt in foreign currencies may allow these businesses to raise larger amounts than they could in domestic markets before running into pricing pressure associated with the volume raised.

119. In New Zealand, large infrastructure businesses such as Chorus, Vector, Telecom New Zealand and Transpower all have bonds on issue in foreign currencies. Large non-infrastructure businesses such as Fonterra and Coca-Cola also have bonds on issue in foreign currencies. Further, issuing bonds in foreign currencies is very prevalent among New Zealand banks and financial institutions such as Westpac and ANZ.[14]

120. In recent CEG work completed for the Australian Energy Network Association (ENA) I estimated that foreign currency bonds account for almost half (44.3%)[15] of all bonds issued by Australian regulated energy utilities.

121. Further to this, in Australia, both regulators and independent bodies have included foreign bonds in their analysis of corporate credit spreads/premiums. For example, the Independent Pricing and Regulatory Tribunal (IPART) in New South Wales, in its final decision on 'Developing the approach to estimating the debt margin' from April 2011, concluded that US data was suitable for estimating the debt margin[16]:

> *Due to the limited number of relevant proxies in the Australian market, we investigated several alternative sources of data. We found that US debt markets provide a much deeper corporate bond market and therefore a more efficient source of funding for the benchmark firm. Australian bond markets are still relatively thin, particularly for long-dated bonds with a credit-rating of BBB or BBB+. The US market offers an opportunity to raise longer-term debt at more attractive margins than the Australian bond market due to greater investor demand.*

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14 Source: Bloomberg.

15 I have separately estimated that Australian regulated utilities issue 35% of their total debt in foreign currency (CEG, *Debt strategies of utility businesses* p. 23.). However, this is 35% of total debt (drawn and undrawn). The AER has, based on analysis by using confidential business specific data reported that undrawn debt is 11.3% of total debt (AER, Explanatory statement – rate of return guideline, December 2013, Table 8.2 on p. 143. 11.3% is the difference between drawn debt of $29,879.7m and total debt of $33,668.5m expressed as a percentage of total debt.) Therefore, the 35% calculated by me as a percentage of total debt is 39.5% of drawn debt (35%/(1-0.113)). Moreover, given that the analysis focuses on bond yields the relevant proportion is foreign currency bonds as a proportion of domestic bonds. Given that drawn bank debt is 11% of the total drawn debt portfolio then foreign currency bonds are around 44.3% (39.5/(1-0.11)) of all bonds issued by Australian regulated energy utilities.

16 IPART, *Developing the approach to estimating the debt margin,* April 2011. Available at http://www.ipart.nsw.gov.au/Home/Industries/Research/Reviews/WACC/Developing_the_approach_to_estimating_the_debt_margin

> *We conclude that this source of data is a suitable basis to estimate the debt margin for the benchmark utility as it improves our sample of securities in terms of number and quality of observations.*

122. Also the RBA, in its published estimates of aggregate credit spreads for Australian non-financial corporations, has relied on foreign currency bonds. The RBA notes that17:

> *The paucity of Australian dollar-denominated issuance by NFC's, particularly at longer tenors, makes it impractical to estimate credit curves across a range of tenors solely from domestically issued bonds. Therefore, the sample includes bonds denominated both in Australian dollars and foreign currencies.*

123. In light of this evidence regarding the prevalence of issuing foreign currency bonds, I conclude that it is appropriate to include bonds issued in four of the major foreign currencies used by New Zealand businesses: AUD, USD, EUR, and GBP.

4.2 Description of the IMs approach

124. In the Input Methodologies (IMs) for electricity and gas businesses, the task is to estimate the current market yield on a 5 year maturity BBB+ rated bond issued by a privately owned supplier of electricity or gas transport services in New Zealand. The methodology employed involves weighting the interpolated debt risk premium (DRP) of vanilla NZD denominated bonds with approximately 5 years to maturity. The weightings are given with reference to how similar a bond is to a BBB+ bond issued by an electricity distribution or gas pipeline business (EDB or GBP). The weighting given to different bonds is qualitative in nature, which means that it is not transparent, nor is it directly replicable.

125. Specifically, in the context of EDB/GPB's, the Commission has regard to bonds which fit into the following five categories, giving progressively less weight to bonds lower down on the list:

    a. bonds issued by a EDB or GPB (which is not government owned) with a BBB+ credit rating;

    b. bonds issued by another entity (that is not government owned) with a BBB+ credit rating;

    c. bonds issued by a EDB or GPB (that is not government owned) with a credit rating other than BBB+;

17 RBA, *New Measures of Australian Corporate Credit Spreads,* December 2013. Available at http://www.rba.gov.au/publications/bulletin/2013/index.html

d. bonds issued by another entity (that is not government owned) with a credit rating other than BBB+; and

e. bonds issued by government-owned entities.

126. To qualify for the sample a bond needs to be issued by a "qualifying issuer" and have a "qualifying rating". A qualifying issuer is (i) a New Zealand resident limited liability company which undertakes (or is part of a corporate group which undertakes) the majority of its business activities in Australia and New Zealand, (ii) does not operate (or is part of a corporate group which operates) predominantly in the banking or finance industries, and (iii) that issues vanilla NZD denominated bonds that are publicly traded. A qualifying rating means either a Standard& Poor's (S&P's) long term credit rating of the specified grade or an equivalent long term credit rating from another internationally recognised rating agency.[18]

127. If the IM approach was applied to a UCLL/UBA provider, as opposed to an EDB or GBP, the two aspects of the categories outlined above would change. First, the relevant industry would be fixed-line telecommunications providers. Second, the 'target' credit rating would be BBB- or BBB, consistent with Chorus' credit rating as the only fixed-line telecommunications provider in New Zealand. Chorus is rated BBB by S&P and Baa3 (BBB- equivalent) by Moody's. However, S&P placed Chorus on negative credit watch on 6 November 2013[19]. Consistent with the conclusion in section 3 I consider that a BBB- credit rating is the appropriate benchmark for Chorus as the actual provider of UCLL/UBA services and for a hypothetical benchmark provider of these services.

128. In the subsequent section I illustrate potential outcomes of applying the IM approach to a UCLL/UBA provider.

4.3 Estimating the cost of debt for a UCLL/UBA provider

129. In order to estimate a DRP using the IM approach on a broader sample of bonds, I have collected yield data [20] from Bloomberg on bonds issued by companies incorporated in New Zealand in NZD, AUD, USD, EUR, and GBP. In doing this I have assumed that the bond needs to have a "qualifying rating", i.e. a long term credit rating from S&P or an equivalent international ratings agency (assumed to be Moody's or Fitch). If a bond-specific rating is available from more than one ratings

18 Commerce Commission, *Decision No. 710 Input methodologies determination applicable to electricity distribution services pursuant to Part 4 of the Commerce Act 1986 (the Act),* December 2010.

19 Sourced from Bloomberg

20 I have collected option-adjusted spreads (OAS) converted to yields to adjust for any effect of bond optionality. For bonds with no optionality features, the outcome is directly comparable to using yield to maturity from Bloomberg.

agency, I have calculated a composite rating[21]. If no bond-specific rating is available from any credit ratings agency, I have used the issuer credit rating (composite if more than one). Finally, if no bond-specific or issuer credit rating is available, I have used the parent company credit rating (composite if more than one).

130. In order to estimate a DRP for a BBB- rated business, it is relevant to have regard primarily to other bonds of the same rating. However, it is also relevant to have regard to bonds with similar credit ratings, especially in the case where there is limited bond yield data available at BBB-. This is consistent with the approach taken by the Commission in the IMs. To focus the analysis on the most relevant sub-set of bonds, I have limited the sample of bonds to those rated between BB and BBB+. This range includes bonds two credit rating notches above and below the target credit rating of BBB-. I do not believe that bonds rated lower of higher than BB and BBB+ respectively will usefully inform an estimate of the DRP for a BBB- rated business.

131. As such, to implement the IM approach for a UCLL/UBA provider, I would have regard to bonds which fit into the following five categories, giving progressively less weight to bonds lower down on the list:

    a. bonds issued by a fixed-line telecommunications provider (which is not government owned) with a BBB- credit rating;

    b. bonds issued by another entity (that is not government owned) with a BBB- credit rating;

    c. bonds issued by a fixed-line telecommunications provider (that is not government owned) with a credit rating other than BBB-*within the range BB to BBB+*;

    d. bonds issued by another entity (that is not government owned) with a credit rating other than BBB- *within the range BB to BBB+*; and

    e. bonds issued by government-owned entities *within the range BB to BBB+*.

132. I have identified 37 individual bonds rated between BB and BBB+ issued by companies incorporated in New Zealand and denominated in the before mentioned currencies which, according to Bloomberg, do not operate within the financial sector. Out of these 37 bonds, two are issued in foreign currencies. I have converted yields on foreign currency bonds to New Zealand dollar equivalents by adopting the same methodology applied by the Reserve Bank of Australia (RBA) in its recent paper which estimates Australian corporate credit spreads[22]. I note that there are no bonds rated lower than BBB- in this sample.

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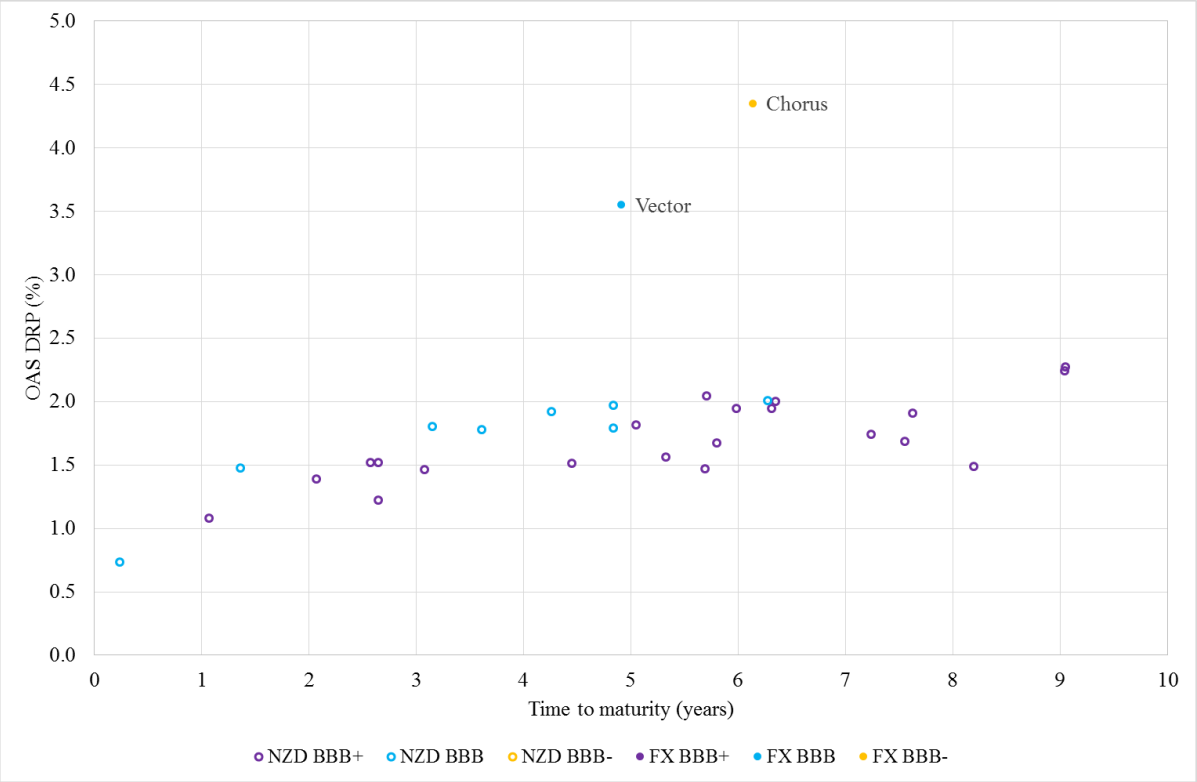
21 Consistent with Bloomberg, we have rounded down when calculating the composite rating.

22 Reserve Bank of Australia, *New Measures of Australian Corporate Credit Spreads,* 2013. Available at http://www.rba.gov.au/publications/bulletin/2013/index.html

133. Figure 1 illustrates the 31 bonds issued by non-financial New Zealand incorporated companies in domestic and foreign currencies (NZD, AUD, USD, EUR and GBP) which have yield data from Bloomberg. The foreign currency denominated bonds are marked with completely coloured circle markers, and the NZD denominated bonds are marked with hollow coloured circle markers.

Figure 1: Bonds issued by New Zealand issuers



Source: Bloomberg, CEG analysis

134. The two foreign currency bonds on this chart are issued by Chorus and Vector, both in British Pounds. The Chorus bond is rated BBB by S&P, and Baa3 (BBB- equivalent) by Moody's, and is labelled on the chart. The Vector bond is rated BBB by S&P since 18 December 2013. Prior to that, on the 26 November 2013, the bond was placed on negative ratings watch by S&P.[23]

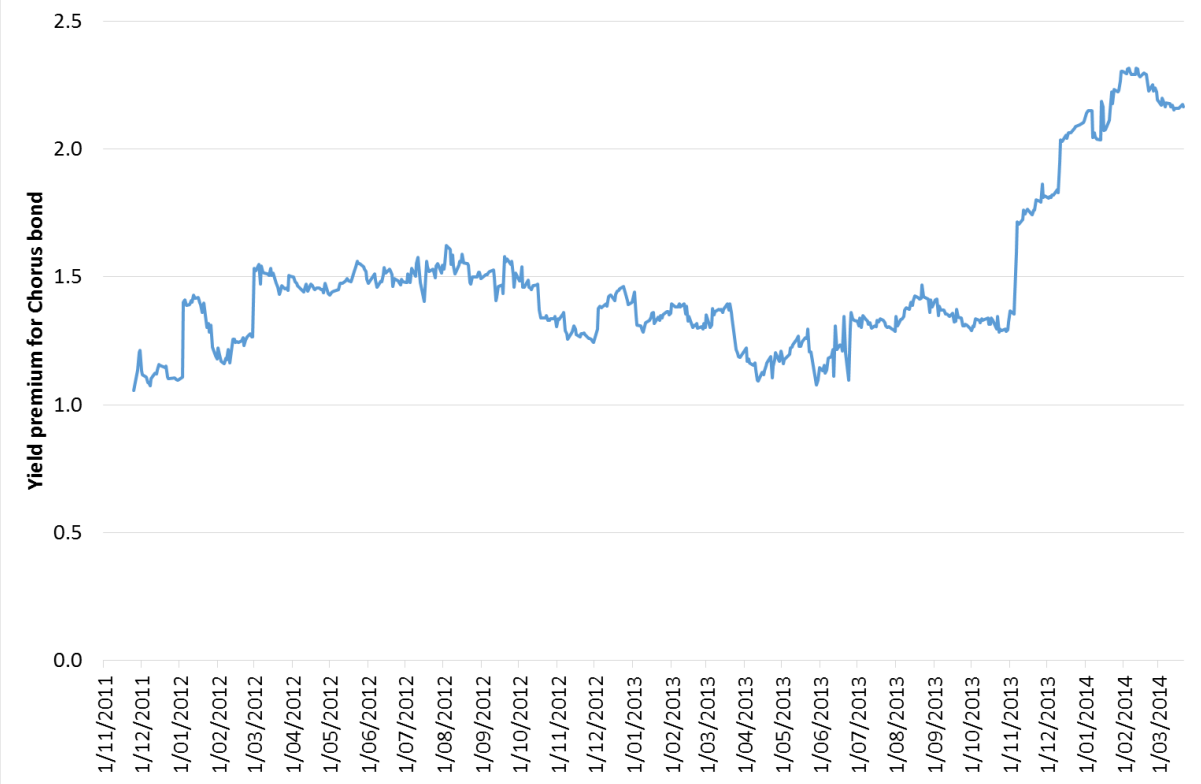
135. Both of these foreign currency bonds have a relatively higher yield than domestic currency bonds. This is, at least in part, the consequence of the regulatory risks faced by both Chorus and Vector.

[23] As I am using a composite credit rating and rounding down, consistent with Bloomberg, Chorus is marked as BBB- rated in the figure.

136. Figure 2 below shows the risk premium for Chorus' long term bond issued in British pounds against the benchmark rate for GPB BBB rated utility debt, interpolated to the same maturity as Chorus' issue (this risk premium is simply the GBP yield on the Chorus bond less the Bloomberg benchmark yield on BBB rated utilities).

137. Figure 2 shows a spike in Chorus' risk premium relative to the benchmark occurring immediately subsequent to the Commission's final decision on benchmarking the UBA price on 5 November 2013. Chorus' risk premium has increased further since that decision and remained elevated relative to the levels occurring prior to the decision.

Figure 2: Yield premium for Chorus bond against utilities benchmark



Source: Bloomberg, CEG analysis

138. To some extent this will reflect lower expected cash-flows from UCLL/UBA sales as a result of the decision. However, it is likely that the magnitude of this increase (around 1%) is explained by more than simply the immediate impact on expected cash-flows. After all, a final pricing principle is known to be in train limiting the period of time that the UBA decision will be in place for.

139. Rather, it is likely that debt investors have increased their perception of the general uncertainty attached to regulatory outcomes in New Zealand. Given that debt investors do not share in any upside associated with uncertainty their required yield

increases with regulatory uncertainty – even if that uncertainty is not 'biased' in the sense that unexpected bad outcomes are more likely than unexpected 'good' outcomes.

140. I note that it is also possible that investors in GBP denominated bonds may be particularly sensitive to this type of risk if they are less familiar or trusting of New Zealand regulatory institutions.

141. Similarly, Vector has been observed to face higher risk as a consequence of the New Zealand regulatory regime being perceived as less stable and higher risk than in other countries. Vector Chief Executive Simon MacKenzie said in relation to being placed on negative credit watch by S&P in November that S&P had made the following assessment[24]:

> *Their [S&P's] assessment is that the regime is less stable than other regimes internationally and they see it as higher risk.*

142. It has also been reported that an Australian fund manager was refusing to invest in locally regulated firms as a result of the UBA decision.[25]

143. If the IM approach is applied to Chorus, using the bonds in Figure 1, the most weight would be placed on the Chorus bond, as it is both in the fixed-line telecommunications industry and rated BBB-, and therefore fits into "category A" (see paragraph 131). No bonds would qualify for "category B" or "category C". Rather, all remaining bonds would qualify for "category D" and "category E". If we interpret the IM hierarchy as describing material reductions in weight as one moves down the hierarchy then a significant amount of weight would need to be given to the Chorus bond and little weight to any other bond. This would result in a high DRP relative to the majority of bonds on the sample. Of course, this would not necessarily be inappropriate if it is the case that the reason that the Chorus bond has a high DRP is that it, as the UCLL/UBA provider, faces a high level of regulatory risk.

144. Alternatively, it may be that the IM hierarchy does not, in reality, require materially less weight be given to bonds in category D and E relative to category A. In which case, it would be valuable to obtain a robust and transparent estimate of the average cost of debt associated with all of the observations. In this case, to obtain an estimate of the average cost of debt across the whole sample of bonds but adjusted to the relevant maturity (in the EDB/GPB IMs this is 5 years). This estimate could then be used as a "baseline" from which qualitative adjustments would be made, giving additional weights to more comparable bonds.

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24 Vector website, *Revised global ratings criteria and methodology impacts Vector*, accessed 26 March 2014.

25 http://www.nbr.co.nz/article/vector-negative-credit-watch-s-and-p-gets-dark-nz-regulatory-regime-bd-149193

145. One way to give all bonds equal weight is to use a curve fitting methodology, that is, to fit a curve through all the DRP observations in a specified sample of bonds. The outcome of using curve fitting methodologies on the sample of BBB- to BBB+ bonds identified above is presented in the following section.

4.4 Using a curve fitting approach to inform the estimate

146. Two potential methodologies for fitting a curve through the observations include an approach established by the Reserve Bank of Australia (RBA) and the Nelson Siegel approach.

147. The RBA approach was developed to estimate aggregate credit spreads of Australian non-financial issuers across maturities from 1 to 10 years. The RBA itself describes its methodology as simple, transparent and relatively robust in small samples. The methodology involves using weights determined by a Gaussian kernel which assigns a weight to every observation depending on the distance of the observation's residual maturity and the target tenor according to a Gaussian (normal) distribution centred at the target tenor. Notably, the RBA included foreign currency bonds as well as Australian dollar bonds in its analysis (see paragraph 122).[26]

148. The Nelson-Siegel methodology provides a flexible function form that allows for a variety of shapes that one would expect a yield curve might take but which also limits the amount of computing power required to estimate the relevant parameters. Both of these approaches are described in more detail in 377.

149. Figure 3 shows a curve fitted using the RBA approach through BB to BBB+ bonds denominated in NZD, AUD, USD, EUR and GBP. At five years to maturity the DRP is 2.19%, and at 10 years to maturity the DRP is 1.90%. It can be seen that the yield curve is 'pulled up' by the Vector and Chorus bonds which have relatively higher DRP estimates at around 5 and 6 years maturity respectively. This is because the RBA method gives bonds most weight in its average yield estimate when the target tenor is close to the bonds actual tenor – and less when the target tenor is further away from the bonds actual tenor.

