

Chorus's actual financing cost for Crown-financed investment

Report for Chorus Ltd

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Contact us:

Incenta Economic Consulting

Suite 1, 104 Langridge Street
Collingwood, Victoria, 3060

Telephone: +61 3 8514 5120

Website: www.incenta.com.au



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1. Introduction and overview

1.1 Our instructions

1. We have been engaged by Chorus Ltd (“Chorus”) to advise on a methodology that could be used to estimate the actual financing cost that Chorus incurs in relation to investments that have been funded through Crown financing. The particular focus of this report is whether Chorus faces a residual risk in relation to the investment that has been financed via these funds.

1.2 Main conclusions

Nature of funding and Commission's objective

2. Chorus received finance from the Crown (“Crown financing”) to assist in the construction of the Ultra-Fast Broadband initiative (“UFB”), which is free of any requirement to pay interest or other distributions until a specified set of dates (referred to herein as the transition dates).¹ After the transition dates, depending on the particular stream of the finance, the finance either needs to be repaid (the part labelled “debt securities”), and for the remainder (labelled “equity securities”) Chorus has the option of repaying the funds via cash, a grant of shares, or commencing payments of dividends (which, if chosen, would be a hybrid instrument referred to as a preference share). Chorus also accepted restrictions to its business (including how it would operate its copper service business) as a condition of receipt of this funding.
3. The law directs the Commission when setting the initial asset base and then setting maximum revenues or prices after the implementation date, when considering investment funded by the Crown finance (“Crown-financed investment”) to “refer to the actual financing costs incurred by the provider”.²

Actual financing costs – conceptual framework

4. At first sight, it may appear that, apart from the economic cost incurred through the business restrictions noted above, as Chorus did not provided the funds for these investments, then its actual financing cost in respect of those investments would be zero, at least until the transition dates.
5. However, the conclusion that Chorus bears no financing cost (apart from the value of business restrictions) would only follow if the Crown was accepting a proportionate share of the project risk for the capital it contributed. If the Crown is accepting less than a proportionate share of project risk, then Chorus would bear a residual risk in relation to the Crown-financed investment. This residual would be given by the difference between the value of the total project risk (i.e., the WACC) and the value of the risk absorbed by – and

¹ The regulated services provided by the UFB project are referred to in this report as fibre fixed line access services (“FFLAS”).

² Telecommunications Act, sections 177(3)(b) and 171(2).

therefore transferred from – Chorus.³ The risk borne by the Crown depends, in turn, on the specific characteristics of the Crown financing.⁴

6. Our finding is that the risk that is absorbed by the Crown is principally debt-like, which follows from the fact that Chorus's future obligations in relation to the funds (i.e., to repay or commence servicing) are tied to the original principal, rather than to the future value of the FFLAS activities. A corollary of this is that it would be expected that Chorus would bear a residual risk in relation to the Crown-financed investments. The Commission will be required to estimate the WACC associated with the FFLAS activities, which consistency would require to be applied in this analysis. The critical question for determining the value of the residual risk to Chorus, therefore is: what is the value of the risk that is borne by the Crown?

Estimating the value of the risk absorbed by the Crown

Overview of method

7. Our proposed method for estimating the value of the risk that is borne by Chorus is as follows.
 - a. First, identify the economic nature of the relevant component of Crown funding
 - b. Secondly, identify market comparables for sources of finance that most closely resemble that economic nature.
 - c. Thirdly, convert those market comparables into benchmarks that can be applied to the New Zealand context.
 - d. Fourthly, apply any available cross-checks to these market comparable estimates (for example, from bottom-up risk-pricing models).
 - e. Fifthly, apply adjustments, where practicable, for any other components of the funding that may change the value transfer between Chorus and the Crown (this applies in relation to the Crown equities, where there are attached options).
8. In developing a method, we have been concerned to ensure that there is consistency, to the extent practicable, with the method to be used to estimate the WACC. A particular issue during the period from December 2011 to now is to ensure consistency between the time period or periods over which market interest rates (risk free rate and debt risk premium) are observed for the WACC estimate and the estimate of the value of the Crown-borne risk, given the volatility observed in interest rates over this period.

³ A direct parallel exists here with the effect of debt finance on the cost of equity. As debt providers only bear part of a project's risk, the addition of debt finance results in a residual risk being borne by equity providers, and so the cost of equity increases with a project's financial leverage.

⁴ In earlier submissions, Chorus has expressed this calculation as to (i) first calculate the return on assets ignoring Crown financing, and then (ii) deducting the benefit to Chorus from the Crown financing, given the characteristics of this financing. We demonstrate in section 2.2 that these alternative expressions are mathematically equivalent. The expression here – and the focus on the residual risk to Chorus – follow more closely the relevant provisions of the legislation.

- a. To this end, we have expressed the value of the different components of the Crown-borne risk in terms of a margin over the cost of (senior) debt. This means that any change to the WACC estimation method would flow through to the value of Crown-borne risk. In terms of the margins themselves, these estimates also vary over time; however, in order to simplify matters, we recommend applying margin estimates that are considered to be a reasonable long-term average
 - b. Expressing results in this manner also permits benchmarks from other markets to be more readily applied to New Zealand.
9. The two further consistency constraints that we apply – and that also simplify the analysis – are as follows:
 - a. *Risk free rate matching the pricing period* – We assume that the risk free-rate component of the costs of the Crown-financing-comparable finance would be swapped so that it matches the length of the pricing period, matching the Commission's standard practice. To this end, we assume a 10 year pricing period for the pre-implementation period consistent with Chorus's proposal.
 - b. *Debt risk premia are also matching the term of the pricing period* – We also assume debt risk premia with a term that align with the pricing period (assumed to be 10 years for the pre-implementation period, as discussed above). Our reason for this is because if Chorus did obtain finance with a (longer) term consistent with the Crown financing, then under the Commission's standard practice a higher WACC would also be allowed to reflect any additional term premium (via the "term credit spread differential"). Applying the (lower) WACC that reflects the term of the regulatory period to estimates of the debt risk premia for the Crown-financing-comparable finance that assume the same term will generate similar results. Moreover, in section 3.2.1 and Appendix A below we present US and Australian evidence that suggests the debt risk premium differential between 10 and 30-year bonds is relatively immaterial in any event. Thus, even factoring in the longer term of the Crown financing would not have had a significant impact on our results.
10. Taken together these assumptions mean that we can express our estimates of the value of the risk borne by the Crown based on a benchmarked differential between the cost of finance that most closely matches the characteristics of the Crown financing and the regulatory debt allowance, for a term that matches the length of the relevant pricing period. as noted above, we assume a 10 year period for the pre-implementation period, but note that this is likely to be different thereafter. It is therefore possible to ignore the complexity caused by the fact that there have been many issues of Crown securities that each have differing (relatively long) terms.
11. One caveat that we note is that the unique nature of the Crown financing means that empirical observations of the relevant market prices are subject to some imprecision, and that material liquidity premia (relative to more well-traded instruments, like corporate bonds) may be built in. We have no prior belief as to the direction of the first factor, but the

presence of liquidity premia would imply that our method may understate Chorus's (residual, actual) financing cost in respect of the Crown financed investments.⁵

Crown debt securities

12. The Crown debt securities are most comparable to senior debt (BBB) and subordinated debt, the proportion of which varies according to a formula over time.⁶
13. Relative to a 10 year, BBB benchmark, the senior debt component would not have a margin over the regulatory benchmark.⁷ Our indicative estimate based on direct observation of yield differentials for subordinated debt issued by BBB senior debt rated businesses in the US bond market is that this implies a **47 basis points** margin to the senior (BBB) debt over the relevant pricing period.⁸

Crown equity securities

14. Whilst we note that the "equity" share of the Crown funding is formally equity (and treated as such by rating agencies), the financial instruments that most closely replicate the Crown equity are a combination of:⁹
 - a. junior subordinated debt, plus
 - b. an option to convert the debt to redeemable preference share (with a predetermined dividend formula: 6 percentage points plus the 6 month bank bill rate) at maturity, plus
 - c. an (alternative) option to redeem the principal through an issue of shares at a predetermined discount (5 per cent) to the future share price, plus
 - d. a grant of warrants to the Crown (i.e., at a predetermined strike price formula).

⁵ The presence of a higher liquidity (or, more accurately, illiquidity) premium relative to corporate bonds would raise the estimated cost for the commercial finance that most closely matches the relevant stream of Crown financing, and so depress the estimate of Chorus's residual financing cost. However, the differential liquidity premium would reflect a market imperfection rather than the value for risk absorbed.

⁶ As Chorus's actual credit rating is (and has been) BBB the risk borne by the Crown would be calibrated to this.

⁷ We have applied Chorus' proposal to use a BBB credit rating for the regulatory WACC as the basis for these estimates. If the Commission were to adopt a different benchmark, then an adjustment to our results would be required.

⁸ Our estimate draws on data in the period 2011 to 2019, which reflects the relevant pricing period. The estimate could be updated for future regulatory periods.

⁹ Whilst it may appear at first sight that the comparable finance for the equity component is a preference share (as this is what the finance will transition to if unpaid), we observe that the key difference between junior subordinated debt and preference shares is that the latter provide discretion as to whether to pay a dividend (subject to the requirement that dividends on preference shares be paid prior to dividends on common equity). As Chorus was not required to make distributions during the pre-implementation period, the additional flexibility implicit in a preference share would have no value. As New Zealand has a tax imputation system, there is no tax consequence of the difference (i.e., a debt security would be assumed to be deductible, whereas an equity security would be assumed to generate imputation credits).

15. A benchmark for the cost of junior subordinated debt can be derived from direct observation of such bonds issued in the US capital market, which delivers a margin over the cost of senior debt of **193 basis points** over the relevant pricing period.
16. In terms of the other components:
 - a. Our analysis suggests that the dividend rate required for the preference share is a much higher cost than what Chorus could obtain and is therefore very unlikely to be exercised. Thus, we do not think this component to contain material value. In our view, this option would only be NPV positive to exercise in the event of a catastrophic market event (such as the global financial crisis) or a material fall in Chorus's credit rating. We believe it would be difficult to estimate the value of this option to Chorus, and it would be better to give it consideration if and when such an event were to occur (in the same way that the Commission has proposed to deal with physical catastrophes on an *ex post* basis).
 - b. We have derived preliminary estimates of the value of the warrants and believe that their value is immaterial.
 - c. Chorus would be unlikely to want to issue new shares, and if it did, the pricing formula is unlikely to provide a concession, and is likely to be disadvantageous to Chorus shareholders except in extraordinary circumstances, so this component also has little value.

