FURTHER ISSUES CONCERNING THE COST OF CAPITAL FOR FIBRE INPUT METHODOLOGIES

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CONTENTS

1. Introduction

This paper addresses a number of further issues concerning the cost of capital for Fibre Input methodologies, arising from submissions on the Commission's (2019) Draft Decision and associated cross-submissions. It also addresses some questions posed by the Commission. I commence with these submissions and cross submissions.

2. Submissions and Cross-Submissions

2.1 Risk-Free Rate and Cost of Debt in the Pre-Implementation Period

Chorus (2020a, page 39) asserts that the pre-implementation period should be treated as a regulatory period, the losses should be determined as the difference between expected and actual cash flows, and therefore the relevant risk-free rate is that prevailing at the commencement of this implementation period. However, it seems clear from section 177 of the Telecommunications Act 2001 that losses are defined as the ex-post difference between revenues and costs rather than the difference between expected and actual cash flows. Furthermore, if Chorus actually believed that "losses" should be defined in the way that they propose, their submission would have provided an estimate of the expected cash flows in the pre-implementation period, it does not do so, and this implies their acceptance of an ex-post definition for losses. Furthermore, and most importantly, regardless of how losses are defined, section 177 of the Act clearly indicates that the ex-post compensation involves compounding the losses forward to the end of the pre-implementation period, this compounding exercise requires risk-free rates, and the relevant risk-free rate for the losses incurred in (say) 2015 is the risk-free rate in 2015, with a term equal to the remainder of the pre-implementation period, and applicable to each year from 2015 till the end of the pre-implementation period (as discussed in Lally, 2019a, pp. 4-7).[1]

[1] There is ambiguity in the Commission's analysis on this issue. The Commission (2019, page 543) implies that firms financed the debt portion of losses incurred in (say) 2015 by borrowing for some term and then used interest rate swap contracts to lock in the risk-free rate component from 2015 to 2021. This implies that losses incurred in 2015 should be compounded at a rate that embodies the six-year risk-free rate observed in 2015, and applied to the entire compounding exercise till 2021. Similarly, losses incurred in 2016 should be compounded forwards to 2021 using a rate that embodies the five-year risk-free rate observed in 2016, and applied to the entire compounding exercise till 2021. This matches the analysis in Lally (2019a, pp. 4-7). By contrast the Commission (2020, pp. 43-45) implies that losses incurred in 2015 should be compounded forwards using rates that embody the six-year risk-free rate observed in 2015, for one year, the five-year risk-free rate observed in 2016, for one year, etc. This is inconsistent with the mathematics of bonds; the six-year rate observed in 2015 can only be applied to borrowing or lending for the entire six-year period 2015-2021 rather than just the first year of that six-year period.

Chorus (2020b, para 15.5) asserts that the risk-free rate that should be used in determining the losses in the pre-implementation period is that prevailing at the beginning of the pre-implementation period (May 2011) until the end of this period. The rationale is explained earlier in their cross-submission. In particular, Chorus (2020b, para 5.3) argues that the Commission's approach of using the risk-free rates from the time of the expenditures until the end of the pre-implementation period "..doesn't reflect the commercial reality of how a project like the UFB build would be funded..". Chorus does not elaborate of how it thinks such a project would be funded. Presumably Chorus understood that its cash flows would be negative in the pre-implementation period and the best it could have hoped for is that these losses would be reimbursed by being compounded forwards and added to the RAB at the implementation date.[2] Accordingly, for the loss incurred in (say) 2015, Chorus would have needed to raise finance at that point and therefore borne a cost of capital from that point until the implementation date. Accordingly the risk-free rate incurred by Chorus would be that observed in 2015, with a term equal to the remainder of the pre-implementation period, as discussed in Lally (2019a, pp. 4-7).

Chorus (2020b, para 5.3) also argues that the Commission's approach to the risk-free rate in the pre-implementation period is inconsistent with its usual practice without adequate explanation or justification. The explanation and justification appears in Lally (2019a, pp. 4-7) and Lally (2019b, pp. 7-8), and both papers predate Chorus's paper.

Sapere (2020, paras 32, 45) argues that the relevant risk-free rate for determining the losses is that at the commencement of the pre-implementation period (2011) for the term of that period (9 years) because this situation is a normal regulatory situation in which prices are set so as to satisfy the NPV = 0 principle. Sapere (2020, para 47) goes on to describe the process by which the fibre prices were set, involving competitive tendering. This is entirely different to the usual regulatory process, in which there is no competition, no competitive tendering, and no formal process by which prices are determined at the commencement of the regulatory period to explicitly reflect (inter alia) contemporaneous risk-free rates. Furthermore, even if prices were set in 2011 in the usual way, the *current* exercise does not concern how prices were set in 2011 but how to compound forward losses to the implementation date, and the

[2] I understand that no explicit guarantees of reimbursement were given in 2011, either through the contracts signed by the firms or otherwise. The reimbursement mechanism appearing in section 177 of the Telecommunications Act 2001 did not appear until 2018, and in response to requests from the service providers.

relevant risk free rates for such an exercise are those at the times at which the losses were incurred.