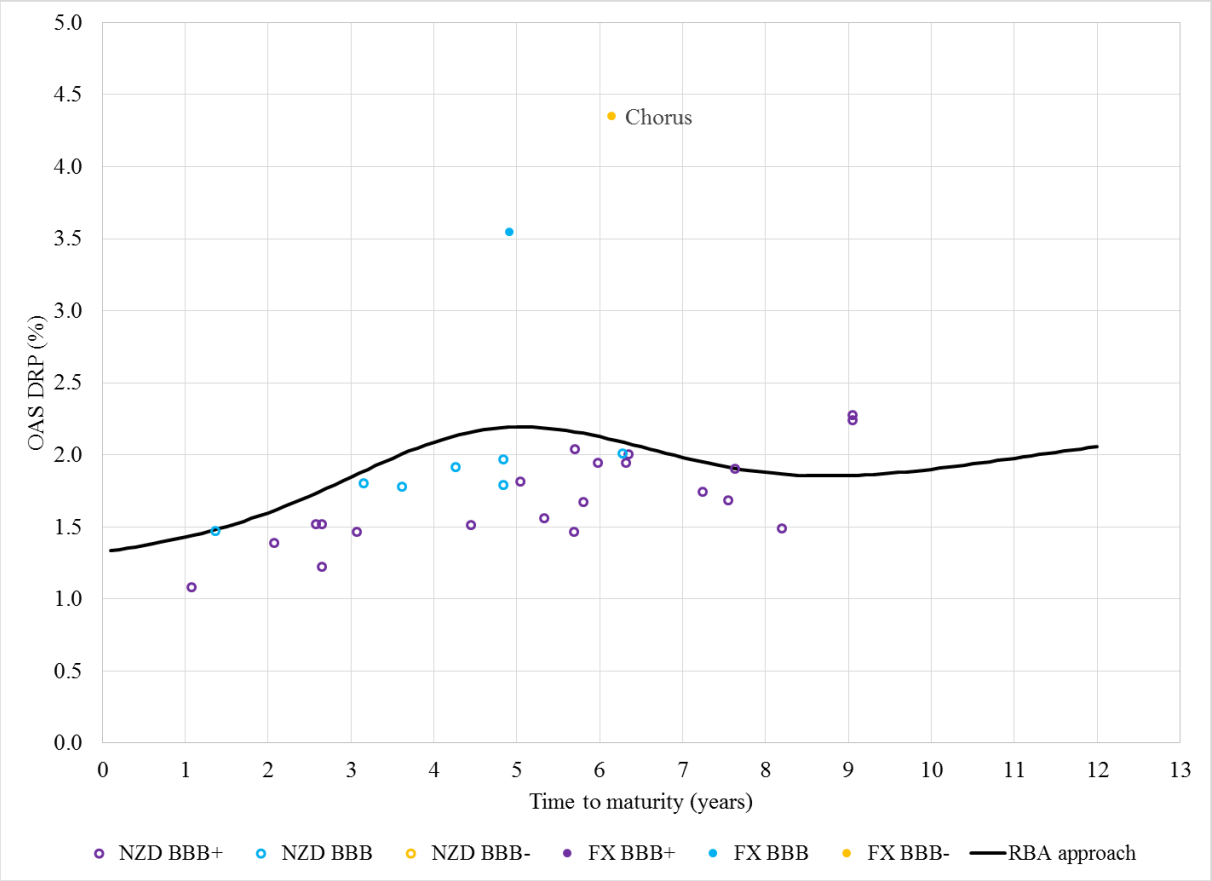
150. I note that these estimates are conservative as a proxy a BBB- rated UCLL/UBA provider. This is because even in that target tenor range, the average yield calculation is dominated by BBB and BBB+ bonds. There are no non-Chorus BBB- bonds (or lower rated bonds) currently on issue which meet the requirements of my sample, but there may be such bonds in the future.

151. Naturally, the RBA approach fails to give the bond issued by Chorus – which is a better proxy for the DRP faced by a BBB- UCLL/UBA provider in New Zealand than

[26] Reserve Bank of Australia, *New Measures of Australian Corporate Credit Spreads,* 2013. Available at http://www.rba.gov.au/publications/bulletin/2013/index.html

any other bond – more weight than other bonds. In this regard the RBA approach is unsatisfactory on its own. However, it does provide a potentially useful estimate of the average yield on similarly rated (BBB to BBB+) bonds from which a qualitative adjustment can be made to better reflect the risks faced by a UCLL/UBA provider.

Figure 3: RBA curve fitting on BBB- to BBB+ bonds

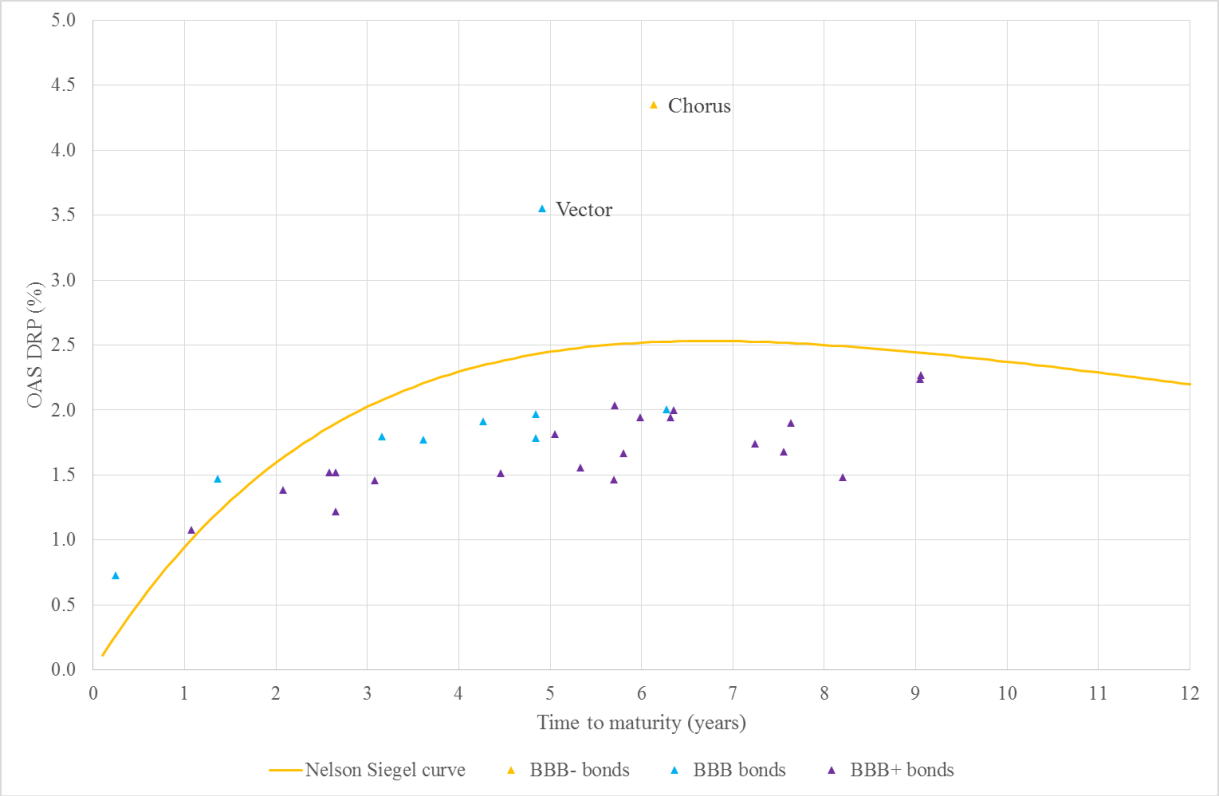


Source: Bloomberg, CEG analysis

152. An alternative to the RBA approach to curve fitting is to rely on a curve fitting approach developed by Nelson and Siegel.

153. Figure 4 shows Nelson Siegel fitted to BB to BBB+ bonds issued by companies incorporated in New Zealand in NZD, AUD, USD, EUR and GBP. Like the RBA approach, the Nelson-Siegel approach gives equal weight to all bonds rather than giving additional weight to the bond issued by Chorus itself. At five years to maturity the DRP is 2.45%, and at 10 years to maturity the DRP is 2.37%.

Figure 4: Nelson-Siegel curve fitting on BB to BBB+ bonds



Source: Bloomberg, CEG analysis

4.5 Determining a DRP estimate for Chorus

154. In this section I have proposed a necessary departure from the IMs so that they are fit for purpose in estimating the cost of debt allowance for Chorus as the UCLL/UBA provider. My proposal involves widening the sample of data that is analysed when estimating the cost of debt to include bonds issued by New Zealand corporations into foreign currencies and to include bonds that do not have credit ratings (assigning these bonds the same credit rating as their issuer or the ultimate parent company (if the issuer is a wholly owned subsidiary)).

155. The alternative methods for estimating DRP canvassed in this section include using the IM approach or a curve fitting approach such as the RBA or Nelson Siegel methodology. In relation to the curve fitting methodologies, I suggest using the estimated DRP as a "baseline" from which qualitative adjustments can be made.

156. Qualitative adjustments may be necessary because curve fitting methodologies such as those applied in this chapter give equal weight to all bonds, whereas it may be desirable to give additional weight to more comparable bonds. The most comparable bond is the bond issued by Chorus itself. Alternative outcomes of different weighting approaches (or combinations of approaches) are presented in

the following table. AS already stated, I do not attempt to arrive at estimate for the DRP in this report. Rather, I present the below calculations (and the preceding analysis) in an attempt to inform the Commission's own analysis.

Table 8: Potential DRP estimates for Chorus

Measure	5 years	10 years
IM approach	3-4%	N/A
Chorus bond	4.35% (6.14 years)	
RBA approach	2.19%	1.90%
Nelson-Siegel approach	2.45%	2.37%
25/75 RBA approach/Chorus bond	3.81%	
50/50 RBA approach/Chorus bond	3.27%	
75/75 RBA approach/Chorus bond	2.73%	
25/75 Nelson Siegel approach/Chorus bond	3.88%	
50/50 Nelson Siegel approach/Chorus bond	3.40%	
75/25 Nelson Siegel approach/Chorus bond	2.93%	

Source: CEG analysis

4.6 Issuance costs and new issue premium

157. I note that any cost of debt allowance should also compensate for debt issuance costs and for the existence of any difference in interest rates in secondary markets versus for new issuance. In relation to the latter point, it is important to recognise that the yield estimates described in this report relate to the trading of debt in secondary markets. A new issue of debt can be expected to have a higher yield if, for no other reason, than the fact that the volumes being sold are larger (on a secondary market subsets of the total amount of bonds on issue can be traded while at the time of first issuance the entirety of the issuance must be sold).

158. I have not had time to attempt to quantify these amounts in this report.

5 Defining an efficient debt management strategy to be costed

5.1 Overview

159. This section proposes that the Commission should calculate the cost of debt based on a well-defined efficient benchmark debt management strategy. I argue that this narrows down the calculation of the cost of debt allowance to one of two high level options:

- The prevailing swap rate with a term equal to length of the regulatory period plus a historical average DRP – measured over the last "N" years where "N" is the benchmark efficient term of debt issuance; or
- A historical average of the cost of fixed rate debt with term "N" measured over the last "N" years.

160. The rationale for this proposal is that efficiency is maximised, and end users interests are served, by a regulatory regime that minimises risks. In order to achieve this, the cost of debt allowance should be set in a manner such that an efficiently operated regulated business can align its cost of debt with the allowance that the regulator will provide. Equivalently, the regulator should set the cost of debt allowance based on a clear and well defined 'benchmark efficient' debt management strategy – a strategy which a regulated business can, if it so chooses, implement.

161. I also consider that, if there are multiple debt management strategies that satisfy the above criteria (i.e., that a business could actually implement) then the Commission should select the benchmark debt management strategy as the strategy that minimises transaction costs (broadly defined) – including minimisation of volatility in prices faced by customers/end users.

162. Both of the calculations set options set out above are associated with a well-defined and potentially implementable debt management. However, the second option (a simple trailing average) is to be preferred because it delivers more stable prices and lower transaction costs generally.

163. I do not consider that the current approach in the IMs to setting the cost of debt promotes efficiency and the long term benefit of end users. The current calculation of the cost of debt does not flow from a well-defined debt management strategy and, therefore, cannot be hedged by regulated businesses. The effect of this is that unnecessary risk is injected into their operating environment. Moreover, this approach gives rise to unnecessary volatility in prices faced by customers and end users.

164. I note that neither of these proposals, nor the reasoning and regulatory precedent presented in this section, were before the High Court in its recent assessment of recent appeals under s 52Z of input methodology determinations of the Commerce Commission.

5.2 Why an efficient debt management strategy must be defined

165. In the context of setting the allowed cost of debt, I consider that a regulator should:

- Define a benchmark efficient debt financing strategy which it assumes a efficient regulated service provider would adopt;
- Estimate the costs of efficiently implementing that strategy; and
- Provide an allowance for the cost of debt that is commensurate with this estimated cost.

166. In my view, the definition of a benchmark efficient financing strategy must be such that it would be efficient for a service provider to undertake that strategy. This does not necessarily mean that a specific regulated entity must actually, or even potentially be able to, implement that strategy. However, it must be conceivable that this strategy would be efficient for a benchmark entity.[27]

167. By way of example, if it is not possible to issue 100 year debt, or it is known to be prohibitively expensive to attempt to do so, then issuing 100 year debt should not be included in the definition of a benchmark efficient debt financing strategy. To do so would be to attempt to arrive at a cost estimate that is associated with doing something that is impossible/inefficient. Similarly, if it is known to be impossible or prohibitively expensive to refinance 100% of a debt portfolio over a narrow window in time then this strategy should not form part of the definition of benchmark efficient debt financing strategy.

5.2.1 What does 'efficient' mean?

168. When I use the term "benchmark efficient debt management strategy" I use the term "efficient" in order to specify that the benchmark financing strategy should give rise to the lowest *expected* finance costs (i.e., the lowest *expected* WACC).

169. In this context it is important to make two observations. First, it is the weighted average rate of return on debt *and* equity that efficiency requires is minimised. Thus, a financing strategy that results in the lowest expected cost of debt need not

[27] This distinction might be important if, for example, the actual service provider was of too small a scale to access wholesale debt markets and if the regulator took the view that the actual service provider was smaller than the minimum efficient scale.

be efficient if undertaking that strategy raises the cost of equity by a more than offsetting amount.[28]

170. Second, financing strategies are designed without perfect knowledge of the future. This means that different financing strategies will give rise to different costs in different market circumstances. When I define an efficient financing strategy as one that gives rise to the lowest *expected* finance costs, I do not mean that it always gives rise to the lowest actual financing costs. Rather, I mean that it is a finance strategy that prudently takes into account future uncertainties and seeks to minimise the (actuarially weighted) expected financing costs under all possible future states of the world.

171. By way of illustration, a generally upward sloping yield curve for corporate debt suggests that issuing very short term debt (e.g., 3 month debt) might minimise interest costs in most circumstances (i.e., this strategy might be "most likely" to achieve cost minimisation given the range of future possible states of the world).[29]

172. However, this strategy would involve refinancing 100% of debt every 3 months. Any future disruption to financial markets could have potentially disastrous consequences for an entity's debt and equity investors if the firm finds itself unable to refinance its debt.[30] Consequently, even if there is only a small probability of this occurring, the actuarially expected costs of financing solely with 3 month debt might be higher than the actuarially expected costs of funding using long term debt. Thus, even though short term funding might be 'most likely' to achieve cost minimisation,

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28 That is, if undertaking that strategy results in a higher weighted average rate of return on debt *and* equity.

29 This is actually a doubtful proposition. The corporate yield curve is generally upward sloping at least in part because short term debt issued by a corporation is less risky than long term debt because it matures first. Consequently, a short term lender is less worried about default because they know the business has locked in funding from other debt providers that it does not need to repay in the short term. If all debt is short term debt then this advantage disappears – and we would expect the cost of short term debt to rise. For a recent discussion of this type of dynamic see Brunnermeier, M. K. and Oehmke, M. (2013), The Maturity Rat Race. The Journal of Finance, 68: 483–521.

30 For example, debt investors suffer default and equity investors have their rights usurped by debt investors in bankruptcy proceedings. In the process, part of the intrinsic value of the firm is destroyed due to constraints on its ability operate without funds and in the midst of legal disputes between stakeholders. As discussed in section 5.3 and Appendix A, the avoidance of exposure to these types of bankruptcy costs are precisely why firms do not adopt aggressive financing strategies (e.g., a highly geared short term debt portfolio). The academic recognition of the importance of bankruptcy costs in explaining firm financing strategies can be traced back to Baxter (1967) (Baxter N. (1967) "Leverage, Risk of Ruin and the Cost of Capital," Journal of Finance 22, September 1967, pp. 3956-403) who was himself writing in response the publication by Modigliani and Miller (1958) demonstrating that in the absence of such transaction costs, all financing strategies would be equally efficient (Modigliani, F.; Miller, M. (1958). "The Cost of Capital, Corporation Finance and the Theory of Investment". American Economic Review 48 (3): 261–297).

it still has a higher actuarially expected costs than long term debt funding because it magnifies exposure to low probability but high cost events/risks.

5.2.2 No reasonable alternative to defining a debt management strategy

173. In my view there is no reasonable alternative to the approach set out above for setting the cost of debt allowance. Any departure from this approach that is carried out in an internally consistent manner must set an allowance that is higher than the efficient costs of financing. That is, if the regulator defines a less than efficient debt management strategy and sets the WACC commensurate with this then, by definition, that allowance will be expected to be higher than that associated with an efficient debt management strategy.

174. Alternatively, a regulator might simply arrive at a cost of debt estimate that is not based on any well-defined debt management strategy (efficient or otherwise). However, such an estimate will, by definition, be arbitrary. Because such an estimate is not based on the costs of a well-defined debt management strategy, a regulated entity will not be able to align their own strategy and costs to the allowance.

175. An inability to align costs to the regulatory benchmark injects unnecessary risk into the provision of regulated services (and ultimately leads to higher prices or reduced investment incentives or both). This is true even if, over the long run, there is no bias in the cost of debt allowance set by the regulator. That is, even if the allowance set by the regulator is not *a priori* expected to be higher or lower than the efficient costs of a service provider. Of course, a cost of debt allowance not based on a well-defined debt management strategy may well be biased also (i.e., expected to over or under compensate relative to efficient costs in the long run).

5.2.2.1 An illustrative example

176. The concepts being considered here can usefully be illustrated by an example. Consider a scenario where, for simplicity, there are only two possible debt management strategies. A business can maintain a portfolio of either:

- 4 year debt issued evenly over the last 4 years; or
- 8 year debt issued evenly over the last 8 years.

177. For simplicity, assume that both approaches are equally efficient (in that both approaches lead to the same *expected* cost of debt and WACC). Also assume that no interest rate swaps are used to alter the underlying duration of the portfolio. However, once embarked on, it is not possible to switch between the strategies (at

least not without incurring costs and/or undergoing a transition period).[31] In this simple scenario, the interest expense furan efficient service provider will be either:

- The historical average cost of issuing 4 year debt measured over the last 4 years; or
- The historical average cost of issuing 8 year debt measured over the last 8 years.

178. While, by assumption, these are equally efficient in an expected sense, they may give rise to different costs of debt in an *ex ante* sense. For example, if interest rates have been higher in the last 4 years than they were in the preceding 4 years then the short term strategy is likely to have higher interest costs (and *vice versa*).

179. Now consider three different regulatory policies for setting the cost of debt allowance:

    i. The regulator sets the cost of debt based on one strategy and maintains that policy indefinitely (or only ever communicates a departure from that strategy in advance and provides transition arrangements should they be needed);

    ii. The regulator randomly decides (e.g., by the flip of a coin) which strategy the cost of debt allowance will be based on at the time of each decision;

    iii. The regulator sets the cost of debt allowance based on whichever strategy delivers the:

    b. lowest cost of debt at the time of the decision; or

    c. highest cost of debt at the time of the decision.

180. The first policy sets the cost of debt based on a well-defined debt management strategy and, in so doing, provides the service provider with the ability to manage their actual debt costs to be commensurate with the regulatory allowance.

181. The second policy provides an unbiased estimate of the efficient cost of debt in the sense that committing to this policy is not expected to under or over compensate the

[31] For example, if a business has issued long term debt it cannot convert that long term debt into short term debt overnight – it must wait many years until its existing debt portfolio has matured (or attempt to buy back its long term debt on the secondary market – where it would incur transaction costs and could not be guaranteed of paying the same amount for the bonds as the amount it originally borrowed (i.e.., secondary market value need not equal the face value of the bonds (e.g., if interest rates or company specific risk perceptions had changed)). Even if they did this, they would still be unable to go back in time and issue short term debt at historical short term interest rates. Similarly, a short term issuer cannot go back in time and issue long term debt in order to give it instantly give it the same interest expense of a firm that was following the long term issuance strategy.

efficient cost of debt in the long run.[32] However, it will make it impossible for the service provider to align its own cost of debt to the regulatory allowance (recalling that once embarked on, it is not possible to convert one strategy into the other strategy (at least not without a long transition)).

182. This will create risk for the service provider that could otherwise be avoided (i.e., would be avoided under policy i). This risk will translate into a higher cost of debt (and possibly equity) for the service provider. If this is compensated it will lead to higher prices for end users. If it is not compensated it will lead to reduced investment incentives.

183. The third policy results in both a biased allowance and an allowance that a business cannot hedge to (align their costs with). Under policy iiia) the business can only ever expect to 'break even' and half the time can expect to be undercompensated. Moreover, there is uncertainty in the magnitude of any under-compensation creating risk. Obviously, policy iiib) also has uncertainty but, because this uncertainty relates solely to the potential for overcompensation it is 'risk' that a service provider would happily absorb.

