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WACC parameters in the UCLL and UBA draft decision

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Executive summary

1. We have been asked by Chorus to review the Commerce Commission's draft decision on the cost of capital for providing the UCLL and UBA services. In particular, we have been asked to:

   - assess the reasonableness of the Commission's estimate of the asset beta;
   - comment on specific aspects of the Commission's approach to estimating the cost of debt; and
   - undertake a comparison of the WACC allowed by the Commission against those allowed in other jurisdictions.

2. Our views on these issues are summarised below.

Asset beta

3. We consider that the Commission should set an asset beta of 0.50 based upon data over the past 20 years, as well as the most recent observations of beta. This is also consistent with asset betas allowed by other regulators for regulated fixed line telecommunications businesses.

4. In our view, the Commission's draft decision to set an asset beta of 0.40 turns upon its view that only recent betas are relevant – without a clear rationale for what defines a 'recent' beta estimate. The Commission considers that it should not have regard to beta estimates using earlier data because those estimates are not relevant to the forecast period including because some of these beta estimates may be affected by the tech bubble. Instead, the Commission proposes that betas estimated over the period from 2009 to 2014 are most relevant for assessing betas expected in future economic conditions.

5. We demonstrate that:

   - asset betas estimated over the past 5 years have been depressed due to the effects of the global financial crisis and the European sovereign debt crisis; but
   - asset betas measured over periods that do not include the effects of these crises have recently recovered from these lower levels and have returned to levels previously experienced prior to 2008.

6. In our view, the Commission should have regard to average asset betas over the past 20 years because:

   - the empirical evidence shows that betas for fixed line telecommunications businesses have not remained at the low levels that they fell to during the global financial crisis and subsequent European sovereign debt crisis. These periods

of crisis, which overlap with the period sampled by the Commission's beta estimates, cannot be considered to be representative of future expected economic conditions that will prevail over Chorus' first regulatory period;

- rather, the evidence based on our updated analysis suggests that current betas have recently returned to a level of around 0.50. This is also consistent with the long run average of betas over the past 20 years; and
- this is consistent with the methodology that the Commission applied in the Input Methodologies and which was upheld on appeal to the High Court. Applying the same methodology for Chorus will promote regulatory predictability and stability.

Cost of debt

Debt issuance costs

7. We consider that debt issuance costs of 0.35% (for a 7 year term) or 0.28% (for a 10 year term) are consistent with the empirical results relied upon by the Commission in its Input Methodologies final decision. The Commission's proposal to apply debt issuance costs of 0.25% is not consistent with these results.

Weight given to bonds affected by New Zealand Power proposal

8. The Commission proposes to not give weight to the debt risk premium (DRP) on bonds issued by Genesis, Mighty River Power and Meridian because it considers that their yields are inflated over its sampling period during July 2014. We have considered the empirical evidence and agree with the Commission that uncertainty over the valuation of these firms' assets appears to have given rise to an increase in DRP on bonds issued by these firms. This uplift appears to be in the order of 0.07% to 0.16%.

9. In contrast to what the Commission suggests in its draft decision, we consider that this type of risk is very relevant to the risk profile of a UCLL and UBA provider facing regulation under TSLRIC. Both the affected generation companies prior to the 2014 election and the provider of UCLL and UBA regulated under TSLRIC face the prospect of future revaluation of their assets that has the potential to reduce the equity buffer protecting debt lenders. We consider that the uplift estimated over the affected period should be captured and added to any estimate of DRP in the future.

Term for the cost of debt

10. We continue to believe that 10 years is an appropriate estimate for the term of debt. The average term of debt estimate on the sample of firms used by the Commission to benchmark asset beta is 10.7 years.

Transaction costs of swaps

11. We consider that a reasonable compensation for the transaction costs of swap contracts is likely to be at least 0.10% to 0.13%, and potentially much greater than this. The Commission's estimate of 0.04% is underestimated because:

    - it is derived using a methodology that does not serve to approximate the transaction costs of swaps;
    - it does not recognise that the debt raising behaviour that the Commission assumes of businesses required two swap transactions in respect of each dollar of debt raised, rather than one; and
    - it includes no allowance for the impact on the New Zealand interest rate swap market of an attempt by the provider of UBA/UCLL to hedge its entire debt portfolio in a short period of time (i.e., over a regulatory averaging period).

International comparison

12. We conduct a comparison of allowed WACC premiums for fixed access telecommunications networks across different jurisdictions, including the WACC premium allowed for Chorus in the Commission's December draft determination.

13. Our comparison shows that the implied WACC premium proposed by the Commission of 3.56% is very low. It is the lowest in our comparator group of 11 European jurisdictions, the US and Australia.

14. The results of this survey suggest that the Commission's cost of capital parameters affecting its allowed WACC premium – its debt risk premium, TAMRP and asset beta – together give lower compensation above the risk free rate than regulators of comparable businesses. This provides a further cross check on the Commission's cost of capital allowance that supports the conclusions in the remainder of this report.

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1 Introduction

15. The Commerce Commission draft decision setting prices for the UCLL and UBA services includes a draft decision on the cost of capital to use for this purpose. The Commission has determined an estimate of the weighted average cost of capital (WACC) applicable to both UCLL and UBA. The Commission's estimate of post-tax WACC of 6.47% is the weighted average of:

    - a cost of debt of 6.33%, which is comprised of:
        - a risk free rate of 4.19% estimated as one-month average (observed in July 2014) of the interpolated 5 year yield on New Zealand government bonds;
        - a debt risk premium of 1.85% for a 7 year BBB+ benchmark bond;
        - an allowance for debt issuance costs of 0.25%; and
        - an allowance for the transactions cost of interest rate swaps of 0.04%.
    - a cost of equity of 7.92%, comprised of:
        - a risk free rate of 4.19% estimated as one-month average (observed in July 2014) of the interpolated 5 year yield on New Zealand government bonds;
        - an investor tax rate of 28%;
        - an asset beta of 0.40; and
        - a TAMRP of 7.0%.

16. CEG has been asked by Chorus to review specific parts of the Commission's WACC estimate. In particular, Chorus has asked us to:

    - review the reasonableness of the Commission's estimate of asset beta in light of asset beta estimates for comparable businesses and the approach taken by the Commission in the Input Methodologies;
    - assess the reasonableness of the Commission's cost of debt estimate in relation to:
        - its estimate of debt issuance costs of 0.25%;
        - its decision to effectively give no weight to debt risk premiums on bonds issued by Mighty River Power, Genesis and Meridian in coming to its estimate for debt risk premium of 1.85%;
        - its continued reliance on a term for the cost of debt of 7 years; and
        - its estimate of swap transaction costs of 0.04%.
    - develop a comparison of the overall cost of capital allowed by the Commission to that provided to fixed line telecommunications service providers in foreign jurisdictions.

17. The remainder of this report is set out as follows:

- Section 2 examines the asset beta for the UCLL and UBA provider, including examining a long term history of beta, how it has changed over time and also international regulatory precedent;
- Section 3 responds to the questions raised by Chorus about the reasonableness of the Commission's cost of debt assumptions; and
- Section 4 conducts a review of the WACC allowed by international regulators for regulated fixed line telecommunications businesses.

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2 Asset beta

18. Beta is a measure of systemic risk of a security in comparison to the market. Empirically estimated betas are not typically constant over time and are affected by market conditions, including random shocks to the market. For the purpose of setting the cost of capital, it is the forward-looking level of beta expected by investors, over Chorus' future five-year regulatory period, which is important. In order to estimate the forward-looking level of beta, we have regard to both a long-run average estimate of the historical betas for the proxy group and also the most recent beta estimates on the basis that this approach is:

    - more resilient to market shocks than relying solely on the most recent five-year estimates of beta;
    - is consistent with the approach applied by the Commission in its Input Methodologies Final Reasons paper, upheld by the High Court; and
    - gives rise to an estimate that is also consistent with the most recent estimates of short-term beta.

19. As is demonstrated in the Input Methodologies process, empirically estimated betas can change over time, sometimes rapidly. It is therefore important that estimates of beta be updated to take into account new data that has become available since 10 April 2014. In this report, we present estimates of beta based on data up to and including 11 December 2014.

20. In its draft decision, the Commerce Commission's consultant Oxera estimated an asset beta of 0.40, based primarily on an analysis of asset betas over the most recent five year period ending 10 April 2014. Our conclusion is that the Commission should set an asset beta of 0.50 based upon data over the past 20 years, as well as the most recent observations of beta. This conclusion is also supported by a survey of the asset beta allowed by thirteen international regulators for fixed line telecommunications, which average 0.48.

21. Oxera gives two reasons to restrict its analysis to the recent five-year period.[1] Firstly, that in the full period more weight would be given to firms with a longer trading period because the sample size is smaller prior to 1999. We discuss below why the bias claimed to exist by Oxera does not exist. The second reason cited is that beta estimates are materially lower in the more recent period as a result of a structural change. We disagree with Oxera on two counts. First, the most recent betas are actually not materially lower than betas measured prior to the global financial crisis. Second, we disagree with Oxera's speculation as to why one would expect the underlying beta risk of fixed line telecommunication providers to have

[1] Oxera, *Review of expert submissions on the WACC for UCLL/UBA*, 4 November 2014, p. 4.

fallen recently. On this basis we reject the proposed approach of assuming that investors' expectations of the future value of beta should not be based predominantly on unusually low beta estimates derived using data over the 2009 to 2012 period.

22. We also compare the Commission's approach applied in the Input Methodologies final reasons paper for electricity distribution and gas pipeline businesses, which relied upon betas estimated across 20 years of data.

2.1 Long-run beta estimates

23. We agree with Oxera that, for the purpose of setting the cost of capital, it is the forward-looking level of beta, over the future regulatory period (proposed to be five years), which is important. We consider it to be unsound to assume that investors' expectations of the future value of beta will be exclusively based on measured betas over a period in which betas are affected by the global financial crisis and subsequent European sovereign debt crisis. In order to estimate the forward-looking level of beta, we propose taking a long-run average beta on the basis that this approach is:

- more resilient to market shocks than relying solely on the most recent five-year estimates of beta;
- is consistent with the approach applied by the Commission in its Input Methodologies Final Reasons paper, upheld by the High Court; and
- gives rise to an estimate that is also consistent with the most recent estimates of short-term beta.

24. We give equal weight to each firm's five-year beta observation over the 20 year period and therefore avoid giving undue weight to earlier periods where there is data available for fewer firms.

2.1.1 Economic conditions

25. As noted above, empirically estimated betas are noisy. They are not typically constant over time and are sometimes materially higher/lower than average depending on the nature of the shocks affecting the individual businesses and the market overall. There is no particular reason to expect that future conditions will reflect conditions in the previous five year period.

26. The recent five-year period that Oxera places a high degree of weight upon is affected by major economic crises that, on the basis of empirical results presented below, appear to have depressed beta estimates for telecommunications firms. Our time series of beta indicates that recent estimates appear to be returning to where they were prior to the global financial crisis.

27. The empirical evidence presented in this report shows that asset betas for fixed line telecommunications businesses have not remained at the historically lower levels experienced during the global financial crisis and subsequent European sovereign debt crisis. This period of crisis, which substantially overlaps with the five year period relied upon by the Commission, cannot be considered to be representative of future expected economic conditions that will prevail over Chorus' first regulatory period.