Atlas Infrastructure (2020, page 2) argues that the WACC for the pre-implementation period should reflect information available in 2011 rather than 2020 because a service provider would have fixed its debt costs in 2011. However the debt in question would have been raised as losses arose in pre-implementation period, in order to finance them. For example, the 2015 losses would have required finance to be raised in 2015, at the 2015 cost of capital and with a term equal to the remainder of the pre-implementation period. This accords with the Commission's (2019, page 543) approach rather than Atlas's belief that a service provider would have fixed its costs of capital in 2011. No service provider would have needed to fix such debt costs in 2011, nor could they have known then how much finance would be required. Even if they had known, and had raised the finance in 2011, they would not have needed to do so, and therefore should not be compensated for something they did not need to do.

Cooper Investors (2020, page 2) argues that the cost of debt should not be reset annually within the pre-implementation period because service providers do not refinance their debt annually. However the Commission's (2019, page 543) approach does *not* imply annual refinancing. In respect of losses incurred in (say) 2012-2013, the risk-free rate used within the cost of debt is that prevailing in mid 2012 for the remaining term of the pre-implementation period (9.5 years), which is consistent with the firm borrowing for its preferred term (five years perhaps) and then swapping the risk-free rate component of its cost of debt into that of 9.5 year debt.[3] In respect of the DRP, firms seek to smooth out their annual refinancing needs, which implies firm would (in respect of the debt-financed fraction of the loss in a particular year) gradually transition to a trailing average over their preferred debt term. If this preferred term were five years, they would borrow 20% of the total initial sum for one year, which would be replaced at its maturity by five-year debt, borrow 20% of the total initial sum for two years, which would be replaced at its maturity by five-year debt, etc. So, for the purposes of compounding the 2012-2013 loss to 2022, the DRP paid for 2012-2013 would be the five-year DRP prevailing in mid 2012 (assumed to be the same for shorter terms at that time), the DRP paid for 2013-2014 would average over the five-year

[3] The Commerce Commission (2019, page 543) explicitly assumes that firms entered such interest rate swap contracts.

rates in mid 2012 (80% weight) and mid 2013 (20% weight), etc. This calculation is complex. A simplification proposed in Lally (2019a, section 3) and adopted by the Commission (2020, page 72) would be to identify the year corresponding to the median loss, determine the DRP prevailing at the beginning of that year, and apply it throughout the calculation. Lally (2019b, pp. 7-8) assesses the error from this simplification at only 0.7% of the correct figure. As with the Commission's treatment of the risk-free rate, this approach does *not* imply annual refinancing.

Enable Networks Ltd (2020, paras 5.1-5.3) argues that the relevant risk-free rate and DRP for determining the losses in the pre-implementation period is that prevailing in 2011 in accordance with the Commission's usual approach and its approach in the post implementation period. However this argument fails to recognize that the Commission's usual approach is concerned with setting allowed prices or revenues at the beginning of a regulatory cycle whereas the present exercise is concerned with the entirely different exercise of compounding forward losses from the date incurred until some future point in time. The risk-free rate and DRP relevant to the first such exercise are not relevant to the second such exercise.

Investors Mutual Ltd (2010, page 1) argues that Chorus entered into contractual commitments in 2011 to build part of the UFB network, and therefore into capital expenditures at various points during the pre-implementation period. Accordingly the applicable cost of capital should be that prevailing in 2011. Investors Mutual are implying that Chorus raised the capital in 2011 for these future expenditures or locked in the cost of capital at that time. However, even if Chorus did either of these things (and I am unaware if they did), Chorus would not have needed to have done so until the expenditures actually occurred. Capital expenditures along with other loss components occurring in (say) 2015 would therefore not require financing until 2015, and the relevant cost of capital for compounding forward the losses until the end of the pre-implementation period would be that prevailing in 2015. This matches the Commission's process.

L1 Capital (2020, page 24) repeats the argument of Investors Mutual Ltd (2020, page 1), with the additional claim that Chorus locked in its debt financing costs in 2011 for these future expenditures. This argument is addressed in the previous paragraph. Furthermore, it deals only with debt financing and the financing of capital expenditures.

Northpower Fibre Ltd (2020, para 11) argues that the pre-implementation period is "equivalent" to a normal regulatory period, and therefore the cost of capital should be set at the beginning of that period. However Northpower do not identify in what way the pre-implementation period is equivalent to a normal regulatory period. The analysis that involves setting the cost of capital at the beginning of a regulatory period is in pursuit of setting allowed revenues or prices at the beginning of that period. The current exercise is instead concerned with compounding forward losses incurred during a period till the end of that period, and the cost of capital relevant to the current exercise is therefore not necessarily the same as that relevant to the usual regulatory exercise. The appropriate analysis for the current exercise is that in Lally (2019a, pp. 4-7), and implies that the cost of capital should be set quite differently, as the Commission does.

Telstra Super (2020, page 2) argues that the WACC of service providers was used to determine prices in 2011, and therefore the 2011 WACC should be used to roll forward the losses to the implementation date. However, although it is true that CFH (the Crown entity dealing with this matter) developed cost-based estimates of appropriate prices prior to the receipt of tenders, the prices accepted under the competitive tendering process were lower (Oxera, 2019, paragraph 3.17, in a report prepared for Chorus). Furthermore, even if the prices were set in the way claimed by Telstra Super, it does not follow that the same WACC would be appropriate for compounding forward the losses until the end of the pre-implementation period. Necessarily, the correct rate for compounding forward losses incurred on date T to some later date S is the cost of capital on date T until date S because doing so compensates service providers for the cost of capital incurred by them as a result of the delay in compensating them.

