

Guidelines for WACC determinations under the cost of capital input methodologies

Regulation under Part 4 of the Commerce Act 1986

Date: 30 April 2018

Confidential material in this report has been removed. Its location in the document is denoted by [].

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Glossary

Act	Commerce Act 1986
CPP	Customised price-quality path
DPP	Default price-quality path
DPRY	Debt premium reference year
EDBs	Electricity distribution businesses
GDBs	Gas distribution businesses
GPBs	Gas pipeline businesses
GTBs	Gas transmission businesses
ID	Information disclosure
IMs	Input methodologies
IPP	Individual price-quality path
NSS	Nelson-Siegel-Svensson
TCSD	Term credit spread differential
WACC	Weighted average cost of capital

Introduction

Purpose of these guidelines

1. These guidelines set out how we apply the cost of capital input methodologies (IMs) when determining weighted average cost of capital (WACC) estimates for businesses regulated under Part 4 of the Commerce Act 1986 (Act).¹
2. In particular, the guidelines explain how we currently estimate the risk-free rate and debt premium, which are the only two WACC parameters which are required to be updated over time under the IMs.
3. The guidelines do not explain the reasons for adopting the approach specified in the cost of capital IMs.² Those reasons are explained separately in our IMs reasons papers.³

Structure of this document

4. The rest of this document is structured as follows:
 - 4.1 the **Background** section explains that we are required to make regular cost of capital determinations under the IMs, provides the relevant clause references to the IMs, and sets out where further information on our reasons for adopting the methodologies specified in the cost of capital IMs can be found;
 - 4.2 the **Formulas and fixed parameter values for calculating WACC estimates** section sets out the formulas used to generate our WACC estimates (including different WACC percentiles), and the values for WACC parameters which are fixed under the IMs;
 - 4.3 the **Methodology for estimating the risk-free rate** section explains how we determine our estimates of the risk-free rate; and
 - 4.4 the **Methodology for estimating the average debt premium** section explains how we determine our estimates of the average debt premium.

¹ The cost of capital IMs form part of the package of IMs the Commission was required to set under Part 4 of the Commerce Act.

² See paragraphs 6 to 8 below for a brief introduction to the cost of capital sections of the IM determinations, including clause references for the relevant sections.

³ See paragraphs 15 to 17 below for further details on our cost of capital IMs reasons papers.

Background

5. This section explains that:
 - 5.1 we are required to make regular WACC determinations under the IMs and provides references to the cost of capital sections of our IM determinations;
 - 5.2 the timing of our WACC determinations differs based on the regulatory instrument and disclosure years of the regulated companies;⁴ and
 - 5.3 our reasons for adopting the methodologies specified in the cost of capital IMs can be found in our IMs reasons papers.

We are required to make regular WACC determinations under the IMs

6. The IMs require us to complete regular WACC determinations for both price-quality path regulation and information disclosure (ID) regulation, for the businesses we regulate under Part 4 of the Act. These include electricity distribution businesses (EDBs), Transpower, gas distribution businesses (GDBs), gas transmission businesses (GTBs) and airports.⁵ GDBs and GTBs are referred to together as gas pipelines businesses (GPBs).
7. The methodology to be applied when making our regular WACC determinations is specified in the relevant IM determinations. The IMs:
 - 7.1 set out the formulas to be used to calculate WACC estimates;
 - 7.2 explain the method for estimating the risk-free rate and average debt premium; and
 - 7.3 specify the values for other parameters required to estimate WACC (such as leverage and equity beta).
8. Table 1 below sets out the relevant clause references of the airports, electricity distribution, gas distribution, gas transmission and Transpower IMs determinations respectively.

⁴ The disclosure years are specified in the ID determinations that apply to the different regulated suppliers.

⁵ Auckland, Wellington and Christchurch airports are subject to ID regulation under Part 4 of the Act.

Table 1: Clause references for WACC sections of IM determinations

Sector	Relevant IM determination	ID regulation	Price-quality path regulation
Airports	Airport Services Input Methodologies Amendments Determination 2010 (as of 20 December 2016)	Clauses 5.1-5.7	N/A ⁶
Electricity distribution	Electricity Distribution Services Input Methodologies Determination 2012 [2012] NZCC 26 (as of 31 January 2019)	Clauses 2.4.1-2.4.6	Clauses 4.4.1-4.4.6
Gas distribution	Gas Distribution Services Input Methodologies Determination 2012 [2012] NZCC 27 (as of 3 April 2018)	Clauses 2.4.1-2.4.6	Clauses 4.4.1-4.4.6
Gas transmission	Gas Transmission Services Input Methodologies Determination 2012 [2012] NZCC 28 (as of 3 April 2018)	Clauses 2.4.1-2.4.6	Clauses 4.4.1-4.4.6
Electricity transmission (Transpower)	Transpower Input Methodologies Determination 2010 [2012] NZCC 17 (as of 28 February 2017)	Clauses 2.4.1-2.4.6	Clauses 3.5.1-3.5.6

9. The cost of capital IMs also include a second component (in addition to WACC), referred to as the term credit spread differential (TCSD).⁷ The TCSD allowance compensates suppliers for the additional debt premium that can be incurred from issuing debt with a longer original tenor than the five-year regulatory period. It applies to qualifying suppliers only.⁸
10. Given that the TCSD does not form part of the regular WACC determinations we make under the IMs, it is not discussed further in these guidelines.