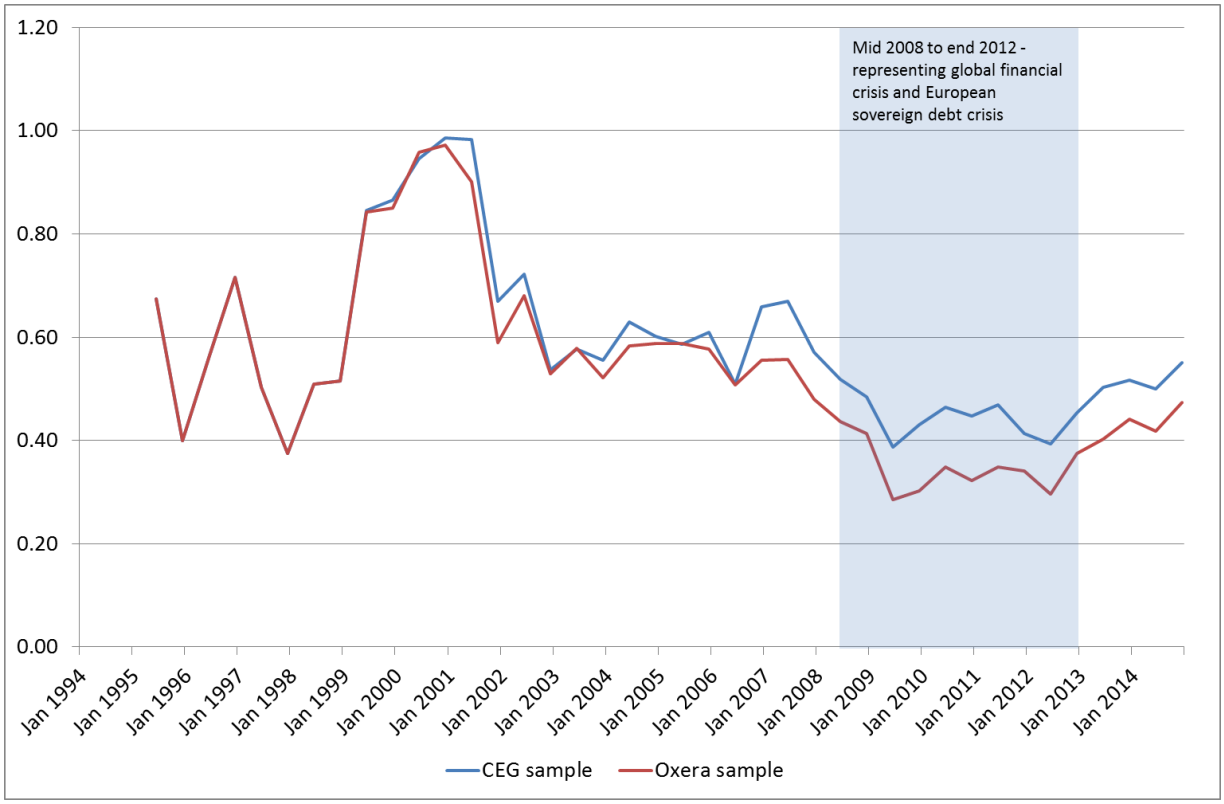
28. Empirically estimated betas are not typically constant over time. The beta estimates presented by Oxera disguise some of this variation because it reports:

    - 5 year betas; and
    - 2 year betas, measured once every 5 years.

29. In Figure 1 below we present a time series of six month beta estimates. This allows us to discern finer movements in the beta over time than can be seen in 5 year betas (or 2 year betas sampled once every 5 years). It also demonstrates the most recent six month period using data not taken into account by Oxera (which uses data up to and including 10 April 2014).

30. For instance, Figure 1 clearly shows the impact of the tech bubble over 1998 to 2001 to increase betas for telecommunications firms. It also shows the effect of the global financial crisis and the following European sovereign debt crisis in depressing betas for telecommunications firms.

Figure 1: Time series of six month beta estimates



Source: Bloomberg data, CEG analysis

31. Figure 1 also shows that the most recent betas measured over this period have returned to where they were prior to the global financial crisis. Figure 1 also clearly demonstrates a historically abnormal level of 6 month betas measured using data from 2008 to 2012.

32. This period of historically unprecedented low betas for telecommunication businesses is affected by the events of the global financial crisis of 2008/09 and the subsequent period affected by the global financial crisis beginning in 2008 and the subsequent European sovereign debt crisis. These periods saw extremely high betas for financial stocks directly embroiled in the crisis. The flipside of this is that other firms' betas were depressed by this. This is a mathematical truism that flows from the fact that the average beta for the market portfolio is by definition 1. If financial sector betas are heightened, then other betas must on average decline.

33. The depressed nature of telecom betas during the crisis years is apparent in Figure 1. The inverse relationship between telecom and finance sector betas can also be

seen in Figure 2 which charts betas for finance and telecom components of the S&P Europe (SPE) Index.[2]

Figure 2: European finance vs telecommunications betas

Source: Bloomberg data, CEG analysis

34. The global financial crisis is generally described as beginning in mid-2007 when a liquidity crisis first hit financial institutions that had been relying on short term borrowing[3] and creating distress for a number of banks including Countrywide Financial in the US in August 2007, Northern Rock in the UK in September 2007. It then escalated over 2008 with the March 2008 run, and subsequent bail out, of Bear Sterns in the U.S and the filing for bankruptcy of Lehman Brothers investment bank in September 2008. The crisis continued with global stock markets reaching their nadir in March 2009. In Europe, the global financial crisis precipitated the European sovereign debt crisis (also referred to as the Eurozone crisis) where large

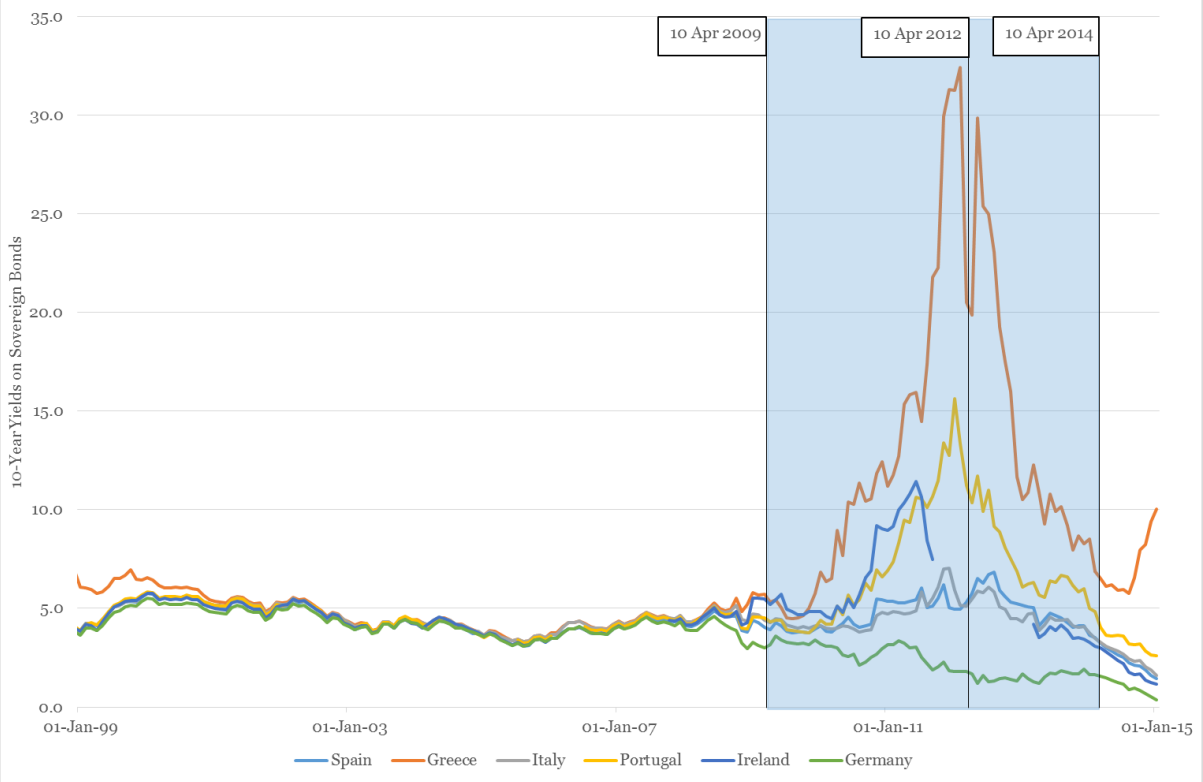
2 Data is sourced from Bloomberg. Daily index returns are calculated as the percentage change in closing price between two consecutive days (excluding non-trading days). Sample period starts from 7th of March 2003, which is the first date daily index weightings are available from Bloomberg, and ends on the most recent date when the analysis was preformed (12th of Feb 2015). Betas are estimated on a 6 month basis (128 trading days).

3 Baily and Elliot, The US Financial and Economic Crisis: Where Does It Stand and Where Do We Go From Here?, Business and Public Policy at Brookings, P. 5.

sovereign governments, especially in Portugal, Italy, Ireland, Greece and Spain (PIIGS), faced the prospect of default and potentially exit from the Euro currency area.

35. The European sovereign debt crisis can be tracked over time by examining the spread between the yield on 10 year debt issued by the PIIGS and the yield on debt issued by the German government. Figure 3 shows that this spread reached its peak in mid-2012 but returned to more sustainable levels, especially for Italy and Spain, from 2013 onwards.

Figure 3: Time yield on PIIGS debt to German debt



Source: Bloomberg data, CEG analysis

36. The average spread between PIIGS sovereign debt and German sovereign debt is also provided in tabular form for relevant periods.

Table 1: 10-Year Spreads to German Sovereign Bonds

Average Yield	Spain	Greece	Italy	Portugal	Ireland
30 Apr 2012 – 30 Apr 2014	3.338	11.843	3.005	5.455	1.958
30 Apr 2009 – 30 Apr 2014	2.484	10.807	2.361	4.903	3.262
29 Jan 1999 – 31 Dec 2014	0.957	4.063	1.022	1.913	1.057
30 Jun 2014 – 31 Dec 2014	1.253	6.215	1.464	2.282	0.851

Source: Bloomberg, CEG analysis

37. We are in agreement with Oxera that it is the beta that is expected to apply in the future period that should be used in the cost of capital formula. However, Oxera states:[4]

> … ***betas have fallen and there is no reason to believe that investors would expect them to rise to pre-2000 levels.*** *Statistical analysis demonstrates that betas have been lower in recent years, and a forward-looking analysis should not take into account data from a period when betas were different from those anticipated for the future.* [emphasis in original]

38. We do not consider that Oxera's conclusion that there *"is no reason to believe that investors would expect [betas] to rise to pre-2000 levels"* is well-founded given that our analysis, and Oxera's, demonstrates that betas for telecommunications stocks overall have been depressed since the onset of the global financial crisis in 2008 and remained depressed over the European sovereign debt crisis. However, instead of identifying this as an effect of these crises, Oxera instead concludes that this level is a 'new normal' and reflects expected market conditions in the future. Oxera's analysis of movements in beta over time focuses on:

- an incomplete time series of two year betas (i.e., one two year beta is estimated only once every five years) and a series of four different five year beta estimates; and
- only includes data up to and including 10 April 2014.

39. This means that Oxera's reported two year betas include data back to and including April 2012 (i.e., the worst of the European sovereign debt crisis) and are not free of the effects of the European sovereign debt crisis. Its five year betas include data back to and including April 2009. Oxera's view that recent beta estimates are likely to persist amounts to a conclusion that the effects of the global financial crisis and the European sovereign debt crisis on beta are likely to persist in the medium term and that the most recently observed beta estimates of around 0.5 will be reversed. This would be a far-reaching conclusion that would have effects on other parameters of the WACC if it were consistently applied.