Vector (2020b, pp. 5-6) asserts that the Commission's approach to the cost of debt in the pre-implementation period is inconsistent with the fact that firms use debt with a variety of maturity dates. This appears to replicate the claim by Cooper Investors (2020, page 2) that the Commission mistakenly assumes that debt is refinanced annually. However, as discussed above in responding to the claims by Cooper Investors, the Commission's approach makes no such assumption and is entirely consistent with firms smoothing out the maturity dates of their debt.

2.2 Systematic Risk in the Pre-Implementation Period

Spark (2020, pp. 10-11) argues that the loss correction regime reduced risk in the pre-implementation period to the extent that the beta should be set to zero in this period, and attributes to me the view that an estimate of zero is a "viable option" (but provides no citation from my work). However, as argued in Lally (2019a, section 3), the beta is very likely to be positive in this period, the choice must lie at zero or the value used if regulation applies, and the better estimate is the latter. Spark does not respond to this analysis and it has mispresented my view.

Vector (2020a, paras 14-16) notes that the pre-implementation period can be divided into two subperiods, being that up to the announcement of the loss correction regime in November 2018 and that after it, which raises the question of whether the losses claimed in the second subperiod are efficiently incurred losses. It also raises the question of whether losses in these two subperiods warrant different costs of capital for compounding them forwards. The situations in these two periods were different in that service providers did not know in the first subperiod whether their losses in the entire period would be reimbursed whilst they knew in the second subperiod that their losses in the entire period would be reimbursed. However, once the decision was made to reimburse the losses, the principles underlying estimation of the cost of capital are the same. In particular, the reimbursement for all of these losses could be too high or too low depending upon market conditions within the entire period, as discussed in Lally (2019a, section 3). So, once the decision was made to reimburse the losses, systematic risk was the same throughout the entire period and therefore the same beta estimate should apply to both subperiods.

2.3 Implications of Crown Financing

Chorus (2020a, page 44) argues that it bears a residual risk in relation to Crown financing because Crown financing is essentially debt financing. Chorus goes on to assert that Incenta's (2019, section 3) analysis relating to Crown financing is correct. I agree that Chorus bears a residual risk in relation to Crown financing, in the usual sense that equity holders in any firm bear a residual risk in relation to any debt financing, because debt has the first claim on the firm's cash flows. However, it does not follow from this that Incenta's entire analysis relating to Crown financing is correct. As demonstrated in Lally (2019b, pp. 8-11), Incenta's equation for taking account of the presence of Crown financing is incorrect. Chorus does not respond to this analysis.

2.4 TAMRP

MEUG (2020) argues against the Commission's practice of rounding the TAMRP estimate to the nearest 0.5%, and instead favours the median estimate across the set of methodologies considered by the Commission (which are each rounded to the nearest 0.05%). In support of this, MEUG notes that rounding to the nearest 0.5% rather than 0.05% could lead to small changes in the median estimate (from say 7.2% to 7.3%) inducing a fivefold increase in the rounded estimate, from 7.0% to 7.5%. MEUG (2020, para 11) quotes my earlier view on this matter that "Over time the small over and under estimations implicit (but essentially unobservable) in a TAMRP rounded to the nearest 50bps will net out. In this respect it is not error in any one regulatory period which matters but error over the life of the assets". MEUG (2020, para 12) claims that my view presumes that the TAMRP estimation methodology does not change and notes it did change in 2010. However MEUG's belief that my views are premised on no change in methodology is not correct. Regardless of whether the methodology changes, there will still be over and under estimations arising from rounding to the nearest 50bps and they will tend to net out over time.

To illustrate this point, suppose the true TAMRP never changes from 7.25% over time, it is estimated using only the historical averaging of excess returns, and the results at different points in time are uniformly distributed over the range from 7.0% to 7.5%. In this case, the Commission will be equally likely at each estimation point to obtain an estimate from 7.0% to 7.25% (leading to a rounded estimate of 7.0% and therefore an underestimate of 0.25%) and to obtain an estimate from 7.25% to 7.50% (leading to a rounded estimate of 7.5% and therefore an overestimate of 0.25%). Over time, these overs and unders tend to net out. Now suppose that, after using the historical averaging method for some time, the regulator switches to a new estimation methodology, whose results are also uniformly distributed over the range from 7.0% to 7.5%. Despite this change, it still remains true that, at any estimation point, the estimate rounded to the nearest 0.5% is equally likely to be too high by 0.25% or too low by 0.25%. So, netting out of errors over time continues as before. Similarly, a person tossing a fair coin that costs them $1 if they toss a tail and wins them $1 if they toss a head will experience a netting out of their gains and losses over many tosses, and this remains true even if at some point they switch from using their left to their right hand for tossing the coin, or even asking someone else at some point to toss the coin. Changes in methodology don't change the fundamental principle here.

