Return on capital and inflation

Prepared for and in collaboration with NBN Co | 7 December 2022

Disclaimer

Contents

Tables

Summary

Overview of return on capital approach

1. NBN Co's Special Access Undertaking (**SAU)** variation proposes a building block model (**BBM**) to set revenue allowances for future regulatory cycles to apply from July 2023. A key building block is the return on capital allowance, which is conventionally estimated by applying a weighted average cost of capital (**WACC**) to the regulatory asset base.

2. Frontier Economics has worked with NBN Co to produce a suitable methodological approach for estimating the WACC for the first regulatory cycle and also for the remainder of the SAU term to 2040. This report documents the proposed methodology and 'placeholder' estimates for the first regulatory period or cycle[1], noting that some parameter values will be subject to updating prior to the commencement of that period to ensure it reflects the latest available information.

3. We start from the conventional regulatory approach that the minimum return that a business must pay its investors, in order to attract and retain the capital necessary to finance efficient and prudent investments, is the 'market cost of capital' associated with that investment. We submit that this approach is consistent with the legislative criteria relating to the reasonableness of terms, and would promote the long-term interests of end-users, in that accurate estimates of the market cost of capital would avoid incentives for inefficient underinvestment and overinvestment.

4. Consistent with NBN Co's views that the proposed methodological approach applies to the first regulatory cycle but should also be suitable for the remainder of the SAU term, our methodological approach has the following objectives:

   - the method should be capable of producing reliable estimates of the market cost of capital for a benchmark entity that faces a similar degree of risk as that which applies to nbn in its provision of high speed broadband services, in a wide range of plausible market conditions; and
   - the method should promote stability in the allowed return on capital over time.

Summary of approaches to estimating each WACC parameter

5. Table 1 provides an overview of the approaches we have taken to estimation of each WACC parameter. These approaches are further outlined in later sections of this report.

[1] Regulatory period and regulatory cycle are used interchangeably in this report.

Table 1 Overview of approaches to estimate of WACC parameters

Parameter/issue	Approach
Form of WACC	Nominal vanilla WACC: • $WACC = Return\ on\ equity \times (1 - Gearing) + Return\ on\ debt \times Gearing$
Return on equity formula	Estimated using Capital Asset Pricing Model (CAPM) • $Return\ on\ equity = Risk\text{-}free\ rate + Equity\ beta \times Market\ risk\ premium$ Point estimate of the return on equity derived by giving equal weight to estimates of the 'long-term' and 'current' return on equity: • $Return\ on\ equity_{long} = Risk\text{-}free\ rate_{long} + Equity\ beta \times Market\ risk\ premium_{long}$ • $Return\ on\ equity_{current} = Risk\text{-}free\ rate_{current} + Equity\ beta \times Market\ risk\ premium_{current}$ Risk-free rate and market risk premium estimates are paired consistently when estimating the required return on equity.
Risk-free rate	• Current risk-free rate estimated using a 40-day average of the prevailing annualised yield on 10-year Commonwealth Government Securities. • Long-term risk-free rate fixed at 5.0%, consistent with the average of observed historical rates over the relevant period (and in line with the long-term risk-free rate assumed in the Australian Government's *2021 Intergenerational Report)*.
Market risk premium	• Current market risk premium estimated using four differently-specified Dividend Growth Models (DGMs): ○ Damodaran (2013); ○ Bank of England (2002); ○ Bank of England (2010); and ○ 3-stage DGM (implemented using Bloomberg and consensus analyst earnings forecasts) All approaches have been calibrated to ensure that they produce average estimates that are consistent with the average of observed outcomes (see below). • Long-term market risk premium fixed at 6.5% (consistent with the available evidence on the arithmetic average of historical excess returns for Australia).

Parameter/issue	Approach

Equity beta	• An industry-specific parameter that is estimated using a broad sample of listed comparator firms
	  ○ Estimate an equity beta of 0.66, from averaging relevered estimated asset betas using weekly and monthly frequencies over the ten-year and five-year windows to October 2022, using a set of 77 comparators.
	  ○ Relevering using the estimated benchmark gearing of 37%

Return on debt	• Estimated as a 10-year historical trailing average of 10-year BBB corporate bond yields.
	• Apply a 'return on debt true-up':
	  ○ Changes to the return on debt allowance are to be computed annually.
	  ○ The difference between (a) the return on debt allowance fixed at the start of the regulatory period; and (b) the updated trailing average return on debt allowance in each year are to be trued-up in an NPV-neutral way in the next regulatory period (i.e., a 'return on debt true-up').
	• Historical data on 10-year BBB corporate bond yields obtained from published RBA statistics.