4 Oxera, *Review of expert submissions on the WACC for UCLL/UBA*, 4 November 2014, p. 7

40. In our view this conclusion is not supported by the empirical data on beta. In this report we present betas calculated up to and including 11 December 2014 – including seven months of data more than captured by Oxera. Figure 1 shows six monthly betas, and demonstrates that the lowered level of beta that persisted during the global financial crisis and the European sovereign debt crisis has recently reversed. Based on this empirical analysis, beta estimates have reverted back to levels experienced prior to 2008. This is also the level of the long term average of beta over the past 20 years, as we discuss further in Section 2.1.2.

41. In conclusion, we agree with Oxera that it is the expected future level of beta that is important in setting the cost of capital. Unlike Oxera, we do not consider that relying solely on recent estimates of beta is likely to provide a good approximation of forward looking beta.

42. If the emphasis on estimating beta is to focus on the recent data, as suggested by Oxera, then it is important that the most up to date estimates of beta are used – especially where these are consistent with the long run historical averages. In this respect, we observe that:

    - the estimates of asset beta that we present in this report employ stock market data up to and including 11 December 2014, which includes 7 months of data more than Oxera's; and
    - the time series of six-month beta presented in Figure 1 above shows important trends in beta across the sample of telecommunications firms that should be taken into account if recent observations are deemed to be of greatest importance. There is no economic theory motivating a choice of 2 year or 5 year betas that would recommend estimating beta over a period of abnormally low beta estimates when both historical averages and the most recent estimates are at odds with this period.

43. We have also estimated two and five-year betas using data up to and including 10 April 2014 in order to cross-check our estimates with Oxera's results. Appendix A presents these results and discusses potential sources of difference.

2.1.2 Long-run average consistent with most recent beta estimates

44. The empirical evidence suggests that recent estimates of beta have recovered from their depressed level during the economic crises and are at levels similar to the long run average of beta over time (including averaging over both the tech bubble and the economic crises). On this basis, we believe that relying on the long run average of asset beta is likely to be a reasonable estimate of beta in forward looking conditions.

45. We also note that the use of long run average is consistent with the approach applied by the Commerce Commission in its Input Methodologies. Adopting the

same approach to determining beta across sectors signals regulatory predictability and stability. As we discuss below at section 2.1.3, we believe that interpreting the Commission's decision in the Input Methodologies Final Reasons Paper as preferring the long term average asset beta is not a mischaracterisation of that decision. It accurately reflects the Commission's decision given the reasons stated in its Final Reasons Paper and the facts and expert opinions that were placed before it to consider. It also reflects the position relied on by the High Court when it upheld the Commission's decision rather than the views of appellants that the most recent estimates should be used.

2.1.3 IM approach and High Court review

46. Our proposed approach of estimating betas over 20 years is consistent with the Commission's final decision in the Input Methodologies process. Initially, in its IM draft decision, the Commission estimated a beta for EDBs at 0.34 based on a single period of estimation being the most recent 5 year period. However in its final decision, it relied on data from 1990 to 2010, a 20-year period, to decide that its original estimated beta of 0.34 was reasonable (and that the Commission should not increase its estimate of beta to reflect an increase in measured betas between draft and final decision). The timeline describing the evolution of the Commission's approach to estimating beta in the IM process is as follows:

47. In reaching its final decision, the Commission estimated average betas going back and using data from 1990 to 2010. It reported that the average weekly/monthly beta using data from:

- 2000 to 2010 was 0.36/0.31; and
- 1990 to 2010 was 0.32/0.28

48. On the basis of this historical data –which included the period of the dot com bubble – the Commission concluded:[5]

> *The additional analysis confirms the Commission's original estimate of 0.34 included in the Draft Reasons Paper is a reasonable estimate of the asset beta for the sample. Indeed it could be argued, based on the broader range of time periods that were analysed, that an allowance of 0.34 is generous in favour of suppliers, and could be reduced to around 0.30 (the average of the weekly and monthly estimates), and is in line with the Commission's estimates in previous decisions. However, given the variability in the estimates, and that beta cannot be estimated with precision, the Commission considered*

5 Commerce Commission, *Input Methodologies (electricity distribution and gas pipeline services) reasons paper*, December 2010, p. 525

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> *the more prudent approach was to leave the estimate of the asset beta at 0.34 as proposed in the Draft Reasons Paper.*

49. In reaching this position, it rejected an argument to take only the most recent 5 year period for which data was available (i.e., the period ending 20 June 2010) over which asset betas were above 0.34. The reason that the Commission did not adopt this estimate is the reason set out in the above quote from the final decision and is the same reasoning the High Court ascribes to the Commission. The High Court stated in response to the proposition that the data in the longer period was too old to be relevant that "One might have thought that the longer the period the better" and went on to add:[6]

> *Moreover, we think it is fair to say that at any one point in time it would be unwise to place too much weight on the most recent estimates. As the Commission pointed out, data in the period to 2000 indicated estimates of asset beta of less than 0.20. If those estimates had been relied upon in or around 2001, as being the most recent estimates, the resulting asset betas would have been too low*

50. In summary, the Commission's approach in the electricity and gas Input Methodologies was to analyse a long period to estimate beta, including giving weight to betas extending back to periods affected by the technology boom.

51. We agree that technology betas using data from around 2000 were affected by the tech bubble. Based on its statistical analysis, Oxera concluded that actual betas were unlikely to be unchanged from this earlier period.[7]

> *Oxera has performed a statistical test to compare the data from the first ten years of the sample against the data from the second ten-year period. It demonstrates that it is highly unlikely that the actual beta was unchanged over the period, and that the changes represent normal fluctuations in observed betas.*

52. We note that the same logic applies in reverse for electricity and gas network betas. That is, while technology firms experienced higher betas during this period, electricity and gas network businesses experienced lower betas during this period. Indeed, these two facts are opposite sides of the same coin. This is because the average beta for the market portfolio is by definition 1. If telecommunications betas (amongst other tech-related stocks) have risen, then other betas must on average decline – as noted previously this is a mathematical truism. This is also empirically observable in the estimates of electricity and gas network business beta presented

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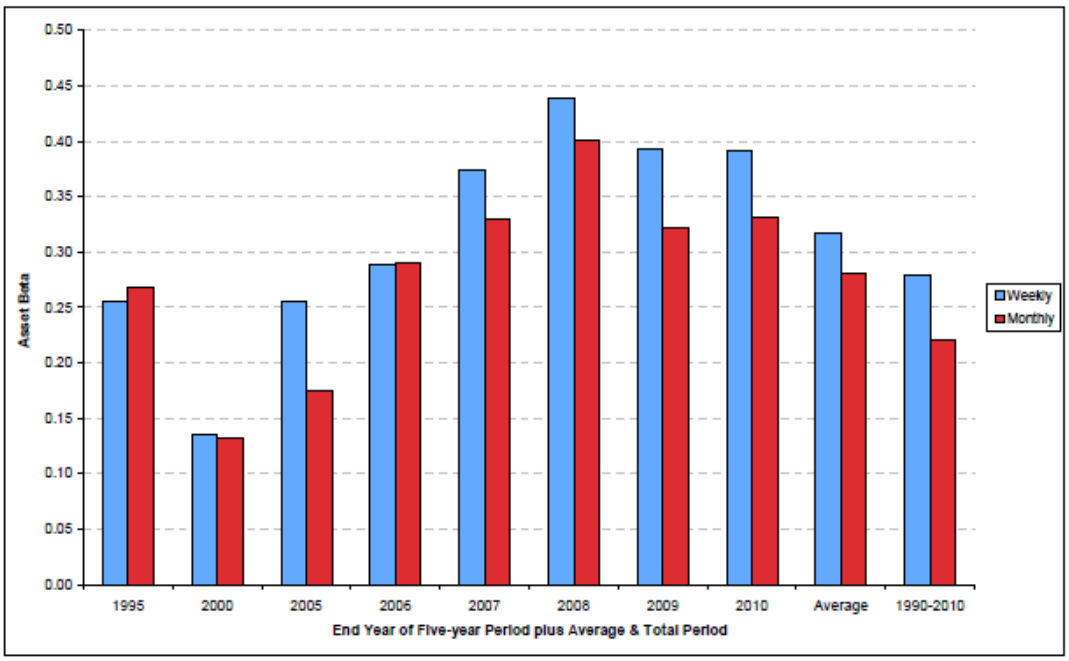
6 *Wellington International Airport Limited v Commerce Commission* [2013] NZHC at 3289 at [1522] and [1523]

7 Oxera, *Review of expert submissions on the WACC for UCLL/UBA*, 4 November 2014, p. 6.

by the Commission in Figure H9 of its Input Methodologies final decision, shown below.[8] The 2000 and 2005 5 year betas (relied on by the Commission in the Input Methodologies process) are significantly lower than earlier and subsequent beta estimates.

Figure 4: Figure H9 - unadjusted average asset beta for electricity distribution businesses comparable firms



Source: Commerce Commission

53. Despite the corollary of higher asset betas for telecommunications businesses being lower asset beta estimates for electricity and gas network businesses, in the Input Methodologies process neither the Commission nor the High Court accepted this as a basis for not giving weight to asset beta estimates from this period. We do not consider that Oxera's analysis provides any new evidence upon which to base a different conclusion for telecommunications firms.

2.1.4 Observation weighting

54. Despite the sample size varying over time, our approach to summarising betas gives no undue weight to earlier periods (where there are fewer observations). This is in direct contrast to one reason Oxera provides for restricting its analysis to the most recent period – which is that in the full period too much weight would be given to

[8] Commerce Commission, *Input Methodologies (electricity distribution and gas pipeline services) reasons paper*, December 2010, p. 524

early values of beta for which very few firms have data. We agree that it is not appropriate to give disproportionate weight to a small number of beta estimates but our methodology does not do this.

55. The only approach that would lead to such bias would be taking an average across the individual firm betas to arrive at a single estimate for each five year period and then take an average of these averages (i.e., and average across the four 5 year periods). In such an approach, equal weight would be given to each five-year period which would be unjustified since some five year periods have much fewer observations of asset beta than others, resulting in those few observations receiving very high weight in the final estimate under this methodology. However, this bias does not exist in either the Input Methodologies approach[9] or in a similar approach that we have adopted, which give broadly consistent results to one another.

56. The Input Methodologies approach was to take an average of the beta estimates for each firm in the sample. Under this approach, a firm that had the longest history of betas was given the same weight as the firm with the shortest history. The source of 'bias' described by Oxera simply does not exist.

57. We have previously suggested a similar approach in which the average of all observations is taken (for all firms, across all periods):[10]

> *An alternative but similar approach is to take the average of all individual observations (rather than to take the average of each firm and then average those averages). This approach is, in my view, likely to give a better estimate on the assumption that each firm in the sample has the same underlying asset beta and that variations between firms and through time are due to measurement error. I have used this method when reporting averages across sample periods. This approach gives 3.3 times the weight to the most recent period as the most distant period (there are 6 observations from the most distant period and 20 in the most recent period).*

58. It is worth noting that this approach gives similar results to the Input Methodologies approach. We have applied both approaches and found that they give 70% (the Input Methodologies approach) and 64% (similar CEG approach) weight to the most recent 10 year period in which betas are more available than in the preceding 10 year period. Our methodology for summarising estimates of beta over time is free from the bias claimed by Oxera and does not give undue weight to individual beta estimates in earlier periods.