MEUG (2020, para 10) also asserts that the QCA used to estimate this parameter to the nearest 1.0% (in 2012) but no longer has any explicit rounding principle. This is true. However the QCA's decisions since 2012 have been 6.5% in the Market Parameters Decision (QCA, 2014, page 23), 6.5% in the DBCT Decision (QCA, 2016, section 4.7), and 7.0% in the UT5 Draft Decision (QCA, 2017, page 83). So, the QCA is now *implicitly* rounding to the nearest 0.5%, which essentially matches the Commission's current practice. So the QCA's approach supports rather than contradicts the Commission's position.

MEUG (2020, para 14) also asserts that the Commission does not apply a rounding process to any other WACC parameters. However this is not correct; rounding must be and is always used because parameter values are not constrained to a finite number of decimal points. It is therefore simply a question of the degree of rounding. For example, if a beta estimate from a regression process is reported at 0.489, then it has been rounded to three decimal points. If the value of 0.49 were instead adopted, then rounding would have occurred to only two decimal points. If the value of 0.50 were instead adopted, rounding would then have occurred to one decimal point.

Remarkably, MEUG's (2020, para 14) claim that the Commission does not round other parameters is contradicted by its own footnote 3, in which it notes that the Commission rounds other parameters to two decimal points whilst the TAMRP is rounded to only one decimal point. Perhaps MEUG meant to argue that the Commission was being inconsistent in the number of decimal points to which rounding is performed. However, the number of decimal points depends upon the way in which the TAMRP is presented. If it is presented as a percentage (7.5%), then rounding has occurred to one decimal point. If it is instead presented as a decimal (0.075), then rounding has occurred to three decimal points. Furthermore, the degree of rounding depends upon the degree of precision with which a parameter can be estimated and the extent of rounding in the raw data. The risk-free rate is rounded to two decimal points by the Commission (when presented as a percentage) despite being observable to any desired degree of precision (from bond prices and promised payments) because the Commission's data source data (the Reserve Bank website) does so. If the Reserve Bank website presented the data to three decimal points, the Commission would presumably have done likewise. By contrast, the TAMRP cannot be observed, the choice of rounding therefore reflects the extent to which it can be even moderately well

estimated, and this points to rounding to one decimal point when it is expressed as a percentage.

MEUG (2020, para 6) also notes the Commission's view that "Rounding saves regulators the need (and hence the cost) to estimate the TAMRP to a very high degree of precision, and this is desirable because high levels of precision in this area are spurious. Rounding also helps limit lobbying over small variations in the TAMRP." MEUG accepts that high levels of precision can be spurious but asserts that this is not true in the current situation where the median estimate across the various methodologies is close to the midpoint for rounding (7.25%). However MEUG is confusing a mathematical consequence of a median estimate being close to 7.25% with the degree of precision with which the TAMRP can be estimated. The TAMRP cannot be reliably estimated to the nearest 0.05%, and this is true regardless of whether the median estimate is 7.24% or 7.04%. These are entirely different issues.

In summary, rounding to 0.5% is desirable because it saves regulators the need and hence the cost of trying to estimate the TAMRP to a much higher degree of precision than is actually attainable, and it limits lobbying over changes in the TAMRP estimate that are too small to have any confidence in. These are significant advantages. The downside is that estimation errors will be larger than had rounding to the nearest 0.05% been used but these estimation errors are small and will tend to offset over time.

BARNZ (2020) also argues against the Commission's practice of rounding the TAMRP estimate to the nearest 0.5%, and also favours the median estimate across the set of methodologies considered by the Commission (which are each rounded to the nearest 0.05%). In support of this, BARNZ (2020, paras 6-7) claims that the Commission's practice of rounding the TAMRP is inconsistent with its practice in respect of other parameters. The same (invalid) claim was made by MEUG (2020, para 14) and has been addressed above.

BARNZ (2020, para 9) also speculates that the Commission's rationale for rounding was to avoid changes to the estimate, and notes that this has still occurred (from 7.0% to 7.5%), which "…erodes one of the supposed benefits of rounding". However, BARNZ's suggestion that rounding was undertaken by the Commission in order to avoid changes in the estimate is incorrect. The Commission's rationale for rounding was correctly articulated by BARNZ (2020, para 6): it saves regulators the need and hence the cost of trying to estimate the

TAMRP to a much higher degree of precision than is actually attainable, it limits lobbying over changes in the TAMRP estimate that are too small to have any confidence in, and these advantages outweigh the small increase in the mean squared error of the estimation errors. BARNZ's speculation about the Commission's rationale for rounding was therefore unnecessary and it also misrepresented the Commission's actual rationale.

BARNZ (2020, paras 10-11) also notes that rounding gives rise to changes in the TAMRP when they do occur that are larger than the change in the median estimate across the various estimation methodologies used, leading to a less accurate estimate. This claim is correct, and reflected in the Commission's rationale as described correctly by BARNZ. However, if a policy is pursued because its identified advantages are considered to outweigh an identified disadvantage, it is no criticism to simply recite that disadvantage. As with many things in life, the best course of action involves trade-offs. The only meaningful critique that could be offered here would be to identify further disadvantages of the Commission's approach, or to contest my earlier estimate of the increase in the mean squared error of the estimation errors (from 0.87% to 0.88%, which BARNZ is aware of: see Lally, 2016, page 66), or to argue that this disadvantage outweighs the advantages of rounding to 0.5%. BARNZ has not done any of these things.