5.3 Observed practice and efficiency

5.3.1 The Modigliani Miller Theorem

184. The cornerstone of modern finance theory on the optimal capital structure for a firm (including the optimal debt management policy) is the work of Modigliani and Miller (1958).[33] This section summarises their key findings and the implications for defining an efficient debt management strategy. More detailed discussion is provided in Appendix A.

185. The first principal insight of Modigliani and Miller (1958) is that the level of risk in a firm is rather like the amount of air in a balloon. Squeezing one end of a balloon does not reduce the amount of air that is inside – it just shifts it to "the other end". Modigliani and Miller demonstrated is that if financial markets are efficient and there are no transaction costs, any reduction in the cost of debt by following a particular strategy (e.g., issuing shorter term debt) will be perfectly offset by a higher cost of equity. A firm's capital structure therefore has no effect on its weighted average cost of capital (WACC). This "law of the conservation of risk" is comparable to the "law of conservation of energy" from the physical sciences. Like

[32] Recall that we have assumed that both approaches have the same *expected* cost of debt. Consequently, randomly switching between these will not cause the expected regulatory allowance to deviate from the expected cost of debt.

[33] Modigliani, F.; Miller, M. (1958)."The Cost of Capital, Corporation Finance and the Theory of Investment". American Economic Review 48 (3): 261–297.

energy, risk cannot be destroyed – it can only be converted from one form to another.

186. The second principal insight of Modigliani and Miller (1958) is that the above is not true in a world of transaction costs (defined broadly to include costs associated with dealing/trading in imperfect markets and, in particular, the costs of insolvency and bankruptcy). Modigliani and Miller demonstrated that it is the minimisation of transaction costs that defines an efficient debt management strategy.

187. Given the finding that, in frictionless financial markets, a business's capital structure simply does not matter then, if capital markets were frictionless, one would expect that firms with very similar attributes (products, competitors, cost structures and so on) would exhibit a great variety of capital structures. For example, some may have short term debt, others long term debt; some may have high gearing and others low gearing, and so on. There would be no 'common' strategy because, in the absence of frictions, there is no advantage from adopting any particular practice.

188. In actuality, businesses with similar attributes will often consistently adopt the same (or similar) debt raising strategies. The insight of Modigliani Miller is that consistently observed debt management strategies must be explained by a desire to minimise transaction costs (broadly defined) associated with less than perfect markets. That is, once one relaxes the assumption that capital markets are efficient, theory suggests that businesses (or subsets of businesses) will often adopt debt raising strategies that are designed to minimise exposure to those imperfections with a view to reducing transaction costs. Common strategies may therefore start to emerge.

189. The key implication of this for regulatory practice is that the regulator should, as far as possible, base its definition of the efficient debt management strategy on the debt management strategy actually undertaken by service providers of the type it is regulating. This is because the observed debt management strategies will reflect the rational response of regulated businesses to the capital market imperfections that they face. To the extent that the observed practice of similar businesses follows a consistent pattern then the regulator should adopt that practice as a component of its efficient debt management strategy. The regulator should not, without very good reason, depart from observed practice when defining a benchmark efficient debt management strategy.

5.3.2 Components of a debt management strategy

190. Key aspects of a debt management policy include the following:

    i. The term of debt issuance and the spread of the maturity profile for existing debt; and

ii. The use of derivative products, such as interest rate swaps, to alter the characteristics of the debt portfolio described by i) and ii) above.

191. I describe observed practice in relation to each of these and discuss the possible market frictions that might explain observed practice.

5.3.3 The spread of maturity profile

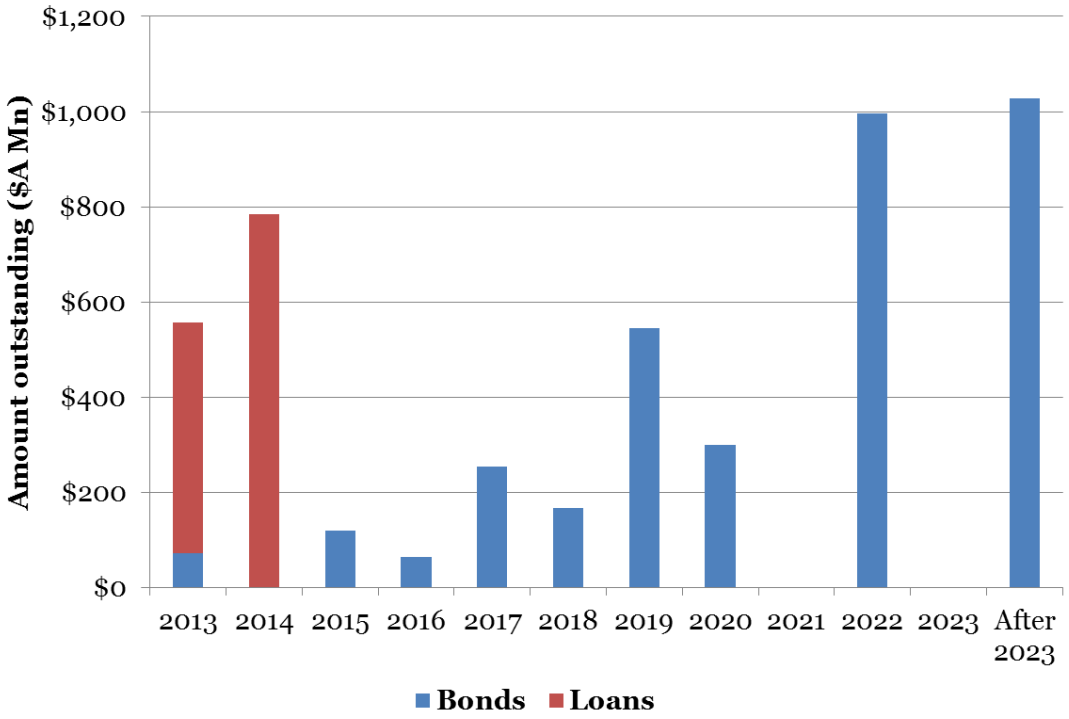
5.3.3.1 What is observed practice

192. Fixed line broadband services are provided using long lived infrastructure assets. The standard, if not universal, practice amongst businesses is to maintain a spread of maturities for its debts so that only a limited proportion of the debt portfolio must be refinanced in any given period. Put simply, businesses engaged in a staggered issuance of debt in order to maintain a staggered maturity profile for debt.

193. In a recent report for the Australian Energy Networks Association (ENA) I surveyed this practice for Australian regulated energy businesses.[34] I reproduce Figure 10 from that report below which shows the spread of debt maturity for APA Group – although the same sort of spread is observed for all businesses.

34 CEG, *Debt strategies of utility businesses*, June 2013. Available at http://www.aer.gov.au/node/18859

Figure 5: Current debt portfolio of APA Group



Source: Bloomberg, CEG analysis

194. I am instructed that Chorus' treasury policy, consistent with standard business practice, clearly states that the target maturity profile will extend out from 10 to 15 years. That is, the maturity profile for Chorus' debt should spread out to 10-15 years into the future. Specifically, the treasury policy states:

> *Term debt maturities are to be distributed over a 10 year horizon*
>
> *The maturity horizon may be lengthened to 15 years.*
>
> *The maximum amount of term debt to mature in any calendar year will not exceed 30% of gross debt (measured at the time of new debt issuance).*

195. In my view, no company with a material debt portfolio would ever deliberately structure their debt portfolio in such a manner that would require all debt to be refinanced at the same time in preference to an arrangement that involves a staggered debt maturity profile. This includes regulated businesses who have regular revenue resets (such as the Australian energy businesses who's practices I reviewed in the paper discussed above - all of whom have staggered debt portfolios). I am unaware of any company with a material debt portfolio that does not have a staggered maturity profile.

5.3.3.2 What might explain observed practice?

196. The universal practice of maintaining a staggered debt portfolio is strong evidence that this practice is efficient. That is, this practice tends to lower the overall risk adjusted finance costs of a regulated energy business. If this was not the case then we would not observe such a tendency in the data.

197. Moreover, the fact that we do observe this strong tendency in the data means that having to refinance a significant portion of the debt portfolio in a narrow window of time must raise risk adjusted finance costs by exposing the firm to higher levels of some transaction cost (market imperfections). The obvious candidate for this transaction cost is refinance risk and, ultimately, exposure to the costs of insolvency and bankruptcy costs. These are discussed in more detail in Appendix A.

198. A firm that is able to spread out its maturity profile can limit the proportion of its debt portfolio it needs to refinance in any given period. For example, a firm that has a debt portfolio made up of 7 year debt that has been evenly issued through time will have only 14% of its debt falling due in any 12 month period.

199. The impact of a future disruption to financial markets has the potential to destroy a business that must refinance all of its debt at that time. While a firm that has a staggered debt portfolio may also be impacted the potential negative consequences can be limited by only having to refinance a limited amount of debt (which might be able to be done through equity markets or dividend reductions if the yield required by debt providers is prohibitive).

200. However, the larger the debt that needs to be refinanced the more strain that a business will face. This can have potentially more serious implications for a business than simply being forced to raise debt at elevated interest rates due to market disruptions. The very fact of refinancing at elevated rates will reduce the credit worthiness of the borrower (because their interest expense will rise if they refinance at elevated rates). This reduction in credit worthiness will further raise the interest rate that must be paid – especially if lenders view the raising of debt finance in those conditions as a signal of financial weakness. This creates the potential for a vicious circle and the denial of credit at interest rates other than those which threaten the insolvency of the borrower.

201. As discussed in more detail in Appendix A.4, insolvency or near insolvency imposes costs on a range of parties, including debt and equity investors. Depending on the nature of the contracts with debt holders, insolvency may also give rise to debt holders taking full or partial control of the company and, potentially, to bankruptcy proceedings. Protracted legal battles may ensue between debt and equity holders (and between different groups of debt/equity holders) over the future of the firm. This may paralyse management, with the principal focus being on the division of the existing value of the firm (and debt holders attempting to ensure the maximum repayment of their debts) rather than on maximising the total value of the firm

(including the equity stake). These costs can destroy the value of a firm that would, had it adopted a less aggressive capital management strategy, never have become insolvent in the first place.

202. Consistent with this Kanangra[35] has described the approach of credit rating agencies in the following terms:

> *Rating agencies do not stipulate the debt amount for the capital structure for an issuer. Neither do they counsel issuers on the most appropriate markets for raising debt, nor the term of the debt. However rating agencies are looking for issuers to be conservative in their approach to the debt markets.*
>
> *Factors which the rating agencies seek in highly rated users are:*
>
> - *A company with a spread of maturities to its debt, such that only a small proportion of its debt matures within each year;*
> - *Refinance of maturing debt within 6-9 months of its maturity. Early refinancing obviates the risk of the issuer not being able to refinance a tranche of debt if there is a market disturbance when the debt is maturing; and*
> - *Access to liquid funds.*
>
> *Neither rating agency has published rules concerning debt maturity or refinance. Neither are direct ratings drivers, but both contribute to a well-managed company and go towards stronger ratings.*
>
> *Liquidity is however a significant consideration for rating agencies. The rating agencies take the approach that a company cannot be investment grade without adequate liquidity. In order to be IG an issuer must not only satisfy the long term metrics but must also have acceptable liquidity. Both agencies measure liquidity by calculating the ratio of the assured cash sources over the next 12-24 months to the cash uses over the same time period. In each opinion each agency has a section on liquidity, in which it describes the sources and uses of cash for the next 12-18 months.*

203. Debt requiring refinance forms part of the denominator of this ratio. In a standard regulated business refinancing around 10% of their debt portfolio every year this ratio should be around 1.0. For example, I estimate a 0.89 ratio for Vector based on the Commission's 2010-15 financial model.[36] At this level the business still needs to

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35 Kanangra, Credit Ratings for Regulated Energy Network Services Businesses, p. 26. Available at http://www.aer.gov.au/node/18859

36 Calculated as average revenues divided by "opex plus capex plus interest costs plus 10% refinance of its debt portfolio (which is assumed to be 44% of the total value of the regulated asset base)". However, if

access capital markets to fulfil its cash needs but the required access is limited to around 12% (1/0.89-1) of revenues. However, if 100% of debt must be refinanced in a given year this ratio drops to 0.28. This means that the firm must access capital market to obtain more than 250% of their annual revenues (1/0.28-1).

204. Put simply, this liquidity ratio is very sensitive to the amount of debt that must be refinanced in the relevant period. It is the attempt to manage this type of metric that businesses engage in staggered debt issuance and maturity.

5.3.4 The term of debt issuance and spread of maturity

5.3.4.1 What is observed practice

205. Fixed line broadband services are provided using long lived infrastructure assets. There is a very pronounced tendency for fixed line service providers and long lived infrastructure operators more generally to issue long term debt (on average around 10 years or more at the time of issuance). The table below provides a summary of the average term at issuance for the same sample of 27 fixed line telecommunication companies used to estimate the asset beta in section 2 above. I note that the numbers in this table are based on the assumption that all bank debt is fully drawn. This is generally not true and, because bank debt tends to be short term debt, this tends to bias down the estimated tenor relative to the true weighted average tenor.

100% of debt had to be refinanced in a given year then this ratio would fall to below 0.3. This means that cash-revenues only cover less than 30% of cash-requirements – with the business relying on access to capital markets to fulfil the other more than 70% of cash requirements.

Table 9: Estimated weighted average tenor of debt at issuance

Firm	Average tenor	Firm	Average tenor
AT&T	20.9	Portugal Telecom	8.0
Belgacom	9.8	Swisscom	7.0
BT Group	16.4	TDC	7.1
Centurylink	19.2	Telecom New Zealand	8.4
Cincinnati Bell	10.8	Telecom Italia	12.4
Cogent Communications	12.8	Telefonica	7.2
Colt Group		Telekom Austria	8.3
Deutsche Telekom	8.7	Telenor	7.6
Elisa OYJ	7.0	Teliasonera	11.4
Frontier	12.1	Telstra	9.9
Hellenic Telecom	6.6	TW Telecom	8.9
Iliad	5.8	Verizon	15.1
KPN	14.8	Windstream	8.6
Orange	14.3		
Simple average		**10.7**	

Source: Bloomberg, CEG analysis

206. The average term of debt for these businesses is clearly around 10 years. Chorus, not included in the above table, has a weighted average term of debt of 5.9 years. It is notable that Chorus as a shorter term of debt at issuance than all but one of the firs in the sample. However, the Chorus' debt portfolio largely reflects the results of the debt split between Telecom and Chorus at demerger and cannot be assumed to be an equilibrium observation. Indeed, Chorus' treasury policy quoted from above clearly states that the debt management strategy is to maintain a maturity horizon of between 10 and 15 years (consistent with a an average term of debt issuance of between 10 and 15 years).[37]

207. The same pattern is observed for other industries. In a recent report for the Australian ENA I estimated the following average maturity of debt for different industries in different countries.

[37] In order to have a maturity profile of 10 years a business must have recently issued a 10 year bond. In order to maintain such a profile overtime a business must regularly issue 10 year bonds.

Table 10: Weighted average debt term at issuance

Years (# businesses)	AU	NZ	GB	US	Average
Electric Utilities	8.0 (2)	8.7 (3)	15.9 (2)	18.1 (31)	17.5 (38)
Gas Utilities	14.3 (2)	N/A	N/A	15.1 (22)	14.9 (24)
Multi Utilities	9.2 (3)	7.6 (1)	18.3 (2)	18.9 (21)	18.3 (27)
Water Utilities	N/A	N/A	22.5 (4)	21.5 (10)	22.2 (14)
Highways & Rail-tracks	13.1 (3)	N/A	N/A	N/A	13.1 (3)
Airport Services	11.9 (1)	6.5 (1)	N/A	6.2 (2)	10.5 (4)
Marine Ports & Services	N/A	6.4 (1)	N/A	N/A	6.4 (1)
Average	11.3 (11)	8.1 (6)	19.1 (8)	18.2 (86)	17.7 (111)

Source: Bloomberg, CEG analysis. Table is from CEG, Debt strategies of utility businesses, June 2013.

208. I have also recently been provided audited non-publicly available information sourced from Australian ENA members. Based on these data I estimated a simple and weighted average term of debt at issuance of 10.9 years and 10.5 years respectively.[38] My letter to the AER detailing this analysis is provided in the separate attachment.

209. The same pattern of long term debt issuance is observed for US and UK regulated energy businesses.[39] In the context of a report for the ENA, I estimated a weighted average term of debt at issuance of 18.2 years across a sample of 86 regulated US energy businesses. The weighted average term to maturity at issuance for the businesses within the sample with the highest proportion of regulated assets is even higher, at 19.4 years. In the same report, I demonstrated that the weighted average term of debt at issuance for UK regulated energy businesses is 19.1 years.[40]

5.3.4.2 What might explain observed practice?

210. The explanation for why businesses issue long-term debt is likely the same as why businesses issue staggered debt. Specifically, the degree to which a business can stagger its debt portfolio depends on the maturity at which it issues its debt.

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38 The AER, relying on the same data presented by me, adopts an estimate of 8.7 year term at issuance – although this is achieved by including the wholly Singapore Government owned business SPIAA and treating callable debt 'as if' it matures at the first call date. See AER, Explanatory Statement to the Rate of Return Guidelines, p. 142.) For the reasons outlined in my letter, I do not consider that these are appropriate adjustments to make when estimating the benchmark term of debt issuance for a benchmark efficient entity. In any event, the AER adopts a 10 year term as the relevant benchmark.

39 CEG, *Debt strategies of utility businesses, A report for the ENA*, p.31. Available at http://www.aer.gov.au/node/18859

40 CEG, *Debt strategies of utility businesses, A report for the ENA*, p.30. Available at http://www.aer.gov.au/node/18859

211. For example, if the business only ever issues 2 year debt then, even if it perfectly evenly spaces the maturity of that debt then it will still have 50% of its debt portfolio maturing in any 12 month period. In order to reduce the amount of debt being refinanced in a 12 month period the business must issue longer term debt. Issuing 5 year debt will, if perfectly spaced, ensure that no more than 20% of debt falls due in a 12 month period. Issuing 10 year debt will, if perfectly spaced, ensure that no more than 10% of debt falls due in a 12 month period and so on.

212. Of course, it is unlikely that perfect spacing of debt issuance will be possible. This is because debt issuance will commonly be "lumpy" to reflect lumpy capital expenditure programs, economies of scale in debt issuance and responses to variability in capital markets. Given this, even if all debt issued is 5 year (10 year) debt then in some years more than 20% (10%) of debt will fall due.

213. The near universal practice of regulated infrastructure issuing long term debt of around 10 years maturity or more suggests that this is required to maintain an efficient staggering of debt maturity. That is, this practice would appear to lower the overall risk adjusted finance costs of a regulated energy business. If this was not the case then we would not expect to observe such a tendency in the data.

214. Moreover, the fact that we do observe this strong tendency in the data means that issuing short term debt must be expected to raise risk adjusted finance costs by exposing the firm to higher levels of some transaction cost (market imperfection). The obvious candidate for this transaction cost is refinance risk and, ultimately, exposure to the costs of insolvency and bankruptcy costs. These are discussed in more detail in Appendix A.

215. It is also relevant that issuing long term debt can, if that debt is fixed rate, have the effect of locking in interest rates – thereby limiting exposure to the risk that rising interest rates will be a drain on cash-flows. However, as discussed in the following section, there are derivative products (interest rate swaps) that can perform a similar function in relation to movements in the base rate of interest (interest rate swaps cannot be used to manage variation in the DRP component of interest rates face by a firm).

5.3.5 The use of derivative products

5.3.5.1 What is observed practice

216. Interest rate swaps are commonly used by large firms to synthetically smooth their maturity profile and, thereby, limit their exposure to interest rate risk. Similarly, cross currency swaps and interest rate swaps are used in combination to hedge businesses exposure to exchange rate variation when issuing debt (or earning revenues) in foreign currency.

217. By way of example, page 38 of Chorus' 2013 annual report states:

> *Chorus has interest rate risk arising from the cross currency interest rate swap converting the foreign debt into a floating rate New Zealand dollar obligation and the floating rate on the drawn down portion of the syndicated bank facility. Chorus aims to reduce the uncertainty of changes in interest rates by entering into interest rate swaps to fix the effective interest rate to minimise the cost of net debt and manage the impact of interest rate volatility on earnings. The interest risk on the cross currency interest rate swaps has been hedged using interest rate swaps. The interest rate exposure on the syndicated banking facility has been hedged up to $565 million with the remaining paying floating interest.*

5.3.5.2 What might explain observed practice?

218. Businesses can use derivative products to manage their base interest rate risks. For example, a firm that has floating rate bank debt might use interest rate swaps to convert its exposure to floating (and potentially rising) interest rates into a fixed interest rate. This can avoid the potential for rising interest rates to create cash-flow problems for the firm – up to and including raising the potential for insolvency.

219. Alternatively, a firm might find that it has been unable to maintain an even debt issuance program in the past (e.g., due to large and lumpy capex or an inability to access debt markets for some periods). Such a firm may find itself with an uncomfortably large refinancing requirement in, say, 3 years' time. If base interest rates were to rise significantly between now and then the firm would find, if it took no action now, that it had to pay those higher interest rates on the debt when it was refinanced. Once more, this might create some degree of cash-flow problems for the firm – up to and including raising the potential for insolvency.

220. A firm in this situation could use interest rate swaps to manage that risk. For example, it could,for the same notional value of the debt falling due in 3 years,:

- enter into a 10 year interest rate swap where it paid the fixed leg and received the floating leg; and
- enter into a 3 year interest rate swap where it paid the floating leg and received the fixed leg.