Timing of WACC determinations differs based on regulatory instrument and balance date of regulated companies

11. Separate WACC estimates are determined for the different sectors regulated under Part 4. The timing of our WACC determinations varies based on the following factors.

⁶ There are no cost of capital IMs for price-quality path regulation of airports, because they are subject to ID regulation only.

⁷ The TCSD is included in the cost of capital IMs for energy businesses, but not airports. See clauses 2.4.7-2.4.9 and 4.4.7 of the Electricity Distribution Services IM determination, clauses 2.4.7-2.4.9 and 4.4.7-4.4.10 of the Gas Distribution Services and Gas Transmission Services IM determinations; and clauses 2.4.7-2.4.9 and 3.5.8 of the Transpower IM determination.

⁸ Qualifying supplier means a regulated supplier whose debt portfolio, as at the date of that supplier's most recently published audited financial statements, has a weighted average original tenor greater than 5 years.

- 11.1 **Regulatory instrument.** WACC estimates for price-quality path and ID regulation are published at different times. For default price-quality path (DPP) and individual price-quality path (IPP) regulation, we are required to determine WACC estimates as at the first business day of the month seven months prior to the start of each five year regulatory period.⁹ For ID regulation, WACC estimates are determined as at the first day of the disclosure year in question.
- 11.2 **Disclosure years of the relevant companies.** The timing of our WACC determinations for ID regulation also differs depending on the disclosure years of the regulated companies. For example, we determine ID WACC estimates for Wellington Airport as at 1 April each year, and WACC estimates for Auckland and Christchurch Airports as at 1 July each year.
12. Table 2 and Table 3 below summarise the current timetable for ID and price-quality path WACC determinations under the IMs, respectively, for the different regulated businesses.

Table 2: Annual ID WACC determinations

Type of regulated business	WACC estimated as at
Electricity distribution – EDB ID Airports – Wellington Airport ID	1 April each year
Electricity transmission – Transpower ID Gas distribution – GasNet and Vector ID Airports – Auckland Airport and Christchurch Airport ID	1 July each year
Gas distribution – Powerco and First Gas ID Gas transmission – First Gas ID	1 October each year

Table 3: Price-quality path WACC determinations (every 5 years)

Type of regulated business	Next WACC determination estimated as at
Electricity distribution – EDB DPP Electricity transmission – Transpower IPP	1 September 2019
Gas distribution and transmission – GPB DPP	1 March 2022

⁹ Transpower is the only regulated supplier subject to an IPP. The WACC determined for DPP regulation also applies to any suppliers subject to customised price-quality path (CPP) regulation.

13. Airports are also able to propose that we determine additional WACC estimates commencing at the start of any quarter in a disclosure year, to coincide with a price setting event.¹⁰
14. We are required to publish all WACC determinations and estimates that we make under the IMs on our website, no later than one month after having made them.¹¹

Our reasons for determining the cost of capital IMs are explained elsewhere

15. Our reasons for adopting the methodologies specified in the cost of capital IMs are not explained in this document – they are set out separately in our IMs reasons papers.
16. The IMs were originally determined in December 2010. References to the relevant sections of our 2010 IM reasons papers are included in Table 4 below.

Table 4: References to cost of capital sections of December 2010 IM reasons papers

Sector	Relevant IM reasons paper	Cost of capital section references
Airports	Input methodologies (airport services): Reasons paper ¹²	Pages 104-141 and Appendix E
Electricity distribution, gas distribution and gas transmission	Input methodologies (electricity distribution and gas pipeline services): Reasons paper ¹³	Pages 132-174 and Appendix H
Electricity Transmission (Transpower)	Input methodologies (Transpower): Reasons paper ¹⁴	Pages 72-75

17. There have also been two main reviews of the IMs since they were first determined in 2010.
- 17.1 In 2014 we amended the WACC percentile estimates applying to energy businesses. Separate reasons papers were published for [price-quality path](#) and [information disclosure](#) regulation respectively.¹⁵

¹⁰ See clause 5.5 of the Airports IM determination.