Overall results

17. Our overall preliminary findings are summarised in Table 1.¹⁰ They show that, from the commencement of the UFB project until the present time, the actual cost of Crown funding securities has been between **1.81 per cent** and **1.85 per cent** per annum.¹¹
18. This estimate of the residual cost to Chorus from the investment that was funded via Crown financing has been derived by subtracting:
 - a. Our preliminary estimate of the (annual) value of the risk that has been transferred to the Crown (based on our estimate of the cost of finance under instruments that are most closely comparable to the Crown financing),¹² from

¹⁰ The results in the table compare the respective costs of finance on a post company tax basis, and so is consistent with the Commission's proposal to apply a post tax WACC. Expressing the respective costs of finance on a post tax basis is necessary to make a proper comparison between the costs of debt and equity finance (i.e., to take account of the fact that the former is deductible for company tax, whereas the latter generate imputation credits). If a vanilla WACC were to be applied instead, then an appropriate adjustment to the tax calculation would be required to ensure consistency.

¹¹ These results apply for the Crown financing that is referred to as the CIP1 finance. Whilst the same principles apply to the recognition of CIP2 securities, the split between "debt" and "equity" is different for the latter, and so the value of the risk borne by the Crown would also differ.

¹² This variation is caused by the fact that the proportion of senior debt in the Crown debt securities increases over time. The shares between senior and subordinated debt shown here are an approximation that would need to be confirmed.

- b. Our assumed regulatory WACC for Chorus of 8.02 per cent (this reflects Chorus's proposal, with some simplifying assumptions applied, and is assumed to be held constant throughout the period and is based on the parameter assumptions shown in Table 1).¹³

Table 1: Actual financing cost to Chorus of Crown-funded investments (CIP1 financing)

Year (calendar)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cost of project risk (Commission WACC)									
Risk free rate	5.77%	5.77%	5.77%	5.77%	5.77%	5.77%	5.77%	5.77%	5.77%
Asset beta	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
TAMRP	7%	7%	7%	7%	7%	7%	7%	7%	7%
Gearing	30%	30%	30%	30%	30%	30%	30%	30%	30%
Equity beta	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Investor tax rate	28%	28%	28%	28%	28%	28%	28%	28%	28%
Corporate tax rate	28%	28%	28%	28%	28%	28%	28%	28%	28%
Debt risk premium	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
Cost of equity (post tax)	9.15%	9.15%	9.15%	9.15%	9.15%	9.15%	9.15%	9.15%	9.15%
Cost of debt (pre tax)	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%
WACC (post tax)	8.02%								
Value of risk absorbed by the Crown									
<u>Margins to cost of senior debt</u>									
Crown senior debt	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Crown subordinated debt	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%
Crown equity (junior subordinated debt)	1.93%	1.93%	1.93%	1.93%	1.93%	1.93%	1.93%	1.93%	1.93%
<u>Proportions of the different elements of Crown financing</u>									
Share of senior debt	10%	11%	16%	13%	15%	15%	17%	20%	20%
Share of subordinated debt	40%	39%	34%	37%	35%	35%	33%	30%	30%
Share of equity	50%	50%	50%	50%	50%	50%	50%	50%	50%
Cost of finance - senior debt share of "debt" (pre tax)	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%	7.47%
Cost of finance - subordinated debt share of "debt" (pre tax)	7.94%	7.94%	7.94%	7.94%	7.94%	7.94%	7.94%	7.94%	7.94%
Cost of finance - "equity" (pre tax)	9.40%	9.40%	9.40%	9.40%	9.40%	9.40%	9.40%	9.40%	9.40%
Weighted value of risk absorbed by the Crown (pre tax)	8.62%	8.62%	8.60%	8.61%	8.60%	8.60%	8.59%	8.58%	8.58%
Weighted average value of risk borne by Crown (post tax)	6.21%	6.21%	6.19%	6.20%	6.19%	6.19%	6.19%	6.18%	6.18%
Residual cost to Chorus									
Residual cost to Chorus (post tax)	1.81%	1.82%	1.83%	1.82%	1.83%	1.83%	1.84%	1.85%	1.85%

Source: Commerce Commission, Chorus, Bloomberg and Incenta analysis.

19. These results imply that, when calculating Chorus's annual revenue requirement for the pre-implementation period (and in turn, the value of the "loss asset" as at the implementation date), it should be assumed that:

¹³ For the pre-implementation period, Chorus has proposed a 10 year term for the risk free rate and debt risk premium, an averaging period just prior to May 2011, a BBB credit rating and an asset beta of 0.50. For the risk free rate, we have applied the average for the calendar month of April, 2011 (using the Bloomberg C25010Y Index fair value curve). For the debt risk premium, we have the value the Commission derived for April 2011 for a 5 year BBB+ debt risk premium as a proxy for the 10 year BBB debt risk premium for simplicity, noting that under Chorus's WACC proposal this input will need to be estimated.

- a. For the portion of investment that has been funded by Chorus, a required post tax rate of return equal to the estimate of the regulatory WACC should be applied (8.02 per cent is assumed in this report), and
- b. For the portion of investment that has been funded via the Crown financing, our preliminary view is that a required post tax rate of return ranging between 1.81 per cent and 1.85 per cent should be applied to reflect the residual risk in relation to this investment that is borne by Chorus.

2. Framework for analysis

2.1 Nature of the concession

20. Chorus Ltd (Chorus) has received concessional finance from the Crown (Crown financing) to assist with the construction of the Ultra-Fast Broadband (UFB) initiative.¹⁴ The financing became available progressively as properties were passed by the UFB, and is free of any requirement to make interest / servicing payments for a defined period (we refer to the end-date of this defined period as the “transition date”).¹⁵ At the transition date, the requirements differ for the funding that was labelled as “CIP debt securities” and that labelled as “CIP equity securities”:¹⁶

- a. the CIP debt securities must be redeemed (repaid) in full at the original issue price, and
- b. for the CIP equity securities,¹⁷ Chorus has a choice of either:
 - i. redeeming the securities with cash at the original issue price
 - ii. redeeming the securities with an issue of new shares at the original issue price, with the value of shares set at a defined discount to the then prevailing share price, or
 - iii. commencing the payment of dividends, which are calculated at a prescribed yield on the original issue price.

21. Accordingly, the concession that Chorus has obtained from the Crown financing is the receipt of funds that are free of requirements to make interest or other distributions for a defined period only. However, as noted further below, a requirement for Chorus to receive the Crown financing was to agree to certain restrictions principally in how it operated its copper service business. Accordingly, the net concession to Chorus was the difference between the benefit and the cost caused by the required business restrictions.

2.2 Objective – the actual financing costs associated with the CIP-funded investments

22. The provisions that govern the treatment of Crown financing are as follows:¹⁸

¹⁴ It is understood that the local fibre companies (LFCs) also received Crown financing, although the analysis here relates to the specific context of Chorus.

¹⁵ More specifically, for each \$1 of Crown securities there are four applicable transition dates at 30 June 2025, 2030, 2033 and 2036, with a prescribed proportion of the Crown financing transitioning at each date.

¹⁶ The original Crown financing (referred to in the agreements as CIP1) were evenly split between debt securities and equity securities, whereas the funds associated with the extension of the UFB (referred to as the CIP2 funds) permit Chorus to nominate whether the funds are debt or equity, subject to an upper limit on the equity component.

¹⁷ The equity securities also contained a grant of warrants, which are discussed further below.

¹⁸ Telecommunications Act, sections 177(3)(b) and 171(2).

[When determining the initial value of the fibre asset] in respect of any Crown financing provided in connection with those investments, must refer to the actual financing costs incurred by the provider (or a related party).

...

[When determining maximum revenues or prices after the implementation date] [t]he Commission must ensure that the maximum revenues, or the maximum price or prices, reflect, in respect of any Crown financing, the actual financing costs incurred by the provider (or a related party) in the regulatory period to which the determination applies.

23. The requirement, therefore, is that the financing costs that are associated with investment that has been funded by the Crown financing to reflect Chorus's actual financing costs incurred in connection with that investment. It is assumed in the provisions cited above – and clearly correct – that the receipt by Chorus of the Crown financing will reduce Chorus's actual financing cost associated with the investment that has been funded by this finance. The critical question, however, is whether the Crown financing will absorb all of the financing costs associated with the relevant investment, or only part of it.
- a. A firm's (actual) financing cost associated with a particular activity will depend upon the risk that the firm bears in relation to that activity. In relation to Chorus's FFLAS activities more generally (and ignoring for the moment the Crown-financed investments), the Commission's estimate of the WACC will reflect its estimate of the actual financing costs associated with those activities, which will be estimated to reflect the risk Chorus bears.¹⁹
 - b. In relation to the Crown-financed assets, we assume that the Commission's WACC estimate will reflect its best estimate of the actual financing cost that Chorus would have borne if no Crown financing had been received. The important question, then, is whether the provision of the Crown financing has resulted in the Crown bearing all of the risk associated with that portion of investment, or only part of the project risk. This question will turn on an examination of the precise nature of the terms of the Crown financing. To the extent that the Crown only bears part of the project risk,²⁰ then there will be a residual actual financing cost that will continue to be borne by Chorus in respect of the Crown-financed assets, as well as the other costs that were caused as a consequence of accepting the Crown financing.²¹
24. In mathematical terms, the above discussion means that the revenue requirement that should be calculated for Chorus in the presence of Crown financing should be calculated as follows (ignoring, for simplicity, complications from the intra-year timing of cash flows and any other adjustments that may be required):

¹⁹ Consistent with this, the Commission has described its intention when estimating the WACC as being to estimate the actual cost of capital for the relevant firm (Emerging Views, para.402).

²⁰ A direct parallel exists here with the effect of debt finance on the cost of equity. As debt providers only bear part of a project's risk, the addition of debt finance results in a residual risk being borne by equity providers, and so the cost of equity increases with a project's financial leverage.