2.5 The Choice of Credit Rating

Chorus (2020a, page 12) proposes a cost of debt for the pre-implementation period that is based upon Chorus's credit rating of BBB rather than the benchmark rating of BBB+ used by the Commission. In support of this it claims that this would be consistent with the "risk applied in the calculation of Crown financing". Chorus is conflating two distinct issues. The first is the cost of debt that should be adopted by the Commission sans Crown financing. It is fundamental to regulation that the regulator specifies a benchmark DRP, which may be derived from a benchmark credit rating, and must be consistent with its benchmark leverage. This incentivises a firm to outperform the benchmark (i.e., attain a lower DRP) by improved operating efficiency. It also allows the firm to choose a higher or lower leverage, and therefore a higher or lower DRP. The fact that Chorus's credit rating is below the benchmark therefore reflects inferior operating efficiency and/or a conscious choice of higher leverage, and should therefore be irrelevant to the Commission when setting the benchmark cost of debt sans Crown financing. The second issue is the treatment of Crown financing. I understand most of the Crown debt is subordinated, which will embody a higher than normal

DRP (i.e., lower credit rating) when supplied commercially. So, the interest saving from the Crown finance being supplied at zero cost will be higher than the benchmark cost of debt. So, the appropriate credit rating to use for determining the cost of debt within the benchmark WACC figure is unrelated to the treatment of Crown financing. Chorus's belief that they must match is not correct.

Chorus (2020, page 12) also claims that use of a cost of debt based upon Chorus's credit rating of BBB rather than the benchmark rating of BBB+ used by the Commission would be consistent with "the leverage assumed in the estimation of the asset beta". It is uncontroversial that the leverage that should be used (not assumed) in the estimation of a firm's asset beta is the actual leverage of the firm, and this actual leverage is a factor in determining its actual credit rating. However the benchmark leverage and credit rating adopted by a regulator for incentive regulation purposes need not match the actual values of a regulated firm; it is fundamental to regulation that the regulator chooses benchmark values for leverage and the DRP, leaving a firm to choose a different leverage (and hence credit rating and hence DRP) and/or operate at a higher or lower level of operating efficiency than that implicit in the benchmark firm.

Sapere (2020, page 1) also proposes a cost of debt for the pre-implementation period that is based upon Chorus's actual credit rating of BBB rather than the benchmark rating of BBB+ used by the Commission. In support of this it claims that this would be consistent with the "risk applied in the calculation of the avoided financing cost building block". This argument matches the first argument presented by Chorus in the penultimate paragraph, and has been addressed there. In support of its proposal Sapere (2020, page 1) also claims that using Chorus's actual credit rating in the pre-implementation period would be consistent with "the credit rating proposed for the post-implementation period". Sapere does not elaborate on whose proposal this is, but it is not the Commission's because the Commission proposes the same BBB+ rating for the post-implementation period (Commerce Commission, 2020, page 82). So, presumably this proposed credit rating for the post-implementation period is Sapere's view. This is even less useful than Sapere's view about the appropriate rating in the pre-implementation period, and the latter has been considered above.

Enable Networks (2020, para 5.3) also supports the use a cost of debt for the pre-implementation period that is based upon Chorus's actual credit rating of BBB rather than the

benchmark rating of BBB+ used by the Commission. However, it offers no arguments in support of this.

L1 Capital (2020, pp. 16-18) argues that the Commission's use of a cost of debt for the pre-implementation period that is based upon a benchmark credit rating of BBB+ does not reflect the credit ratings of the comparator firms used to estimate leverage and the asset beta. Since the benchmark values for leverage and the credit rating are closely intertwined, the Commission has a choice:[4]

(a) To use a set of comparators to obtain benchmark values for both parameters, or
(b) To use a set of comparators to obtain initial values for both parameters, and then to impose a higher credit rating (and a commensurably lower leverage) for benchmark purposes, or
(c) To use a set of comparators to obtain initial values for both parameters, and then to impose a higher credit rating (but no change in leverage) for benchmark purposes
(d) To use a set of comparators to obtain benchmark leverage, to derive the benchmark credit rating in a different way (setting it at BBB+ as a signal to the regulated businesses as to the minimum credit rating that they should seek), and then to assess whether this leverage and credit rating pair is consistent.

The normal (and defensible) course of action is option (a), whilst option (b) is also readily defensible. By contrast, the Commission (2019, paras 3.858 and 3.1009) has adopted option (d) whilst L1 Capital appears to believe that it has adopted option (c). The Commission's use of option (d) is defensible if its choice of credit rating is not inconsistent with the comparator evidence, and the Commission (2019, para 3.866) believes this to be the case. In particular, the Commission notes that CEPA (2019, page 43) concludes that "BBB/BBB+ is consistent with the wider comparator set." By contrast, L1 Capital (2020, page 18) notes CEPA's (2019, page 43) results that investment grade wholesalers had an average rating of BBB/BBB- whilst investment grade integrated firms had an average rating of BBB+/A-. L1 Capital then asserted that most such firms were integrated, and then concluded that the overall average rating would be closer to BBB than BBB+. However L1 Capital's conclusion does not follow from the data. If even half of the firms were integrated, the overall average of BBB/BBB- for wholesalers and BBB+/A- for integrated firms would be BBB/BBB+. So,