221. The floating leg received on the first swap would pay for the floating leg owed on the second swap. The net effect would be that the firm:

- had to pay, over the next 3 years, the difference between today's 10 year fixed swap rate and today's 3 year fixed swap rate;
- had locked in paying today's 10 year swap rate over the subsequent 7 years but would be paid the prevailing floating interest rate over those 7 years.

222. Consequently, if interest rates rose materially between now and 3 years' time when the debt requires refinancing the firm would be protected against that because the structure of their swap portfolio would mean that they were receiving the higher interest rate from their swap counterparty but only paying a fixed rate based on today's lower interest rates. In this scenario, and many others like it, interest rate swaps can be used as a synthetic means to smoothing a lumpy debt portfolio's effective base rate of interest maturity structure.

5.3.5.3 Implications for the regulatory benchmark efficient debt financing strategy

223. While the use of interest rate swaps is common, this is because interest rate swaps are used to attempt to synthetically manage an interest rate risk in circumstances where the peculiarity of a firm's underlying debt issuance creates that exposure. That is, a firm that has managed to achieve an evenly spaced long term issuance of fixed rate debt is unlikely to need to use interest rate swaps to manage interest rate risk for the simple reason that its underlying portfolio has already limited exposure to this risk.

224. Put simply, if the regulator defined a benchmark debt management strategy that involved the issuance of evenly spaced long term debt there would be no need to assume an interest rate swap overlay to manage interest rate risk. The only role for including an interest rate swap overlay in regulator's definition of a benchmark efficient debt management strategy would be if the underlying debt portfolio was defined in such a way as to create interest rate risk (e.g., lumpy debt issuance) which then needed to be mitigated. In my view, a far simpler approach would be to simply define a benchmark debt issuance strategy that already mitigated interest rate risk.

225. I note that for a regulated business there is the potential for the regulator to create a special source of interest rate risk for the service provider. This will occur if regulated revenues are reset every X years based on prevailing X year interest rates at that time. This will cause fluctuations in revenues, and therefore cash-flows, such that falling interest rates reduce the revenue component of cash-flows (and *vice versa*). If a regulator chose to create this source of interest rate risk for a service provider then, contingent on the regulator choosing to create this risk, it may be in that service provider has an incentive to use interest rate swaps to provide a hedge against this.

226. That is, a firm faced with this risk may maintain a staggered portfolio of "X year debt" but enter into interest rate swaps such that the base rate of interest is reset at the beginning of every regulatory period. If the regulatory period is, say, 5 years, and a business does finance itself in this way then its cost of debt at the beginning of the regulatory period will be equal to:

- the prevailing 5 year fixed swap rate at that time; plus

- a historical average of the debt risk premium calculated over the previous "X years".[41].

5.4 Defining a benchmark debt management strategy consistent with observed practice

227. In my view, any benchmark efficient debt management strategy needs to be based on a staggered issuance of debt with a term at issuance of around 10 years. This is the observed practice of both New Zealand and foreign regulated infrastructure operators. Consistent with the Modigliani Miller theorem, it is appropriate to assume that the observed practice of regulated utilities staggering their debt maturity profile (and therefore their issuance requirements) is efficient. This fact means that the cost of debt on an efficient debt management portfolio will be a function not just (or even primarily) of prevailing interest rates but will be a function of historical average interest rates over the period the current debt portfolio was raised.

228. An important question then becomes whether a swap overlay should be assumed such that base interest rates are reset at the beginning of each regulatory period. Managing a debt portfolio in this manner may be an efficient response to a regulatory regime that assumes that this how a debt portfolio is managed. However, this is circular. The key question is whether a regulator should make this assumption in the first place. The fact that a benchmark entity could arrange its affairs to be consistent with the regulator's assumed debt management strategy is a necessary condition for that assumed debt management strategy to be efficient. However, it is not a sufficient condition.

229. I set out below five criteria that I consider a benchmark efficient debt management strategy should satisfy.

    i. It should be hedgeable/replicable in the sense that it is able to be implemented by the benchmark efficient entity – the strategy must be feasible for a business to implement.

    ii. Implementation of the strategy involves low transaction costs for the business – if there are two equally implementable debt raising strategies, the strategy that involves the lowest transaction costs (direct and indirect) should be preferred.

    iii. It minimises the prospect and consequences of estimation error – a business should be able to be confident that, if it manages to the benchmark strategy, its cost of debt will move with the ERA's estimate of costs.

[41] It should be noted that the debt risk premium in this case is measured relative to swap rates not government bond rates

iv. It gives rise to relatively low price volatility for customers. Customers are not well placed to hedge against the resulting volatility in network prices and especially do not want to be facing higher prices when they are facing broader budgetary pressures, e.g., due to a financial crisis.

v. The benchmark debt management strategy should reflect the standard practice of businesses operating in similar environments to network energy businesses.

5.4.1 Assessment of a 10 year trailing average (no swap overlay) against the criteria

230. I consider that setting a cost of debt allowance based on a 10 year trailing average of fixed interest rates on 10 year debt performs well against each of these criteria. This approach would result in a stable cost of debt allowance that was simple and low cost for a business to hedge to. The stability of a trailing average allowance would be in customers' and businesses' mutual interests.

231. Assessment against each criteria is discussed below.

i. It is hedgeable/implementable. In order to implement this benchmark all a business must do is engage in staggered issuance of 10 year debt so that it is refinancing around 10% of its portfolio each year.

ii. It is low transaction cost for the business. The business must simply issue staggered debt at a rate of about one 10th of their portfolio every year. Similarly, by spreading refinancing over 10 years this will prudently manage refinancing risk and minimise the associated transaction costs.

iii. The potential cost of estimation error is low. A business can be confident that, if it issues staggered 10 year debt its costs will move with the regulator's estimate of costs. An error in one period's estimate will not have a significant impact on the overall allowance. Only if the cost of debt was repeatedly misestimated, and in the same direction each time, would the benchmark estimate depart materially away from the actual market cost of debt associated with that benchmark.

iv. It gives rise to relatively low price volatility and does not result in higher prices when customer budgets are under stress. The gradual updating of a trailing average means that it is relatively stable. This stability has the effect of preventing cost of debt allowances materially contributing to network price increases at precisely the time that customers would most value lower prices (and vice-versa with respect to cost of debt reductions contributing to price reductions when these are less important to customers).

v. A 10 year trailing average is consistent with standard business practice. It is standard practice for infrastructure businesses to engage in staggered issuance of long term debt. Consistent with the reasoning in Appendix A, this suggests that this approach is likely to minimise transaction costs.

5.4.2 Assessment of imposing a swap overlay against the criteria

232. Imposing a swap overlay (to the effect that base interest rates are reset at the beginning of each regulatory period) will retain many of the characteristics of a simple staggered debt portfolio. As already described, under this approach the cost of debt would (assuming a 5 year regulatory period) be equal to:

- the prevailing 5 year fixed swap rate at that time; plus
- a historical average of the debt risk premium calculated over the period that the entity raised its existing debt instruments (say, 10 years).

233. I assess the impact of using this approach against the above 5 criteria.

i. It is hedgeable/implementable to the extent that the business in question has ready access to swap markets, the counterparties to the swap contracts do not default over the course of the contract and the regulator accurately estimates the cost of arranging and entering into the swap contracts.

ii. It is higher transaction cost for the business than a trailing average. The business must, in addition to arranging its staggered debt portfolio, arrange a swap portfolio that changes the interest rate properties of that portfolio fundamentally.

iii. The potential cost of estimation error will be raised to some degree because the relevant swap rates and transaction costs will be measured imperfectly.

iv. The volatility of debt costs and therefor prices would be increased materially – with 100% of the variation in prevailing interest rates at the beginning of each regulatory period being passed onto end customers. This compares with a simple trailing average where the cost of debt changes gradually as the trailing average updates gradually overtime. Not only does this make budgeting more difficult for end users, because this volatility is driven by the level of prevailing interest rates it would mean that broadband prices are strongly correlated with the level of stress on end user budgets. That is, when households are paying higher interest rates on their debt they will also be paying higher prices for their broadband services. Further, to the extent that other broadband suppliers do not have such volatile prices then customers may be encouraged to switch to those suppliers – creating a potential distortion to the retail market.

v. I am aware that there is some evidence of some Australian regulated energy infrastructure businesses, who until recently were subject to a regime that reset the cost of debt allowance every 5 years, using swaps to effectively reset the base interest rate on at least part of their debt portfolios at the same time. However, not all businesses pursued this strategy and there was broad support for the regulator moving to a trailing average so that the need for a swap overlay did not exist.

234. In my view, point iv) provides a powerful motivation for not including a swap overlay in the regulator's definition of a benchmark efficient debt management strategy. Even if interest rate swaps could be used to perfectly manage the risks for a business (i.e., even if criteria i, ii, iii and v) were met perfectly. Imposing a swap overlay creates volatility in prices faced by customers (and ultimately end users). There is ultimately no reason why customers should have to deal with such volatility and, in my experience, customers actively dislike such volatility.

235. In the recent review of how the rate of return for energy businesses is set in Australia, customer groups were strongly supportive of the adoption of a trailing average approach largely on the grounds that this would reduce volatility in prices relative to an approach that resets the cost of debt allowance based on prevailing interest rates at the beginning of each regulatory period. This is illustrated in the following quotes from submissions (all emphasise is added):

> Public Interest Advocacy Centre.[42]
>
> *Of particular concern is the current regulatory practice to assume (from a methodology point of view) that all debt for the 5-year determination period is raised over a short period of time close to the determination itself.*
>
> *This is highly problematic and is not supported by observation of private sector network reports.*
>
> *To the extent that a portfolio approach using historical averaging* ***provides more stability in the cost of debt****,* ***while not exposing networks to unhedgeable risks****, then this approach is to be preferred as consistent with the overall objectives.*
>
> Major Energy Users[43]
>
> *The recognition of the need for the return on equity component to be* ***less volatile*** *over time and the introduction of a trailing average approach to developing the allowance for the return on debt are welcome changes…*
>
> The Energy Users Association of Australia[44]
>
> *We support the AER's proposals on the use of a simple trailing average…*

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42 PIAC, *Reasonably rated: submission to the AER's Draft Rate of return Guideline*, 15 February 2013, p.25. Available at http://www.aer.gov.au/node/18859

43 MEU, Comments on the draft guideline, October 2013, p.3. Available at http://www.aer.gov.au/node/18859

44 EUAA, Letter to Warwick Anderson, dated 11 October 2013. Available at http://www.aer.gov.au/node/18859

Council of Small Business Australia[45]

> *COSBOA is supportive of the AER's proposed use of a simple trailing average approach to establishing the return on debt and of annual updating of this. We believe this is … a better representation of the actual debt financing practices of NSPs and other firms than the existing AER approach. We also note the AER's comment that it* ***would smooth movements in the return on debt over time and so price volatility, which we recognise is consistent with the long term interests of consumers, other things being equal.***

236. I draw particular attention to the first quote from the Public Interest Advocacy Centre. I regard this quote as an excellent summary of how a regulator should approach defining benchmark efficient debt management strategy.

237. The assessment against criteria iv) alone would, in my view, be sufficient to justify not imposing a swap overlay on the definition of the benchmark debt management strategy. However, imposing a swap overlay tends to worsen the assessment against criteria i), ii), iii) and v) also.

238. In this regard I note that I am aware that large businesses operating in Australia have argued that attempting to reset the entirety of their swap contracts at the beginning of the regulatory period would result in them creating significant pricing pressure – essentially straining swap markets in that period. Advice to this affect from UBS was provided to the AER on a confidential basis.[46]

239. This is consistent with the submission from the Australian Financial Markets Association to the AER that incorporating a swap overlay into the benchmark efficient debt management strategy would raise rather than lower the cost of debt.

> *AFMA submitted that due to recent international regulatory developments it considers that interest rate swaps are likely to increase the cost of debt rather than reduce the cost of debt.*[47]

240. In relation to points i, ii, and iii above I note that any swap contract involves contracting with a less than perfectly safe counterparty. Thus, these contracts are not perfectly guaranteed to alter interest rate exposure – especially if there is a systemic crisis in the financial sector. Also, consistent with the advice provided by

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45 COSBOA, Australian Energy Regulator – better regulation program, comments, October 2013. Available at http://www.aer.gov.au/node/18859

46 See Ausgrid, Transition Regulatory Proposal, January 2014, p. 21. Available at http://www.aer.gov.au/sites/default/files/Ausgrid%20-%20Transitional%20regulatory%20proposal%20-%2031%20January%202014.PDF

47 AER, *Explanatory Statement to the Rate of Return Guidelines*, p. 140. Available at http://www.aer.gov.au/node/18859

UBS, to the extent that swap markets are not perfectly liquid, this approach can be expected to give rise to transaction costs – especially if the size of the portfolio that needs to be "swapped" at the beginning of the regulatory period is large relative to the ordinary volumes of the interest rate swap market over that period.

241. In terms of measurement issues, it is relevant to note that swap contracts are bilaterally negotiated derivative contracts and are not exchange traded. It is, therefore, not possible to observe a traded price for swap rates. Rather, the swap rates quoted by the NZ Financial Markets Association (NZFMA) are based on the average of self-reported yields from a range of different contributors reflecting the fixed rates that they would be prepared trade at with a particular type of counterparty.[48] The resulting published rate is not necessarily the rate at which any contracts have been negotiated that day and is not necessarily the rate that a service provider could actually contract with its bank(s).

242. For all of these reasons I consider that, when defining the benchmark debt management strategy, adding a swap overlay onto a staggered debt issuance program is inappropriate.

5.4.3 Including a swap overlay still requires a trailing average DRP estimate

243. It is important to emphasise that adding a swap overlay to the efficient debt management strategy **does not** give rise to a cost of debt allowance equal to the prevailing cost of debt at the beginning of the regulatory period. As noted by the Commerce Commission:

> *The Commission notes that firms have a mix of debt maturities to manage refinancing risk, including long term debt. This spreads a firm's re-financing requirements and reduces the amount of debt that needs to be refinanced in any one year. Reducing re-financing risks has benefits for consumers, but long-term debt typically has a greater cost (specifically a greater debt premium) than medium or short term debt.*[49]
>
> and:
>
> *Where a supplier has a debt portfolio with a long average tenor, consumers benefit from the reduced refinancing risk and thus it is appropriate to recognise that part of the higher cost of issuing longer maturity debt cannot be removed through the swap market. Therefore, the*

48 NZFMA describes its process in a document available here: http://www.nzfma.org/Site/practices_standards/reference_rate_rules.aspx

49 Input Methodologies (Electricity Distribution and Gas Pipeline Services) Reasons paper, December 2010, pp. 442-3.

cost of capital IM provides an allowance that recognises the incremental debt premium on longer term debt and the cost of executing an interest rate swap to shorten the re-pricing period of the long-term debt.

This allowance (called the term credit spread differential) will only apply where supplier's debt portfolio has a weighted average tenor exceeding the length of the regulatory period. For suppliers whose debt portfolio has a weighted average tenor which is less than the length of the regulatory period, the allowance will not apply. For such suppliers, a debt premium based on the term of the regulatory period is sufficient.

This allowance will not be added to the estimate of the weighted average cost of capital (which will apply to all suppliers of services regulated under Part 4); rather the allowance will be added separately as an allowable cost (along with operating costs, depreciation etc.) for qualifying suppliers only. The mechanics of how this allowance will apply in practice are explained in Appendix H6.

The practical effect of the term credit spread differential, in conjunction with a term for the risk-free rate and debt premium which matches the regulatory period, is to ensure suppliers are appropriately compensated including where greater debt premium is incurred due to the issue of long-term debt. It ensures suppliers are not overcompensated for risks and costs they do not incur (which would occur if the term of the risk-free.[50]

244. In these passages the Commission correctly recognises that:

    i. issuing staggered debt portfolios is standard debt management practice to manage refinance risk;

    ii. this can involve issuing debt with a maturity of greater than the term of the regulatory period; and

    iii. the debt risk premium on a staggered debt portfolio cannot be reset using interest rate swaps.

245. I agree with these sentiments. I also agree that it is appropriate "to ensure suppliers are appropriately compensated including where greater debt premium is incurred due to the issue of long-term debt". However, I do not consider that the practical implementation of the Commission's term credit spread differential actually achieves this.

246. I do not consider that it correctly compensates for either:

[50] Input Methodologies (Electricity Distribution and Gas Pipeline Services) Reasons paper, December 2010, p. 142

- The adoption of a staggered issuance strategy (even if that staggered issuance program involves a maturity at issuance that is the same length as the regulatory period); or
- The issuance of debt with a maturity that is longer than the length of the regulatory period.

247. I further note that even if ii) were not the case (i.e., even if all debt was issued with a term exactly equal to the term of the, say, 5 year regulatory period) the interest cost on a staggered debt portfolio would not be equal to the Commission's estimate of the cost of debt. This is true even if the business uses interest rate swaps to reset *base* interest rates at the beginning of the regulatory period. In this situation the business would still be paying a DRP that reflected the historical average DRP over the preceding 5 years.

248. Both of these points can be illustrated in an example. Consider the case of a 10 year bond issued 3 years before the beginning of a regulatory period when the 10 year DRP (measured relative to swaps) was 3%. Let the 5 year DRP measured at the same time also have been 3%. Also, let the prevailing 5 year cost of debt at the beginning of the 5 year regulatory period be 6% - comprised of a 5% five year swap rate plus a 1% DRP (measured relative to the same swap rate).

249. Assume that the service provider has used interest rate swaps to reset their base interest rate on this bond at the beginning of the regulatory period. In this situation the cost to the service provider associated with this bond is 8% calculated as:

- The prevailing 5 year swap rate at the beginning of the regulatory period (5%); plus
- The DRP on the bond at the time of issue (3%).

250. By contrast, the Commission's allowance for the cost of debt will be 6% given by:

- The prevailing 5 year swap rate at the beginning of the regulatory period (5%); plus
- The DRP on 5 year debt at the beginning of the regulatory period (1%); plus
- The term credit spread difference (0% = 3% DRP on 10 year debt less 3% DRP on 5 year debt – *with both measured at the time the debt was issued*).

251. The reason that the Commission's calculation gives the wrong answer (does not compensate the service provider for the costs of maintaining a staggered portfolio of long term debt) is that:

- the term credit spread has been estimated as the DRP incurred at the time of issue (3%) less the contemporaneous 5 year DRP (also 3%); while
- the correct calculation is the DRP incurred at the time of issue (3%) less the (1%) 5 year DRP at the beginning of the regulatory period (i.e., the DRP that the

Commission is actually compensating for in its base level estimate of the cost of debt).

252. In effect, the Commission's calculation compensates a service provider 'as if':

- They raised all their debt at prevailing interest rates at the beginning of a regulatory period; plus
- The difference between the DRP on any long term debt (measured relative to swaps of the same tenor) and 5 year debt at the time the debt was actually issued.

253. This approach simply does not compensate a service provider for the interest rate costs associated with efficiently maintaining a staggered portfolio of long term debt. Even if the benchmark debt management strategy assumes the use of interest rate swaps to reset 100% of the debt portfolio at the beginning of the regulatory period, the cost of debt for that debt management strategy will be equal to:

- The prevailing swap rate at the beginning of the regulatory period; plus
- The average DRP paid on each bond in the staggered debt portfolio at the time that the bond was issued.

254. Moreover, this is true even if the maturity of all debt is the same as the term of the regulatory period.

255. This is the benchmark debt management strategy that a group of Australian energy utilities proposed be adopted by the AER in preference to its previous approach of resetting the cost of debt based on prevailing conditions once every 5 years.[51] However, largely for the reasons that I set out in section 5.4.2 above, this was rejected in favour a simple trailing average of the cost of debt (which was ultimately supported by the businesses proposing a 5 year swap rate plus a 10 year trailing average DRP provided a transition arrangement was put in place).

5.5 Commission's consultation paper

256. The Commission's discussion paper states:

> *Chorus referred to the High Court judgment regarding the IMs merits appeals when suggesting that a revised TCSD could potentially be used to compensate businesses for staggered portfolio issuance.*
>
> *However, the High Court's main concern was whether the TCSD is required at all, rather than whether a revised version could be used to*

[51] ETSA Utilities, CitiPower and Powercor Australia, 2012, "Joint Response to AEMC Consultation Notice on Cost of Debt Issues", 5 July 2012. Available at http://www.aemc.gov.au/Media/docs/ESTA-Utilities-CitiPower-and-Powercor-Australia-1c410e75-9980-4328-81dd-371ed06feff0-0.PDF

provide additional compensation to regulated suppliers. The Court stated (emphasis added):

> *Given the view we take of the basic issue of principle (that to avoid under and over compensation the risk-free rate should be matched to the regulatory period); the material before us has not persuaded us of the need for a TCSD at all.*

Significantly, the Court supported the principle that, to avoid under or overcompensating regulated suppliers, the term of the risk-free rate should match the length of the regulatory period.

We invite submissions on whether the TCSD should be applied when determining the cost of capital for the UCLL and UBA FPPs. We note that the TCSD is not required to estimate the WACC. If the TCSD is to be applied, we will need to determine the appropriate weighted average tenor of debt to use.

257. In this response the Commission has not grappled with Chorus' key point. Specifically, that a staggered debt portfolio is efficient practice and, consistent with this, the regulatory allowance for the cost of debt must provide compensation commensurate with such a debt management policy. (At least it must do this if the regulator's objective is to compensate for efficiently incurred costs.)