¹¹ See clauses 5.7 of the Airports IM determination; 2.4.6 and 4.4.6 of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services IM determinations; and 2.4.6 and 3.5.6 of the Transpower IM determination.

¹² Commerce Commission “Input methodologies (airport services): Reasons paper” (December 2010).

¹³ Commerce Commission “Input methodologies (electricity distribution and gas pipeline services): Reasons paper” (December 2010).

¹⁴ Commerce Commission “Input methodologies (Transpower): Reasons paper” (December 2010).

¹⁵ Commerce Commission “Amendment to the WACC percentile for price-quality regulation for electricity lines services and gas pipeline services: Reasons paper” (30 October 2014); and Commerce Commission Amendments to the WACC percentile range for information disclosure regulation for electricity lines services and gas pipeline services: Reasons Paper” (12 December 2014).

17.2 In 2016 we made several amendments to the IMs, as part of a wider review of all of our IM determinations. The reasons for the amendments we made to the cost of capital IMs are explained in [Topic paper 4: Cost of capital issues](#) and [Topic paper 6: WACC percentile for airports](#).¹⁶

¹⁶ Commerce Commission “Input methodologies review decisions – Topic paper 4: Cost of capital issues” (20 December 2016); and Commerce Commission “Input methodologies review decisions – Topic paper 6: WACC percentile for airports” (20 December 2016).

Formulas and fixed parameter values for calculating WACC estimates

18. This section sets out:
- 18.1 the formulas we use for generating vanilla and post-tax WACC estimates under the IMs;
 - 18.2 how we determine different WACC percentile estimates; and
 - 18.3 the WACC parameter values which are fixed under the IMs.

We estimate both vanilla and post-tax WACC estimates under the IMs

19. Under the IMs, we calculate both vanilla and post-tax mid-point WACC estimates for ID and price-quality path regulation. A vanilla WACC is a weighted average of the pre-corporate tax cost of debt and the post-tax cost of equity. A post-tax WACC is the weighted average of the post-corporate tax cost of debt and the post-tax cost of equity.
20. The formulas for calculating mid-point vanilla and post-tax WACC estimates are shown in Table 5 below.¹⁷

Table 5: Formulas for mid-point vanilla WACC and post-tax WACC

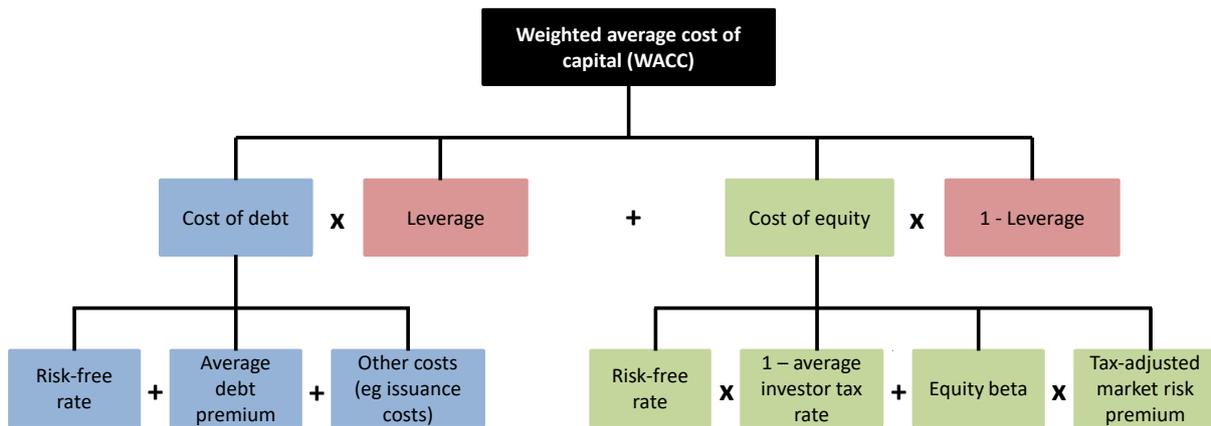
Form of WACC	Formula
Mid-point vanilla WACC	$r_d L + r_e (1 - L)$
Mid-point post-tax WACC	$r_d (1 - T_c) L + r_e (1 - L)$

Where:

- L is leverage
- r_d is the cost of debt and is estimated in accordance with the formula: $r_f + p + d$
- r_e is the cost of equity and is estimated in accordance with the formula: $r_f(1 - T_i) + \beta_e TAMRP$
- T_c is the average corporate tax rate
- r_f is the risk-free rate
- p is the average debt premium
- d is the debt issuance costs
- T_i is the average investor tax rate
- β_e is the equity beta
- $TAMRP$ is the tax-adjusted market risk premium.