²¹ As these costs were a condition of receiving the (financing-cost-reducing) CIP funds, in our view they are properly interpreted as part of Chorus's actual financing costs.

$$RR_t = (RAB_t - CrownFinancing_t) \times WACC + Dep_t + Opex_t + Tax_t + CrownFinancing_t \times (WACC - CrownRisk) + OC_t \quad (1)$$

Where:

- *CrownFinancing* means the value (at issue price) of Crown financing on issue for the relevant year
- *CrownRisk* means the value (in terms of the required return) of the risk that is absorbed by the Crown
- *OC* means other costs associated with the receipt of Crown financing for the relevant year, and
- *RR*, *RAB*, *WACC*, *Dep*, *Opex* and *Tax* mean revenue requirement, the regulatory asset base, the weighted average cost of capital, operating expenses and the taxation allowance for the relevant year.

25. This equation can also re-written to show that an alternative way of thinking about the required adjustment to recognise Crown financing is to (i) commence with a revenue requirement that assumes that Chorus has financed all of the investments, and then (ii) to subtract the specific benefit (in terms of the reduction in financing cost) associated with the receipt of the Crown financing.²² This is shown in Equation 2:

$$RR_t = RAB_t \times WACC + Dep_t + Opex_t + Tax_t - (CrownFinancing_t \times CrownRisk - OC_t) \quad (2)$$

26. Lastly, if it was the case that the Crown was, through the Crown financing, absorbing a full (proportionate) share of the project risk, then the variables WACC and CrownRisk would be identical, with the effect that the Crown-financed investment could simply be excluded from the “return on assets” calculation, as follows:

$$RR_t = (RAB_t - CrownFinancing_t) \times WACC + Dep_t + Opex_t + Tax_t + OC_t \quad (3)$$

27. While applying this last equation would simplify matters considerably, to foreshadow the discussion below, we find that the nature of the CIP funding is principally debt-like,²³ and so the Crown is not absorbing the full project risk in relation to the CIP-funded part of the FFLAS activities. This means that Chorus will bear a residual financing cost in relation to this investment, and that Equation 3 will lead to Chorus's actual financing costs being

²² This alternative specification is how Chorus has explained the required adjustment in previous submissions.

²³ Specifically, Chorus's future obligations to the Crown in respect of the CIP funds are related to the original funds received (i.e., issue price of the securities) rather than to the future value of the FFLAS activities.

understated. The main focus of this report is providing a view on how the extent of risk that is absorbed by the Crown via the CIP funds can be estimated.

2.3 Position of the Commission and Professor Lally

28. The Commerce Commission indicated in its earlier report²⁴ that it intended to adjust the calculation of losses during the pre-implementation period to recognise the benefit that Chorus has received – and will receive – from the concessional finance. While the post-implementation period was not mentioned, it is assumed that the continuing benefit would also be recognised in a similar manner. The Commission discussed two methods for making the adjustment, which in broad terms differed by whether the benefit would be calculated as an annual amount in each year during which concessional funding was retained (Option 1), or as a one-off amount that reflected the capitalised benefit of the funding over the period that it was enjoyed (Option 2). The Commission recognised that there may be costs caused for Chorus associated with the Crown financing.
29. Professor Lally provided a report to the Commission that recommended:²⁵
- a. recognising the benefit of the Crown financing as an annual offset to the required return on assets in the building block calculation (Option 1)
 - b. making that calculation by simply removing the accumulated Crown financing at any time from the asset value upon which the regulatory weighted average cost of capital is applied, and
 - c. that, in principle, the other costs associated with Crown financing should be compensated through an operating expenditure allowance, but also noting that the type of costs that Chorus had drawn attention to were hard to quantify and so unlikely to be “actual costs” as required by the Law, in his terms as follows:²⁶

However, these do not seem to be quantifiable and therefore cannot be incorporated into the loss calculation. Again, this is consistent with the requirement under Section 171 of the Telecommunications Act 2001 that the allowance for Crown financing reflect the actual costs of that financing.

30. In terms of Professor Lally's first conclusion, we agree that either of the Commission's Options 1 or 2 could be applied to deliver equivalent results if consistent assumptions were applied. However, in relation to Professor Lally's second conclusion – that the RAB should simply be reduced by the quantum of Crown financing for the relevant year – as noted above, this conclusion assumes that the Crown is absorbing a proportionate share of the project risk in relation to the self-funded investments. The main conclusion of this report is

²⁴ Commerce Commission (9 November, 2018), New regulatory framework for fibre, Proposed Approach, paras. 7.71-7.74.

²⁵ Lally, Martin (30 April, 2019), *The Cost of Capital For Fibre Network Losses*, Capital Financial Consultants Ltd., pp.9-10.

²⁶ Lally, p.10.

that this view is incorrect. We further observe that Professor Lally's conclusion was not supported with any detailed reasoning or analysis of the Crown financing agreements.

31. Lastly, in relation to the other costs, there is no logic to Lally's proposition that merely because certain cost items cannot simply be observed and are difficult to quantify that they are not actual costs. As the Commission has observed, the weighed average cost of capital for a project cannot be observed and has to be estimated, but it is nonetheless still an actual cost.²⁷ We further observe that the costs to which Chorus has referred would cause either additional costs to be incurred, a loss or revenue or cause additional risk to be accepted, all of which fall within an economic definition of cost.

²⁷ Emerging Views, para.402.

3. Method for estimating the financing cost associated with Crown funded investments

3.1 Introduction

32. In this section we describe a method that can be used to estimate the actual financing costs associated with Crown financing. This is done in three parts:
- a. We begin this section by outlining the overall method.
 - b. We then describe the key economic features of the Crown financing debt and equity securities in turn, concluding that the major components are in the nature of debt securities, whether they are labelled “debt” or “equity.”
 - c. Finally, for each of the securities:
 - i. We describe the method that can be applied to estimate the financing cost or valuation; and
 - ii. Provide some preliminary estimates of the likely costs / values using the method.

3.2 Method overview

3.2.1 Consistency required with estimation of the WACC

33. Our basic method proposed for estimating the value of the risk that the Crown will bear via the Crown financing is to find sources of commercial funding that most closely matches the risk characteristics of the Crown financing, and then to apply an estimate of the market cost of that commercial funding as a proxy for the value of the risk the Crown bears. However, it needs to be borne in mind that the purpose of estimating the cost of the risk that is absorbed by the Crown is to estimate the residual risk that borne by Chorus in relation to these investments. This residual, in turn, is the difference between the estimated WACC for the FFLAS activities and the value of the Crown-borne risk. Thus, it is important for there to be consistency between the assumptions that are used to estimate cost of the Crown-borne-risk and the assumptions that are applied to estimate the WACC.
34. There are three principal areas where we think it is important to maintain consistency.
- a. *Timing of interest rate observations* – one of the key challenges with arriving at an estimate of the WACC for the period between December 2011 is that government interest rates have fluctuated substantially, so that the choice of date or dates at which the market interest rates are observed when estimating the WACC can have a material effect on the estimated WACC. In our view, it is important that the same date or dates that are applied to estimate the WACC are also applied to estimate the cost of the Crown-borne risk. Consistency on this matter will ensure that Chorus's residual risk in relation to the Crown-financed investments will reflect a risk differential only, rather than being affected by different (and potentially arbitrary) choices about the

timing of interest rate observations. The indicative results that are presented in this report assume that market interest rates are sampled immediately prior to the start of the UFB build (i.e., reflecting Chorus's preferred position).

- b. *Term of the underlying market securities (risk free component)* – one of the Commission's standard approaches to WACC estimation is to derive the risk-free component of the WACC estimate as the yield of a government security with a term to maturity matching the period between the resetting of prices. The Commission's logic for this is that, if the price resetting period is known, then a firm can use a combination of swaps to reduce the term of the base interest rate portion of the required return to match the pricing term, without accepting any risk. In our view, the same logic applies to the case of the estimation of the extent of risk that is borne by the Crown via the Crown financing, and so the value of the risk absorbed by the Crown should be determined on the same basis. Hence, we assume a term of the risk-free component that aligns with the regulatory period, consistent with the Commission's standard regulatory assumptions. We observe that if Chorus had actually raised this debt, it could have used swaps to align its term exposure to the length of the pricing period without accepting any risk.
- c. *Term of the underlying market securities (risk premium component)* – likewise, we think it is appropriate to assume a term for the risk premium component that matches the term of the pricing period even though the term of the Crown financing is longer. This is because if Chorus had actually raised this debt, then under the Commission's standard approach, the WACC Chorus received would be set higher to reflect that longer term (via the term credit spread differential adjustment). Applying the standard WACC together with a term matching the regulatory period for the risk premium component of the Crown financing would deliver a similar estimate of Chorus's residual financing cost to applying the longer-term assumption for both the Crown financing and WACC. Moreover, we note that we have assumed a pricing period for the pre-implementation period of 10 years (following Chorus's proposal). As described in Appendix A below, we find empirically that there is little change in debt risk premia between 10 years and 30 years, and indeed the potential for declining risk premia with term for lower rated debt.

35. The basic method that we employ when arriving at the market cost for finance that most closely reflects the various streams of Crown financing is to derive the margin that such finance would be expected to require over the benchmark cost of Chorus's senior debt. By expressing the cost of equivalent finance to the Crown financing as a margin over senior debt for a term of 10 years, it is straightforward to maintain consistency with the WACC estimation.²⁸ In addition, focussing on the margin in this manner makes it possible to apply information from overseas capital markets to the New Zealand context.

²⁸ To be clear, as Chorus has a BBB credit rating, it will follow that the risk the Crown will bear is reflective of that BBB credit rating, and so we also derive any benchmarks from overseas markets on the assumption of a BBB credit rating for senior debt. We have also assumed that a BBB credit rating is applied for the regulatory WACC following Chorus's proposal. If the Commission adopts a different benchmark, then a small adjustment to our results would be required (for example, if the Commission were to adopt a BBB+ benchmark, then our margin estimates would need to be reduced by the New Zealand differential between BBB and BBB+ rated senior debt).