258. Instead, the Commission has simply referred to the fact that, on the material before it, the High Court was not persuaded of the need for a TCSD at all. The Commission goes onto invite submissions on whether "the TCSD" allowance is required at all – defining the choice between adopting "the TCSD" currently in the IMs and having no TCSD at all. I do not consider that this is a sound construction of the choices that the Commission must consider.

259. Nor do I consider that it is a sound interpretation of the High Court decision. The immediately preceding paragraphs of the High Court decision state:

> *We observe more generally that the TCSD was developed by the Commission very late in the piece: the concept of a TCSD was first mentioned in the Airports Consultation Update Paper of 1 October 2010. A TCSD methodology first appeared in the Revised Draft IM Determination for the EDBs released on 22 October 2010. Thus, unlike other aspects of the IMs, the TCSD was only subject to comment on technical drafting. As noted, a TCSD has not featured previously in the Commission's risk-free rate term decision*
>
> *We accept the submissions of the regulated suppliers that the concept of the TCSD, and more particularly its implementation, were not well explained by the Commission. For example, the Commission responded to criticisms by Vector of the feasibility and efficacy of swaps to re-price*

> *long-term debt to the regulatory period with what can be described as the "two swap" example. But, at no point, did the Commission explain the relationship between that example and the TCSD. Moreover, Ms Scholtens at one point acknowledged that there was no evidence of the availability of a "five year swap product" which appeared to be another type of swap the Commission had in mind.*

260. Subsequently the High Court directs the Commission as follows:

> *[We] would expect the Commission to review the structure and efficacy of the TCSD and, in so doing, undertake further empirical research on the nature and availability of swaps for regulated suppliers so that a TCSD – where necessary – may be able to be better articulated and connected with market practice.*

261. In my view this is precisely what Chorus has proposed be done. In this report, I consider that I have provided answers to the questions that the High Court asked in its judgement. Specifically:

- A version of the TCSD is required because it is efficient to maintain a staggered portfolio of debt.
- Consequently, the efficient cost of debt will be based on either:
  - A trailing average of the historical fixed rate cost of debt; or, if a swap overlay is assumed
  - the prevailing "N" year swap rate (where the regulatory period is N years long) plus a trailing average of the historical DRP.
- The period over which the average (of debt or DRP costs) should be measured is the period over which a benchmark service provider has raised its existing debt portfolio. In my view this period should be 10 years – reflecting the average tenor of similar telecommunications and other infrastructure issuers.
- The TCSD included in the IMs will give the correct answer only if it is assumed that a swap overlay is efficient and the level and term structure of the debt risk premium is constant through time (assumptions that are patently violated);
- Therefore, an amendment to the TCSD is required such that:
  - If a swap overlay is assumed to be efficient then the TCSD equals the trailing average DRP less the prevailing DRP embodied in the prevailing cost of debt estimate (all measured relative to swaps). In this case, there is no need to change the current practice in the IMs to equate the term of the prevailing cost of debt estimate with the term of the regulatory period;
  - If a swap overlay is not assumed to be efficient (consistent with my recommendation) then a trailing average cost of debt should be adopted. Of course, there is a definition of the TCSD that will, in conjunction with

the IM cost of debt, give the same effect. Namely, the TCSD would need to be defined as the trailing average cost of debt less the prevailing cost of debt – such that, when the TCSD is added to the prevailing cost of debt, the prevailing cost of debt effectively cancels out leaving only the trailing average cost of debt.

262. Either of these approaches is consistent with an NPV=0 criterion in that the cost of debt allowance will be equal to the debt costs associated with an efficient debt management strategy. Consequently, the NPV of cash-flows to the service provider net of interest expenses will be equal to the equity value of the RAB. Indeed, failure to set the cost of debt allowance on the basis of an efficient debt management strategy will cause this NPV=0 requirement to be violated (i.e., equity owners will not expect to receive a return on their investment equal to their cost of equity).

263. I note that neither of these two options for estimating the cost of debt, nor the reasoning behind them, were before the High Court when it considered the term of the cost of debt and the TCSD. In that case, the High Court was asked to decide between, in effect:

- A cost of debt allowance reset every five years based on a five year cost of debt; and
- A cost of debt allowance reset every five years based on a 10 year cost of debt.

264. The second option is clearly inconsistent with any even hypothetical debt management strategy. That is, it is not possible to issue 10 year debt every 5 years unless the firm is repurchasing every bond issued half way through its life. The first option is consistent with a hypothetical debt management strategy where a firm refinances itself with 5 year debt once every 5 years. Clearly, the first option would be more efficient than issuing 10 year debt once every 5 years. Facing a choice between these two constructions of the cost of debt it is not surprising that the High Court found that adopting a 10 year term for the cost of debt is not materially better than adopting a 5 year term. Both approaches are equally unrealistic as a representation of the costs of an efficient debt management strategy.

265. The gap in the materials before the High Court was a proposal to use historical average and any materials supporting that proposal. This report provides two internally consistent estimates of the cost of debt that derive from a well-defined debt management strategy. Neither of which were part of the materials before the High Court.

266. By comparison, the Commission's Input Methodology does not compensate for an internally consistent debt management strategy. Specifically, the Commission acknowledges the efficiency of staggered debt issuance as a means to manage refinance risk but then compensates for the cost of debt in a way that fails to provide compensation based on maintaining a staggered debt portfolio.

267. The effect of this is that it is impossible for a service provider to hedge its own cost of debt to the allowance provided by the regulator. This impossibility injects risk into the regulatory regime that is arbitrary and unnecessary.

268. The only debt management strategy that it would actually give rise to a cost of debt that matched the calculation in the IMs would involve the refinance of 100% of the debt portfolio at the beginning of the regulatory period. Of course, any firm that actually attempted to undertake that strategy would almost certainly have a much higher cost of debt (and lower credit rating) than assumed by the Input Methodology for the reasons discussed in section 5.3.4.2 (a cost of debt well above that which would result from a more prudent staggered debt portfolio).

5.6 Regulatory precedent

269. As already discussed, the Australian Energy Regulator (AER)[52] has, in December 2013, signalled an intention to depart from its previous practice of setting the cost of debt based on prevailing interest rates at the beginning of the regulatory period. The AER considered the two definitions of a benchmark efficient debt management strategy that I have outlined above. It chose to set the cost of debt based on a 10 year trailing average.

270. In doing so, the AER adopted the same approach that the UK energy regulator Ofgem had adopted. Ofgem uses a 10 year trailing average of 10 year debt costs.[53] Similarly, US regulators also set the cost of debt allowance based on a long term trailing average of the cost of debt (although for US regulators the time horizon reflects the actual issuance of a regulated business (often extending out to 20 years)).[54] Ofcom also sets the cost of debt allowance based having regard to the historical average level of interest rates. The effect of which is that, in its most

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52 AER, *Explanatory Statement to the Rate of Return Guidelines*, December 2013. Available at http://www.aer.gov.au/node/18859

53 Ofgem, Strategy decision for the RIIO-ED1 electricity distribution price control, March 2013, p.10. Available at http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/annexes/annexes.pdf

54 There are many different State and Federal based regulators of US energy networks. However, Regulatory Research Associates provides a summary of standard practice by US regulators called "The rate case process: a basic guide" published in June 2011. On page 6 of that document US regulatory practice is summarised as follows:

In a rate case, the cost of debt, 6.5% in the table above, is the "embedded" cost of debt, usually an average of the cost of the debt issues that the company has outstanding. It is not the current yield – it is the embedded cost which reflects the bonds' coupon payments. This issue is usually straightforward. The same methodology applies to the cost of preferred stock.

recent decision, Ofcom set the cost of debt around 3.0%-3.6% above prevailing yields.[55]

5.7 Specific assessment relative to the legislative definition of TSLRIC and legislative objectives

271. The Telecommunications Act 2001 defines TSLRIC in the following manner

> *TSLRIC, in relation to a telecommunications service,—*
>
> *(a) means the forward-looking costs over the long run of the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, the service, taking into account the service provider's provision of other telecommunications services; and*
>
> *(b) includes a reasonable allocation of forward-looking common costs*

272. The Purpose of the Act is as described below.

> *To **promote competition** in telecommunications markets **for the long-term benefit of end-users of telecommunications services** within New Zealand by regulating, and providing for the regulation of, the supply of certain telecommunications services between service providers.*
>
> *In determining whether or not, or the extent to which, any act or omission will result, or will be likely to result, in competition in telecommunications markets for the long-term benefit of end-users of telecommunications services within New Zealand, **the efficiencies that will result, or will be likely to result, from that act or omission must be considered**.*
>
> *To avoid doubt, in determining whether or not, or the extent to which, competition in telecommunications markets for the long-term benefit of end-users of telecommunications services within New Zealand is promoted, consideration must be given to the **incentives to innovate that exist for, and the risks faced by, investors in new telecommunications services that involve significant capital investment and that offer capabilities not available from established services**.* [Emphasis added]

55 See Ofcom, Fixed access market reviews: Approach to setting LLU and WLR Charge Controls, 20 August 2013, A15.52 to A15.74. I note that while I agree that it is appropriate to have regard to historical interest costs; the nature of Ofcom's calculation is somewhat arbitrary. Specifically, Ofcom sets the cost of debt based on a historical average estimate of the risk free rate (which is 2.7% above the prevailing real risk free rate) plus a debt risk premium which is based on a more short term estimate which is around 0.4% to 1.0% the prevailing DRP estimate. In my view, a more sensible approach would be to estimate the historical average cost of debt – although I do not know if this would result in a materially different answer to Ofcom's estimate in the circumstances of Ofcom's decision.

273. I consider that, in relation to debt funding, "forward-looking costs over the long run" means the costs of implementing an efficient debt management policy to fund assets that are assumed to already be in existence and capable of providing the "total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, the service".

274. The assets in question do not necessarily need to be the actual assets used to provide the service. However, they must be assumed to be currently in place in order to arrive at a meaningful estimate of the costs of financing the assets. The nature of the assets in question is that they take many years to build and, consequently, they are financed over many years. Consequently, the interest rates paid on this debt financing today and tomorrow will be influenced by interest rates that existed in the past – this is true even if it is assumed that the task is to estimate the cost of debt for a hypothetical new entrant who has just finished putting in place "the total quantity of the facilities and functions that are directly attributable to, or reasonably identifiable as incremental to, the service, taking into account the service provider's provision of other telecommunications services"

275. Moreover, once in place, the efficient debt financing strategy for these assets will involve staggered issuance of long term debt. Thus, at any given time, the debt financing costs for a UCLL/UBA service provider will be a function of historical interest rates paid by the service provider.

276. Also consider that adopting a cost of debt based on an efficient benchmark debt management strategy is consistent with the purpose statement. Doing so will allow the service provider to hedge its actual cost of debt to the regulatory benchmark – reducing risk which can ultimately give rise to an improved incentive to invest and/or lower cost of debt allowance and lower prices faced by customers. I regard that this is a source of both 'incentives' and 'efficiencies' that the purpose statement directs the Commerce Commission to consider.

277. I also consider that, if the cost of debt allowance is set based on a stable trailing average calculation, then Chorus's prices will be more stable through time. Chorus' prices are an important input into the competitive supply of broadband services in New Zealand. Stability in these input prices will allow competition in the sector to deliver more stable prices to end users – which is ultimately to their long term benefit.

5.8 An estimate of the trailing average cost of debt/DRP

278. I have not estimated a trailing average cost of debt or DRP in this report. However, I do not consider that this would be a difficult task and, as discussed above, the potential magnitude for error when estimating a trailing average is lower due to the fact that measurement errors in different time periods will tend to 'cancel out'.

6 Internal consistency between the TAMRP and the risk free rate

6.1 A departure from the IMs

279. This section proposes a departure from the IMs in that it is proposed that expected return on the market and the risk free rate (both inputs into the simplified Brennan-Lally CAPM) are determined concurrently (over the same time period and in the same market conditions). The effect of this is that the TAMRP (being the difference between the risk free rate and the required return on the market portfolio) are set in an internally consistent manner.

280. I note that this is not necessarily inconsistent with the IMs. The IMs attempted to set a process for estimating the cost of equity where parameters, including the TAMRP, were locked in for a given period. This resulted in the Commission arriving at an estimate for the TAMRP in 2010 and holding it constant for the duration of the IMs (at 7.0%).

281. This may or may not have been an appropriate approach to estimating the TAMRP in the IMs. However, it is unnecessary and inappropriate to adopt a 2010 estimate of the TAMRP in a 2014 determination of the cost of capital that is specific to UCLL/UBA. That is, there is no reason not to reconsider the best estimate of TAMRP at the time that the cost of capital is first determined for UCLL/UBA services.

282. This is true in general, but is especially in the context of the additional evidence presented in this report and dramatically different levels of Government bond yields in 2014 than in 2010 (noting that the TAMRP is simply the expected return on the market less government bond yields).

283. In its consultation paper the Commission rejected Chorus' submission that the TAMRP should be estimated in current market circumstances on the grounds that:

> *We considered using a forward-looking (ex ante) approach to estimating TAMRP in the IMs. However, the two ex ante approaches to estimating TAMRP that we identified, the discounted cash flow model and results from surveys of academics and practitioners, both have significant limitations. Therefore, we relied on both expost and ex ante approaches when estimating the TAMRP. We propose to use a TAMRP of 7.0% for the UCLL and UBA FPPs, subject to our decision regarding the term of the risk-free rate.*

284. This statement appears to suggest that because the Commission took into account forward looking estimates of the TAMRP in 2010 when arriving at its 7% estimate of

the TAMRP it is not necessary to have regard to forward looking estimates in 2014 when it sets the cost of equity for the first time for Chorus. To the extent that the Commission took into account forward looking estimates in 2010 when setting the TAMRP to apply to EDBs and GPBs, the logical conclusion would be that this suggested it should do the same for Chorus in 2014. The conclusion that the Commission appears to be coming to in the above statement is that a forward looking estimate of the TAMRP once undertaken need not be revisited. In my view, this is inconsistent with a natural interpretation of the term "forward looking".

6.2 Why TAMRP and risk free rate need to be measured in the same time period

285. The simplified Brennan-Lally capital asset pricing model (CAPM) is, like all asset pricing models, a model of relative risk. The expected return on the market portfolio $E[R_m]$ is an input into the CAPM, not an output. The output of the CAPM is an estimate of a particular asset's required return *relative to* $E[R_m]$. The return on each asset is determined as:

$$E[R_i] = E[R_{\beta=0}] \cdot (1-T) + \beta_i \cdot (E[R_m] - E[R_f] \cdot (1-T)) \quad \text{(Equation 1)}$$

286. where $E[R_i]$ is the expected return on the asset, $E[R_{\beta=0}]$ is the expected required return on a zero beta asset, β_i is the beta for the asset, $E[R_m]$ is the expected return on the market portfolio and T is the investor tax rate.

287. The inputs into this model are $E[R_f]$ (or the 'risk free rate'), β_i, $E[R_m]$ and T. The above equation could just as easily and correctly be written as:

$$E[R_i] = \beta_i \cdot E[R_m] + E[R_f] \cdot (1-T) \cdot (1-\beta_i).$$

288. The expected tax adjusted market risk premium (TAMRP) is the last term in brackets of equation 1. That is:

$$E[TAMRP] = E[R_m] - E[R_f] \cdot (1-T)$$

289. E[TAMRP] is not an input into the CAPM model. E[TAMRP] is simply the difference between the value of $E[R_m]$ and $E[R_f] \cdot (1-T)$.

290. Contingent on an assumption that $E[R_m]$ is an invariant value above $E[R_f]$ one could attempt to estimate the invariant MRP as a means to estimating $E[R_m]$ from $E[R_f]$. However, this process superimposes an assumption on the asset pricing model that E[MRP] is invariant.

291. The existence of an invariant TAMRP is in no way an assumption of the CAPM. Indeed, it is entirely inconsistent with modern asset pricing theory that is focussed

on explaining the time varying nature of both E[R_m] and E[TAMRP] – as is explained in section 3 of Hird and Grundy (2013).[56]

6.2.1 Commerce Commission IM methodology

292. Nonetheless, the Commerce Commission Input Methodology sets a fixed value for the TAMRP of 7% and adds this to a floating value for the risk free rate based on New Zealand Government bond rates estimated over a one month period.

$$\text{Commission estimate of } E[R_m] = E\left[R_f\right] \cdot (1 - T) + 7\%. \qquad \text{(Equation 2)}$$

293. The effect of this is that E[Rm] has varied one-for-one with movements in the government bond yields. NZ Government bond yields have, in the last 5 years, been highly unstable and reached historic lows in 2012 (as noted by the Reserve Bank of New Zealand (RBNZ)). Consequently, the Commission's estimate of E[Rm] has also been highly unstable and reached historic lows in June 2012, during the midst of the European sovereign debt financial crisis, implying that equity capital for the average New Zealand firm was at historical lows during a period that the RBNZ and RBA have both described as a period when investors were fleeing risky assets in favour of low risk assets (see section 6.4 below).

6.2.2 E[R_m] and E[TAMRP] are time varying

294. E[R_m] is just the average of required returns across a range of risky assets. Just like in any other market, prices in the market for risky assets are determined by supply and demand. An increase in demand for risky assets will, holding other things constant, raise asset prices and reduce expected returns on those assets. An increase in supply of those assets will, holding other things constant, lower asset prices and increase expected returns on those assets.

295. The same is true for low risk or riskless assets. An increase in demand for low risk assets will, holding other things constant, raise asset prices and reduce expected returns on those assets. An increase in supply of those assets will, holding other things constant, lower asset prices and increase expected returns on those assets.

296. *If* supply and demand conditions in all asset classes move in 'lock step'[57] then the required return on risky assets E[R_m] and riskless assets E[R_f] will also move in lock step. In this special case, E[MRP] = E[R_m] - E[R_f] will be constant through time.

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56 Hird and Grundy, *Estimating the return on the market*, June 2013. Available at http://www.aer.gov.au/node/18859

57 That is, a one-for-one movement in the two variables

297. The empirical literature contains no support for a conclusion that E[MRP] is constant. That is, the literature universally fails to find that E[R_m] and E[R_f] move in lock-step.[58]

298. The literature is less than universal on whether these variations are predictable in advance. Most, and in my opinion the highest quality (see section 4 of Hird and Grundy), [59] published literature finds that E[R_m] and (equivalently) E[MRP] are predictable. Based on this literature, I and Professor Grundy concluded that the best estimate of E[R_m] at any given time will be achieved by application of the dividend growth model.[60](I also note that in the same report Professor Grundy and I explain why if variations in E[R_m] were to be assumed to impossible to predict then the best assumption would be that E[R_m] was constant – not that E[TAMRP] was constant.)

6.3 How to estimate TAMRP consistently with the risk free rate

299. If the prevailing yield on government bonds is being used as the estimate of the risk free rate in the BL-CAPM then an internally consistent application requires that E[R_m] be estimated concurrently (over the same time period and market conditions). As already described, my view is that the best estimate of E[R_m] is derived from application of a DGM model. My proposed methodology is based on the AER's description of its DGM methodology for estimating E[R_m].[61] Variations to this methodology are also described.

300. I calculated forecast dividend yields for the current and next two financial years by dividing the average of Bloomberg forecast dividends for the New Zealand Exchange 50 Gross Index(NZ50) for each of the current, next and following years into the future[62] by the prevailing value of the NZ50 (sourced from Bloomberg).[63] I also

58 See section 4 of Hird and Grundy, *Estimating the return on the market*, June 2013. Available at http://www.aer.gov.au/node/18859

59 Hird and Grundy, *Estimating the return on the market*, June 2013. Available at http://www.aer.gov.au/node/18859

60 See section 2.2 of Hird and Grundy, *Estimating the return on the market*, June 2013. Available at http://www.aer.gov.au/node/18859

61 See, AER, *Explanatory Statement- Rate of Return Guideline,* December 2013, appendix E, pp. 116-119. Available at http://www.aer.gov.au/node/18859

62 IDX_EST_DVD_CURR_YR", "IDX_EST_DVD_NXT_YR" and "EST_DVD_FY3_AGGTE"

63 These yields are averaged over a 20 day period.

adjusted for the effect of imputation credits by scaling up cash dividend yields by a factor of 1.3889.[64]

301. The rate of growth in forecast dividends between year 2 and year 3 was then assumed to gradually return linearly to the assumed long run growth rate over 8 years.[65] Consistent with the AER methodology, I assume a long run dividend growth rates equal to nominal long run GDP growth less 1.0. I base this on long run real GDP growth rate of 3.02% on average real GDP growth since 1900 or since 1945 – both of which give the same answer.[66]and I assume future expected inflation is 2% (consistent with the RBNZ inflation target

302. Since this method moves from the growth rate between the short-term dividend forecasts sourced from Bloomberg to an estimate of long-run dividend growth, I have modelled the linear transition in growth rates as occurring over 8 years (which I understand to be the AER's three-stage model). My use of an 8 year transition path is consistent with (although more conservative than) Lally's advice that "a convergence period of at least 10 years is sensible".[67]

303. Each dividend is assumed to be paid at the middle of the financial year. The forecast dividend for the current financial year is adjusted pro-rata for the remaining period of the financial year, and is assumed to be paid midway between the date of the forecast and the end of that financial year. To be consistent with the AER's terminology, let year 1 be the following year (the first full year, assuming the model is not estimated at the beginning of the financial year). The next dividend yield forecast was assigned to year 1 with the third and final dividend forecast from Bloomberg is assigned to financial year 2.