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9 Which first estimates an average for each firm across all periods before then averaging across all firms.

10 CEG, *Cross submission: UBA/UCLL cost of capital*, August 2014, p. 17

2.1.5 Technological change

59. Oxera argues that:[11]

> *Dr Hird also notes that technological change is generally synonymous with increased risk; however, in the case of telecoms, it may be argued that mobile telephony replacing landlines, and/or entrants building alternative networks, was a major threat to the viability of network access operators 20 years ago. The advent of broadband has provided a significant insurance to fixed networks and reduced the perceived business risk for legacy incumbent operators.*

60. Oxera has confused systemic (beta) risk (sensitivity of profits to general market conditions) and firm specific asymmetric risk (risk of asset stranding due to technological change). It is correct that the advent of ADSL technology allowing broadband to be provided over copper wires increased the value of the copper wire infrastructure and, other things equal, reduced the prospect that fixed to mobile substitution would strand the value of fixed line copper networks.

61. However, there is no reason to regard this as a reduction in systematic risk (i.e., beta risk). Variations in the risk of asset stranding due to technological change are changes in the asymmetric risks that businesses face. These are risks that are particular to the business in question rather than being risks that are connected in some way to exposure to macroeconomic (market wide) shocks. It is the latter which determine the level of beta risk.

62. Moreover, as is plainly evident, other things have not been equal. With the advent of smart phones and high speed mobile data delivery the value of the underlying copper networks has been eroded and the potential for fixed to mobile substitution heightened. Indeed, competition with mobile networks is an important drive of fixed line operators' investment in substantial upgrades to their networks including rolling out fibre – which creates its own source of firm specific asymmetric risk.

63. Examination of Figure 1 also demonstrates that the timing of the fall in measured asset betas is in 2008. It is difficult, and Oxera makes no attempt, to tie the advent of 'broadband' to the fall in measured asset betas from 2008. Certainly, application of Occam's razor would suggest the onset of the global financial crisis provides a better explanation consistent with this timing.

64. In summary, the competitive pressures faced by fixed line operators cannot reasonably be described as materially lower now than prior to 2008 when measured asset betas were at or above 0.5. Oxera's speculation that lower betas observed post 2008 are explained by the advent of 'boradband' resulting in a sudden and ongoing

[11] Ibid, p. 6

structural reduction in fixed line telecommunications risk is not consistent with the facts.

2.2 Empirical estimates

65. We have previously presented long-run beta estimates based on 5 year asset betas over the previous 20 years. In this report, we update this evidence for the period ending 11 December 2014.

66. We have already presented a time series of 6 month betas over in Figure 1. Table 2 shows that over the most recent 5 year period preferred by Oxera, which has been substantially affected by the global financial crisis and the European sovereign debt crisis, average daily asset betas were 0.465 based on CEG's preferred sample and 0.373 based on Oxera's preferred sample.

67. However, over a long time period, average asset beta has been higher. An average of each of the 5 year observations in Table 1 is 0.58. The result is very similar if, as per the Input Methodologies approach, we average the beta estimates for each firm and then average across the firms. The estimate resulting from this methodology is 0.56 for the full sample and 0.50 for Oxera's restricted sample.

68. Furthermore, we note that these results are also consistent with the most recent period (i.e., measured to 11 December 2014):

    - six month estimates of beta, shown in Figure 1, which is 0.55 for the full sample and 0.47 for Oxera's restricted sample; and
    - yearly estimates of beta which is 0.52 for the full sample and 0.44 for Oxera's restricted sample; and
    - two year beta estimates which is 0.52 for the full sample and 0.43 for Oxera's restricted sample.

Table 2: Five year daily asset betas over the 20 years to 11 December 2014

Comparator	Sample	Five years ending 11/12/1999	Five years ending 11/12/2004	Five years ending 11/12/2009	Five years ending 11/12/2014
CNU NZ Equity	CEG & Oxera, fixed only				0.372
TWTC US Equity	CEG, fixed only		1.292	0.837	0.787
CCOI US Equity	CEG, fixed only		-0.011	1.170	0.974
LMOS US Equity	CEG, fixed only				0.438
ILD FP Equity	CEG & Oxera		0.798	0.608	0.371
COLT LN Equity	CEG, fixed only			0.722	0.726
TEL NZ Equity	CEG			1.082	1.275
TLS AU Equity	CEG & Oxera		0.608	0.355	0.412
T US Equity	CEG & Oxera	0.668	0.719	0.647	0.441
VZ US Equity	CEG & Oxera	0.531	0.559	0.558	0.407
CTL US Equity	CEG & Oxera, fixed only	0.387	0.494	0.454	0.355
WIN US Equity	CEG & Oxera, fixed only			0.440	0.306
FTR US Equity	CEG & Oxera, fixed only		0.314	0.424	0.305
CBB US Equity	CEG & Oxera	0.424	0.763	0.363	0.277
FRP US Equity	CEG & Oxera, fixed only				0.407
HCOM US Equity	CEG & Oxera, fixed only				0.257
DTE GR Equity	CEG & Oxera		0.802	0.337	0.329
TEF SM Equity	CEG	0.650	0.993	0.515	0.480
ORA FP Equity	CEG & Oxera		0.867	0.337	0.413
TIT IM Equity	CEG & Oxera		0.438	0.410	0.279
BT/A LN Equity	CEG & Oxera, fixed only	0.997	0.846	0.546	0.670
TEL NO Equity	CEG		0.799	0.565	0.597
TLSN SS Equity	CEG		0.898	0.644	0.562
SCMN VX Equity	CEG/Oxera	0.482	0.421	0.408	0.394
KPN NA Equity	CEG/Oxera		0.627	0.337	0.318
BELG BB Equity	CEG/Oxera			0.423	0.454
TKA AV Equity	CEG/Oxera		0.579	0.490	0.275
HTO GA Equity	CEG/Oxera		0.703	0.431	0.439
TDC DC Equity	CEG/Oxera		0.820	0.081	0.220
PTC PL Equity	CEG/Oxera	1.091	1.269	0.628	0.463
ELI1V FH Equity	CEG/Oxera	1.137	1.201	0.579	0.420
CEG sample		0.707	0.730	0.533	0.465
Oxera sample		0.715	0.713	0.443	0.373
Fixed only		0.692	0.587	0.656	0.509

Source: Bloomberg data, CEG analysis

2.3 International regulatory decisions

69. In addition to the empirical analysis discussed above, we also present below the findings of a survey of the asset betas set in international regulatory decisions for fixed line telecommunications businesses. These betas are sourced in the context of the broader WACC premium benchmarking exercise that we discuss in more detail at section 4 below.

70. Our long-term estimates of beta are consistent with asset betas allowed in these regulatory decisions, as set out in Table 3 below. The average of the asset betas set in the regulatory decision in each jurisdiction surveyed is 0.48. The average asset beta for decisions made in 2013 and 2014 is 0.49 while for the most recent regulatory decisions issued in 2014 alone the average is 0.53.

Table 3: International regulatory telecommunications fixed line asset beta decisions

Country	Decision month	Asset beta
Denmark	Dec-14	0.50
Ireland	Dec-14	0.55
Norway	Dec-14	0.45*
United Kingdom	Jun-14	0.50
Belgium	May-14	0.60
Finland	May-14	0.58
Sweden	Dec-13	0.44
Portugal	Dec-13	0.42*
Spain	Sep-13	0.50
Australia	Jul-11 & May-13	0.42*
France	Jan-13	0.48*
Netherlands	July 12	0.39
Italy	Apr-10	0.43*
Average		**0.48**
Commerce Commission draft decision		**0.40**

Source: Regulatory decisions, discussed in detail at section 4.2 below. Only equity betas were reported. Asset betas have been calculated by de-levering equity beta values, assuming a debt beta of 0.*

71. We consider that the evidence set out in Table 3 above supports a view that the Commission's proposed position on asset beta, as informed by advice from Oxera, is not in line with the positions of other international regulators of fixed line telecommunications businesses. In our view, our long term estimate of asset beta of 0.50 is consistent with this evidence.

2.4 Conclusion

72. We consider that the Commission should set an asset beta for the provider of UCLL and UBA services of 0.50. This is based upon long term estimates of asset betas over the past 20 years. It is also supported by, and is consistent with,:

- the most recent observations of beta, using up to date data sourced up to an including 11 December 2014;
- international regulatory decisions of asset beta for regulated fixed line telecommunications businesses; and
- the approach applied by the Commission in its consideration of asset beta in its Input Methodologies process for electricity distribution and gas pipeline businesses.

73. In its draft decision, the Commission's consultant Oxera estimated an asset beta of 0.40, based primarily on an analysis of asset betas over the most recent five year period ending 10 April 2014. In our opinion the asset betas estimated over this period are not likely to be the best estimates of betas that will apply in the forward looking period for which the Commission is setting UCLL and UBA prices.

74. The 5 years to 10 April 2014 is dominated by periods affected by the global financial crisis and the European sovereign debt crisis. The empirical analysis that we conduct suggests that asset betas for fixed line telecommunications businesses fell in response to these events, but have since risen. This supports our view that estimating asset beta over a longer period and a wider range of economic conditions is likely to give rise to a more robust estimate of beta which is also a better estimate of forward looking beta than the estimate proposed by the Commission.

3 Cost of debt

75. Chorus has asked CEG to review the Commission's draft decision on cost of capital for the UCLL and UBA in respect of:

- debt issuance costs;
- the weight given to bonds issued by Genesis, Mighty River Power and Meridian;
- the term of debt; and
- the allowance for the cost of swap contracts.

3.1 Debt issuance costs

76. The Commission proposed to include an allowance of 0.25% per annum for debt issuance costs in its cost of debt. We consider that this estimate is too low and that debt issuance costs of at least 0.35% per annum should be used over a 7 year term. Over a 10 year term, the Commission should use debt issuance costs of at least 0.28% per annum.

77. A key factor driving the difference between our estimates of debt issuance costs and the Commission is that we consider that a cost of capital should be applied to amortise upfront (non-recurring) debt issuance costs over time. In its draft decision and in previous considerations of this issue, the Commission appears to have implicitly assumed a cost of capital of 0% for this purpose.

78. We also consider that our estimates are likely to be conservative because the methodology used to amortise debt issuance costs assumes that the entire cost is incurred upfront on a one-off basis and is non-recurring. We would expect part of the debt issuance costs to be recurring each year.

79. We consider that a cost of capital should be applied to amortise debt issuance costs over time. This is also consistent with the advice of the Commission's advisor on cost of capital issues, Professor Martin Lally, as we discuss further below.

80. With a cost of capital of 9%, a debt issuance cost amortised to 0.35% per year over 5 years is equivalent to an upfront debt issuance cost of 1.36%. Amortised over 7 years, this is equivalent to an annualised debt issuance cost of 0.27% over 5 years, rather than the 0.25% calculated by the Commission.[12]

[12] This amortisation uses a simple annuity formula, expressed in the following formula where A is an annuity and C is the present value (or upfront) cost:

$$A = C\frac{r(1+r)^T}{(1+r)^T - r}$$

81. We note that the 0.35% that the Commission adopts from its Input Methodologies process appears to have similarly been calculated with an assumed cost of capital of 0%. In order to show the effect that taking into account the cost of capital has, it is helpful to start from first principles and identify the evidence that informs the estimates of debt issuance costs.

82. The best evidence of upfront issuance costs available in the New Zealand context is provided by PwC in its report for Telecom.[13] Telecom's analysis shows that across a number of New Zealand issues, mean issuance costs as a percentage of the issue amount were 1.97%. The median was 2.00%. This evidence was considered by the Commission in coming to its Input Methodologies estimate for debt issuance costs of 0.35%.