21. The key parameters for estimating a vanilla WACC are summarised in Figure 1 below. The parameters for estimating a post-tax WACC are the same as for the vanilla WACC, except that the cost of debt is also multiplied by $1 -$ the average corporate tax rate.

¹⁷ See clauses 5.1(1)-5.1(3) of the Airports IM determination; 2.4.1(1)-2.4.1(3) and 4.4.1(1)-4.4.1(3) of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services IM determinations; and 2.4.1(1)-2.4.1(3) and 3.5.1(1)-3.5.1(3) of the Transpower IM determination.

Figure 1: Components of vanilla WACC

22. We are only required to update the risk-free rate and average debt premium when we make our WACC determinations. All other parameter values for estimating the WACC are specified in the IMs.

We also determine WACC range and 67th percentile estimate for some sectors

23. For EDBs, Transpower and GPBs we are required to determine different WACC percentile estimates, in addition to our mid-point estimate. Specifically, we are required to determine:
- 23.1 67th percentile WACC estimates for price-quality path regulation; and
- 23.2 a WACC range from the 25th percentile to the 75th percentile, and 67th percentile WACC estimates, for ID regulation.
24. Formulas for calculating the WACC percentile estimates are shown in Table 6 below.¹⁸

Table 6: Formulas for calculating WACC percentile estimates

Percentile estimate	Formula
25 th percentile	mid-point estimate of WACC - 0.674 × standard error
67 th percentile	mid-point estimate of WACC + 0.440 × standard error
75 th percentile	mid-point estimate of WACC + 0.674 × standard error

Where:

- The mid-point estimate of WACC is treated as the 50th percentile
- The standard error of the mid-point estimate of WACC for EDBs and Transpower is 0.0101
- The standard error of the mid-point estimate of WACC for GPBs is 0.0105.

¹⁸ See clauses 2.4.5 and 4.4.5 of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services IM determinations; and 2.4.5 and 3.5.5 of the Transpower IM determination.

25. For airports, we are not required to determine a WACC range or 67th percentile estimate. However, the IMs specify a standard error of the mid-point estimate of WACC of 0.0146. This enables different ‘WACC percentile equivalents’ to be estimated.¹⁹

Many WACC parameter values are fixed under the input methodologies

26. Many of the WACC parameter values are specified directly in the IM determinations. Specifically, values for leverage, equity beta, tax-adjusted market risk premium (TAMRP) and debt issuance costs are specified in the IMs.
27. The fixed WACC parameter values for each sector are listed in Table 7 below.²⁰

Table 7: Fixed WACC parameter values under the IMs

Parameter	EDBs/Transpower	GPBs	Airports
Leverage	42%	42%	19%
Equity beta ²¹	0.60	0.69	0.74
Debt issuance costs	0.2%	0.2%	0.2%
TAMRP ²²	7.0%	7.0%	7.0%

28. The values for the ‘average investor tax rate’ and ‘average corporate tax rate’ are not strictly fixed under the IMs; they will only be updated if the relevant statutory tax rates change.²³ The current value for both the average investor tax rate and average corporate tax rate is 28%.

¹⁹ See clause 5.6 of the Airports IM determination.

²⁰ See clauses 5.2 of the Airports IM determination; 2.4.2 and 4.4.2 of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services IM determinations; and 2.4.2 and 3.5.2 of the Transpower IM determination.

²¹ These equity betas are calculated by re-levering our asset beta estimates of 0.35 for EDBs/Transpower, 0.40 for GPBs and 0.60 for airports. The leverage values in Table 7 are used to re-lever the asset betas.

²² The TAMRP is set for a five year period commencing the first day of the regulatory period.

²³ Under the IMs, the:

- ‘average corporate tax rate’ is the average of the corporate tax rates that, as at the date that the estimation is made, will apply during the five year period commencing on the first day of the disclosure year/DPP regulatory period in question; and
- the ‘average investor tax rate’ is the average of the investor tax rates that, as at the date that the estimation is made, will apply to each of the disclosure years in the five year period commencing on the first day of the disclosure year/DPP regulatory period in question.

Methodology for estimating the risk-free rate

29. This section explains our methodology for estimating the risk-free rate, which is the rate of interest expected when there is no risk of default. Debt issued by the New Zealand Government and denominated in New Zealand dollars is considered to be free of default risk.
30. We estimate the risk-free rate using bid yields on New Zealand government bonds, for a term to maturity of five years. Specifically, the IMs require us to estimate the risk-free rate, as at the date of the WACC estimate, using the approach in Box 1 below.²⁴

Box 1: Methodology for estimating the risk-free rate

- (a) obtaining, for notional benchmark New Zealand government New Zealand dollar denominated nominal bonds, the wholesale market linearly-interpolated bid yield to maturity for a residual period to maturity equal to five years on each business day in the three months preceding the date of the WACC estimate;
- (b) calculating the annualised interpolated bid yield to maturity for each business day; and
- (c) calculating the unweighted arithmetic average of the daily annualised interpolated bid yields to maturity.