3.2.2 CIP2 securities

36. From 2017 the Crown financing arrangement has also provided for the issue of CIP2 Securities. These securities are subject to a maximum face value of \$407 million, with Chorus having the discretion to apportion the debt and equity components of CIP2 Securities subject to a maximum constraint of \$302 million in CIP2 Equity Securities. As the key economic features of CIP2 securities are the same as those of CIP1 Securities we do not give further explicit consideration to the CIP2 Securities. We believe the same principles and estimation issues that we discuss in relation to CIP1 Securities may be applied to CIP2 Securities.

3.2.3 Caveats to our analysis – imprecision and illiquidity

37. As will be discussed further below, one of the constraints to this analysis is that finance that most closely resembles the risk-characteristics of the different streams of Crown financing is not widely issued in New Zealand, and typically not widely issue and also thinly traded in most other markets. As a consequence of this, some imprecision in the estimate of the residual financing cost to Chorus is inevitable.

38. An additional consequence of the sparse issues is that one would expect the yields (where they are available) to contain a material liquidity premium relative to (senior debt) corporate bonds. However, this premium for relativity illiquidity is not a premium for the risk borne by the holder of the different securities, and so the inclusion this premium in the margin will lead to an overstatement of the cost of the Crown-borne risk. It follows that our estimates of the residual financing risk to Chorus would be expected, all else constant, to be understated.

3.3 The nature of Crown financing

3.3.1 Crown financing - overview

39. Crown financing has been provided to Chorus to assist in the construction of the Ultra-Fast Broadband initiative (“UFB”). This financing is free of any requirement to pay interest or other distributions until a specified set of transition dates. At the transition dates the Crown funded component labelled “debt securities” needs to be repaid. However, for the Crown funded component labelled “equity securities,” Chorus has the option of repaying the funds via:

- a. Cash;
- b. A grant of shares; or
- c. Commence payments of dividends (if chosen, this would be a hybrid instrument referred to as a preference share).

40. As noted in section 3.2.2, this discussion relates only to CIP1 securities. While CIP2 securities have the same general economic characteristics, the proportions of “debt” and “equity” are different.

3.3.2 Crown financing – “debt” securities

41. The component of Crown financing labelled as “debt” (which we also refer to as the “Crown financing debt securities”) have the following key features:
 - a. Unsecured;
 - b. Non-interest bearing; and
 - c. Carry no voting rights at meetings of holders of Chorus shares.
42. Between 2025 and 2036, Chorus is required to redeem the debt securities that it has issued according to a prescribed schedule, as set out below.

Table 2: Crown financing debt securities – redemptions at transition dates

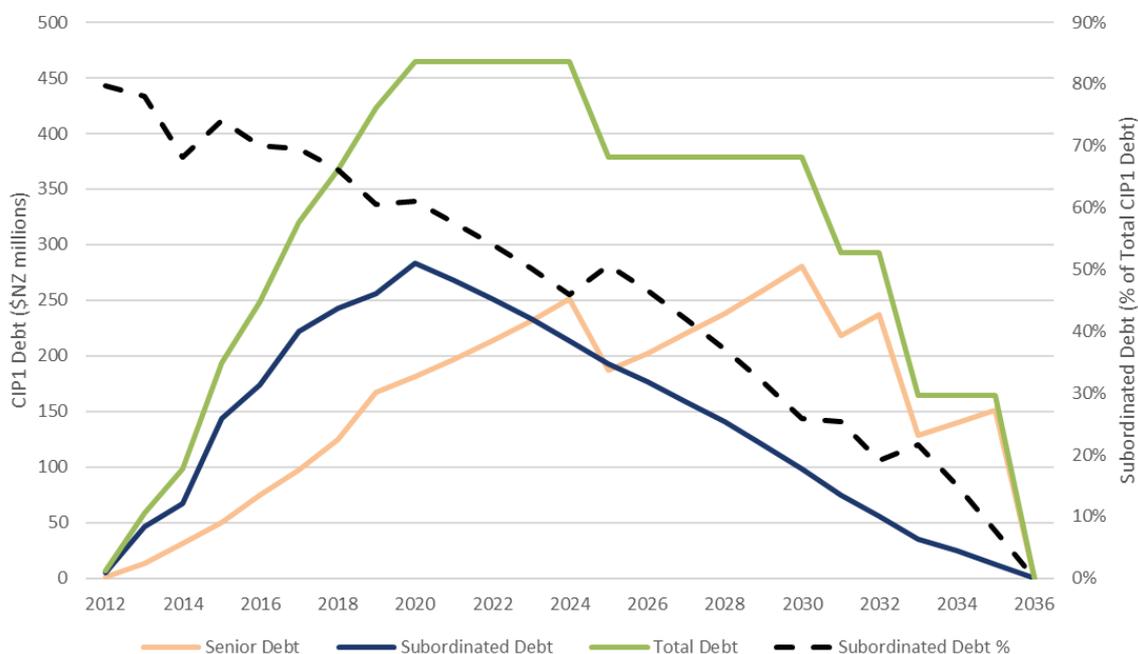
	30 June 2025	31 June 2030	32 June 2033	33 June 2036
Debt repayment (\$NZ millions)	86	86	129	164
Per cent of total	18.5%	36.9%	64.6%	100%

Source: Chorus, *Summary of CIP1 Securities*, p.2.

43. The Crown financing securities labelled “debt” have “senior” and “subordinated” sub-components, and there is a formula for determining the split between them. The value of the senior component of the debt securities at any time is the “present value of the sum repayable on the CIP1 Debt Security (i.e. the issue price) at that time, calculated using a discount rate of 8.5%.”²⁹ The subordinated component of a debt security at any time is the difference between the issue price (\$1) and the senior debt component at that time.
44. Figure 1 assumes that the remainder of the \$465 million in Crown financing debt securities is incurred up to 30 June 2020 and applies the prescribed formula to calculate the split. We find that at 30 June 2012, the subordinated debt component is close to 80 per cent of the total debt securities value at that time. The subordinated debt component continues to rise up to a maximum value of close to \$280 million when the debt securities reach their maximum value at 30 June 2020. From that point the absolute value of subordinated debt begins to fall, and by the time the first redemption of debt takes place in 2025, subordinated debt comprises approximately 50 per cent, then falls further to comprise a minority of the total Crown financing debt securities during the redemption period (2025 to 2036). The senior debt, by contrast, rises to a peak of approximately \$280 million by 2030, and then falls in absolute terms, although its proportion of the total continues to rise, right up to the final redemption date of 30 June 2036.

²⁹ Chorus, *Summary of CIP1 Securities*, p.2.

Figure 1: Crown financed debt securities – split between senior and subordinated debt



Source: Chorus and Incenta analysis

3.3.3 Crown financing – “equity” securities

45. Half of each tranche of Crown financing securities must be used to subscribe to Crown financing equity securities (which we also refer to as “equity” securities), and also issues a tranche of Crown financing warrants for no consideration (which are discussed separately below).

Prior to the transition dates

46. Prior to the transition dates, no distributions are required, and the securities have the following other characteristics:
- Ranking in capital structure* – The Crown financing “equity” securities rank junior to senior debt and subordinated debt, but senior to ordinary shareholders.
 - Voting rights* – Along with senior, subordinated and junior subordinated debt, Crown funded equity securities do not ordinarily have voting rights.³⁰

At transition

47. At transition, Chorus can redeem the securities via cash, via a grant of shares or it has the option to allow the securities to continue and commence paying distributions. If the *grant of shares* option is selected, then this is to be based on a value for Chorus shares set at a 5 per cent discount to 20-day value weighted average price (VWAP) of Chorus shares traded on

³⁰ There is an option for security holders to obtain voting rights only in certain default conditions.

the New Zealand Stock Exchange (NZX) just prior to the transition date.³¹ If the option to convert to a *preference share* is chosen, then the features would be:

- a. *No maturity date* – No maturity date, but callable at any time.
- b. *Ranking in capital structure* – The Crown financing equity shares would continue to rank junior to senior debt and subordinated debt, but senior to Chorus equity holders.
- c. *Payment of preferred dividends* - The dividend rate would be the 180-day bank bill rate in New Zealand plus a margin of 6 per cent.
- a. *Payment deferral option* – Unlike subordinated debt, which has no option for coupon deferral, the payment of dividends on the Crown funded equity securities can be deferred on a non-cumulative basis, but would need to be paid before dividends are paid to Chorus's ordinary shareholders.

Table 3: Crown financing equity securities – schedule of transition dates (when dividend becomes payable if not redeemed)

	30 June 2025	31 June 2030	32 June 2033	33 June 2036
Equity on which dividends become payable (\$NZ millions)	86	172	300	465
Per cent of total	18.5%	36.9%	64.6%	100%

Source: Chorus

Crown financing warrants

48. Each tranche of Crown equity financing securities is accompanied by an issue of warrants (referred to also as “Crown financing warrants”) at no cost. The objective of these warrants is to:³²

... allow CIP (or the holder, if they are transferred) to participate in the upside if Chorus Shares perform in excess of a total shareholder return of 16% per annum over the relevant period described below.

49. The “base price” for the calculation of the total shareholder return is:
- a. For warrants issued during the first 18 months of Chorus trading, the VWAP of Chorus ordinary shares over the first 20 days of Chorus trading; and
 - b. For warrants issued after the first 18 months of Chorus trading, the VWAP during months 16 to 18 of Chorus trading.

³¹ This is subject to the constraint that the holder of Crown funded equity securities should not have an interest in 20 per cent or more of the Chorus share register (unless the holder otherwise agrees).

³² Chorus, *Summary of CIP1 Securities*, p.5.

50. The exercise dates for the Crown financing warrants correspond to the dates on which the Crown financing equity securities are due to pay dividends if Chorus elects not to redeem them (i.e. between 2025 and 2036).

3.4 Valuing risk absorbed by the Crown – “debt” securities

3.4.1 What is the most comparable form of finance?

51. The form of financing that most closely resembles the Crown equity debt finance is a mixture of senior BBB debt and subordinated debt issued by a firm whose senior debt has a BBB credit rating.

3.4.2 Estimation method and preliminary results

Senior debt

52. As discussed earlier we are expressing the value of risk absorbed by the Crown as a margin over the cost of Chorus's senior debt. Since this component is most closely proxied by Chorus's senior debt, the margin is zero.