83. If we assume that all issuance costs are upfront (as noted below, a conservative assumption) then at a 9% cost of capital, the mean issue amount of 1.97% can be amortised at:

- 0.39% per annum over 7 years; or
- 0.31% per annum over 10 years.

84. However, in its decision the Commission notes that some of the bonds captured by PwC actually raised more capital than the original issue amount. The Commission used this as a basis to revise its view of PwC's evidence from 0.37% per annum to 0.33% per annum.[14] Using the Commission's method, this is consistent with a revised view of upfront issuance costs of 1.78%.[15]

85. Again assuming a 9% cost of capital, upfront issuance of 1.78% can be amortised at:

- 0.35% per annum over 7 years; or
- 0.28% per annum over 10 years.

86. We note that the application of a cost of capital is in fact consistent with the advice of Lally that the Commission has regard to in the Input Methodologies Reasons paper. Lally states:[16]

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13 PwC, *Submission on the Cost of Capital Material in the Commerce Commission's Draft Input Methodologies Determinations and Reasons Papers*, August 2010, p. 34

14 The Commission appears to have estimated 0.37% per annum as the median debt issuance costs of 2.00% divided by the median life of 5.4 years. However, this calculation is in error because it assumes a 0% cost of capital and because it uses a term of 5.4 years when the Commission uses its estimate for an assumed term of 5 years.

15 That is, 5.4 years multiplied by 33 basis points – using the Commission's methodology.

16 Lally, *The Weighted Average Cost of Capital for Gas Pipeline Businesses*, 28 October 2008, p. 87. We note that Lally's debt issuance assumption of 1.30% is different from the recent New Zealand evidence

> *Lee et al (1996, Table 2) suggests an average issue cost for utilities of about 1.3% (by averaging over issues of at least US$40m). Discussion with New Zealand investment bankers indicates similar figures here. Annualisation of this figure requires a bond term. Using a ten year bond term, the equivalent annual figure would be about .20%. If a three year term was used, to match the assumed frequency of price resetting, then the equivalent annual figure would rise to .50%. However, triennial refinancing is likely to be inferior to longer-term debt coupled with a swap contract to ensure exposure to triennial interest rate movements (with swap costs added to the issue costs). This suggests an allowance of about .30%.*

87. Lally is clearly using a cost of capital to annualise debt issuance costs, since without a cost of capital he could not annualise 1.30% over three years to 0.50%, or the same amount of 10 years to 0.20%.[17] Although Lally does not disclose the cost of capital he is using, his estimates are consistent with a cost of capital approximately in the range from 7% to 9%.

3.2 Weight given to bonds affected by New Zealand Power proposal

88. In estimating the debt risk premium (DRP), the Commission opted to omit three issuers from its benchmark sample: Genesis, Mighty River Power and Meridian Energy.

89. The Commission held the view that these issuers were "anomalous". Specifically, the Commission found that the DRPs associated with these issuers were likely to be affected by the New Zealand Power proposal made by opposition parties in the lead up to the 2014 elections, including during the July 2014 averaging period. The Commission indicated in its WACC calculation spreadsheet that the uncertainty resulting from the New Zealand Power proposal on the DRPs in question was sufficient to warrant their exclusion from the sample.

90. The excluded issuers and bonds are summarised in Table 4.

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presented by PwC. However, we consider that PwC's estimates are preferable on account of being more recent and more relevant to the New Zealand regulatory context.

[17] The quote above also reveals that Lally considers swap costs to be about 10 bppa – the difference between his suggested allowance of 0.30% (inclusive of swap costs) and his calculated allowance on 10 year debt term of 0.20%. This is germane to our discussion of the transaction costs of swaps at section 3.4 below.

Table 4: List of issuers and bonds omitted from benchmark sample

Issuer	Maturity date	Years to maturity	Average DRP
Genesis	**Interpolated**	**7.0**	**1.99**
	23 Jun 2020	5.9	1.85
	8 Mar 2023	8.6	2.12
Mighty River Power	**Interpolated**	**7.0**	**1.99**
	11 Feb 2020	5.5	1.85
	6 Mar 2023	8.6	2.15
Meridian Energy	**16 Mar 2017**	**2.6**	**1.40**

Source: Bloomberg, Commerce Commission analysis

91. The Commission has selected an averaging period from 1 July 2014 to 31 July 2014. This sample period lies between:

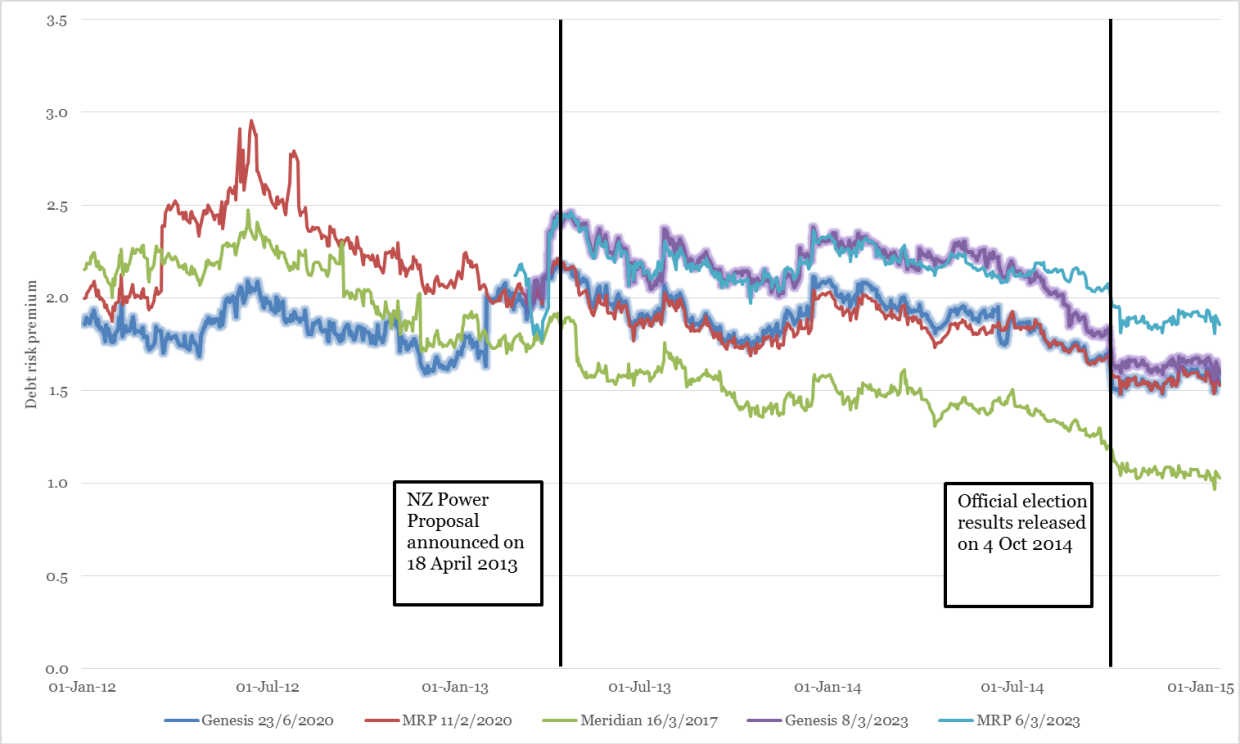
    - the announcement of the New Zealand Power proposal on 18 April 2013;[18] and
    - the official election results, released on 4 October 2014.[19]

92. In order to understand how the DRPs of the excluded bonds were affected by the New Zealand Power proposal, we obtain DRPs on all bonds in the benchmarking sample for a longer period of time around the averaging period (4 January 2012 to 20 January 2015). The extended DRP series for the five bonds listed in Table 4 are shown in Figure 5.

[18] Adam Bennett, "Labour, Greens make power promise", *The New Zealand Herald*, 18 April 2013, http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10878295.

[19] Electoral Commission, *New Zealand 2014 General Election Official Results*, 4 October 2014, http://www.elections.org.nz/news-media/new-zealand-2014-general-election-official-results.

Figure 5: DRP series of the five excluded bonds



Source: Bloomberg, CEG analysis

93. It is not clear from Figure 5 that the DRP of the relevant bonds increased immediately following the New Zealand Power proposal. The bonds issued by Genesis and Mighty River Power, maturing in 2023, appear to show significant upswings in March prior to the announcement of the proposal. However, it is unclear whether this is linked specifically to the proposal.

94. Following the release of the official election results on 4 October 2014, the DRPs of all five bonds decreased. The DRPs appear to be less volatile in the months following the October election.

95. In order to establish the effect of the New Zealand Power Proposal on the relevant DRPs, we conduct an event study by selecting a sample of comparator bonds. We select the sample of comparator bonds using the following criteria:

- issuer credit rating of A-, BBB+, or BBB;
- time to maturity of at least 5 years; and
- yield data available from at least 18 April 2013.

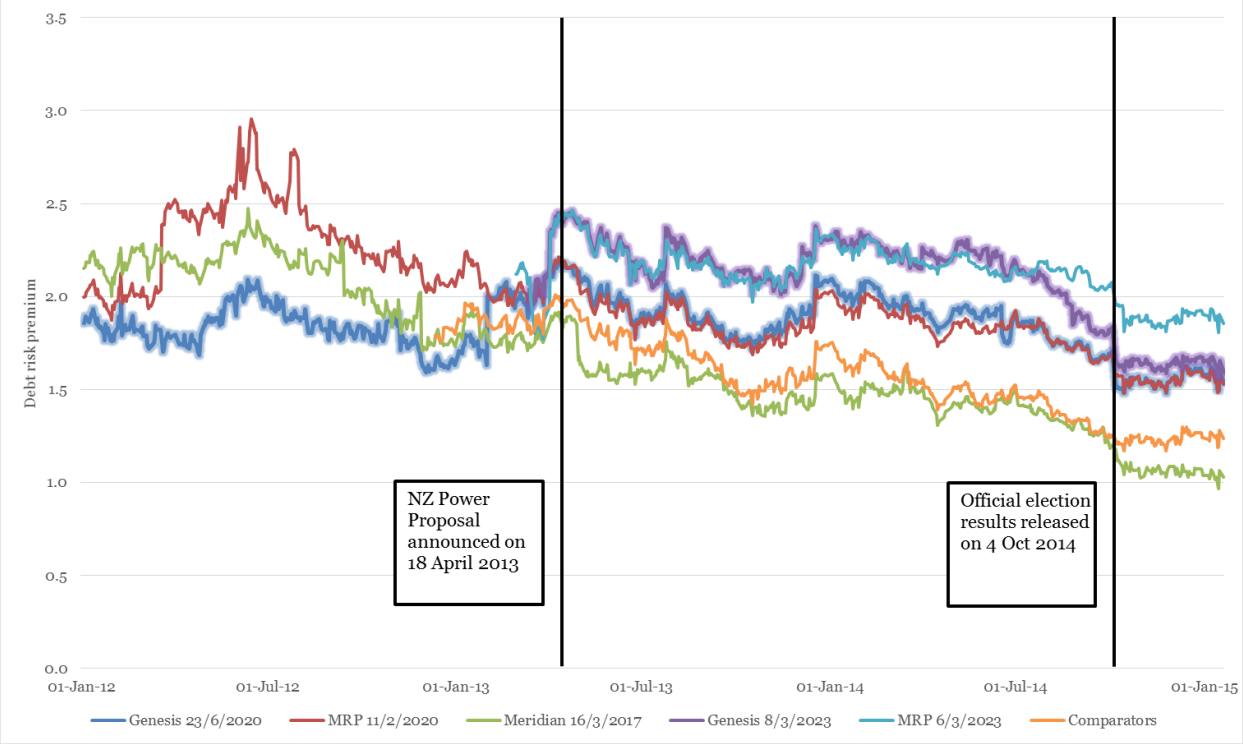
96. Of the bonds examined by the Commission, only the following three meet all of the criteria:

- Auckland Airport International Limited – 13 December 2019;

- Spark – 25 October 2019; and
- Christchurch Airport International Limited – 6 December 2019.