31. The methodology for estimating the risk-free rate is specified in the relevant clauses of each IM determination, as set out in Table 8 below.

Table 8: IM clause references for risk-free rate methodology

Relevant IM determination	ID regulation	Price-quality path regulation
Airports IM determination	Clause 5.3	N/A
Electricity distribution IM determination	Clause 2.4.3	Clause 4.4.3
Gas distribution IM determination	Clause 2.4.3	Clause 4.4.3
Gas transmission IM determination	Clause 2.4.3	Clause 4.4.3
Transpower IM determination	Clause 2.4.3	Clause 3.5.3

32. In practice, our methodology for estimating the risk-free rate involves:

- 32.1 identifying New Zealand government New Zealand dollar denominated nominal bonds;

²⁴ Table 8 contains the relevant clause references for this approach. References to the 'date of the WACC estimate' in paragraph (a) of Box 1 differ from the exact wording in some of the IMs. To simplify the discussion, we have used generic wording that is applicable to risk-free rate estimates for both ID and price-quality path regulation.

- 32.2 obtaining wholesale bid yield data for each of these bonds, for each business day in the three months preceding the date of the WACC estimate;²⁵
- 32.3 setting the target date for linear interpolation for each business day in the three month period, which is five years in the future (for example, the target for a bid yield dated 1 January 2018 would be 1 January 2023);
- 32.4 identifying the two New Zealand government bonds with the closest maturity dates which straddle the target date;
- 32.5 estimating, by linear interpolation between those two bonds, the bid yield for a residual period to maturity of five years;
- 32.6 annualising each linearly-interpolated bid yield to reflect the six monthly payment of interest;²⁶ and
- 32.7 calculating the mean of the daily annualised interpolated rates.

²⁵ As explained in footnote 24 above, we have used the generic wording 'date of the WACC estimate' to simplify the discussion. This term means:

- the first day of each disclosure year, for ID regulation; and
- the first day of the month seven months prior to the start of each regulatory period, for price-quality regulation.

²⁶ The 'coupon frequency' for all relevant New Zealand government bonds is currently semi-annual (S/A) – ie, six monthly payment of interest.

Methodology for estimating the average debt premium

33. This section explains how we estimate the debt premium, which is the additional interest rate, over and above the risk-free rate, required by suppliers of debt capital to compensate them for being exposed to the risk of default in lending to a firm.²⁷
34. This section explains that:
- 34.1 the average debt premium is calculated based on the debt premium values for the five most recent debt premium reference years (DPRYs);
 - 34.2 debt premium values for DPRYs 2013-2017 are specified directly in the IMs; and
 - 34.3 debt premium values for DPRYs after 2017 are estimated using the methodology in the IMs.

The average debt premium is the mean of the five most recent debt premium reference years

35. Under the IMs we are required to estimate an average debt premium for each disclosure year (for ID regulation), and each regulatory period (for price-quality regulation).
36. We estimate the debt premium as a five year historical average, which is referred to as the *average debt premium*. Specifically, the average debt premium is calculated as the simple arithmetic average (ie, the mean) of the debt premium values for the:
- 36.1 current DPRY; and
 - 36.2 four previous DPRYs.
37. The methodology for estimating the average debt premium is specified in the relevant clauses of each IM determination, as set out in Table 8 below.

Table 9: IM clause references for average debt premium methodology

Relevant IM determination	ID regulation	Price-quality path regulation
Airports IM determination	Clause 5.4	N/A
Electricity distribution IM determination	Clause 2.4.4	Clause 4.4.4
Gas distribution IM determination	Clause 2.4.4	Clause 4.4.4
Gas transmission IM determination	Clause 2.4.4	Clause 4.4.4
Transpower IM determination	Clause 2.4.4	Clause 3.5.4

²⁷ This includes an allowance for the inferior liquidity of corporate bonds relative to government bonds.

38. The DPRYs are specific to each sector, as shown in Table 10 below.²⁸ For example, 'debt premium reference year 2016' for EDBs means the 12 month period ending 31 August 2016.

Table 10: Debt premium reference years

Sector	Debt premium reference year
Electricity distribution and transmission	1 September to 31 August
Gas distribution and transmission	1 March to 28 February
Airports	1 July to 30 June

39. The 'current debt premium reference year' refers to the debt premium reference year that contains the start of the relevant disclosure year. For example, EDB disclosure year 2019 starts on 1 April 2018. In this case, the *current* debt premium reference year is DPRY 2018 (1 September 2017 to 31 August 2018).