304. In the three-stage model, the AER transitions the growth rate linearly from the short run to the long run rates such that the long run rate is first applied in the discounted terminal value assigned to year 9. To be clear, the growth rate applied to

64 Uplift = 1/(1-tax rate) the tax rate is 0.28. This is consistent with the assumption that dividends carry imputation credits and imputation credits are fully valued by investors (consistent with the simplified BL CAPM assumptions).

65 The growth rate in dividends assumed between year 3 and 4 (the first year of the transition) was capped at 7% in order to ensure that unusually high, and likely temporary, growth rates between the Bloomberg forecasts for year 2 and 3 were not assumed to persist into the transition period. For the same reason we have used the average growth rate between years 2 and 3 over the preceding 12 months (rather than 20 days) in order to define the growth rate in the first year of the transition.

66 Real GDP growth is sourced from the Madison project (http://www.ggdc.net/maddison/oriindex.htm) up to 2008 and from Statistics New Zealand between 2009 and 2013. We note that the Madison project has annual New Zealand GDP estimates going back to 1871. Going back to 1871 would raise the long run average GDP growth to 3.35%.

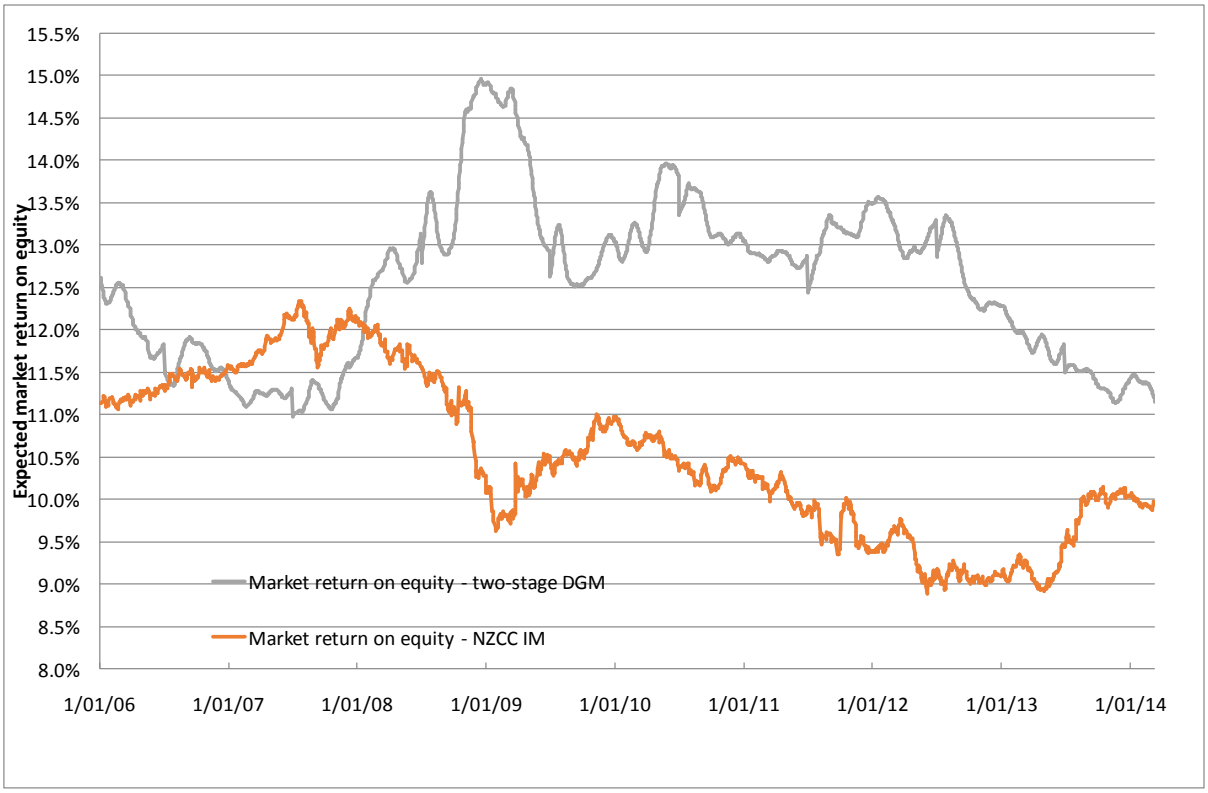
67 Lally, The Dividend Growth Model, 4 March 2013, p.20. Available at www.aer.gov.au

calculate D_9 was still higher (or lower) than the long run growth rate, with the long run growth rate finally applied to calculate the terminal value of D_9 x (1+g)/(k-g).

305. The expected market return on equity was calculated as the discount rate at which the net present value of the series of uplifted dividend yields equals 1. The market risk premium is calculated as the expected market return on equity less the prevailing 5 year New Zealand government bond yield.

306. The result of consistent application of this methodology since 2006 is illustrated in Figure 6 below.

Figure 6: E[Rm](DGM with 8 year transition) vs E[Rm] with an invariant MRP



Source: Bloomberg, AER, CEG analysis

307. I consider that this approach gives sensible results that accurately demonstrate the expected behaviour of the market cost of equity over the period. In particular, this approach provides a materially better estimate of the market cost of equity than assuming that the TAMRP is constant at 7%. Under this approach the estimated market cost of equity increased markedly in 2008/2009 as one would expect due to the then prevailing global financial crisis. By contrast, an approach that assumed a constant TAMRP of 7% would have estimated a falling cost of equity during the

global financial crisis. As is discussed in the next section, the same can be said in relation to the 2011/12 European sovereign debt crisis.

308. I note that changes to the underlying assumption concerning long run dividend growth and/or the value of imputation credits will have the effect of shifting the estimated market cost of equity time series up or down but will not have a material impact on the shape of the time series. It may well be that the Commission, on inspection and consideration, prefers a variant of the DGM model outlined above. However, the key point that I am attempting to make in this section is that a DGM estimate of the market cost of equity is relatively simple to produce and provides sensible results through time – more sensible than estimating the market cost of equity as a fixed premium above the risk free rate.

6.4 Why estimating the risk free rate and TAMRP inconsistently is a problem – a case study

309. Market conditions influencing spot government bond yields at any given time will also be influencing spot E[Rm] and, therefore, the spot E[MRP] estimate (which is simply the difference between these two if government bond yields are used as the proxy for the zero beta rate in the CAPM). Moreover, there will be times when market conditions are such that very low spot government bond yields are associated with a normal (or even a heightened) spot expected return on the market E[MRP] – such that the spot E[MRP] estimate is heightened relative to average conditions.

310. In this section I address a specific set of market circumstances that provides a near perfect illustration of the problems with adopting a fixed estimate of the TAMRP but a floating estimate of the risk free rate when for setting the cost of equity. In the June 2012 Monetary Statement the Reserve Bank of New Zealand (RBNZ) made the following statements

> *Since the March Statement, global equity markets, commodity prices and the New Zealand dollar have fallen sharply.* ***Investor preference towards lower risk assets*** *has driven government bond yields in many countries to fresh lows, including the United States, Germany, Australia and New Zealand, while government bond yields for troubled nations like Italy and Spain have risen sharply.*(Page 9)
>
> *Ten-year government bond yields reached fresh lows for Germany, United States, United Kingdom, Australia and New Zealand, among other countries,* ***reflecting the flight to perceived low risk assets****.*(Page 11)

311. Echoing this, on the 24thof August 2012 the Reserve Bank of Australia (RBA) Governor (Glenn Stevens) made a statement to the House of Representatives Standing Committee on Economics that included the following statement.

> *But, as we said at the last hearing, sorting out the problems in the euro area is likely to be a long, slow process, with occasional setbacks and periodic bouts of heightened anxiety. We saw one such bout of anxiety in the middle of this year, when financial markets displayed increasing nervousness about the finances of the Spanish banking system and the Spanish sovereign. The general increase in risk aversion saw yields on bonds issued by some European sovereigns spike higher, while those for Germany, the UK and the US declined to record lows.* ***This 'flight to safety' also saw market yields on Australian government debt decline to the lowest levels since Federation****. [Emphasis added]*

312. The heightened levels of risk aversion in 2010 can clearly be seen in the Figure 6above where the prevailing NZ market cost of equity remained in a relatively tight band of around 12.5% to 13.0% (or 12.0% to 12.5% without transition) from January 2010 until September 2012. This level of the cost of equity was maintained despite a 2.6% fall in the NZ Government 5 year bond rate over this period. That is, the fall in the NZ Government bond rate was more or less fully offset by an offsetting rise in risk premiums – entirely consistent with the commentary from the RBNZ (and the RBA).

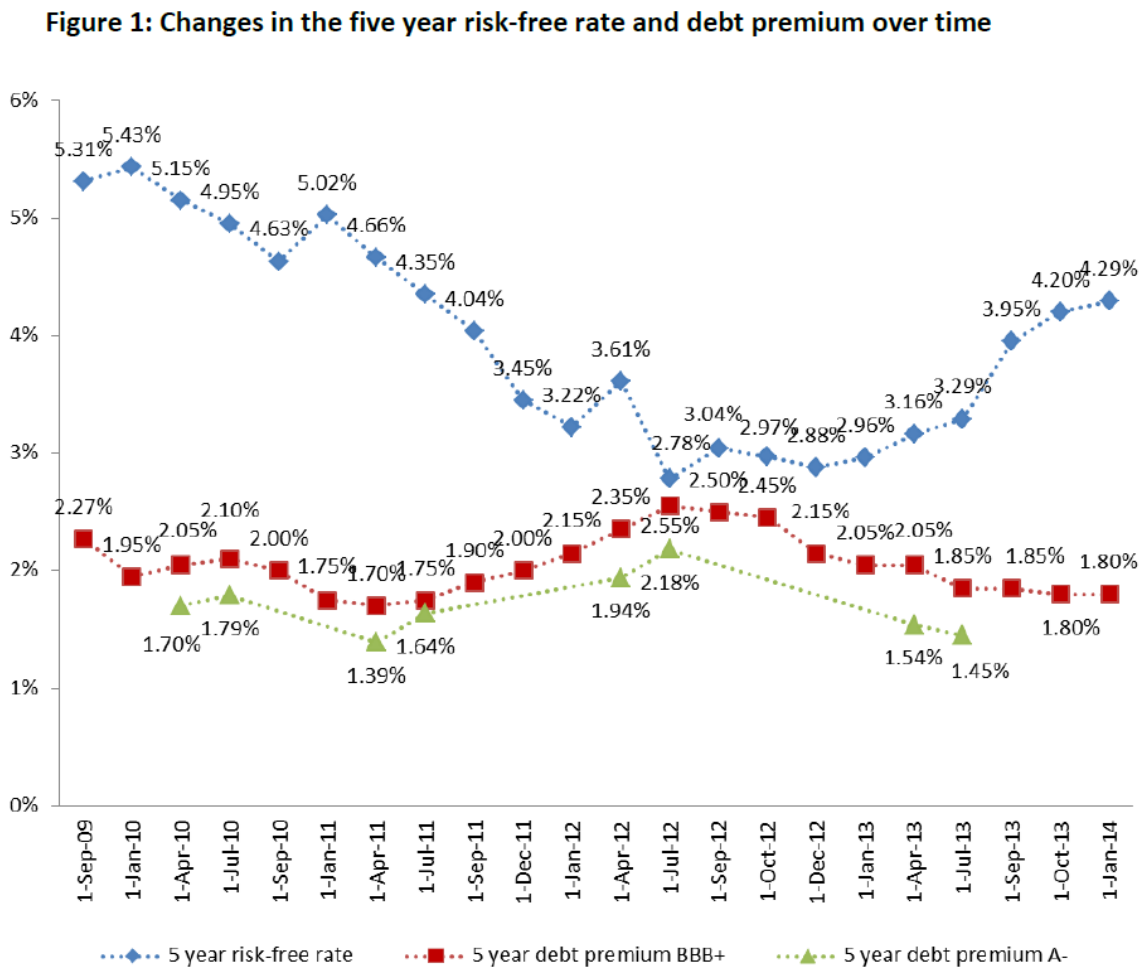
313. This can be seen more clearly in the chart below which compares the TAMRP with the level of the 5 year NZ Government bond rate (noting that the TAMRP is simply the estimated cost of equity less (1-0.28)*(5 year Government bond rate)).

Figure 7: TAMRP (DGM with 8 year transition) vs 5 year Government bond rate

Source: Bloomberg and CEG analysis

314. Moreover, precisely the same pattern can be seen in the Commerce Commission's own estimates of the risk premium on corporate debt and the risk free rate. The figure below is taken from the Maui 2014 cost of capital determination. This figure clearly shows an inverse relationship between the level of the risk free rate and the risk premium on corporate debt – with risk premiums peaking at the same time that risk free rates reached their nadir.

Figure 8: Reproduction of Figure 1 from Maui 2014 cost of capital determination



315. Further evidence of heightened risk premiums in these periods is provided in Appendix A where I examine data showing an inverse relationship between Australian Government bond yields and risk premiums on Australian dollar denominated assets.

316. As it happens, two cost of capital decisions, one in New Zealand and one in Australia, were made during the mid-2012 crisis periods being referred to by the RBA and RBNZ above- with real consequences for regulated businesses. The Roma to Brisbane Pipeline (RBP), regulated by the AER, had its averaging period for setting the risk free rate during the period described by RBA Governor Glenn Stevens as a 'flight to quality'. The RBP averaging period started on the 25 June 2012 and ended on 20 July 2012. The RBP decision's averaging period occurred over precisely the worst of the crisis to which Governor Stevens was referring in his remarks:

This 'flight to safety' also saw market yields on Australian government debt decline to the lowest levels since Federation.

317. The effect of this was that the cost of equity allowance for RBA was set at historic lows – despite the evidence suggesting that, if anything, the cost of equity was elevated relative to historic levels.

318. Similarly, the New Zealand Commerce Commission made a decision setting the WACC to apply in respect of any customised price-quality path proposal by a supplier of Electricity Distribution Services (EDS) in the 12 months following the 28th of September 2012 but based on risk free rate estimates averaged over the month of August 2012. The effect of this was to similarly set a historic low for the cost of equity allowance – creating a significant barrier to any business who might otherwise wished to embark on a customised price path in that period.

319. Both of these decisions resulted in a cost of equity estimate that was assumed to have fallen 'one-for-one' with the prevailing government bond rates at that time (i.e., no increase in the allowed risk premium was allowed to even partially offset the fall in the risk free rate). This is notwithstanding that the fall in government bond yields was a direct corollary of "investor preference for lower risk assets", "a flight to perceived low risk assets", "heightened anxiety", an "increase in risk aversion", and a "flight to safety". This was a direct result of having predetermined the value of the TAMRP/MRP, largely on the basis of long run historical market conditions and then measuring the risk free rate during a very short period of time that happened to be strongly affected by financial crisis.

320. That is, there was clear evidence that risk premiums were rising as Government bond rates fell – with the net effect being that the required return on risky assets did not fall one-for-one with the fall in Government bond rates. Nonetheless, both the AER and the Commerce Commission fully reflected the fall in government bond rates to historic lows in a lower cost of equity estimate.

321. I consider that this is an exemplar of the problems with a adopting an estimate of the market risk premium in the context of the Brennan-Lally CAPM) that is not taken from the same market conditions under which the risk free rate is estimated.

7 Accounting for uncertainty in WACC estimates

322. The Commission is separately carrying out a process to assess merits of setting the WACC above the midpoint estimate that was prompted by a High Court decision made in the context of an appeal of the IMs applying to regulated energy and airport businesses. The Commission summarised the views of the Court as follows:

> *In considering MEUG's arguments about the use of the 75th percentile, the Court:*
>
> *9.1 was sceptical that the use of a WACC estimate substantially higher than the mid-point was necessary to promote incentives to invest and innovate, noting that "[i]f anything an abundance of capital is likely to lead to wasteful investment";*
>
> *9.2 considered that the use of the 75th percentile WACC involves the likelihood that suppliers will earn excess returns, and therefore might be at odds with the section 52A(1)(d) objective of limiting the ability of regulated suppliers to earn excessive profits;*
>
> *9.3 acknowledged that there was strong support for our choice to use the 75th percentile, including from our experts, but highlighted that there was no analysis or empirical evidence justifying that choice;6*
>
> *9.4 noted that MEUG did not present any evidence in support of using the mid-point instead; and*
>
> *9.5 was therefore not satisfied that applying a mid-point estimate would lead to a 'materially better' cost of capital IM.*

323. Professor Grundy has provided a report addressing the question of whether regulated prices should be based on a higher modelled return than the midpoint WACC. His conclusions are summarised by me as follows:

i. In order for an investor in a regulated asset to expect to earn the midpoint WACC, the cash-flow modelling undertaken by the Commission may need to allow a higher return than the midpoint WACC. This is the case where the cash-flows actually expected to be received by a regulated business are asymmetrically distributed around the modelled cash-flows – such that it is more likely that actual cash-flows will be below rather than above the modelled cash-flows.

ii. Even if actually expected cash-flows are equal to modelled cash-flows (or if an accurate separate adjustment is made to reflect the asymmetry

contemplated in a.) then the allowed cash-flows based on the midpoint WACC will still only be set at a level that is only sufficient to entice voluntary investment in assets half the time (or by half of all investors). To the extent that it is more costly to have too low WACC (and the associated barriers to investment) than it is to have a too high WACC (and the associated higher prices for customers) then this provides a rationale separate from a.) above for setting a higher WACC.

324. I discuss each of these context of a UCLL/UBA provider in New Zealand.

7.1 Asymmetric risk to cash-flows

7.1.1 What are asymmetric risks to cash flows

325. Chorus, or a hypothetical UCLL/UBA service provider, faces potential asymmetric risks to cash-flows of the following form:

a. Demand for services within a regulatory period may be more likely to be lower than the midpoint forecast than higher due to the existence of low frequency but high impact events (such as earthquakes) that are difficult to incorporate into a forecast;

b. Costs of providing services within a regulatory period may be more likely to be higher than forecast due to:

- (once more) the existence of low frequency but high impact events (such as earthquakes); and/or
- The asymmetric relationship between demand and costs. For example, if demand for UBA services grows then the provider may incur additional costs in installing and maintaining additional electronic equipment in exchanges. However, if demand for UBA services falls the provider may be unable to make equivalent cost savings (given that much of the costs of existing capacity is sunk). This makes higher demand less profitable than the losses associated with lower demand – creating a source of asymmetry.

c. Technological and competitive developments in the broadband sector may result in the future stranding of the provider's assets. This can occur if the provider simply cannot recover its costs from future customers even if the regulator removes any restrictions on pricing. That is, if future customers simply are unwilling in sufficient numbers, given the substitutes they have available, to buy UCLL/UBA at prices that recover its costs.

d. Future regulatory decisions may also strand the value of the UCLL/UBA provider's assets in a similar way. For example, the regulator may decide to effectively write down the value of the provider's assets based on an estimated reduction in the costs of modern equivalent assets – even if the regulator's

previous pricing had not anticipated and allowed compensation for the depreciation in the value of the provider's assets. Similarly, future Government policy may have the same effect.

7.1.2 Quantification requires more detail on the regulatory regime

326. All of these potential sources of asymmetry appear to be very real risks faced by Chorus or a hypothetical UCLL/UBA provider operating in New Zealand. However, quantifying the magnitude of the asymmetries described above is simply not possible at the present time. This is because they are all dependent on the rules governing the regulators decision making and these have not been satisfactorily described at this stage of the process to allow for quantification.

327. For example, before risks of the type a) and b) could be quantified the Commission would need to describe how it would respond to a low frequency but high impact event. For example, how would the Commission respond to an earthquake that severely damaged Chorus' assets (or a hypothetical UCLL/UBA provider) in Wellington and surrounding areas?

328. If the Commission were to commit that it would revise upwards UCLL/UBA prices from those previously established in order to generate sufficient additional revenue to compensate the provider for higher costs (associated with reconstruction) and lower volumes (during periods of service interruption) then the Commission would have promised to eliminate the asymmetric impact on cash-flows of an earthquake.

329. To the extent that such a promise was credible then there may[68] be no need for a pre-emptive upward adjustment to modelled cash-flows in anticipation of such an event – the regulatory regime would simply apply the necessary adjustment if and when the event occurred and the magnitude of compensation was clearer. However, if the Commission were to make clear that it would not revise prices upward in the event of a future earthquake then it would be necessary to arrive at an actuarially fair assessment of the earthquake related expected impact on the UCLL/UBA provider's cash-flows and to include the recovery of this in modelled costs.

330. Of course, the regulator is not sufficiently powerful to eliminate risks of type c) because these risks emanate from technological change and market forces. Consider a scenario where, rapid advances in mobile broadband technology led to a superior service being supplied at lower cost than can be provided using

[68] I use the word 'may' here because a major earthquake could conceivably result in a large enough impact on the UCLL/UBA provider that, even if the regulator was willing to allow higher prices, customers would be unwilling to pay them. For example, if the UCLL/UBA provider's Wellington network was destroyed the lost revenues/higher costs may be of such a magnitude that customers would switch to mobile or fibre broadband (or simply drop broadband altogether) rather than pay the prices necessary to make good the earthquake losses. That is, an earthquake might tip the UCLL/UBA provider into asymmetric risk of type c) above.

UCLL/UBA. In that situation, it would not matter how high the Commission allowed UCLL/UBA prices to rise, the UCLL/UBA provider would not be able to recover their costs.