[4] The set of comparators used to estimate the asset beta can be decoupled from the set of comparators used to establish benchmark values for leverage and the credit rating, because the former set of comparators must reflect the operating risk of the regulated activity whilst the latter are concerned instead with financing risk.

if more than half were integrated as claimed by L1 Capital, the average overall rating would be closer to BBB+ than BBB, which is contrary to L1 Capital's claim and even more in favour of the Commission's position than the Commission's conclusion of BBB/BBB+. So, the Commission's approach would seem to be reasonable. However the comparators to which the Commission refers in its citation of CEPA (2019, page 43) are just firms with investment grade credit ratings whilst its benchmark leverage appears to be based upon a set of firms without that restriction, so the two sets do not match. Using all of the firms noted by CEPA (2019, Table Appendix B.6), the median credit rating is BBB and the average just under that (if adjoining ratings differ by one unit).[5]

I therefore consider two alternative approaches. The first is as follows. The Commission has used a set of comparators to determine the benchmark leverage (at 31%), and set its benchmark credit rating at BBB+ using a different approach, whilst the comparators used to set its benchmark leverage at 31% suggest a lower credit rating benchmark than BBB+. This suggests that, if the Commission desires a higher benchmark credit rating than that consistent with its leverage of 31%, it should lower its benchmark leverage (below 31%), in accordance with option (b). However, amongst firms with a BBB+ rating, CEPA (2019, page 44) notes that the average leverage for 2014-2019 was 34%. Thus the empirical evidence does not suggest the need for any reduction in the benchmark leverage, and therefore is compatible with the Commission's position of benchmark leverage of 31% and a benchmark credit rating of BBB+.

The second alternative approach would be for the Commission to, having set its benchmark credit rating at BBB+ for telecommunications firms, choose a set of comparator telecommunications firms with that credit rating, determine their average leverage (which is 34% as noted in the previous paragraph), and adopt that figure as its benchmark. Instead, it used a benchmark of 31%. So, its benchmark leverage is too low. Letting k_u denote the unlevered WACC, p the DRP plus the allowance for debt issuance costs, L leverage, and T_c the corporate tax rate, Lally (2009, equation 5) shows that the WACC (inclusive of the tax deduction on debt) is[6]

[5] Assigning value of 1 to a credit rating of B, 2 to a credit rating of B+, and so on, the average rating is 6.9, which is fractionally under the figure of 7.0 for BBB.

[6] The Commission (2019, para 3.589) uses a vanilla WACC that does not incorporate the tax deduction of debt in WACC but instead deals with it through the cash flows. This is merely presentational.

$$WACC = k_u + p(1 - T_c)L$$

So, with p = 0.02 and T_c = 0.28, the effect of understating L by 0.03 is to understate WACC by 0.0004, i.e., 0.04%. This is inconsequential, and further supports the reasonableness of the Commission's approach. Alternatively, if the Commission chose to raise leverage to 34% consistent with its benchmark credit rating of BBB+ and the CEPA report, it should raise its WACC and doing so would yield an increase of about 0.04%.

L1 Capital (2020, page 17) also argues that a benchmark credit rating of BBB+ rather than BBB reduces the revenues of Chorus, with no compensating advantage. However the Commission (2019, para 3.848) has articulated a clear rationale for its BB+ benchmark: to signal to firms like Chorus the need to improve their credit rating so as to reduce their bankruptcy risk. Furthermore, Chorus can attain this by the simple expedient of reducing its leverage, which has averaged 55% in the 2014-2019 period (CEPA, page 54). If Chorus chooses to retain a leverage level well above the industry comparator average, and therefore a credit rating below BBB+, it must bear the revenue consequences of that. By their very nature, benchmarks are not mere replicas of the actual values for a particular firm.

L1 Capital (2020, page 17) also argues that a benchmark credit rating of BBB+ is inconsistent with the Commission's treatment of CFH loans, which take account of the actual cost of debt for the recipient of the loans. This replicates Chorus's (2020, page 12) argument above, and has been addressed there.

L1 Capital (2020, pp. 17-18) also argues that the BBB+ benchmark credit rating is above the earlier contractual requirement for Chorus to maintain a rating of at least BBB- during the pre-implementation phase. However the earlier contracts provided no guarantee that pre-implementation period losses would be reimbursed. L1 Capital (naturally) does not object to the November 2018 announcement concerning reimbursement of the losses. Its complaint concerning the revised credit rating standard is therefore cherry picking.

3. Questions Posed by the Commission

The Commission has raised a number of questions, and the first of these relates to zero-cost Crown financing. In particular, the Commission has raised the question of whether this

funding should be assumed to displace conventional funding at the benchmark cost of capital. So, if the Crown finance is debt, the issue is whether it is assumed to displace debt at the benchmark credit rating of BBB+. I understand most of the Crown debt is subordinated, which is at a higher rate (i.e., lower credit rating) than senior debt when supplied commercially, and at a higher rate than the average over both debt types. For a firm whose debt costs corresponded to the benchmark, its average rate (over senior and subordinated) would match the benchmark. So, even for a firm operating at the benchmark, the interest saving from the (subordinated) Crown finance being supplied at zero cost would be higher than the benchmark rate. Thus, Crown funding should not be assumed to displace conventional funding at the benchmark cost of debt. This conclusion matches the Commission's (2019, pp. 114-119) current view.