Debt premium values for DPRY 2013 to DPRY 2017 are specified in the IMs

40. The debt premium values for DPRY 2013 to DPRY 2017 are specified in the IMs. The values for the regulated businesses in each sector are set out in Table 11 below.

Table 11: Debt premium values for DPRY 2013 to DPRY 2017

DPRY	EDBs/Transpower	GPBs	Airports
2013	2.24%	1.90%	2.06%
2014	2.04%	2.34%	1.50%
2015	1.76%	1.84%	1.25%
2016	1.59%	1.66%	1.05%
2017	1.59%	1.54%	1.38%

Debt premium values for post-2017 DPRYs are calculated using the approach in the IMs

41. Debt premium values for DPRYs after 2017 are calculated using the methodology specified in the IMs.
42. Our estimate of the sector-wide debt premium for a given DPRY is informed by observed debt premiums on relevant New Zealand corporate bonds. The debt premium for each relevant bond is calculated as the difference between:
- 42.1 **the observed interest rate on the corporate bond** – bid yields to maturity on publicly traded New Zealand corporate bonds are used; and

²⁸ See the definitions of 'debt premium reference year' in clause 1.4(2) of the Airports IM determination; and clause 1.1.4(2) of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services, and Transpower IM determinations.

- 42.2 **a contemporaneous estimate of the risk-free rate for each bond** – we estimate a contemporaneous interpolated bid yield to maturity of notional benchmark New Zealand government New Zealand dollar denominated nominal bonds.

Relevant corporate bonds we consider when estimating the debt premium

43. Under the IMs, relevant New Zealand corporate bonds that we consider when estimating the debt premium must be:²⁹
- 43.1 publicly traded **vanilla NZ\$ denominated bonds** – which means senior unsecured nominal debt obligations denominated in New Zealand dollars without callable, puttable, conversion, profit participation, credit enhancement or collateral features;
 - 43.2 issued by a **qualifying issuer** – which means a New Zealand resident limited liability company that:
 - 43.2.1 undertakes, or is part of a corporate group that undertakes, the majority of its business activities in Australia or New Zealand;
 - 43.2.2 does not operate, or is part of a corporate group that does not operate, predominantly in the banking or finance industries; and
 - 43.3 **investment grade rated** – which means the bond is endorsed with a credit rating by an established credit rating agency (such as Standard and Poor's) of "investment grade" on that agency's credit rating scale applicable to long-term investments.
44. Having identified relevant New Zealand corporate bonds which meet the criteria in paragraph 43 above, we undertake the steps in Box 2 below to generate daily debt premium estimates for each bond.

²⁹ See the definitions of 'vanilla NZ\$ denominated bonds', 'qualifying issuer' and 'investment grade rated' in clause 1.4(2) of the Airports IM determination; and clause 1.1.4(2) of the Electricity Distribution Services, Gas Distribution Services and Gas Transmission Services, and Transpower IM determinations.

Box 2: Methodology for estimating debt premium on New Zealand corporate bonds

- (a) obtain its wholesale market annualised bid yield to maturity;
- (b) calculate by linear interpolation with respect to maturity, the contemporaneous wholesale market annualised bid yield to maturity for a notional benchmark New Zealand government New Zealand dollar denominated nominal bond with the same remaining term to maturity; and
- (c) calculate its contemporaneous interpolated bid to bid spread over notional benchmark New Zealand government New Zealand dollar denominated nominal bonds with the same remaining term to maturity, by deducting the yield calculated in accordance with subparagraph (b) from the yield obtained in accordance with subparagraph (a),

for each business day in the 12 months preceding the start of the debt premium reference year.

45. We then calculate the average of the daily spreads calculated under Box 2 for each bond. This process results in a list of debt premiums for relevant issuers of New Zealand corporate bonds.

Hierarchy of bonds when estimating the debt premium

46. When forming our view regarding the debt premium value for the DPRY in question, the weight we place on the observed debt premiums for issuers of corporate bonds differs by sector. In particular, the 'benchmark' corporate bond we target when estimating the debt premium differs, as shown in Table 12 below.³⁰

Table 12: Criteria for benchmark/target corporate bond

Criteria	EDBs, Transpower and GPBs	Airports
Issued by	EDB or GPB that is neither 100% owned by the Crown nor a local authority	Airport that is neither 100% owned by the Crown nor a local authority
Qualifying rating	BBB+	A-
Remaining term to maturity	5 years	5 years
Other requirements	Publicly traded	Publicly traded

³⁰ See clause 5.4(6)(d) of the Airports IM determination; and clause 2.4.4(6)(d) of the Electricity Distribution Services, Gas Distribution Services, Gas Transmission Services, and Transpower IM determinations.