331. However, there are actions that the regulator can take to reduce the potential for this sort of commercial asset stranding. In order to understand these mechanisms it is important to recognise that the 'cost' of UCLL/UBA services today is a function of the expected cost of UCLL/UBA in the future. Most simply, applying high depreciation rates today will raise modelled 'cost' today but will lower modelled 'cost' in the future (when modelled asset values are lower to reflect high levels of past depreciation). It follows that applying a high levels of depreciation today reduces the risk of future commercial stranding by reducing future cost. Lower future costs implies lower future prices needed for cost recovery which implies lower probability that competing technologies will be able to undercut UCLL/UBA pricing in a way that prevents cost recovery.

332. Put simply, there are two factors that need to be estimated in order to arrive at a quantification of commercial asset stranding risk of the type in point c) above. The first is the potential path of quality adjusted commercial prices for competing technologies (such as mobile broadband). The second is the path of cost recovery (depreciation) that the regulator will build into its UCLL/UBA prices. Only with the latter known is it possible to attempt to quantify the stranding risk of the type c) faced by a UCLL/UBA provider.

333. Finally, there are stranding risks of the type outlined in point d) above. These come about as a result of, for example, the regulator making a future decision about the level of UCLL/UBA prices that is inconsistent with the assumed path of prices (and therefore depreciation/asset values) in past decisions. For example, the regulator may set UCLL/UBA prices on the assumption that the underlying assets used to provide UCLL/UBA services are worth "X" and will fall to be worth ¾ of X in five years' time. However, there may be a y% probability that, in 5 years' time, the regulator will make an assessment that the actual value of the UCLL/UBA assets is only worth ½ X.

334. In this situation there is a y% probability that today's UCLL/UBA provider will suffer a loss (stranding) of ¼X (¾X – ¼X) in 5 years' time. In order for today's UCLL/UBA provider to have an expectation of cost recovery their regulated prices over the next five years will need to include compensation that has an present value equal to a loss of ¼X in five years' time. Of course, if today's regulator did credibly commit to not making time inconsistent decisions of this nature then there would be no need for compensation for this risk. This further illustrates the need for the regulator to clearly spell out its decision rules prior to a quantification of asymmetric risk being undertaken. Of course, there potential asset stranding events that flow from policy decisions taken by Governments that a regulator clearly cannot credibly commit to prevent. These will always need to be quantified.

7.1.3 Are these risks compensated in the 75th percentile WACC calculation

335. Only systematic risks are captured in the CAPM cost of equity (and, in particular, the equity beta). Asymmetric risks to cash-flows are not beta risks and are not compensated in the CAPM cost of equity.[69] The Commission has previously recognised this fact:

> *"A number of suppliers of regulated services submitted that an allowance for asymmetric risks should be included within the cost of capital. Some of these submitters considered that the Commission could make allowance by adopting a point estimate at the upper end of the estimated plausible range. However, other submitters argued that choosing a point at the higher end of the range did not make any allowance for asymmetric risks. The Commission recognises that choosing a point estimate at the upper end of the range would be difficult to quantify and* ***would risk becoming conflated with the unrelated issue of recognising the potential asymmetries arising from estimation uncertainty****. In addition, whilst allowing an uplift to the cost of capital might provide firms with the necessary revenues to undertake self-insurance, without any form of 'ring fencing' arrangements in place, it is unlikely to provide consumers with any guarantee that the additional funds would be employed for that purpose …* ***The IM does not make any adjustments to the cost of capital for Type I asymmetric risk****."* (Emphasis added) [70]

336. It is clear from this quote that the Commission recognises that the IM cost of capital is not intended to compensate for asymmetric risk. I note that this is clear from its construction where no part of the IM cost of capital estimate, including the 75th percentile adjustment, is grounded in an actuarial assessment of asymmetric risk.

7.1.4 What should the Commission do

337. The level of asymmetric risk facing a hypothetical UCLL/UBA provider, or Chorus as the actually UCLL/UBA provider, is, in my view, likely to be material. However, the quantification of these risks is difficult and interdependent with the way that the Commission intends to model costs and respond to future events.

338. I therefore recommend that the Commission begin a separate process aimed at quantifying these risks and, in so doing, clearly stating its policy for how it will respond to future events that are relevant to a quantification of asymmetric risk. I recommend that the Commission begin this process immediately in order to ensure

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69 Although some asymmetric risks may, in addition, have "beta risk". For example, the potential for an earthquake may create asymmetric risks to cash-flows. These must be quantified and compensated for whether there is any beta risk attached or not. There may also be beta risk in the sense that a major earthquake in New Zealand is likely to negatively impact the market portfolio of investments. Consequently, a loss associated with an earthquake may also create beta risk. However, this is above and beyond the immediate costs of the earthquake itself.

70 Commerce Commission Final Reasons Paper, pp.112-113.

that, as it makes decisions on other elements of its regulatory approach, it clearly has in mind the impact of these decisions on the level of asymmetric risk.

7.2 Investment incentives

339. Professor Grundy explains that, even if there is no asymmetric risk setting the regulatory WACC at the midpoint estimate will only result in positive incentives for investment around half of the time. The other half of the time investors would prefer not to invest in regulated assets – and will only do so under duress (e.g., if they face penalties for not investing).

> *In general, potential investors are not required to invest in regulated businesses. Potential investors will only invest when the true expected return from doing so is greater than or equal to the cost of capital. Thus, if (i) the regulated price is set at a level such that the expected value of the true rate of the return that investors will earn on their investment is equal to an unbiased estimate of investors' true required return, and (ii) uncertainty is symmetric, then only 50% of the time will the expected value of the rate of the return that investors will earn on their investment exceed investors' true required return. In the other 50% of cases investors' true required return will exceed the regulator's unbiased estimate of investors' required return and investors will not be willing to invest.*

340. It is clear from the Commission's construction of the 75th percentile adjustment in the IMs that this is the problem that the Commission is attempting to solve. The 75th percentile adjustment is calculated based on the uncertainty around the relevant WACC parameters. The Commission's calculation attempts to ensure that 75% of the time the cost of capital allowed will be at least as high as investors actual cost of capital.

341. Whether the optimal percentile target is 75% or something higher or lower is an open question. As Professor Grundy makes clear, the answer requires the specification of the loss function that the regulator is seeking to minimise. However, it is my view that some adjustment is required in order to ensure an efficient regulatory regime. If the cost of capital is set at the midpoint WACC then the regulator must lean hard on penalties and coercion, and ultimately, the threat of stranding of sunk assets in order to engender efficient levels of investment. This may be possible in some circumstances but, ultimately, is likely to lead to perverse and inefficient results.

342. However, even if it was possible to use the 'regulatory stick' to engender investment for some businesses with large assets already sunk. The likely effect of this will be that investors, observing this conduct for existing assets, shun new investments that will be, or might, be regulated in the future.

343. Moreover, while assets are sunk and equity financing is permanent, debt financing must be rolled over. Setting the WACC at the midpoint WACC and relying on penalties to induce investment will raise the risks that debt investors face. This will raise the perceived level of regulatory risk faced by debt investors. This in turn can be expected to raise the cost of debt for regulated businesses and, to the extent that this feeds into regulatory determinations, at least partially offset the impact on prices of choosing the midpoint WACC.

COMPETITION ECONOMISTS GROUP

Appendix A Modigliani Miller and efficient debt management

A.1 Finance theory

344. The cornerstone of modern finance theory on the optimal capital structure for a firm is the work of Modigliani and Miller (1958). The following three subsections summarise their results. The first describes the optimal capital structure in the hypothetical context of perfect (zero transaction costs) capital markets. The second describes optimal capital structure in the more realistic context of imperfect capital markets, where "frictions" exist. The third describes the special role of bankruptcy/insolvency costs in determining an optimal capital structure.

A.2 Modigliani-Miller with perfect financial markets

345. The principal insight of Modigliani and Miller (1958) is that the level of risk in a firm is rather like the amount of air in a balloon. Squeezing one end of a balloon does not reduce the amount of air that is inside – it just shifts it to "the other end". In much the same way, issuing debt does not reduce the overall level of risk – it simply shifts it somewhere else – in this case, to equity. Miller (1991) made a similar observation some 30 years later:

> *Think of the firm as a gigantic tub of whole milk. The farmer can sell the whole milk as it is. Or he can separate out the cream, and sell it at a considerably higher price than the whole milk would bring. (Selling cream is the analog of a firm selling debt securities, which pay a contractual return.) But, of course, what the farmer would have left would be skim milk, with low butter-fat content, and that would sell for much less than whole milk. (Skim milk corresponds to the levered equity.) The Modigliani-Miller proposition says that if there were no cost of separation (and, of course, no government dairy support program), the cream plus the skim milk would bring the same price as the whole milk.*

346. In this quote Miller notes that issuing low risk debt securities is analogous to a farmer separating out cream from whole milk; namely:

- the firm gets a good price (low interest rate) for its debt; but
- the corollary is that the remaining equity is less desirable, and so requires a higher return to attract investors.

347. What Modigliani and Miller demonstrated is that if financial markets are efficient and there are no transaction costs, any reduction in the cost of debt will be perfectly

offset by a higher cost of equity. A firm's capital structure therefore has no effect on its weighted average cost of capital (WACC). This "law of the conservation of risk" is comparable to the "law of conservation of energy" from the physical sciences. Like energy, risk cannot be destroyed – it can only be converted from one form to another.

348. It should be noted that Modigliani and Miller do not define "transaction costs" as encompassing simply the direct and observable costs of an activity (such as payments to printers for a prospectus). Rather, transaction costs are defined much more broadly to include costs associated with dealing/trading in imperfect markets. These include, for example, costs associated with imperfect management incentives (agency problems and incentive problems with asymmetric information), and costs associated with trading in illiquid markets and/or with financial constraints that force a business to make suboptimal decisions.

349. A further conclusion that flows from Modigliani and Miller is that, if financial markets are perfectly efficient with zero transaction costs, then no particular debt raising strategy will dominate any other. Irrespective of whether a business issues large or small amounts of debt, short-term debt or very long term debt, callable or puttable debt, etc., its WACC will be the same.

A.3 Modigliani-Miller financial markets with frictions

350. Given the finding that, in frictionless financial markets, a business's capital structure simply does not matter then, if capital markets were frictionless, one would expect that firms with very similar attributes (products, competitors, cost structures and so on) would exhibit a great variety of capital structures. For example, some may have short term debt, others long term debt; some may have high gearing and others low gearing, and so on. There would be no 'common' strategy because, in the absence of frictions, there is no advantage from adopting any particular practice.

351. In actuality, businesses with similar attributes will often consistently adopt the same (or similar) debt raising strategies. The insight of Modigliani Miller is that consistently observed debt management strategies must be explained by a desire to minimise transaction costs (broadly defined) associated with less than perfect markets. That is, once one relaxes the assumption that capital markets are efficient, theory suggests that businesses (or subsets of businesses) will often adopt debt raising strategies that are designed to minimise exposure to those imperfections with a view to reducing transaction costs. Common strategies may therefore start to emerge.

352. A straightforward example is that businesses rarely, if ever, issue public debt at levels below a certain threshold, typically measured in the millions of dollars. This is because there are transaction costs associated with selling debt on both the seller

(prospectus/legal fees etc.) and buyer side (becoming informed about the quality of the debt etc.). For this reason, businesses will typically seek to avoid repeatedly incurring the same transaction costs by undertaking a smaller number of large debt issues (as opposed to a large number of small issues).

A.4 Special role of insolvency/bankruptcy costs

353. Once the Modigliani-Miller result was understood finance academics immediately attempted to explain, within the paradigm of transaction costs, why high levels of gearing were not common? This question was especially pertinent given that the existence of tax as a transaction cost and the tax deductibility of interest costs would tend to suggest that 99.99% gearing would minimise tax costs (and therefore transaction costs).

354. The generally accepted answer was that there were very high levels of transaction costs associated with insolvency/bankruptcy and this was why firms tended not to adopt high levels of gearing. Baxter (1967)[71] was one of the first to make this point but many authors have built on his insight since.[72]

355. The purpose of the present paper is to explain, in the context of the Modigliani and Miller discussion, how excessive leverage can be expected to raise the cost of capital to the firm. It is argues that when account is taken of the "risk of ruin" a rising average cost of capital is perfectly consistent with rational arbitrage operations. Allowing for the possibility of bankruptcy is tantamount to relaxing the assumption that the anticipated stream of operating earnings is independent of the capital structure

356. Insolvency or near insolvency imposes costs on a range of parties, including:

- Debt investors: insolvency means that debt holders do not get paid when debts fall due (a technical default). Debt investors will typically incur significant costs to manage that disruption (such as curtailing consumption/investment in other activities or borrowing from third parties – often at penalty rates due to the financial distress of the original technical default). If they cannot manage the technical default then they will themselves be rendered insolvent (unable to pay their debts as they fall due);

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71 Baxter, N., "Leverage, Risk of Ruin and the Cost of Capital," Journal of Finance 22, September 1967, pp. 3956-403.

72 For example: Stiglitz, J.E., "A Re-Examination of the Modigliani-Miller Theorem," American Economic Review 59, December 1972, pp. 784-793;Kraus, A. and R.H. Litzenberger, "A State Preference Model of Optimal Financial Leverage," Journal of Finance, September 1973, pp. 911-922; and Kim, E.H., "A Mean-Variance Theory of Optimal Capital Structure and Corporate Debt Capacity," Journal of Finance 33, March 1978, pp. 45-63.

- Equity investors: insolvency (or near insolvency) means that equity investors must stop receiving a dividend on their investment, which they have to manage in the same manner as debt investors and with analogous consequences. Equity investors will also suffer because the businesses reputation as a reliable borrower will be damaged. Moreover, existing equity investors may be forced to participate in a rights issue and/or a public equity raising to address the insolvency. Both of these options are likely to involve substantial transaction costs for equity investors.

357. Depending on the nature of the contracts with debt holders, insolvency may also give rise to debt holders taking full or partial control of the company and, potentially, to bankruptcy proceedings. Protracted legal battles may ensue between debt and equity holders (and between different groups of debt/equity holders) over the future of the firm. This may paralyse management, with the principal focus being on the division of the existing value of the firm (and debt holders attempting to ensure the maximum repayment of their debts) rather than on maximising the total value of the firm (including the equity stake).

358. These costs can destroy the value of a firm that would, had it adopted a less aggressive capital management strategy, never have become insolvent in the first place. Moreover, the disastrous nature of the potential transaction costs associated with insolvency (and bankruptcy), can see a firm in moderate financial distress quickly spiral into insolvency. This is because debt investors may be unwilling to fund the firm (or only at penalty interest rates) for fear of subsequent exposure to these costs. In other words, if there is perceived to be the potential for insolvency, this can become a self-fulfilling prophecy.

359. It is for these reasons that transaction costs associated with insolvency/bankruptcy play a key role in the 'real world' analysis of optimal capital management plans. Any change to capital management strategy can materially influence the likelihood (or perceived likelihood) of insolvency/bankruptcy, and so the probability of these substantial costs being incurred. It is important to recognise that there does not need to be an imminent threat of insolvency or bankruptcy for these factors to have a material bearing upon a firm's optimal capital management strategy. What matters is the potential effect of a particular strategy on expectations.

360. If a more aggressive capital management strategy raises the probability of future insolvency/bankruptcy – by any amount – this will reduce the expected (actuarially estimated) value of future cash-flows. This reduction will be equal to the change in probability of insolvency/bankruptcy multiplied by the expected additional transaction costs associated with those outcomes. Given the substantial magnitude of those costs, even small increases in the probability of those outcomes transpiring (e.g., from 0% to 5%) can have a significant effect on expected future cash-flows and, in turn, on the optimal capital structure.

361. Equally, if one aspect of a debt management strategy raises insolvency/bankruptcy risks another aspect of the debt management strategy might need to be made more conservative so that the net impact is reduced. For example, consider a firm exposed to high levels of refinancing risk due to heavy reliance on short term or lumpy debt maturity profile. Such a firm will have a large amount of its debt portfolio come due in a short period of time. As discussed in section 5.3.3, this is a situation that businesses treasuries (and credit rating agencies) seek to avoid due to the refinancing risks[73] associated with this. Such a firm may need to adopt a lower gearing and/or higher level of prefunding than would otherwise be the case. This may manage down the expected transaction costs of insolvency/bankruptcy but at the expense of higher other transaction costs (e.g., higher tax costs associated with lower gearing and line of credit fees/carrying costs associated with prefunding debt maturity).

73 The ability to refinance debt on reasonable terms is critical if a firm is to limit its exposure to insolvency risk.

Appendix B Letter to the AER on debt term

362. Provided separately

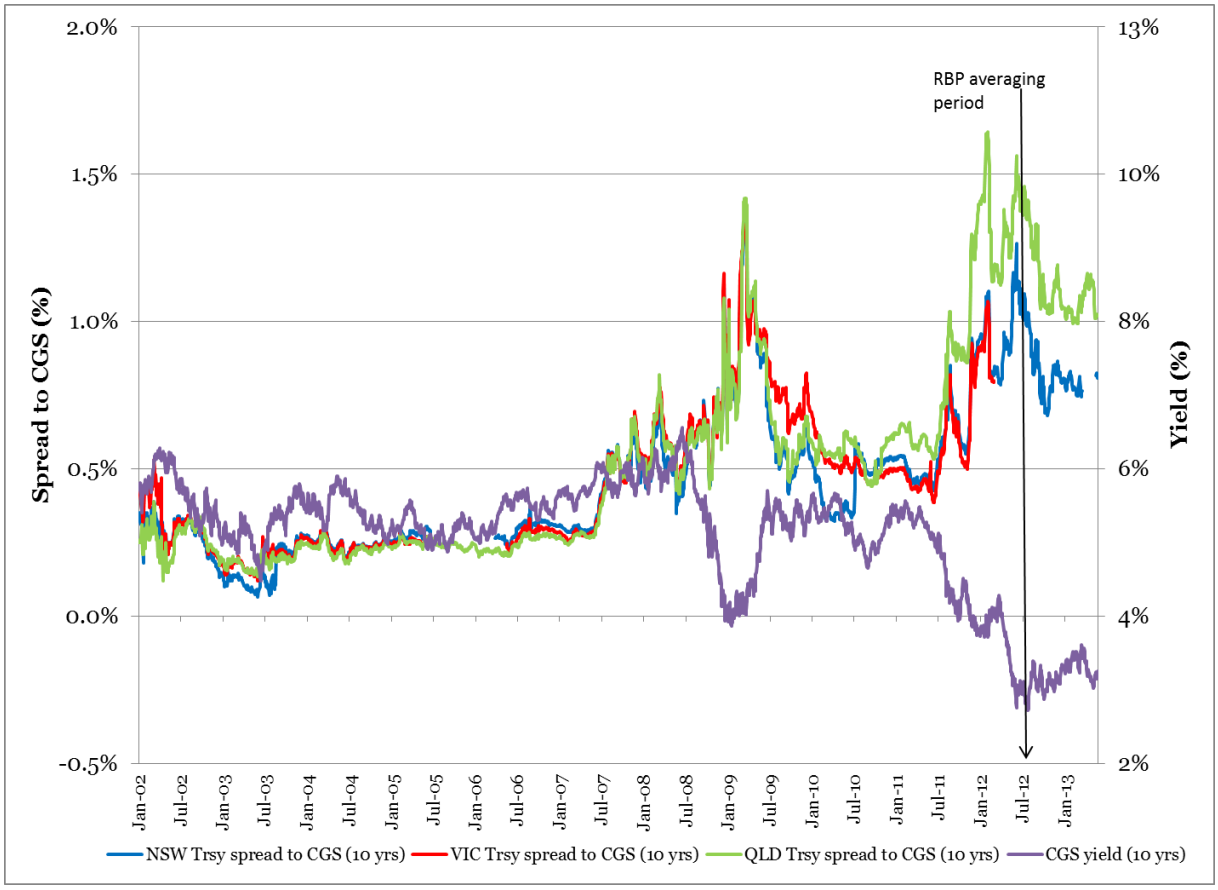
Appendix C Illustration heightened risk premiums when risk free rates are falling

C.1 Required returns on low risk assets and the RBP averaging period

363. The following two figures illustrate spreads between Australian government bond yields and the yields on other very low risk assets during the RBP averaging period for the risk free rate. These figures show that required returns on these very safe assets did not fall one-for-one with CGS yields during the RBP averaging period. This finding is in contrast to the implicit assumption that required returns on equity in regulated business can be estimated by adding a fixed premium to the prevailing government bond yield.

364. Figure 9shows that the required return on state government debt (rated AAA for NSW and Victoria and rated AA+ for Queensland) has increased materially relative to the required return on CGS since mid-2011. As a result, the difference in these returns (the "spread") increased materially. Moreover, this spread was at levels not seen since the midst of the 2008/09 financial crisis during the RBP averaging period. This figure provides ample evidence to the effect that required returns on low risk assets have not fallen in line with required returns on CGS.

Figure 9: Spread between 10 year Australian state government debt and 10 year Australian government bond yields



Source: Bloomberg, CEG analysis.

365. This is strong evidence that the forces driving down required yields on Australian Government bond yields (Commonwealth Government Securities or "CGS")were not driving down required yields on all other asset classes to the same extent. Put simply, if heightened demand for safe/liquid assets is causing risk premiums relative to CGS for the next most safe/liquid assets to rise by 70bp (and in so doing trebling in magnitude), then risk premiums relative to CGS for the much riskier and much less liquid equity market must be rising by many multiples of this.

366. Another very low risk financial asset is an interest rate swap. Before 2008, these traded at a spread of around 40bp or so – see Figure 10below. The spread spiked in 2008/09 and then returned to levels above, but much closer to, pre GFC levels. Then, over 2011 and the first half of 2012, spreads to CGS rose to a new post 2008/09 spike – with its peak just before the RBP averaging period. This demonstrates, once more, that required returns on swap contracts did not fall one-for-one with the falls in CGS yields in the lead up to the RBP averaging period.