For example, suppose the cost of debt for a firm at the benchmark credit rating of BBB+ is 5%. Thus, if all of a firm's debt were of the same type, that rate would be 5%. Suppose further that half of the firm's debt is senior and half subordinated. Arbitrage requires that the average of the rates for the senior and subordinated debt be equal to 5%. So, suppose senior debt is 4% and therefore subordinated debt would be 6%.[7] So, if the Crown supplied the subordinated debt at zero cost, the interest rate saving to the firm would be 6% rather than the benchmark rate of 5%.

If a firm operates above/below the benchmark level, during to superior/inferior operating efficiency or leverage above/below the benchmark level, the benefit from zero-cost Crown finance would still not be equal to the benchmark cost of debt. For example, suppose the benchmark rate is 5% and all of the firm's debt is equally ranked with a cost of 5.5% (because the firm chooses leverage above the benchmark level). If Crown finance displaces half of this, but is equally ranked, the saving to the firm from this Crown finance would be 5.5% rather than the benchmark rate of 5%. By choosing leverage above the benchmark level, the firm chooses a cost of debt above the benchmark level and therefore the benefit to it from zero-cost Crown financing is above the benchmark interest rate. Expressed equivalently, the Crown is giving up 5.5% in supplying zero-cost finance. So, again, Crown

[7] By contrast, for example, if senior debt were at 5.5%, subordinated at 4%, and equally ranked debt were at 5%, firms with equally ranked debt would have an incentive to switch to half senior and half subordinated, thereby reducing their overall interest rate from 5% to 4.75%.

funding should not be assumed to displace conventional funding at the benchmark cost of debt and this conclusion matches the Commission's (2019, pp. 114-119) current view.

The second question posed by the Commission relates to systematic risk in the pre-implementation period. In an earlier report (Lally, 2019a, page 9) I concluded that "In summary, systematic risks are present in the pre-regulatory period but differ from those once regulation commences. Therefore, properly estimating the beta in the pre-regulatory period would require identifying suitable comparators, and these are unlikely to be available. So, the choice must be between a beta estimate of zero and that for the regulatory situation. Using a beta estimate of zero would be too low whilst using the same beta applied to the regulatory situation may be too high or too low. The latter is likely to produce a smaller estimation error and is therefore preferable." In response to this, the Commission has raised the question of why my lower bound is zero and why my upper bound is the beta applicable to the regulatory situation. In respect of the lower bound, my earlier analysis (Lally, 2019a, section 3) demonstrated that systematic risk is positive in the pre-implementation period. So, the beta must be above zero and therefore zero is the lower bound. In respect of the upper bound, I did not present one. Instead, as indicated in the quotation above, I concluded that suitable comparators are not likely to be available for estimating the beta in the pre-implementation period and the only candidate was that applicable to the regulatory situation, which might be too high or too low.

The third question posed by the Commission relates to changes in costs of capital over the course of the pre-implementation period. In an earlier paper (Lally, 2019a, section 2), I concluded that the Building Block approach to determining losses was equivalent to the Cash Flow approach providing that the allowed cost of capital in determining the Building Block loss for each year was the same as the rate used to compound losses to the end of the pre-implementation period. However the proof there considered the case of only one period within the pre-implementation period and therefore did not consider the implications of costs of capital changing over the pre-implementation period. The question is therefore how those formulas change in this event.

Consider three points in time, corresponding to the beginning of the pre-implementation period (time 0), the mid-point one year later (time 1), and the end one further year later (time 2). Investment of I_0 occurs at time 0, revenues of REV_1 at time 1, revenues of REV_2 at time 2,

depreciation of DEP_1 at time 1, and depreciation of DEP_2 at time 2. In addition the cost of capital at time 0 for the next two years is k_{02} per year, and the cost of capital at time 1 for the next year is k_{12}. Under the Cash Flow approach to determining the losses, and corresponding to equation (2) in Lally (2019), the compounded loss at the end of the pre-implementation period is the sum of cash outflows, each compounded to the end of the pre-implementation period using the cost of capital prevailing at the time of the cash outflow until the end of the pre-implementation period, less the undepreciated investment remaining at the end:

$$L = I_0(1 + k_{02})^2 - REV_1(1 + k_{12}) - REV_2 - (I_0 - DEP_1 - DEP_2) \qquad (1)$$

In respect of the Building Block Method, the cost of capital must be applied to the initial investment I_0 for the next year, and this does not correspond to either k_{02} or k_{12} because it is a cost of capital for the one year period commencing at time 0. Let this cost of capital be denoted k_{01}. So, under the Building Block method of determining losses, and corresponding to equation (1) in Lally (2019a), the compounded loss at the end of the pre-implementation period is the sum of Building Block losses, each compounded to the end of the pre-implementation period using the cost of capital prevailing at the time of the loss until the end of the pre-implementation period, and with Building Block losses determined using k_{01} and k_{12}:

$$L = [I_0 k_{01} + DEP_1 - REV_1](1 + k_{12}) + (I_0 - DEP_1)k_{12} + DEP_2 - REV_2 \qquad (2)$$