97. Figure 6 shows all the same DRP series as Figure 5, as well as a DRP series for the comparator bonds. The DRP series for the comparator bonds is calculated as a simple average of the individual DRPs.[20]

Figure 6: DRPs of the comparator bonds and excluded bonds



Source: Bloomberg, CEG analysis

98. Figure 6 shows that the DRP of the comparator series does not exhibit the same rise in magnitude prior to the announcement of the New Zealand Power Proposal as the DRP series of the excluded bonds. For example, the Genesis and MRP bonds maturing in 2020 increased by 40 and 65 basis points respectively in the month before the announcement, whereas the comparator series only increased by 13 basis points. We note that the increase in the comparator series does not appear out of line with previous fluctuations in the series.

99. Furthermore, although the DRP of the comparator series did show slight decreases in the time period around the release of the official election results, these appear to

[20] Estimates of the risk-free rate before 15 April 2013 were obtained by interpolating between the New Zealand Government bonds maturing on 15 March 2019 and 15 May 2021. Subsequent risk-free rates used interpolations on New Zealand Government bonds maturing on 15 March 2019 and 15 April 2020.

be in line with the trend of the series over the previous four months. In contrast, all of the five excluded bonds showed sharp decreases in the same time period, with all five exhibiting decreases of at least 12 basis points within one week, while the comparator series only showed a difference of 5 basis points in the same timeframe. The DRPs for the relevant dates are shown in Table 5.

Table 5: DRPs of excluded bonds on selected dates

Issuer	Maturity date	DRP on 3 Oct 2014	DRP on 13 Oct 2014	Change in DRP
Genesis	23 Jun 2020	1.708	1.508	-0.200
	8 Mar 2023	1.835	1.631	-0.204
Mighty River Power	11 Feb 2020	1.693	1.572	-0.121
	6 Mar 2023	2.075	1.951	-0.124
Meridian Energy	16 Mar 2017	1.200	1.085	-0.115
Comparator Series	-/-	1.252	1.206	-0.046

Source: Bloomberg, CEG analysis

100. Our analysis therefore supports the Commission's finding that the bonds issued by the three excluded issuers were indeed affected by the New Zealand Power Proposal.

3.2.1 A provider of UCLL and UBA services in New Zealand faces similar risks as the excluded firms

101. Although our analysis shows that the five bonds were indeed affected by the New Zealand Power Proposal, we disagree with the Commission's argument that this forms a basis for the exclusion of these bonds when determining the DRP that should be applied to Chorus.

102. The DRPs of the excluded bonds increased due to the regulatory risks associated with the New Zealand Power Proposal. Had the proposal been adopted by Parliament, it would have led to a complete overhaul of the valuation methodology of the assets held by the three excluded issuers – an overhaul that had the potential to lead to a considerable devaluation of these assets.

103. The fact that the proposal has not developed given the 2014 election result is especially significant. It shows, consistent with economic theory, that there does not need to be an *actual* devaluation of a firm's assets for the DRP on the firm's bonds to increase. Rather, the *possibility* of a devaluation of the assets is itself sufficient to warrant an increase in the DRP. Investors were not sure how the assets

of these firms would be valued, or how their revenues would be determined. The additional premium observed on the yields on the bonds issued by the three firms in question must reflect investors' changed expectations of default given the proposal.

104. In our view, a provider of UBA and UCLL services (including a hypothetical efficient operator) in New Zealand faces regulatory risks that are similar to those faced by the excluded firms. Such an operator is assessed according to a TSLRIC framework in which the Commission assesses the prices that the provider should receive for its services by reference to a valuation of assets that it may seek to revisit every five years with the potential prospect of devaluation should a new and more cost efficient technology arise. This introduces uncertainty into the valuation of the provider's assets and revenues, which is not unlike the uncertainty experienced by the three excluded issuers. This uncertainty leads to an increase in the costs of debt and resulting DRPs required by investors in the provider.

105. One key difference between the uncertainty caused by the New Zealand Power Proposal and that of the regulatory framework applied to the provider of UBA and UCLL services is that the former appears to be a one-off event, while the latter is constantly present under the Commission's proposed implementation of TSLRIC each regulatory period.

3.2.2 Summary and conclusion

106. Our empirical analysis supports the Commission's assertion that the excluded bonds were affected by the New Zealand Power proposal. We consider that the inflation in DRPs during the averaging period of July 2014 is in the range of 0.07% – 0.16%, as seen in Table 5 above. We also conclude that, since the 2014 election, the inflation in the DRPs of these bonds has largely disappeared.

107. However, we disagree with the Commission's decision to remove these bonds from the benchmark sample.

108. The increase in DRP observed in response to the New Zealand Power proposal is the consequence of the significant risk of asset revaluation faced by the issuers. These are risks which apply in a similar way to Chorus under the TSLRIC framework. Therefore, the observed increase in DRP triggered by the New Zealand Power proposal is relevant also for the hypothetical efficient operator modelled by the Commission. In our view, this provides a rationale for those bonds to be included in the Commission's estimate of the DRP, since they replicate the uncertainty that a hypothetical efficient operator would face under the conditions of the actual regulatory framework.

109. When the Commission comes to update its DRP analysis, it will be during a future period when the New Zealand Power proposal will likely not affect the DRPs of these bonds. However, in light of the above, it is our view that the Commission should include an estimate of the inflation in DRP caused by the New Zealand

power proposal also in its future estimates of DRP for the firm providing UCLL and UBA services.

3.3 10 year benchmark term

110. We consider that 10 years is the appropriate benchmark term for the cost of debt. This is consistent with the debt raising practice of a wide sample of international telecommunications firms.

111. The Commission's draft decision is for a term for the cost of debt of 7 years. Its decision draws upon the views of Professor Martin Lally in his report from June 2014.[21]

112. The Commission's decision does not appear to address the analysis that we provided in our report to the Commission, dated July 2014, in response to Professor Lally's paper.[22] In our view, the material in this section is relevant to the Commission's decision and should be considered.

113. In this report, we do not intend to repeat the content of our earlier report in detail. However, to summarise:

- the basis for a term of 7 years is data requested of electricity, gas and airport firms during the Input Methodologies process. The weighted average term found in that process was 7.4 years, and not 7 years. Many of the firms in that sample are very small and not necessarily comparable to a provider of nationwide UCLL and UBA services;
- we analysed the debt raising practices of the telecommunications firms that were in our recommended sample for determining asset beta. This sample is substantially similar to that recommended by the Commission's consultant Oxera. The average term of debt at issue on this sample is 10.7 years; and
- Professor Lally's recommendation of a term of debt based on the sample from the Input Methodologies process in preference to our sample of telecommunications firms appears to place an unreasonable degree of reliance upon the geographical location of a firm as a driver for its debt raising behaviour, over and above other potentially very relevant characteristics such as industry of operation, the size of the business and ownership structure.

114. The empirical evidence that we summarised in our July 2014 report (which was itself reported in our earlier March 2014 report) is represented in Table 6 below.

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21 Martin Lally, *Review of submissions on the cost of debt and the TAMRP for UCLL and UBA services*, 13 June 2014

22 CEG, *Review of Lally and Oxera reports on the cost of capital*, July 2014, pp. 50-55

Table 6: 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 (full sample)			**10.7**
Simple average (Oxera sample)			**10.7**

Source: Reproduction of Table 3 from June 2014 report. Bloomberg, CEG analysis

115. Drawing these threads together, we note that the Commission's preferred asset beta is based upon a sample of international telecommunications firms similar to that which we estimate a debt term of 10.7 year above. It is evident that the Commission (and its consultant Oxera) consider the firms in this sample to be comparable to the provider of UCLL and UBA for the purpose of determining asset beta. Given the relevance of the telecommunications sample it is not appropriate to instead rely on evidence from gas, electricity and airport businesses. This is especially so given that the asset beta is derived from the telecommunications sample and it is reasonable to believe that the maturity profile of debt issuance is an influence on asset beta.

116. We consider that an estimate of 7 years as the term of debt cannot reasonably be sustained and that 10 years is an appropriate estimate, based on the average term of debt of firms in the Commission's preferred sample for estimating asset beta.

3.4 Allowance for the cost of swaps

117. The Commission has allowed swap costs on the assumption that the provider of UCLL and UBA issues debt of a term longer than the Commission's proposed regulatory period, but seeks to fix the interest rate of these debt over the term of the

regulatory period. The Commission's estimate of swap costs is 4 basis points, which is:[23]

> *…an amount which is half of the wholesale bid and offer spreads for an interest rate swap…*

118. We agree with the Commission that compensation for the cost of entering swap contracts is important if the Commission continues to estimate the cost of debt using the prevailing debt, rather than as a trailing average over time.[24] However, we consider that a reasonable estimate of the direct costs of entering these contracts will be between 10 and 13 basis points if the debt can be raised domestically and more if some debt is raised overseas. There will also be other important indirect costs associated with risks created through this process.

119. Our opinion is based on:

- the fact that *two*, rather than *one*, swap contracts must be taken out to achieve the hedging benefits that the Commission assumes;
- information on the costs of swap transactions provided by a recent reports submitted in recent regulatory proceedings in Australia.

3.4.1 Two swap contracts required

120. The comparable bonds in the Commission's sample from which it determines DRP are all fixed rate bonds. If the regulated firm issues fixed rate debt then it is straightforward to show that it requires two legs of a swap contract to be entered in order to fix the interest rates that it is exposed to over the regulatory period. This means that the Commission should consider double the costs of a single swap transaction in its allowance for swaps.

121. When the regulated firm seeks to fix interest rates as assumed by the Commission immediately prior to the regulatory period, it is conducting a "fixed for floating" swap in which it agrees to pay a 'fixed' (or constant) coupon over the regulatory period in exchange for being paid a 'floating' (or variable) coupon over that period. Interest rate swaps represent contracts with market determined rates that allow this, where the floating rate is determined by the reference to the market yield on an

[23] Commerce Commission, *Cost of capital for the UCLL and UBA pricing reviews: draft decision*, 2 December 2014, p. 28

[24] We note that arguments about these issues are complicated by the fact that it is not possible for the regulated business to replicate the Commission's prevailing cost of debt estimate since it cannot (as the Commission assumes) enter an interest rate swap that completely aligns its interest rates to rates in the price setting period. Swap contracts can only achieve this on part of the cost of debt – the spread to swap portion of the cost of debt remains unhedged.

agreed instrument. In New Zealand these are usually 90 day New Zealand bank bills.

122. However, in order to enter this "fixed for floating" swap over 5 years in a way that actually achieves a hedge, the firm must first have exposure to the floating rate so that entering the swap will allow it to substitute its floating exposure for fixed exposure. The firm can achieve this by raising fixed rate debt and subsequently entering a fixed for floating swap over the life of the bond to give it the floating rate exposure that it needs to hedge to the regulatory period.