Subordinated debt

53. We expect that subordinated Crown financing debt securities would attract a higher required yield than Chorus's benchmark BBB-rated senior debt, based on subordinated Crown financing debt securities ranking below the senior debt in the event of default and liquidation, and having a lower rate of recovery of capital.³³
54. Our preferred estimation method would involve assembling a sample of BBB-rated New Zealand domiciled (New Zealand Country Risk) businesses that have issued subordinated debt in the New Zealand bond market since 2011, and compare the yields of these bonds to the 10 year BBB benchmark senior debt yield at a term of 10 years.
55. Our review of the New Zealand bond market data contained in Bloomberg revealed that there are relatively few traded subordinated bonds in New Zealand, which would make it difficult to make reliable estimates. Moreover, the sparsity of these bonds suggests that the results from an analysis of those bonds may be expected to have a material liquidity premium built into their yields, which would impart an upward bias to the degree of risk transfer to the Crown. We concluded that it was necessary to look for appropriate benchmarks in other countries with deeper bond markets. We therefore looked to the United States, which has the most deeply traded bond markets in the world.
56. The specific method we recommend is to directly estimate the debt risk premium differential in the US market between senior BBB-rated bonds and subordinated bonds issued by

³³ Theory suggests that subordinated debt should require a yield premium compared with senior debt owing to ranking in the event of default. The expected loss given default (ELGD) is calculated as the probability of default (PD) times the loss given default (LGD), or $ELGD = PD \times LGD$. If the loss given default is 40 per cent for senior debt but 60 per cent for subordinated debt, and the probability of default is 2 per cent, then compared with senior debt holders the subordinated debt holders can expect to lose an extra 0.40 per cent of their capital (0.02×0.20), and would therefore demand a return that is at least a 0.40 per cent premium to that of senior debt.

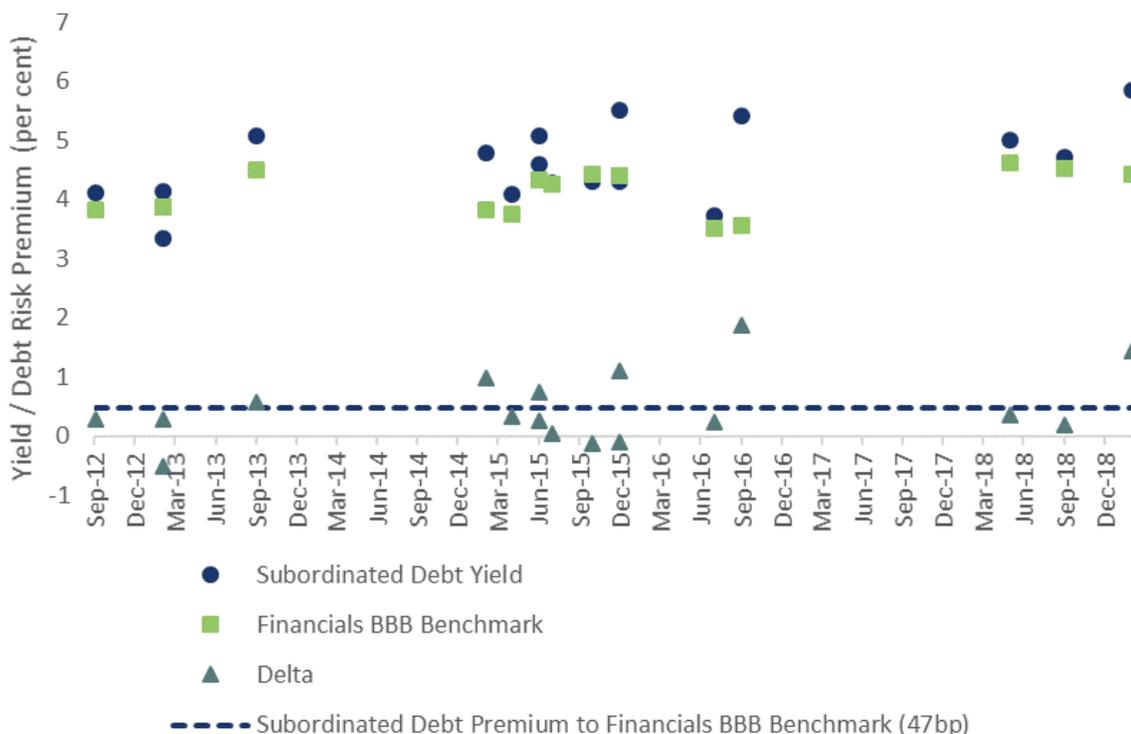
businesses whose credit rating for senior debt is BBB. To derive the preliminary results from applying this method that we report here, we have undertaken the following steps:

- a. Download from Bloomberg the currently active US bonds issued in USD that have a “Payment Rank” of “Subordinated”.
 - b. Select those bonds whose issuance date was in the period between 2011 and 2019.
 - c. Select those bonds that have a debt term from issuance to maturity of 10 years (in practice we recommend including bonds with terms from 9.9 years to 10.1 years).
 - d. Select those bonds whose issuers have a BBB credit rating (i.e. fall within the BBB+, BBB, or BBB- sub-categories) applied by Standard & Poor’s and Moody’s.
 - e. Download from Bloomberg the yields³⁴ for the entire history the bonds’ existence.
 - f. Calculate the average yield for the first 20 trading days after the issuance date and annualise the yield.
 - g. Compare the average annualised 20-day trading yield of the subordinated debt with the average annualised yield for the relevant Bloomberg 10-year BBB fair value curve over the same 20 trading days.
57. In deriving the sample, we found a materially larger sample of financial company subordinated debt issues with the requisite characteristics and compared this against the matched period Bloomberg BBB band (BBB+, BBB and BBB-) Financials fair value curve (IGUUF10 Index). The results are displayed in Figure 2 below, which shows that the average yield/debt risk premium increment over the cost of BBB-rated senior debt was **47 basis points**.³⁵

³⁴ We have relied on Bloomberg’s Yield to Convention (YLD_CONV_LAST) which takes account of yield to the first call date, which we understand is typically relied on by market participants.

³⁵ As a cross-check, we also note that Standard & Poor’s has a notching rule that applies a one-notch downgrade to subordinated debt from the senior debt of the issuing company. We estimated the BBB to BBB- differential (i.e. a one-notch downgrade) in the US using Bloomberg fair value curves over the period, which found a **41 basis point premium** (using the Bloomberg Industrials fair value curves IGUAD10 Index and IGUAB10 Index for the period from 1 July 2011 to 28 June, 2019). This is consistent with our findings using direct observations.

Figure 2: US subordinated debt – debt risk premium relative to Financial BBB benchmark



Source: Bloomberg and Incenta analysis

3.5 Valuing risk absorbed by the Crown – “equity” securities

3.5.1 What is the most comparable form of finance?

Prior to the transition dates the principal comparable is junior subordinated debt

58. In the pre-transition date period, the key characteristics of the Crown financed equity securities are:
 - a. Their position in the capital (payment ranking) structure, which means that they are in the same position as junior subordinated debt (i.e. between subordinated debt and the ordinary equity of the firm)
 - b. The fact that they are not paying distributions means that any benefit from being able to omit distributions (a feature that distinguishes junior subordinated debt and preference shares) does not arise, and
 - c. They are likely to be called at the first opportunity (transition date).

59. Irrespective of the legal nature of the Crown financing equity securities, in our view the risk that has been absorbed by the Crown would therefore be best proxied by the value of risk transfer implied by junior subordinated debt. An assumption inherent in the use of junior

subordinated debt as the proxy during the pre-transition date period is that the principal needs to be repaid at the transition date.

At the transition date

60. As noted above, at the transition date Chorus has two alternative options to simply redeeming the Crown equity securities in cash (at the original issue price), which are to:
 - a. Pay through a grant of shares via a prescribed formula, or
 - b. Allow the securities to continue, in which case they become preference shares with a prescribed dividend formula.
61. In addition, Chorus is also required to grant warrants to the Crown along with issues of the Crown equity securities.
62. Thus, the market finance that would most closely proxy the risk that is absorbed by the Crown is a combination of:
 - a. Junior subordinated debt that matures at the transition dates, and
 - b. Two options for Chorus (i.e., to redeem via a grant of shares or to allow the securities to convert to a preference share at the transition dates), and
 - c. One option to the Crown (the warrants, which are exercisable at the transition dates).

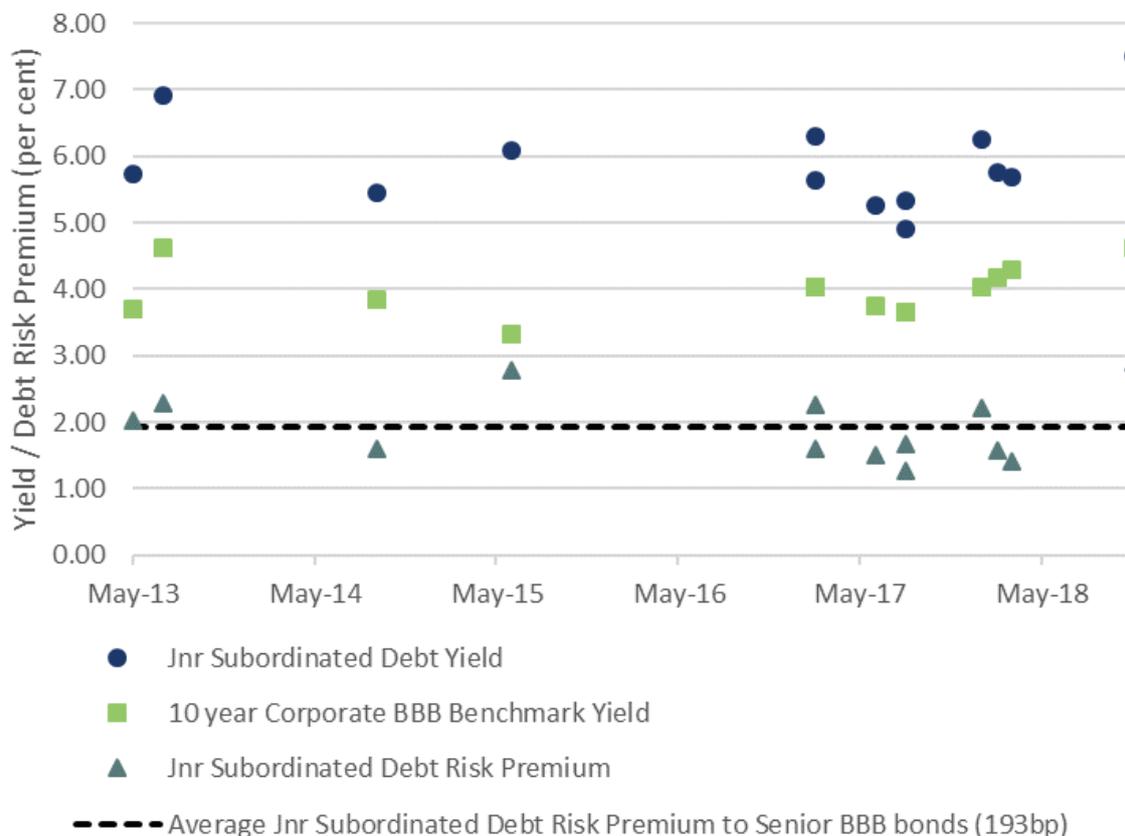
3.5.2 Estimation method and preliminary estimates