47. When estimating a debt premium based on the benchmarks specified in Table 12 above, we place greater weight on bonds that have characteristics closer to our target.
48. We categorise each of the debt premiums calculated under the method in paragraphs 43 to 45 based on the criteria in Table 13 below. The IMs require us to ordinarily have progressively less regard to the spreads observed on bonds in the order they are specified in this table.³¹

Table 13: Hierarchy for considering bonds when estimating the debt premium

Category	Bond criteria for EDBs, Transpower and GPBs IM determination	Bond criteria for airports IM determination
(a)	<ul style="list-style-type: none"> Qualifying rating³² of grade BBB+ Issued by an EDB or a GPB that is neither 100% owned by the Crown nor a local authority 	<ul style="list-style-type: none"> Qualifying rating of grade A- Issued by an airport that is neither 100% owned by the Crown nor a local authority
(b)	<ul style="list-style-type: none"> Qualifying rating of grade BBB+ Issued by an entity other than an EDB or a GPB that is neither 100% owned by the Crown nor a local authority 	<ul style="list-style-type: none"> Qualifying rating of grade A- Issued by an entity other than an airport that is neither 100% owned by the Crown nor a local authority
(c)	<ul style="list-style-type: none"> Qualifying rating of a grade different to BBB+ Issued by an EDB or a GPB that is neither 100% owned by the Crown nor a local authority 	<ul style="list-style-type: none"> Qualifying rating of a grade different to A- Issued by an airport that is neither 100% owned by the Crown nor a local authority
(d)	<ul style="list-style-type: none"> Qualifying rating of a grade different to BBB+ Issued by an entity other than an EDB or a GPB that is neither 100% owned by the Crown nor a local authority 	<ul style="list-style-type: none"> Qualifying rating of a grade different to A- Issued by an entity other than an airport that is neither 100% owned by the Crown nor a local authority
(e)	<ul style="list-style-type: none"> Investment grade credit rated Issued by an entity that is 100% owned by the Crown or a local authority 	<ul style="list-style-type: none"> Investment grade credit rated Issued by an entity that is 100% owned by the Crown or a local authority

³¹ See clauses 5.4(7)-(8)(a) of the Airports IM determination; and clause 2.4.4(7)-(8)(a) of the Electricity Distribution Services, Gas Distribution Services, Gas Transmission Services, and Transpower IM determinations.

³² 'Qualifying rating' means

- (a) a Standard and Poor's long term credit rating of the specified grade; or
 (b) an equivalent long term credit rating of another internationally recognised rating agency.

49. In addition, when considering the observed debt premiums on New Zealand corporate bonds described in Table 13:
- 49.1 the spread on any bond that has a remaining term to maturity of less than five years will ordinarily be considered to be the minimum spread that would reasonably be expected to apply on an equivalently credit-rated bond issued by the same entity with a remaining term to maturity of five years;³³ and
 - 49.2 we adjust spreads observed on bonds described under category (b) to (e) to approximate the spread that is likely to have been observed had the bonds in question been of the type described in category (a).³⁴

We also have regard to the debt premium estimated under the Nelson-Siegel-Svensson approach

- 50. When reaching our final estimate of the debt premium for the relevant DPRY, we also have regard to the debt premium estimated from applying the Nelson-Siegel-Svensson (NSS) approach.³⁵
- 51. The NSS approach is a method for modelling yield curves and term structures of interest rates which establishes a relationship between terms to maturity and the debt premium. A curve is generated by changing the parameters of a yield curve's functional form to minimise the squared deviation between estimated and observed values.³⁶
- 52. We use the NSS approach to generate a yield curve based on the available bond data. This yield curve is then used to estimate a debt premium for a five year term to maturity, for the relevant DPRY.

This methodology results in a set of data used to inform our estimate of the debt premium

- 53. The methodology described in paragraphs 41 to 52 above results in a table of data which we base our debt premium estimate for the relevant DPRY on. We use this data to estimate the debt premium that would reasonably be expected to apply to a vanilla NZ\$ denominated bond that meets the benchmark requirements for the relevant sector specified in Table 12 above.

³³ See clause 5.4(8)(b) of the Airports IM determination; and clause 2.4.4(8)(b) of the Electricity Distribution Services, Gas Distribution Services, Gas Transmission Services, and Transpower IM determinations.

³⁴ See clause 5.4(8)(c) of the Airports IM determination; and clause 2.4.4(8)(c) of the Electricity Distribution Services, Gas Distribution Services, Gas Transmission Services, and Transpower IM determinations.

³⁵ See clause 5.4(6)(d) of the Airports IM determination; and clause 2.4.4(6)(d) of the Electricity Distribution Services, Gas Distribution Services, Gas Transmission Services, and Transpower IM determinations.