123. Consequently, a firm issuing fixed rate debt must enter into two swap contracts, and not one, to fix its cost of debt in the way assumed by the Commission. Our conclusion is supported by the analysis of Evans and Peck, and UBS, which we discuss in more detail below.

3.4.2 Transaction costs of swaps

124. Recent regulatory debate on the cost of debt in Australia has focussed on the achievability of the cost of debt benchmark. As part of this, there have been two recent expert reports on the expected cost of entering into swap contracts. These are:

- a report by Evans and Peck for the Queensland Competition Authority estimating the costs of conducting interest rate swaps; and
- a report by UBS for Transgrid estimating on a bottom up basis the cost of hedging the interest rates of the New South Wales electricity businesses over the previous regulatory period.

3.4.2.1 Evans and Peck report

125. The Evans and Peck report estimates the cost of interest rate swaps as consisting of:[25]

- an execution spread that increases with the maturity of a bond; and
- a credit spread that increases with the maturity of a bond and is also higher for bonds with lower credit ratings.

126. Following the methodology set out in the Evans and Peck report, for a debt term of 10 years and a regulatory period of 5 years, the costs for a BBB+ entity would be:

- execution spread of 4.0 basis points and a credit spread of 4.5 basis points for the 10 year fixed-to-floating leg; and

[25] Evans and Peck, *SEQ Retail Water Price Review*, 4 February 2013

- execution spread of 3.0 basis points and a credit spread of 3.0 basis points for the 5 year floating-to-fixed leg.

127. The total cost of swap transactions for this purpose is 14.5 basis points.

128. The Evans and Peck report does not provide estimates for a 7 year term, but by interpolating we can estimate that the total cost of swap transactions to convert 7 year fixed rate debt to 5 year fixed rate debt is 13.0 basis points.

3.4.2.2 UBS report

129. The UBS report identifies four components of hedging for a BBB+ entity over 10 years being:[26]

- 5 basis points for credit, capital and execution costs;
- 18 basis points for cross-currency credit, capital and execution costs (on the basis that the most efficient debt management strategy would be to raise large volumes of debt offshore and convert this back to floating rate NZ dollar denominated exposure);
- 9 basis points for tracking risk, to hedge for differences in the movement of the benchmark swap rate and the fair value estimates over the averaging period; and
- 6 basis points for deferral risk, to account for hedging occurring in advance of the start of the regulatory period.

130. That is, UBS estimates a total hedging cost of 38 basis points.

131. We note that UBS assumes that debt is issued overseas because of the low ability that it attributes to the Australian domestic market to fund 10 year BBB debt. We would expect the same conclusion to apply to New Zealand with even greater force. As with Evans and Peck's estimates, UBS includes costs for two legs of swaps with the first leg being the cross-currency swap from fixed foreign currency terms into floating Australian dollar terms. However, even if UBS assumed two domestic legs to its transaction, the cost would still be 10 basis points without considering the costs of tracking and deferral. This suggests that 10 basis points is likely to be a highly conservative estimate of the transaction costs of swaps.

132. We also note that any attempt by a hypothetical UCLL/UBA provider to hedge its entire debt portfolio over a short averaging period would certainly have an impact on the market rate of interest rate swaps. The Commission would need to include the cost of such movements in its measurement of interest rate swap rates.

[26] UBS, *Analysis of Liquidity of Interest Rate Swaps*, January 2015

3.4.2.3 *The Commission's methodology*

133. The Commission estimates swap costs as the difference between the bid and ask prices for a 7 year swap as reported by Bloomberg on a single day (1 August 2014). The Bloomberg formulae used to generate the bid and ask prices are:[27]

    - =BDH("NDSWAP" & C12 & " INDEX","ASK",C11,C11,"Dts=H"); and
    - =BDH("NDSWAP" & C12 & " INDEX","BID",C11,C11,"Dts=H").

134. The Commission estimates this difference at 8 basis points and then divides this by 2 to get 4 basis points which is its estimates of costs.

135. We do not consider that this is a reasonable approach to estimating the transaction costs associated with the relevant swap strategy. We understand that interest rate swaps are priced by banks as a spread to the mid-point a to cover credit & execution costs as per the UBS and Evans and Peck approaches.

136. In practice, the quoted bid/offer spread is not relevant to the transaction costs of swaps. Swaps are generally quoted to a customer as 'x' number of basis points over/under the mid rate. The above Bloomberg data recovered by the above formulae is simply the best bid/offer at the end of day. The correct approach is to build up transaction costs as: 'x' for credit costs + 'y' for liquidity/execution costs = 'z' swap transaction cost.

137. Moreover, this should be done for transaction sizes that Chorus, or a hypothetical operator, would have to engage in to hedge their base interest costs to the regulatory decision – and account taken of the size of this transaction relative to market liquidity in the relevant swap maturity. In our view, the Commission should set out precisely the nature of the debt raising (e.g., domestic versus overseas) and interest rate swap strategy it proposes to compensate for. The Commission should then seek advice from an expert source, such as a credible investment bank, on:

    - Whether this debt issuance/interest rate swap strategy is likely to be efficient given market liquidity etc.;
    - What the transaction costs of the strategy would be.

138. As already stated, my view is that this advice will reject the Commissions current basis for estimating swap transaction costs and will conclude that there is a practical limit on market liquidity that would prevent vary large swap transactions occurring at long tenors over short periods (such as a 20 day averaging period).

[27] These can be used to download the prices into excel – where the C12 reference is 7 years and the C11 reference is 1/09/2014

4 International WACC premium comparison

139. In this section, we conduct a comparison of allowed WACC premiums for fixed access telecommunications networks across different jurisdictions, including the WACC premium allowed for Chorus in the Commission's December draft determination.

4.1 Methodology

140. We collate the nominal vanilla WACC from recent WACC decisions for fixed access networks in each of the comparator jurisdictions. If the nominal vanilla WACC is not directly reported in a decision, then we calculate it using the WACC parameters reported in the decision. This ensures that we are comparing across jurisdictions on a consistent basis.

141. We note that regulators in different jurisdictions publish WACC decisions at different points in time, according to their local regulatory cycle. This means that it is impossible to do a comparison at a single point in time. Further to this, regulators do not estimate the risk free rate on a consistent basis. For example, some regulators may use a long term average rate on 10 year government bonds, whilst another uses a short term average rate of 5 year government bonds.

142. To address both of these concerns, we have calculated the WACC premium as the nominal vanilla WACC derived from the regulatory decisions, less the 5 year rate on local government bonds that was prevailing *in the month the decision was made*. This risk free rate will with high probability be different from the risk free rate used in the decision. Calculating the WACC premium in this way will ensure that we are making a like-for-like comparison.

143. We have sourced the prevailing rates on the 5 year local government bonds from Bloomberg, and calculated a monthly average rate from daily data. The indices we rely on for the prevailing risk free rate are the same as those used by Bloomberg in their 'Country Risk Premium' (CRP) analysis, except that we have used the Eurozone 5 year risk free rate for all European countries which use the Euro. This index is comprised of generic government bills and bonds. The relevant Bloomberg tickers for the prevailing risk free rate are summarized in Table 1.

Table 7: Risk free rate

Country	Bloomberg ticker
New Zealand	GNZGB5 Index
Australia	GACGB5 Index
Norway	GNOR5YR Index
Sweden	GSGB5YR Index
Denmark	GDGB5YR Index
Eurozone	GECU5YR Index

Source: Bloomberg

144. For Chorus, our methodology implies a WACC premium of 3.56%. This is the nominal vanilla WACC of 7.23% less the 5 year rate on New Zealand government bonds in the month of December of 3.68%.

4.2 Comparator countries

We have collated recent WACC decisions from 11 European regulators and Australia. The European jurisdictions we have considered include Denmark, Netherlands, Sweden, Italy, United Kingdom, Finland, Belgium, France, Ireland, Norway and Portugal. We provide a brief overview of the WACC decisions we have relied on below.

4.2.1 Denmark

145. In December 2014, the Danish regulator published a final decision about the maximum access prices for the fixed network in 2015, set based on the LRAIC method. The prices apply to incumbent TDC.[28]

146. As part of this decision, the regulator has determined WACC parameters which result in a nominal vanilla WACC of 4.44%. The prevailing rate on 5 year Danish government bonds in the month of December 2014 was 0.16%. This implies a WACC premium of 4.28%.

4.2.2 Australia

147. In July 2011, the Australian regulator the ACCC published a final report on final access determinations (FADs) for the declared fixed line services. The ACCC

[28] Erhvervsstyrelsen (2014), *Afgørelse om fastsættelse af maksimale netadgangspriser efter LRAIC metoden for 2015 – fastnet,* Available here: http://erhvervsstyrelsen.dk/gaeldende-prisafgoerelse-for-2015

determined wholesale access prices for a three year period ending 30 June 2014.[29] The ACCC commenced an inquiry in July 2013 into making FADs for a number of fixed line services, however, due to the number and complexity of the pricing issues the ACCC has not completed this inquiry at the time of writing.

148. As part of this final decision, the ACCC determined a nominal vanilla WACC of 8.54%. The prevailing rate of 5 year Australian government bonds in the month of July 2011 was 4.65%. This implies a WACC premium of 3.89%.

149. In May 2013, the ACCC published a final report on FAD for wholesale ADSL.[30] As part of this final decision the ACCC determined a nominal vanilla WACC of 6.33%. The prevailing rate of 5 year Australian government bonds in the month of May 2013 was 2.76%. This implies a WACC premium of 3.57%.

4.2.3 Netherlands

150. In March 2012, OPTA published a report on the WACC for mobile, fixed-line and cable termination rates prepared by consultant The Brattle Group[31]. This report is part of the draft decision on fixed and mobile termination rates for 2013-2015. In this report, OPTA determines WACC parameters which result in a nominal vanilla WACC of 4.96% for fixed line operators. The prevailing rate on European 5 year bonds in the month of March 2012 was 0.88%. This implies a WACC premium of 4.08%.

4.2.4 Sweden

151. In December 2013, the Swedish regulator, PTS, published the cost results from the hybrid cost model it uses to calculate the cost-based prices for products and services in TeliaSonera's fixed network. These results are valid from the 1 January 2014.[32] As part of the final decision, PTS determined WACC parameters which result in a nominal vanilla WACC of 6.28%. The prevailing rate on Swedish 5 year

[29] ACCC (2011), *Inquiry to make final access determinations for the declared fixed line services,* Available here: https://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/fixed-line-services-final-access-determination-fad-2011

[30] ACCC (2013) *Public inquiry to make a final access determination for the Wholesale ADSL service – Final report,* Available here: http://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/wholesale-adsl-final-access-determination-fad-2013/final-determination

[31] The Brattle Group for OPTA (2012), *The WACC for mobile, fixed-line and cable termination rates,* Available here: https://www.acm.nl/nl/publicaties/publicatie/11385/The-WACC-for-mobile-fixed-line-and-cable-termination-rates-The-Brattle-Group/

[32] PTS (2013) *PTS konsultationssvar på samråd om uppdaterad kalkylränta för det fasta nätet,* Available here: http://www.pts.se/sv/Bransch/Telefoni/SMP---Prisreglering/Kalkylarbete-fasta-natet/Gallande-prisreglering/

Government bonds in the month of December 2014 was 1.69%. This implies a WACC premium of 4.59%.

4.2.5 Italy

152. In April 2010, the Italian regulator, AGCOM, published a public consultation on the definition of a cost model for the pricing of wholesale access services to the fixed network of Telecom Italia and the calculation of the WACC.[33] Appendix C of the decision set out WACC parameters which result in a nominal vanilla WACC of 6.67%. The prevailing rate on 5 year European government bonds in the month of April 2010 was 2.11%. This implies a WACC premium of 4.56%.