To equate the last two definitions for the compounded loss L, k_{01} must be as follows:

$$k_{01} = \frac{(1 + k_{02})^2}{1 + k_{12}} - 1 \qquad (3)$$

This is not a cost of capital in the usual sense, but is a forward expected rate of return, i.e., a rate of return expected over the first year that when coupled with that expected in the second year (k_{12}) is equivalent to earning the expected rate k_{02} over the entire two-year period as follows:

$$(1 + k_{02})^2 = (1 + k_{01})(1 + k_{12})$$

Consider the following example: I_0 = \$10m, $REV_1 = REV_2$ = \$1m, $DEP_1 = DEP_2$ = \$1.5m, k_{02} = .04, and k_{12} = .03. So, using the Cash Flow approach in equation (1), the compounded losses are

$$L = \$10m(1.04)^2 - \$1m(1.03) - \$1m - (\$10m - \$1.5m - \$1.5m) = \$1.786m$$

Using equation (3), the forward rate k_{01} is .0501. So, using the Building Block method in equation (2), the compounded losses are

$$L = [\$10m(.0501) + \$1.5m - \$1m](1.03) + (\$10m - \$1.5m)(.03) + \$1.5m - \$1m$$
$$= \$1.786m$$

So, the compounded loss results match. However, if the cost of capital changes significantly over time, these forward rates may be well above or below the range in these costs of capital. In the example above, the range in the costs of capital is .03 to .04, whilst the forward rate is .0501.

An alternative approach that is free of the problem just identified is as follows. Firstly, determine the compounded loss using the Cash Flow approach as in equation (1) above. Second, find the single compounding rate *k* that produces the same result as (1), i.e.,

$$L = I_0(1+k)^2 - REV_1(1+k) - REV_2 - (I_0 - DEP_1 - DEP_2) \qquad (4)$$

Third, use this single rate *k* in the Building Block method in equation (2), which will produce the same result as equation (4) and therefore the same result as equation (1). Using the example in the previous section, this rate is *k* = .0405, i.e.

$$L = \$10m(1.0405)^2 - \$1m(1.0405) - \$1m - (\$10m - \$1.5m - \$1.5m) = \$1.786m$$

Using *k* = .0405 in equation (2), the result is a compounded loss of \$1.786m as before, i.e.,

$$L = [\$10m(.0405) + \$1.5m - \$1m](1.0405) + (\$10m - \$1.5m)(.0405) + \$1.5m$$
$$- \$1m = \$1.786m$$

This approach is in the same spirit as the approach to ex-ante revenue or price capping. In this case, the Cash Flow approach uses a single discount rate rather than different discount rates ("spot rates") for cash flows at different future points in time, and the Building Block method uses that single discount rate. However, in the compounding situation, this single compounding rate cannot be determined until the end of the pre-implementation period whilst the forward rate method can be applied to losses as they arise.

The fourth question is whether the same risk-free rate should be used for both the cost of debt and the cost of equity, for compounding the losses forwards to 2021. The Commission (2019, page 543) favours this. Doing so is also implicit in my earlier analysis (Lally, 2019a, pp. 4-7), and in the analysis just presented above. Thus, losses incurred in (say) 2015 are compounded forwards to 2021 using a rate that embodies the six-year risk-free rate observed in 2015, and applied to the entire compounding exercise for these 2015 losses. This does not presume that the debt portion of the financing of these losses involves borrowing for six years; the borrowing could be for a different term, such as five years, but is coupled with an interest rate swap contract to convert the risk-free rate component of the cost of debt into six-year debt. In respect of the equity component of the financing of the 2015 losses, use of the six-year risk-free rate observed in 2015 for the compounding exercise until 2021 presumes that the CAPM applied to the six-year period from 2015-2021. Similarly, in respect of the equity component of the financing of the 2016 losses, use of the five-year risk-free rate observed in 2016 for the compounding exercise until 2021 presumes that the CAPM applied to the five-year period from 2016-2021. A consequence of doing this is that estimates of the TAMRP would be required for 1, 2….10 years. However, such estimates have only been undertaken for terms up to five years (Lally, 2015, 2019c). To avoid the need for estimates for the longer terms, different risk free rates could be employed up to a maximum term of five years. For example, in respect of losses incurred in 2015, the CAPM could be assumed to apply for the following five years to 2020, and then the following year to 2021. So, for compounding forwards 2015 losses till 2021, the risk-free rate within the cost of debt would be the six-year rate observed in 2015 and applied to the following six years whilst the risk-free rate within the cost of equity would be the five-year rate observed in 2015 and applied to the following five-years, followed by the one-year rate observed in 2020 for one year.

Acting in the way suggested here would seem to presume that firms could have perfectly forecast that the pre-implementation period would last until 2021 and that losses would be

reimbursed by adding them to the opening RAB once regulation commenced in 2022. This does not follow. It is not possible to know how firms acted in respect of borrowing. The natural course of action is then to presume they acted as suggested above, in accordance with the fact that the pre-implementation period will end in 2021 and the undertaking to reimburse firms at that point was given in 2018, because this requires no judgement about how firms acted. It will also produce more favourable results for firms than any other approach because interest rates fell over the course of the pre-implementation period.

4. Conclusions

This paper has reviewed submissions on the Commission's Draft Decision and addressed some further questions posed by the Commission.

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