Junior subordinated debt

63. To estimate the debt risk premium differential for junior subordinated debt we recommend applying the same method that we applied in the case of subordinated debt which is described in detail above. That is, directly estimate the differential by examining the yields of US BBB-rated businesses that have issued junior subordinated debt (i.e. constructing a sample of BBB-rated businesses that issued junior subordinated debt during the relevant pricing period).
64. We were able to find a sufficient sample of corporate bond issues whose “Payment Rank” was “Junior Subordinated.” In Figure 3 we display the results, which imply an estimated debt risk premium differential to the Bloomberg Corporate 10-year BBB fair value curve of **193 basis points**.³⁶

³⁶ This is based on the US Corporate BBB+, BBB, BBB- BVAL Yield Curve (IGUUBC10 Index). As a cross-check we compared the Bloomberg Corporate BBB (IGUUBC10 Index) and Corporate BB (IGUUC510 Index) fair value curves over the period 2011 to 2019 on the basis that market participants consider that there is a 3-notch credit rating downgrade for junior subordinated debt relative to the rating of the senior debt of the issuing business. This

Figure 3: US junior subordinated debt – debt risk premium relative to Corporate BBB benchmark



Source: Bloomberg and Incenta analysis

Valuation of options

65. In this sub-section we consider whether there is likely to be a material value to Chorus and the Crown arising from the different options that are available to them as a result of the Crown financing arrangements. An option has value when the present value (PV) of potential future benefits is positive, and therefore loses value the further into the distance the potential benefits are, and the less likely those benefits are to materialise. The more distant and less likely the benefits are, the lower will be the value of the option.

Chorus's option to commence payment of dividends on Crown financed equity securities

66. If Chorus chose to commence payment of the prescribed dividend rate on Crown equity financed securities, then they would have the characteristics of a preference share security.

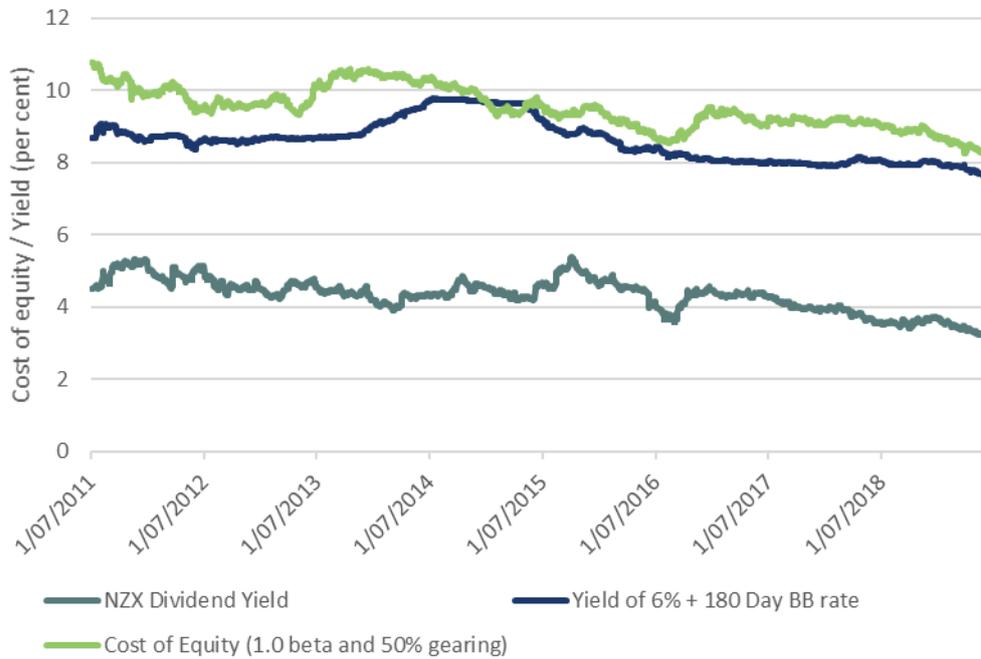
yielded an average differential of **180 basis points**, which again corroborates the findings using direct bond observations.

The key question is whether these securities are likely to be “in the money” for Chorus given the existence of alternative forms of finance.

67. Three sources of risk that would require compensation through a higher yield than that required for Chorus's senior debt:
- a. *Subordination* – Post transition the dividend paying Crown equity securities would have the same ranking as the securities had prior to transition, which would place them in the “junior subordinated” category, but senior to Chorus's ordinary shareholders.
 - b. *Dividend payment risk* – The dividend paying Crown equity securities would be exposed to a potential curtailment of dividends, even though they would need to be paid in the event that Chorus shareholders are paid a dividend.
 - c. *Callability* – The securities would be callable by Chorus at any time.
68. An indication of the potential cost to Chorus in the event that it elects to commence payment of preferred dividends can be obtained from an analysis of the cost, as defined above, relative to the likely cost of Chorus's equity. For the period from July 2011 to June 2019, we estimated an indicative range for Chorus's cost of equity by applying the Commission's formula using a 10-year risk free rate and an equity beta of 0.92.³⁷ The results in Figure 3 below, demonstrate that if the preference shares had been converted and paid 180 day bank bills plus a 6 per cent margin, the yield would have been comparable to a return on equity, even though preference shares have priority to equity for dividends and rank ahead of equity in the event of default.

³⁷ The equity share of the Crown financing accounts for 50 per cent of the total (for CIP1), and so the equity beta should be levered to this level. We have applied Chorus's proposed asset beta of 0.50 for this analysis, which implies an equity beta of 1. We have also applied a risk free rate with a 10 year term, but recalculated this base rate over the period to make it comparable to the “floating” preference share dividend formula.

Figure 3: Historical reconstruction – preferred dividend paying Crown financing equity securities vs cost of equity



Source: Bloomberg and Incenta analysis

69. As a further test, we examined data for 22 Australian preference share issues for which yield data were available over the period from 2015 to 2019. They were mainly issued by banks (often with a AA- credit rating) and other financial institutions. The average first 20-day trading yields of these businesses were 269 basis points above the relevant benchmark fair value curve.³⁸ The differential fell to 230 basis points after August 2016.

³⁸ This was the interpolated Financial sector or Corporate sector fair value curve, which ranged from AA- to BBB.

Figure 4: Australian preference shares – yield and debt risk premium over senior debt



Source: Bloomberg and Incenta analysis

70. We also looked at the “floater formula” that was used for a wider sample of 64 Australian preference share issues since 2004, finding an average margin of 349 basis points applied to a base rate that was either the 3-month or 6-month BBSW (Bank bills swap rate).³⁹ The range was approximately 100 basis points to 500 basis points.⁴⁰ However, these rates incorporate the value of imputation credits.⁴¹ With an Australian tax rate of 30 per cent, on an equivalent basis to the Crown financing preference share the average (pre-imputation adjusted) margin was 244 basis points with a range of 70 basis points to 350 basis points.⁴²
71. The above analysis suggests that for Chorus the Crown financing preference share would be materially “out of the money” as long as Chorus maintained an investment grade credit rating and had other viable sources of finance. The only circumstances in which it would be

³⁹ There was only a 7-basis point difference between these two base rates over the period.

⁴⁰ Two unlisted businesses, one engaged in online gambling and the other a small credit cooperative, issued preference shares at more than 600 basis points margin over the base rate; however, this is only 420 basis points when expressed on a comparable (pre-imputation) basis as the rate applied to Chorus preference shares.

⁴¹ In contrast, if Chorus was to choose to commence paying dividends to the Crown, the dividend would be a cash dividend based on the rate of 600 basis points plus the 180 day bank bill rate, plus imputation credits (and such credits would be required to be attached in the same proportion as they are on dividends on Chorus’s ordinary equity in order to comply with New Zealand’s anti-dividend-streaming rules).

⁴² For further comparability, we note that the Australian 6-month BBSW rate has on average been only 24 basis points lower than the New Zealand 180 day Bank Bills rate since the year 2000.

NPV positive for Chorus to exercise its option to convert the Crown equity financing securities into preference shares and pay such a high yield would be if:

- a. Chorus's credit rating fell to sub-investment grade; or
- b. The capital markets were closed, so that alternative funding could not be sourced, or only be available at a highly inflated price. The global financial crisis was a period that saw such conditions.

72. Hence, the benefit to Chorus from continuing with the equity securities when and if payment of dividends commenced would come in two forms:

- a. *Temporary retention of dividend payments* – whereby Chorus would have the ability to avoid accessing debt or equity markets if temporary market events are occurring (e.g., another global financial crisis), which has a low probability of occurrence, and
- b. *Permanent use of dividend payments* – which would only be beneficial if Chorus's credit rating fell outside of investment grade, which would be something that a capital-intensive infrastructure firm like Chorus would seek strongly to avoid, and hence also has a low probability of occurrence.

73. Thus, we conclude that there are reasonable grounds to believe that the option to convert to a preference share has only a small change of being “in the money”, and so would not have a material value. Moreover, while we concede that the option is not worthless (it has no cost and may have a benefit in some circumstances), it would be a very difficult and complex process to value it.