4.2.6 United Kingdom

153. In 2012, the UK regulator, Ofcom, commenced reviews of the following markets: wholesale local access, wholesale fixed analogue exchange lines, wholesale ISDN30, wholesale ISDN2, and certain related markets in the Hull area. These reviews considered regulated prices (change controls) on BT's local loop unbundling and wholesale line rental services, as well as several quality of service related issues.

154. In June 2014, Ofcom published a fixed access market review statement, which set out the conclusions of the review of the UK's fixed access networks. As part of this statement, Ofcom set out their estimate of BT's WACC. Ofcom estimated different WACC's for different parts of the business, as "different parts of BT are likely to have different systematic risks"[34]. For the purposes of this international comparison, we have focused on Ofcom's WACC for the copper access network assets and services operated by Openreach.

155. The nominal vanilla WACC for Openreach in Ofcom's June 2014 decision is 7.17%. The prevailing rate on 5 year UK government bonds in the month of June 2014 was 2.02%. This implies a WACC premium of 5.15%.

4.2.7 Finland

156. In May 2014, the Finnish regulator published a cost of capital decision to be used in assessing the return on regulated products and services in fixed telecommunications

33 AGCOM (2010), *Allegato C alla Delibera N. 121/10/CONS,* Available at: http://www.agcom.it/documentazione/documento?p_p_auth=fLw7zRht&p_p_id=101_INSTANCE_kidx9GUnIodu&p_p_lifecycle=0&p_p_col_id=column-1&p_p_col_count=1&_101_INSTANCE_kidx9GUnIodu_struts_action=%2Fasset_publisher%2Fview_content&_101_INSTANCE_kidx9GUnIodu_assetEntryId=843230&_101_INSTANCE_kidx9GUnIodu_type=document

34 Ofcom (2014), *Fixed Access Market Reviews: Statement – Annexes,* p. 162

networks, mobile telecommunications networks and digital television broadcasting services.[35]

157. The Finnish regulator has established an upper and a lower limit for the cost of capital for fixed networks. The mid-point of the range of parameters is associated with a nominal vanilla WACC of 5.75%. The prevailing rate on 5 year European government bonds in the month of May 2014 was 0.49%. This implies a WACC premium of 5.26%.

4.2.8 Belgium

158. In May 2014, the Belgian regulator IBPT published a decision on the cost of capital for operators with significant market power (fixed and mobile)[36]. In this decision, the regulatory has determined WACC parameters which result in a nominal vanilla WACC of 6.12% for fixed network operators. The prevailing rate of 5 year European government bonds in the month of May 2014 was 0.49%. This implies a WACC premium of 5.63%.

4.2.9 France

159. In January 2013, the French regulator ARCEP published a decision fixing the cost of capital used to set prices for fixed network products and services for France Telecom for the years 2013 to 2015[37]. In this decision, ARCEP set WACC parameters which result in a nominal vanilla WACC of 6.5%. The prevailing rate of 5 year European government bonds in the month of January 2013 was 0.60%. This implies a WACC premium of 5.90%.

35 Viestintävirasto (2014), *Kohtuullinen sitoutuneen pääoman tuotto kiinteässä televerkkotoiminnassa, matkaviestinverkkotoiminnassa ja digitaalisten televisiolähetyspalvelujen toiminnassa*, Available here: https://www.viestintavirasto.fi/ohjausjavalvonta/ohjeettulkinnatsuosituksetjaselvitykset/ohjeidentulkintojensuositustenjaselvitystenasiakirjat/kohtuullinensitoutuneenpaaomantuottokiinteassateleverkkotoiminnassamatkaviestinverkkotoiminnassajadigitaalistentelevisiolahetyspalvelujentoiminnassa_2.html

36 IBPT (2014), PROJET DE DÉCISION DU CONSEIL DE L'IBPT CONCERNANT LE COÛT DU CAPITAL POUR LES OPÉRATEURS DISPOSANT D'UNE PUISSANCE SIGNIFICATIVE EN BELGIQUE, Available here: http://www.bipt.be/fr/operateurs/telecom/marches/controle-des-prix-et-des-couts/comptabilisation-des-couts?page=1

37 ARCEP (2013), Décision n° 2013-0001 du 29 janvier 2013 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées de France Télécom pour les années 2013 à 2015, Available here: http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000027248710

4.2.10 Ireland

160. In December 2014, the Irish regulator ComReg published a review of the cost of capital for fixed line telecommunications[38]. As part of this decision, ComReg determined WACC parameters for operators with SMP in the fixed line telecommunications market which results in a nominal vanilla WACC of 6.97%. The prevailing rate on 5 year European government bonds in the month of December 2014 was 0.08%. This implies a WACC premium of 6.89%.

4.2.11 Norway

161. In December 2014 the Norwegian regulator published a decision determining the WACC to be used in conjunction with imposing cost accounting, accounting separation and LRIC models for fixed networks[39]. The WACC has been determined based on deliberations by Professor Thore Johnsen in report from December 2013. The WACC parameters in the 2013 report by Professor Thore Johnsen (which underlie the final WACC in the 2014 decision) result in a nominal vanilla WACC of 8.79%. The prevailing rate on 5 year Norwegian government bonds in the month of December 2014 was 1.19%. This implies a WACC premium of 7.59%.

4.2.12 Portugal

162. In December 2013, the Portuguese regulator published a methodology for calculating the cost of capital rate for PT Comunicações, S.A..[40] The cost of capital rates applies from the 2012 accounting year in Portugal. In this decision, the regulator sets WACC parameters that result in a nominal vanilla WACC of 10.05%. The prevailing rate of 5 year European government bonds in December 2013 was 0.84%. This implies a WACC premium of 9.22%.

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38 ComReg (2014), *Review of Cost of Capital – Mobile Telecommunications, Fixed Line Telecommunications, Broadcasting (Market A and Market B),* Available here: http://www.comreg.ie/publications/cost_of_capital.583.104746.p.html

39 Post- of teletilsynet (2014), *Vedtak om kalkulatorisk rente som skal benyttes ved regnskapsrapportering i fastnettmarkedene*, Available here: http://www.nkom.no/marked/markedsregulering-smp/%C3%B8konomisk-regulering/kapitalkostnad-wacc

40 Anacom (2013), *Methodology for calculating the cost of capital rate of PT Comunicações, S.A., which applies from the 2012 accounting year,* Available here: http://www.anacom.pt/render.jsp?categoryId=353184

4.3 Results

163. The following table summarises the nominal vanilla WACC for each country. It also contains the prevailing risk free rate in the month of the decision, which, has noted earlier, has been sourced from Bloomberg, and the implied WACC premium.

Table 8: Summary of results

Country	Date	Risk free rate from decision	Prevailing 5 year risk free rate	Pre-tax cost of debt	Post-tax cost of equity	Nominal vanilla WACC	WACC premium
New Zealand	Dec-14	4.19%	3.68%	6.33%*	9.09%	7.23%	3.56%
Australia	May-13	3.19%	2.76%	4.73%*	7.39%	6.33%	3.57%
Australia	Jul-11	5.16%	4.65%	7.30%*	9.36%	8.54%	3.89%
Netherlands	Mar-12	2.60%	0.88%	4.40%	5.0%	4.96%	4.08%
Denmark	Dec-14	2.08%	0.16%	3.58%	5.01%	4.44%	4.28%
Italy	Apr-10	3.90%	2.11%	5.61%	7.73%	6.67%	4.56%
Sweden	Dec-13	3.07%	1.69%	5.07%	9.08%	6.28%	4.59%
UK	Jun-14	4.5%	2.02%	5.5%	7.95%	7.17%	5.15%
Finland	May-14	1.94%	0.49%	3.90%	6.54%	5.75%	5.26%
Belgium	May-14	2.63%	0.49%	4.44%	7.63%	6.12%	5.63%
France	Jan-13	3.70%	0.60%	4.70%	7.70%	6.50%	5.90%
Ireland	Dec-14	3.63%	0.08%	5.08%	8.23%	6.97%	6.89%
Norway	Dec-14	6.16%	1.19%	7.66%	9.54%	8.79%	7.59%
Portugal	Dec-13	3.96%	0.84%	6.75%	10.49%	10.05%	9.22%

Notes: * Includes debt issuance costs and/or costs of executing interest rate swaps

Appendix A Reconciliation to Oxera's betas

164. In this report, we estimate asset betas based on data available up to and including 11 December 2014. Oxera's asset betas are estimated based on data available up to and including 10 April 2014.

165. We have performed a cross-check by estimating betas on data available up to and including 10 April 2014. This allows us to confirm that our results are approximately aligned with those reported by Oxera. However, we would not expect our results to be exactly the same as Oxera. This reflects the fact that the process of estimating asset betas involves a number of steps. These include:

- sourcing time series of stock returns from a data provider (we use Bloomberg). Depending upon the information that is available, these returns may have to be calculated taking into account changes in prices, dividends paid and actions affecting the capitalisation of the firm;
- sourcing time series of market returns from a data provider;
- estimating the raw equity beta as the slope coefficient of a regression of stock returns against the market returns over a defined time period;
- estimating the average gearing of the stock based on data on its debt and market capitalisation; and
- de-levering the raw beta to expressed it as an unlevered, or asset, beta.

166. Particularly in sourcing the input data for returns and gearing there is the potential to estimate different asset betas over identical periods.

167. Table 4.1 of Oxera's most recent paper sets out 2 year and 5 year daily betas. These are reproduced at Table 9 below. For comparison, Table 10 shows betas that we estimate over the same period.

Table 9: Oxera estimates of 2 year and 5 year beta

	All comparators		Refined comparators	
	Mean	Median	Mean	Median
Two year daily betas				
10 April 1999	0.63	0.53	0.60	0.47
10 April 2004	0.60	0.55	0.60	0.54
10 April 2009	0.50	0.48	0.42	0.43
10 April 2014	0.47	0.42	0.39	0.36
Five year daily betas				
10 April 1999	0.58	0.51	0.54	0.47
10 April 2004	0.71	0.68	0.69	0.67
10 April 2009	0.54	0.52	0.47	0.46
10 April 2014	0.46	0.38	0.35	0.35

Source: Oxera

Table 10: CEG estimates of 2 year and 5 year beta

	All comparators		Refined comparators	
	Mean	Median	Mean	Median
Two year daily betas				
10 April 1999	0.60	0.52	0.59	0.44
10 April 2004	0.61	0.59	0.60	0.55
10 April 2009	0.52	0.47	0.43	0.43
10 April 2014	0.47	0.41	0.39	0.36
Five year daily betas				
10 April 1999	0.61	0.54	0.62	0.51
10 April 2004	0.75	0.78	0.73	0.72
10 April 2009	0.55	0.52	0.47	0.45
10 April 2014	0.45	0.38	0.35	0.36

Source: Bloomberg data, CEG analysis

168. We have used daily betas as the basis of comparators because unlike weekly or monthly betas, there are no variations in timing that might account for differences in daily betas. We note that there remain differences between our estimates of beta and Oxera's. These are most significant for periods ending 1999 and 2004.

169. This is likely to be because we estimate betas using the information that is available. For example, if a stock has three years of share price data to 10 April 1999 we will calculate the beta on that information to compare with 5 year betas. We understand that Oxera will only use share market data to estimate betas where a full 5 years of data is available (if 5 year betas are being used).