Figure 10: Spread between 10 year swaps and CGS

Source: Bloomberg and CEG analysis.

C.2 Required returns on higher risk assets and the RBP averaging period

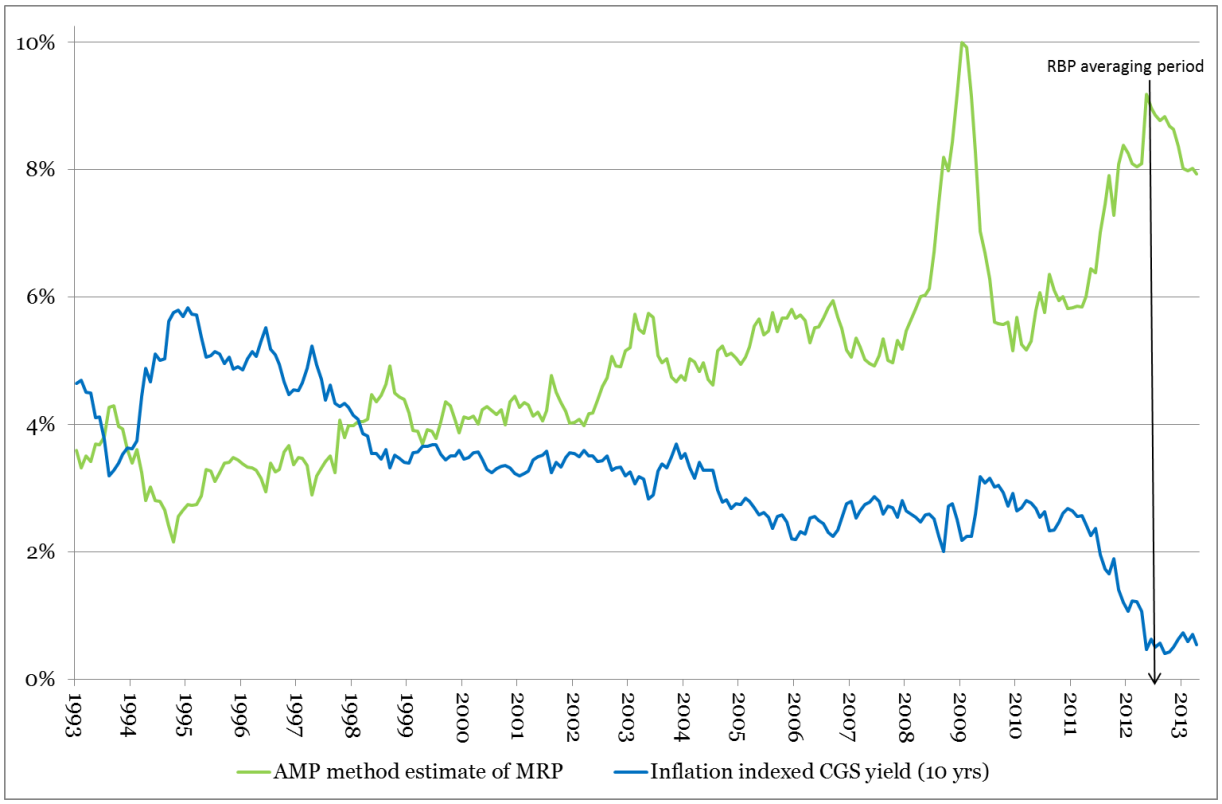
367. The dividend yield on listed equities can also be used to arrive at a direct estimate of the prevailing cost of equity using a simple dividend growth model. In what follows I use the method used by AMP Capital Investors.

368. A more recent estimate is from AMP Capital Investors (2006), who base the growth rate on the expected long-run GDP growth rate, similar to Davis (1998). AMP Capital Investors (2006) estimate the forward looking Australian MRP for the next 5-10 years to be 'around 3.5 per cent' (specifically 3.8 per cent), 1.9 per cent for the US and 2.4 per cent for the 'world'. AMP Capital Investors (2006) considers an extra 1 to 1.5 per cent could be added for imputation credits resulting in a 'grossed-up' Australian MRP of around 4.5 to 5.0 per cent.

369. The AMP methodology involves approximating a cost of equity by adding the long term average real growth in GDP (as a proxy for long term average nominal growth in dividends) to the prevailing dividend yield for the market as a whole. This gives a

'cash' cost of equity. To convert this into a cost of equity including the value of imputation credits, the cost of equity needs to be scaled up by the relevant factor. In Figure 11below I have used 3.9% per annum as the long run growth path for real GDP and a scaling factor of 1.1125 to capture the value of imputation credits. These assumptions are important for the level but not for the variation in the cost of equity estimate. I compare the cost of equity estimated in this manner with the real yield on CPI indexed CGS. When I do this I derive the following chart.

Figure 11: AMP method estimate of the E[MRP] relative to 10 year indexed CGS yields

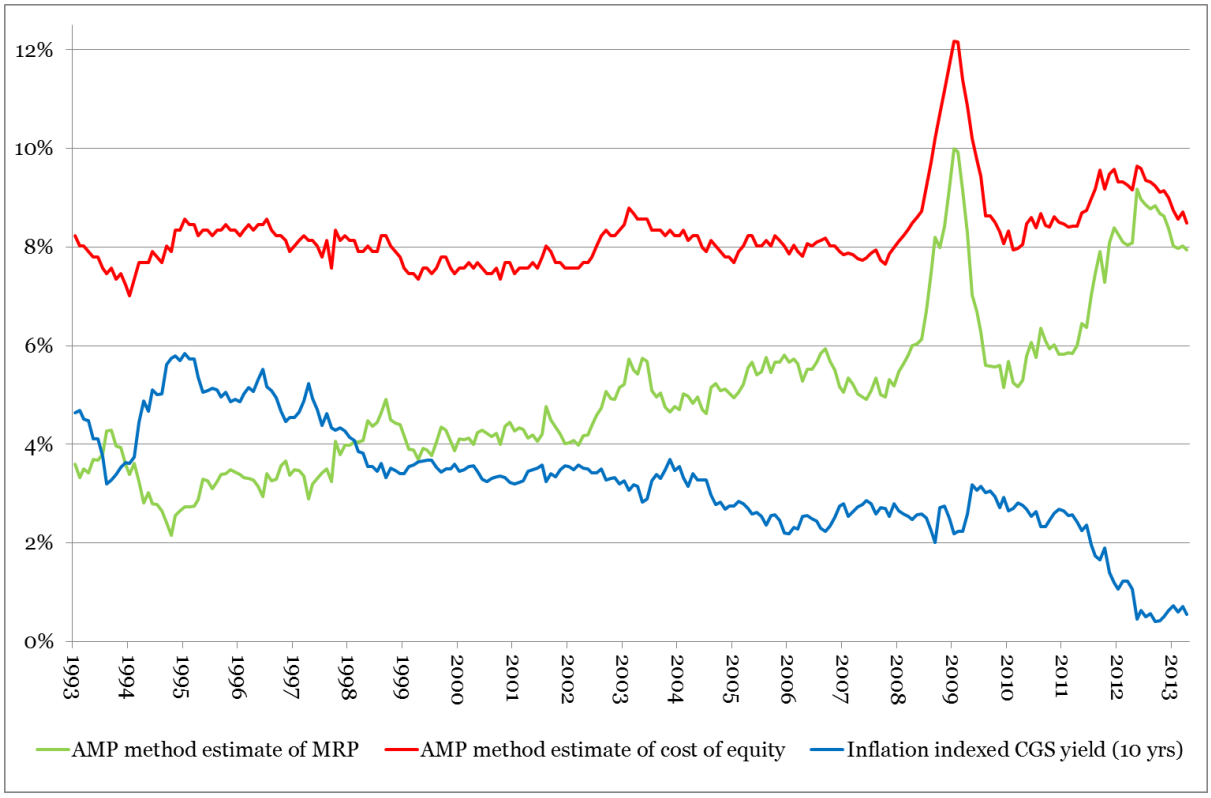


Source: RBA, CEG analysis.

370. Notably, the fall in CGS yields in the lead up to the RBP averaging period has been associated with a more than offsetting rise in E[MRP] measured relative to CGS yields – such that the estimate of E[Rm] has risen materially since mid-2011. I note that the path of these parameters over time is similar to those recently estimated and presented by Capital Research.

371. The estimate of E[Rm], being the sum of the CGS and MRP time series is much more stable than either of these two time series – as shown below in Figure 12.

Figure 12: AMP method estimate of real E[Rm] and E[MRP] relative to 10 year indexed CGS yields



Source: RBA and CEG analysis.

Appendix D IM approach to strict IM sample of bonds

372. In the Commission's most recent electricity decision for Maui from January 2014[74], the Commission relies on the (in some cases interpolated) DRP at around 5 years to maturity on bonds with a qualifying rating[75] issued by qualifying issuers[76]. Using this information, the Commission determines a DRP for a *publicly traded, GBP/EDB-issued bond, rated BBB+ with a remaining term of five years.*

373. Specifically, the Commission has regard to bonds which fit into the following five categories, giving progressively less regard to bonds lower down on the list:

    a. bonds issued by a EDB or GPB (which is not government owned) with a BBB+ credit rating;

    b. bonds issued by another entity (that is not government owned) with a BBB+ credit rating;

    c. bonds issued by a EDB or GPB (that is not government owned) with a credit rating other than BBB+;

    d. bonds issued by another entity (that is not government owned) with a credit rating other than BBB+; and

    e. bonds issued by government-owned entities.

374. The 12 companies which are used to inform the DRP estimate in the January 2014 decision include: Wellington Airport, Powerco, Contact Energy, Telecom, Auckland International Airport, Telstra, Fonterra, Genesis Energy, MRP, Meridian, Christchurch International Airport and Transpower.

375. There are no bonds which fit into category (a) above. Therefore, the most weight is given to a BBB+ bond with 6.4 years to maturity issued by Wellington International Airport, which fits into category (b). Two bonds from Powerco (maturing in 2017 and 2018) fit into category (c), and a 5 year number is calculated by interpolating

74 http://www.comcom.govt.nz/regulated-industries/input-methodologies-2/cost-of-capital/

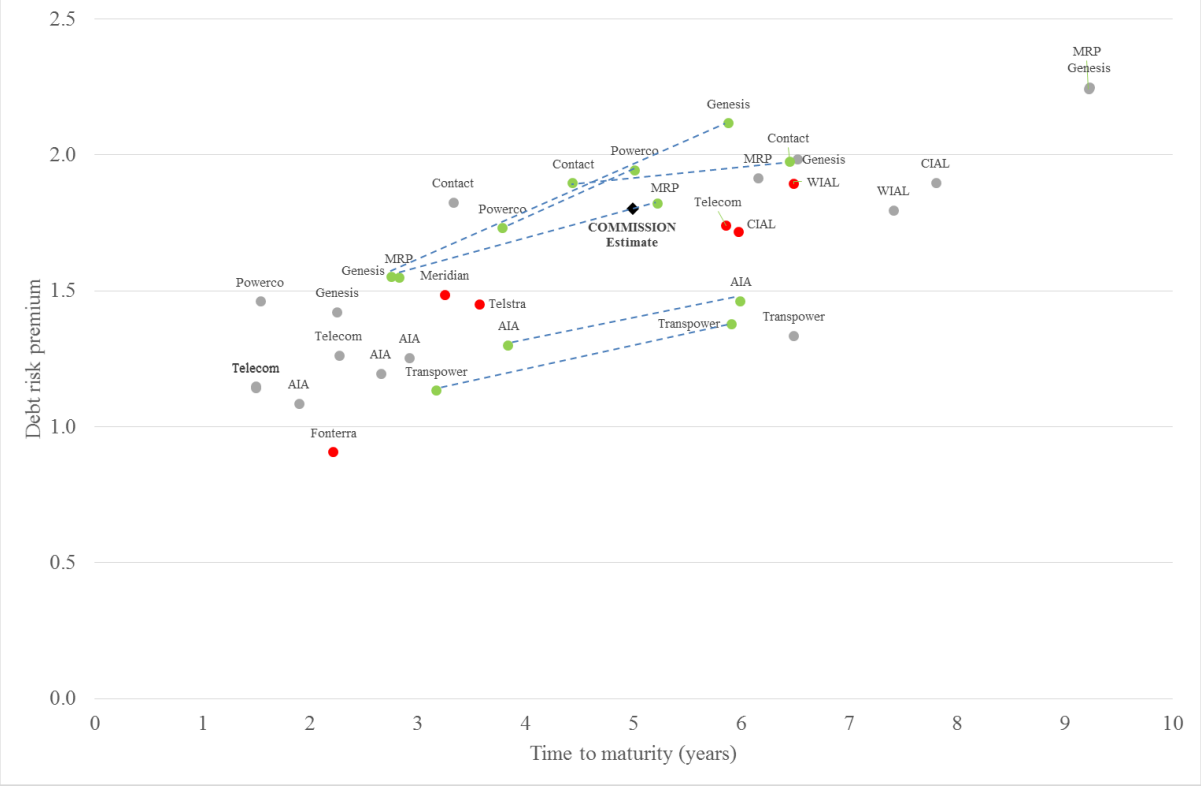
75 A qualifying rating means (a) S&P's long term credit rating of the specified grade, or (b) equivalent long term credit rating of another internationally recognised rating agency.

76 A qualifying issuer is a New Zealand resident limited liability company that (a) undertakes the majority of its business activities in Australia and New Zealand, or is part of a corporate group that undertakes the majority of its business activities in Australia and New Zealand, (b) does not operate predominantly in the banking or finance industries, or is part of a corporate group that does not operate predominantly in the banking or finance industries, and (c) that issues vanilla NZD denominated bonds that are publicly traded.

between them. Three sets bonds fit into category (d), issued by Contact Energy, Telecom and Auckland International Airport, and 5 year numbers are calculated by interpolating between them. Another two bonds, issued by Telstra[77] with 3.5 years to maturity and Fonterra with 2.2 years to maturity are also included in this category. Three sets of bonds fit into category (e), issued by Genesis Energy, Mighty River Power and Transpower, as well as two individual bonds issued by Christchurch International Airport and Meridian respectively.

376. The Commission concludes that a DRP of 1.80% is suitable for a publicly traded, GBP/EDB-issued bond, rated BBB+ with a remaining term of five years as at 1 January 2014. The bonds which have been taken into consideration are illustrated in Figure 13, where red marks bonds which have been taken into account 'on their own', and green marks bonds which have been used to interpolate a 5 year value.

Figure 13: Application of IM approach to determining DRP



Source: Commerce Commission, CEG analysis

** DRP estimates are taken from Commission's spreadsheet*

77 The bond issued by Telstra have their country listed as Australia in Bloomberg (but is issued in NZD), so it does not technically meet the definition of a "qualifying issuer".

7.2.2 Applying the IM approach to Chorus

377. As Chorus is the only fixed-line infrastructure company with outstanding bonds in New Zealand, there are limited comparators. For this reason, it is difficult to apply the Commission's approach sensibly to Chorus. Still, I will interpret an application which could be made using the IMs.

378. In the first instance, I will assume that the Commission will make the industry specific categories (a) and (c) relate to fixed-line infrastructure bonds. In this case, if the benchmark credit rating remains at BBB+, the outcome for Chorus would be very similar to the outcome for Maui development. Only one bond – Powerco – would shift from category (c) to category (d), as it would no longer be a 'same industry' bond. All the other bonds would remain the same. It is unlikely that this shift would materially alter the Commission's estimate of 1.80%.

379. If the benchmark credit rating was changed to BBB-, in order to reflect the recommended benchmark UCLL/UBA credit rating, then another shift would occur: the bond issued by Wellington International Airport would shift from category (b) to category (d). It is impossible to assess how this would affect the Commission's qualitative weighting system and thereby the DRP, however, all the individual DRP estimates remain the same so the impact is not likely to be very material.

380. It is also possible that the Commission suggests that bonds issued by Telecom (and Telstra) fit into category (c), since they operate broadly in the telecommunications industry. This would then place higher weight on bonds with relatively lower DRP estimates (1.63% and 1.45% respectively). This could potentially depress the 1.80% DRP estimate to some extent.

Appendix E Curve fitting methodologies

E.1 RBA curve fitting approach

381. The Reserve Bank of Australia (RBA) has recently started publishing Australian corporate credit spreads. The RBA established a method for estimating aggregate credit spreads of Australian NFCs across maturities ranging from 1 to 10 years. According to the RBA, its methodology is[78]:

> *[…] simple, transparent and relatively robust in small samples.*

382. The RBA's methodology estimates a yield at a particular maturity based on a weighted average of yields on a sample of bonds. The yield of each bond is weighted by the product of:

- the face value of the bond, such that larger bond issues receive greater weight in the assessment of the benchmark spread or yield; and
- the relative closeness of the bond to the target maturity. This second weighting is achieved by estimating a 'Gaussian kernel', or essentially a normal probability density function, that places greatest weight on issues that are closest to the target maturity.
- greatest weight on issues that are closest to the target maturity.[79]

E.2 Nelson-Siegel curve fitting approach

383. The Nelson-Siegel methodology provides a flexible function form that allows for a variety of shapes that one would expect a yield curve might take but which also limits the amount of computing power required to estimate the relevant parameters. It provides a useful cross-check against the fair yield estimates published by Bloomberg and the RBA as well as against the methodologies utilised by regulators such as the ERA to estimate DRP.

384. The Nelson-Siegel functional form used is as set out below:

$$Yield(t) = \beta_1 + (\beta_2 + \beta_3)\frac{1 - e^{-\frac{t}{\beta_0}}}{\frac{t}{\beta_0}} - \beta_3 e^{-t/\beta_0}$$

78 Reserve Bank of Australia, *New Measures of Australian Credit Spreads,* 2013, p. 1

79 Reserve Bank of Australia, *New Measures of Australian Credit Spreads,* 2013

385. Conceptually, β_1 can be interpreted as a long-term component (which never decays), β_2 as a short-term component (its loading starts nearly at 1, and then decays over term to maturity), β_3 as a medium-term component (its loading starts at zero, then peaks at some point and then decays to zero again), and β_0 as a parameter characterising the speed of decay of the short-term and medium-term effects. Therefore, as the term to maturity increases, the estimated yield goes to β_1 rather than to infinity as it would if a linear or quadratic specification were instead adopted. The parameter *t* refers to the bond's term to maturity.

386. This functional form gives the curve the flexibility to take on many different shapes (from monotonically increasing to hump shaped) which allows the curve to be fitted to the data rather than enforcing a shape that may not be consistent with the underlying data. I consider that this is a reasonable assumption - especially for credit ratings that are similar to each other.

387. I estimate β_0, β_1, β_2 and β_3 to define a Nelson-Siegel yield curve for each credit rating by minimising the sum of squared errors between the fair yield curve and the reported yield data over the averaging period. The regression is non-linear due to the inclusion of the speed-of-decay parameter β_0.

Appendix F Construction betas

388. Chorus faces specific risks due to the roll-out of its fibre network that suggest its risk profile may be similar to that of construction businesses. In this section I form a sample of construction businesses and estimate their asset betas. Specifically I look at:

    - 8 overseas businesses engaged in the construction of water and sewer mains, pipelines, and communications and power lines;[80] and
    - 9 businesses in New Zealand and Australia engaged generally in construction or civil engineering works.

389. The businesses in this sample are set out in Table 11 below.

Table 11: Sample of construction businesses

Mastec, United States	Futurefuel Corp, United States	Monadelphous, Australia
Primoris Services, United States	Preformed Line Products, United States	Watpac, Australia
Dycom Industries, United States	Fletcher Building, New Zealand	NRW Holdings, Australia
Renewable Energy Group, United States	Opus International, New Zealand	Cardno, Australia
Aegion Corp, United States	Leighton Holdings, Australia	MacMahon Holdings, Australia
MYR Group, United States	UGL, Australia	

390. Asset betas for these businesses over non-overlapping 5 year periods to 13 March 2014 are shown in Table 12 below.

80 This is SIC code 1623

Table 12: Estimated five year daily asset betas for construction businesses

Firm	Asset beta, 5 years ending 13 March 1999	Asset beta, 5 years ending 13 March 2004	Asset beta, 5 years ending 13 March 2009	Asset beta, 5 years ending 13 March 2014
Mastec	0.960	0.912	0.963	1.058
Primoris Services				0.830
Dycom Industries	0.749	1.290	1.366	1.307
Renewable Energy Group				
Aegion Corp		0.708	1.071	1.252
MYR Group				1.169
Futurefuel Corp				
Preformed Line Products			1.094	1.366
Fletcher Building		0.673	1.155	1.234
Opus International				0.814
Leighton Holdings	1.317	0.683	1.315	1.198
UGL		0.496	0.879	0.735
Monadelphous		0.143	1.014	1.269
Watpac,		2.372	0.519	0.444
NRW Holdings				1.380
Cardno				0.576
MacMahon Holdings	0.263	0.119	0.916	1.324

Source: Bloomberg, CEG analysis

391. These results suggest that the asset betas of construction businesses are on average very high. They are summarised further in Table 13 below, which shows the average 5 year daily asset beta across the entire sample and by sub-sample.

Table 13: Average 5 year daily asset betas for construction businesses by sample

Sample	Number of businesses in sample	Average 5 year daily asset beta across businesses in sample
All construction businesses	15	0.972
SEC 1623	6	1.065
NZ and AU businesses	9	0.911

Source: Bloomberg, CEG analysis