³⁶ For further details on the NSS approach to modelling yield curves, see Commerce Commission "Input methodologies review decisions – Topic paper 4: Cost of capital issues" (20 December 2016), Attachment D.

54. As an example, Table 14 below summarises the relevant debt premium data used to inform our estimate of the debt premium for DPROY 2018 for airports – which was 1.35%.³⁷

Table 14: Five-year debt premium on an airport-issued bond rated A- (as at 1 July 2017)

	Industry	Rating	Remaining term to maturity	Debt premium
Determined debt premium	Airport	A-	5.0	1.35

Category	Issuer	Note ref.	Industry	Rating	Remaining term to maturity	Debt premium	Comment
(a)	Auckland Intl Airport	1	Airport	A-	5.0	1.28	Credit rating and term are an exact match
(b)	Fonterra Cooperative G	2	Other	A-	5.0	1.61	Credit rating and term are an exact match
	Spark Finance Ltd	3	Other	A-	5.0	1.45	Credit rating and term are an exact match
(c)	Wellington Intl Airpor	4	Airport	BBB+	3.4	1.58	5 year debt premium would be higher; A- debt premium would be lower
(d)	Chorus Ltd	5	Other	BBB	4.3	1.73	5 year debt premium would be higher; A- debt premium would be lower
	Contact Energy Ltd	6	-	BBB	4.9	1.65	5 year debt premium would be higher; A- debt premium would be lower
	Genesis Energy Ltd	7	Other	BBB+	5.0	1.61	A- debt premium would be lower
	Mercury Nz Ltd	8	Other	BBB+	5.0	1.68	A- debt premium would be lower
	Meridian Energy Limite	9	Other	BBB+	6.2	1.65	5 year debt premium would be lower; A- debt premium would be lower
(e)	Christchurch Intl Airp	10	Airport	BBB+	4.8	1.66	5 year debt premium would be higher; A- debt premium would be lower
	Transpower New Zealand	11	Other	AA-	5.0	1.16	A- debt premium would be higher
Nelson-Siegel-Svensson estimate					5.0	1.47	

Notes on bonds analysed:

- 1 5.52% bond maturing on 28/05/2021; 4.28% bond maturing on 9/11/2022
- 2 5.5% bond maturing on 25/02/2020; 4.3% bond maturing on 20/10/2021; 5.9% bond maturing on 25/02/2022; 4.42% bond maturing on 7/03/2023
- 3 5.3% bond maturing on 25/10/2019; 4.5% bond maturing on 25/03/2022; 4.51% bond maturing on 10/03/2023
- 4 5.27% bond maturing on 11/06/2020
- 5 4.12% bond maturing on 6/05/2021
- 6 4.4% bond maturing on 15/11/2021
- 7 8.3% bond maturing on 23/06/2020; 4.14% bond maturing on 18/03/2022; 5.81% bond maturing on 8/03/2023
- 8 8.21% bond maturing on 11/02/2020; 5.793% bond maturing on 6/03/2023
- 9 4.53% bond maturing on 14/03/2023
- 10 6.25% bond maturing on 4/10/2021
- 11 6.95% bond maturing on 10/06/2020; 4.3% bond maturing on 30/06/2022

55. In this case:

- 55.1 greatest regard was had to the estimated debt premium on Auckland Airport's bonds (1.28%), given they are in category (a) under Table 13;
- 55.2 we noted that the Fonterra (1.61%) and Spark (1.45%) bonds, which are both category (b), supported a debt premium greater than 1.28% (the NSS estimate of 1.47% also supported a debt premium greater than 1.28%);
- 55.3 starting with the debt premium on the Auckland Airport bonds, but also taking into account the Fonterra and Spark bonds, suggested a debt premium of approximately 1.35% was appropriate;
- 55.4 the estimated debt premiums on other issuers in categories (c) to (e) were generally consistent with a debt premium of 1.35%, when consideration was given to different credit ratings and terms to maturity; and

³⁷ For further details see *Cost of capital determination for disclosure year 2018 for Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)* [2017] NZCC 7 (31 July 2017).

- 55.5 accordingly, we determined a debt premium of 1.35% for DPRY 2018.³⁸
56. In this example, the debt premium values for DPRY 2014 to DPRY 2018 were then averaged, to determine an *average debt premium* of 1.31%.³⁹

³⁸ *Cost of capital determination for disclosure year 2018 for Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)* [2017] NZCC 7 (31 July 2017), paragraphs 71-74.

³⁹ *Cost of capital determination for disclosure year 2018 for Transpower, gas pipeline businesses and suppliers of specified airport services (with a June year-end)* [2017] NZCC 7 (31 July 2017), paragraph 75 and table 9.