74. In order to understand the possible order of magnitude of the option value, we provide an analysis of a simple scenario below. Box 1 provides a valuation of a possible scenario that would result in Crown preference shares being materially cheaper form of finance. It concludes that the annualised benefit would in those circumstances translate to only 4 basis points per annum, which we do not consider to be material.

Box 1: Possible scenario and associated value for the conversion to a preference share

It is assumed that an event may occur that leads to the Crown preference shares being a materially cheaper form of finance than Chorus could obtain in the market directly. Specifically, it is assumed that the margin over the 180 day bank rate of 6 per cent is 1 percentage point lower than the current market cost of equivalent finance, and that this form of finance offers the best value to Chorus. Such an event is assumed to have a probability of occurrence of 10 per cent (it is assumed implicitly here that the same situation persists for all of the transition dates).

In this case, at the transition dates, the liability to Chorus would be approximately 10 per cent lower than the cash amount that would have been payable to redeem the securities (this saving has been estimated using a simple perpetuity formula, and assumes an average 180 day bank bill rate from the transition dates of 3.00 per cent).⁴³ This benefit would accrue on average 15 years after the issue of the Crown securities, and has a present value at the issue date of 3.1 per cent of the face value of the equity securities (using our proxy for the cost of junior subordinated debt of 9.20 per cent pre-tax as the discount rate). The expected (i.e., probability-weighted) value of this benefit would be 0.31 per cent of the face value of the equity securities.

Amortising this expected benefit over the average 15 year term prior to the issue dates implies an annualised expected benefit of 4 basis points per annum. This benefit would not be material.

⁴³ The results are not overly sensitive to the assumed future bank bill rate. If a future rate of 1.5 per cent is assumed instead, then the estimated benefit would increase from 4 basis points per annum to 5 basis points per annum.

75. An alternative means of recognising the benefit to Chorus from being able to convert into a preference share would be.
76. An alternative for the Commission – and an option that we think has merit – would be to recognise the benefit to Chorus from the ability to have part of the Crown financing to transition to a preference share under the prescribed terms if Chorus actually takes advantage of this option (i.e., in the future). That is, to recognise this benefit *ex post* if it actually occurs, rather than trying to predict it in advance. This would avoid having to make a call on difficult valuation issues. In addition to this, we observe that:
- a. If another event like the global financial crisis occurs, then the Commission may be forced to look into whether some form of additional compensation would be required during this period in any event. Chorus's access to the Crown financing equity securities could be taken into account at that stage, and ameliorate the compensation required.
 - b. If Chorus is in the position where the payment of dividends on Crown financed equity securities would be attractive on an ongoing basis, then this is likely to imply that the UFB project has not been a success, potentially because technological change has made competition emerge earlier and/or stronger (i.e., lower cost) than expected. In this situation, the Commission may well be considering whether continued building block regulation is warranted, and possibly also whether *ex post* sources of compensation for stranded asset risk could be drawn upon. Again, the option for Chorus to access finance that is (under that future) a concession could be taken into account when considering how to regulate Chorus at that time, and the extent of asset stranding that has occurred.
77. We observe that the circumstances that would precipitate Chorus's exercise of the option to pay dividends on Crown financing equity securities are akin to catastrophe risk (i.e. low probability, but high value events), which the Commission has proposed to deal with on an *ex post* basis for Chorus.

Chorus's option to redeem the Crown financing equity securities at a 5 per cent discount to the prevailing market price

78. Another option that Chorus holds is the ability to redeem the Crown financing equity securities at a 5 per cent discount to the prevailing market price. Recall that the relevant question is whether the ability for Chorus to redeem the equity securities via an issue of shares will create an additional transfer of risk to the Crown. In our view, this is unlikely to be the case.
79. Critically, the share price that is required to be used to determine the shares that Chorus would need to issue the Crown to redeem the equity securities is the share price that is prevailing in the future (i.e., a short-term average just prior to the transition date), less a discount of 5 per cent. It is reasonable to assume that the future share price will already have factored in the requirement for Chorus to either redeem or commence paying dividends on the relevant tranche of Crown financing equity securities at or from the transition date, and it is also reasonable to assume that Chorus's shares would be fairly valued. In this case, the application of any discount against Chorus's future share price would imply that the Crown

is being overpaid for the redemption of the equity securities. That is, if the prevailing share price had been applied, then the Crown would have been fairly paid – it would have received a parcel of shares that has the same market value as the face value of the securities. This is demonstrated in the simple example below.

Table 4: Overpayment to the Crown through an issue of Chorus shares at a 5% discount to market

Crown share issue based on market price		Crown share issue at 5% discount	
Equity value, ignoring transitioning of Crown financing (\$m)	4,000	Equity value, ignoring transitioning of Crown financing (\$m)	4,000
Tranche of Crown financing (\$m)	100	Tranche of Crown financing (\$m)	100
Equity value just prior to transition date (\$m)	3,900	Equity value just prior to transition date (\$m)	3,900
Shares on issue (m)	1,000	Shares on issue (m)	1,000
Share price just prior to transition date (\$/share)	3.90	Share price just prior to transition date (\$/share)	3.90
Share price applied for transfer to the Crown - no adjustment	3.90	Share price applied for transfer to the Crown - 5% discount (\$/share)	3.71
New shares issued to Crown (m)	25.64	New shares issued to Crown (m)	26.99
Total shares on issue including Crown shares (m)	1,026	Total shares on issue including Crown shares (m)	1,027
Equity value after new shares issued (\$m)	4,000	Equity value after new shares issued (\$m)	4,000
Share price after new share issue (\$/share)	3.90	Share price after new share issue (\$/share)	3.89
Value of original shareholder equity after transfer (\$m)	3,900	Value of original shareholder equity after transfer (\$m)	3,895
Loss to existing shareholders (\$m)	-	Loss to existing shareholders (\$m)	5.12
Value of shares received by the Crown (\$m)	100.00	Value of shares received by the Crown (\$m)	105.12
Overpayment to the Crown (\$m)	-	Overpayment to the Crown (\$m)	5.12

Source: *Incenta analysis*

80. Thus, in our view, the option for Chorus to redeem the equity securities via an issue of new shares at a discount of 5 per cent cannot be interpreted as effecting a transfer of risk to the Crown.
81. It is the case that Chorus may receive a benefit from this option. This benefit would be the ability to issue new shares at a prescribed discount, which may be at a lower cost than what Chorus would otherwise bear if it simply issued shares in the market. The costs in question comprise the fees that would be paid to investment banks and other advisers if new shares were simply issued to the market.⁴⁴
82. However, we also do not consider that this option is likely to deliver a material benefit. From the work that we have done in the past, and based on current advice obtained from market practitioners, we believe that the discount of 5 per cent is likely to exceed by some margin what it would cost Chorus to issue shares directly, except possibly in circumstances where some form of material, adverse capital market event made issuing new shares difficult and also had also closed off any other lower cost option for raising finance. Given the low likelihood of such a circumstance, it is unlikely that this option would comprise a material benefit. Again, we have constructed a scenario to assess the order of magnitude of the value of this option, which is set out in Box 2. The result of this simple scenario is a value of 2 basis points per annum, which we do not consider to be material.

⁴⁴ To be clear, these costs are transaction costs and not a proxy for the value of a risk transfer.

Box 2: Possible scenario and associated value for the share issue option

It is assumed that an event may occur that means that if Chorus was to issue shares directly to the market, this would cost 10 per cent of the capital raised, and that other financing options were unavailable or higher cost. This implies that the option to issue shares directly to the Crown would provide a benefit of 5 per cent of the equity securities redeemed in this manner (which we assume to be 100 per cent), reflecting the difference between the market issue cost of 10 per cent and the Crown discount of 5 per cent. The event is assumed to have a probability of occurrence of 10 per cent.

The equity securities transition on average 15 years after issue, and so the present value of the benefit would be 1.3 per cent of the face value of the equity securities as at the time of issue (using our proxy for the cost of junior subordinated debt of 9.20 per cent pre-tax as the discount rate). The expected (i.e., probability-weighted) value of this benefit would be 0.13 per cent of the face value of the equity securities.

Amortising this expected benefit over the average 15 year term prior to the transition dates implies an annualised expected benefit of 2 basis points per annum. This benefit would not be material.

The Crown's option to exercise Crown financing warrants

83. A warrant has the characteristics of an European call option written by the firm, i.e. one which can be exercised only at a predefined single point in time;⁴⁵ however, it is not the same as a call option, because when a warrant is exercised it increases the physical number of shares on issue.⁴⁶ The Crown financing warrants have been issued far “out of the money,” and would only be “in the money” (i.e. have a realisable value at the exercise date) once the Chorus share performance target had been exceeded. If the performance target is exceeded at the exercise dates (i.e. the transition dates in 2025, 2030, 2033 and 2036) then the holders of Crown financing warrants will be able to purchase newly issued Chorus shares at the strike price that have a value exceeding that price. This would provide an immediate profit to the holders of the warrants.
84. It can be demonstrated that the value of a warrant (W) is related to the value of a call option (C) through “ q ” the ratio of warrants outstanding to shares in the firm. The formula is:

$$W = \frac{1}{1 + q} C$$

85. Value of call options over Chorus's shares can be estimated using the binomial approach, or as is most commonly applied, using the Black-Scholes option valuation model, which has a number of required inputs, including the current share price (S), the relevant risk free rate (R_f) over the period to exercise, the exercise price (X), and the volatility of the stock (the annualised standard deviation of the share price, s).
86. To estimate the value of Crown financing warrants for each year, it would be necessary to establish the number of warrants outstanding and estimate the key input parameters for the Black-Scholes option pricing model at those times.
87. We have undertaken some scenarios using the Black-Scholes model adjusted for dividends, using a range of assumptions drawn from the data and discussion presented above. Our preliminary view based on these estimates is that period the value of Crown

⁴⁵ This compares with American calls, i.e. one that can be exercised at any time up to its expiration.

⁴⁶ Call options by contrast are contracts between buyers and writers, which are settled independently of the business that they are written over.

financing warrants was likely to have been immaterial relative to the value of Crown financing equity securities.

88. To derive preliminary estimates, we ran several scenarios applying the Black-Scholes model and using assumptions for the parameters set out in Appendix B. We found that changing parameter assumptions did not make a great deal of difference to our overall conclusion that the warrants have a low value. For example, we adopted the actual 12-month average of the stock price volatility and assumed the market would apply this well into the future. However, reducing the volatility from these actual values to an assumed long run level (such as the volatility of the NZX Top 20) has the effect of materially reducing the valuation of the warrants at the start of the period.
89. In Table 5 below we present our overall preliminary estimates of the values of the warrants to the Crown using a weighted average exercise date (30 June 2032, being the weighted average of the four actual exercise dates). The benefit to the Crown from holding the warrants that have been granted each year is expressed as the percentage of the value of the Crown equity securities, converted into the equivalent annualised value up to the weighted average exercise date (expressing the value in this manner makes it comparable with an annual financing cost).

Table 5: Valuation of Crown financing warrants – scenario up to weighted average exercise date of 30 June 3032

Start of calendar year	2012	2013	2014	2015	2016	2017	2018	2019
Years to exercise	20.5	19.5	18.5	17.5	16.5	15.5	14.5	13.5
Share price (\$)	3.12	2.94	1.44	2.66	3.91	3.97	4.20	4.85
Exercise price (\$) Pre-18 month (estimated)	25.27	25.27						
Exercise price (\$) Post-18 month (estimated)		19.44	19.44	19.44	19.44	19.44	19.44	19.44
Volatility (12 month average of annualised 90 day SD)	27.0%	27.0%	32.2%	29.7%	26.1%	25.3%	22.5%	18.6%
Dividend yield (12 month average of NZX to 2018)	5.01%	4.51%	4.28%	4.45%	4.67%	4.21%	3.90%	5.40%
Interest rate (10 year NZ Government rate)	4.99%	3.73%	4.14%	4.35%	3.46%	2.78%	3.00%	2.77%
New warrants Pre-18 month	479,216	325,541	-	-	-	-	-	-
New warrants Post-18 month		1,239,085	1,811,124	1,367,266	1,878,347	2,018,127	2,113,223	1,312,357
Value per warrant Pre-18 month (\$)	0.060	0.041						
Value per warrant Post-18 month (\$)		0.063	0.031	0.081	0.077	0.062	0.043	0.006
Value of new warrants issued (\$)	28,793	91,247	55,862	110,296	143,866	125,957	91,021	8,222
Value of Crown financed equity securities issued (\$)	25,220,403	64,613,133	69,848,114	54,048,627	60,055,066	58,153,329	55,874,845	37,750,388
Value as a percentage of Crown equity	0.11%	0.14%	0.08%	0.20%	0.24%	0.22%	0.16%	0.02%
Value as a percentage of Crown equity annualised	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.00%

Source: Chorus, Bloomberg, and Incenta analysis

90. These results show that for the assumptions adopted, the warrants issued each year there is an annualised benefit to the Crown in the order of 0.00 per cent to 0.02 per cent of the Crown equity. That is, we find that it is likely the benefit of this option belonging to the Crown is immaterial, and also in the same order of magnitude as the options that are owned by Chorus, as discussed above.

A. Debt risk premium at longer terms to maturity

91. In Table A.1 below we show the evidence we reviewed for the debt risk premium differential between 10 and 30-year bonds. We found that for BBB credit rated bonds in Australia (Bloomberg's BVCSAB10 Index and BVCAB30 Index, vs BV100127 Index and BV300127 Index) and the United States (Bloomberg's IGUUBC10 Index and IGUUBC30 Index vs USGG10YR Index and USGG30Yr Index), the differential in the debt risk premium at these terms is not material, being a positive one-tenth of a percentage point in the case of the US, and a negative one-sixteenth of a percentage point in Australia. This supports proposition that a reasonable estimate of a long-term BBB yield can be obtained by estimating the 10-year BBB debt risk premium.

Table A.1: BBB bonds – change in the debt risk premium between 10 and 30-year terms to maturity (US and Australia)

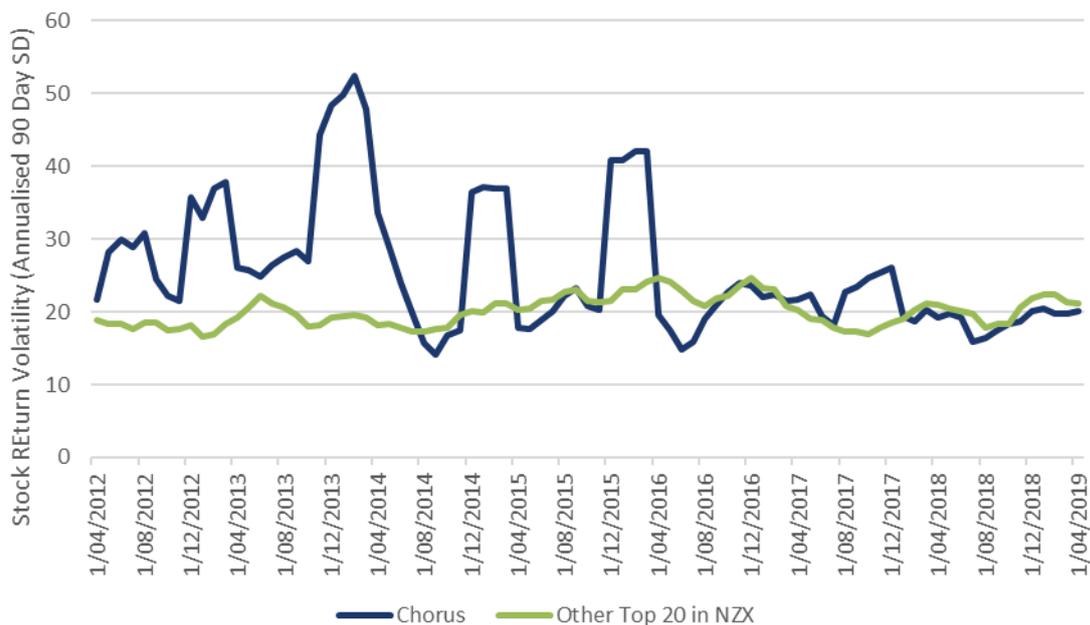
Country/ credit rating	Bloomberg Estimate	Period	10 years	30 years	Delta
United States	Debt Risk Premium	Jan 2012 to June 2019	1.68%	1.78%	0.100%
Australia	Debt Risk Premium	April 2015 to June 2019	2.19%	2.12%	-0.061%

Source: Bloomberg and Incenta analysis

B. Crown financing warrants

92. In this Appendix we discuss the variables whose estimation is critical for calculating a preliminary value of Crown financing warrants. In considering these variables we have made a number of simplifying assumptions:
- a. *Number of shares on issue* – The number of Chorus (CNU) shares on issue has grown over time due to its dividend reinvestment plan. The number of shares on issue is used to calculate the “q” ratio reflecting the dilution effect of issuing new shares. In the case of Chorus, the exercise of warrants would have a very minor dilution effect owing to their small number relative to the number of shares on issue (in the order of 400 million).
 - b. *The “base” share price* – The base share price is the price from which the performance of Chorus shares is to be measured when calculating the exercise price in 2025 and at subsequent exercise dates. Our estimates are:
 - i. \$3.10 for warrants issued during the first 18 months of Chorus trading (VWAP in the first 20 days of trading), and
 - ii. \$2.77 for warrants issued after the first 18 months of Chorus trading (VWAP during months 16 to 18 of Chorus trading).
 - c. *The risk free rate* – For each reporting date between 30 June 2012 and 30 June 2020 the relevant risk free rate will be the New Zealand Government sovereign bond yield to the exercise dates of the warrants. The spread of maturities relevant to each of the exercise dates is approximately from 6 to 24 years. We have applied the 10 year New Zealand Government sovereign bond yield as a simplification for all years (more specifically, the average value over the relevant calendar year).
 - d. *Volatility of the Chorus share price* – Higher share price volatility will increase the value of a call option, and therefore the value of Crown financing warrants. We have measured volatility as at any point in time as the annualised 90-day standard deviation of the share price, in turn averaged over each calendar year in question. Figure B.1 shows the volatility measure for Chorus relative to the other NZX Top 20 listed businesses. This demonstrates that while the NZX Top 20 volatility averaged at approximately 20 per cent throughout the 2011 to 2019 period, during the early years after listing, which were marked by regulatory and other uncertainties, Chorus's volatility was materially higher than that of the average NZX Top 20 business.

Figure B.1: Chorus vs NZX Top 20 – 90-day share price volatility



Source: Bloomberg

- e. *Dividend yield* – The Black-Scholes model assumes a European call option that does not pay dividends. The effect of dividends can be accounted for by subtracting their present value from the underlying stock price. The average dividend yield of the NZX over the 2012-2019 period has generally been between 4 per cent and 5 per cent, while dropping below 5 per cent in recent times. Chorus's dividend yield is currently around 5.3 per cent, and this is expected to be 5.4 per cent in the future according to market analyst reports.⁴⁷
- f. *Exercise price* – Estimating the exercise price is a key part of the valuation of Crown financing warrants. The requirement for a 16 per cent annual total shareholder return means that the exercise price would need to be estimated from a projection of the future price necessary to achieve that result given the dividends that are expected to be paid up to the exercise date, since the re-invested returns on those dividends would also need to be factored in. We back solved the price that would be required at the exercise date in order to make an annual 16 per cent return by finding the share price growth factor that would deliver that return which includes re-invested dividends at the ex-dividend day price. There is clearly an element of uncertainty in projecting dividends and share prices so far into the future, which suggests caution in interpreting the results. The exercise prices estimated for the scenario presented in the body of the report are:
 - i. \$25.27 for warrants issued during the first 18 months of Chorus trading; and

⁴⁷ Phil Campbell (21 May, 2019), *Chorus: Emerging issues paper on Fibre regulation*, p. 6.

- ii. *\$19.44* for warrants issued after the first 18 months of Chorus trading.
93. We found that making even unrealistically low assumptions about the exercise prices (e.g. exercise prices held at the level achieved in 2019) would not produce a material warrant valuation during the 2011 to 2019 period.