Allowance for debt raising costs	• 12.5 basis points per annum (**bppa**) added to the prevailing return on debt in each year.
Gearing	• An industry-specific parameter that is estimated using a broad sample of listed comparator firms. ○ As above, we adopt a gearing of 37%, the average of gearing estimates using the ten-year and five-year windows to October 2022, using a set of 77 comparators (as per the estimation of asset beta).

Placeholder estimates for the first regulatory cycle

6. **Table 2** presents the individual parameter estimates, and overall rate of return estimates, to be applied for the first regulatory cycle.

7. Note that these estimates have been prepared as at December 2021, and will continue to be updated up until the commencement of the regulatory cycle. As highlighted in **Table 2**, updates will reflect the latest available data relating to risk-free rates, market risk premiums, inflation forecasts and the cost of debt.

Table 2: Estimates for first replacement module, 2023-24 - 2025-26 as at October 2022

Approach	'Current' estimate	'Long-term' estimate	Midpoint estimate	Parameter to be updated
Risk-free rate	3.9%	5.0%	4.5%	*
Equity beta	0.66	0.66	0.66	
Market risk premium	7.9%	6.5%	7.2%	*
Return on Equity (nominal, post-tax)	9.1%	9.3%	9.2%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2024)	5.0%	5.0%	5.0%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2025)	5.1%	5.1%	5.1%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2026)	5.3%	5.3%	5.3%	*
Gearing	37%	37%	37%	
Nominal vanilla WACC (FY 2024)	7.6%	7.7%	**7.7%**	*
Nominal vanilla WACC (FY 2025)	7.6%	7.8%	**7.7%**	*
Nominal vanilla WACC (FY 2026)	7.7%	7.8%	**7.8%**	*

Source: Frontier Economics

Other estimates related to the BBM

8. Our report also documents the approach we have recommended to NBN Co, and which NBN Co has adopted, relating to the use of 'gamma' in the BBM, the forecasting of inflation and the use of a benchmark financeability test.

Gamma

9. The BBM contains a standard revenue allowance for taxation expenses. That is, a business will be liable to pay some tax and the ABBRR will need to be escalated to allow for the payment of that tax, as well as recover its other efficient costs. Gamma is a parameter relevant to that tax calculation, as it measures the value of franking credits created under the Australian dividend imputation system. That is:

    a the amount of corporate tax to be paid by the regulated firm is estimated, which is also an estimate of the quantum of franking credits created;

b the quantum of franking credits is then multiplied by gamma to provide an estimate of the value of those credits to investors;

c That value is deducted from the total required return on equity; and

d The regulatory allowance is then set such that the firm is able to provide the balance to investors in the form of dividends and capital gains.

10. NBN Co will not be liable to pay corporate income tax for many years, as it has accumulated significant tax losses which offset against future tax profits. In those circumstances (as per 2G.7.4 of the SAU), if the value of the sum of Taxable Profit and Tax Losses Carried Forward is negative, the value of gamma is unspecified. Nonetheless, we have provided a methodology which produces an estimate of 0.25. This value is based on the 'market value' interpretation of franking credits and dividend drop-off analyses performed over the last 10 years, which have consistently concluded that the best market value estimate of gamma is 0.25.

11. However, we note that NBN Co has for practical reasons, for the first regulatory cycle only, accepted the ACCC's invitation to consider adopting the AER's current gamma allowance of 0.585. Consequently, all figures in this report reflect that estimate of gamma, unless clearly indicated otherwise.

Inflation forecasting

12. Under the SAU, for the forthcoming regulatory period, the real RAB will be indexed using actual (i.e., outturn CPI) to compute the nominal RAB. Furthermore, the forecast nominal ABBRR must specify and include a return on capital that is determined using:

- a nominal vanilla WACC; and
- a forecast nominal RAB.

13. To avoid compensating investors twice for inflation, which would occur as a result of applying a nominal WACC to a forecast nominal RAB i.e., a RAB indexed using forecast inflation, the SAU requires the use of forecast nominal regulatory depreciation (determined using a forecast of inflation over the regulatory period.[2]

14. To derive the forecast nominal RAB and forecast nominal regulatory depreciation, a forecast of inflation over the regulatory period is required. We have recommended to NBN Co an approach that is similar to the approach adopted recently by the Queensland Competition Authority (**QCA**).[3]

15. Under this approach, for a two-year regulatory period such as the first regulatory cycle, inflation would be forecast by computing the geometric average of the RBA's inflation forecasts for years 1 and 2.

16. For longer regulatory periods, the forecasts are determined by using the RBA's inflation forecasts for years 1 and 2 and then supplemented using a glidepath towards a year 5 'anchor point' based on the two-year ahead forecast (with midpoint inflation of 2.5% applied thereafter if applicable). For further details, see **Section 8.**

[2] Regulatory depreciation is defined as straight line depreciation less the forecast indexation of the RAB.

[3] http://www.qca.org.au/project/inflation-forecasting/inflation-forecasting-review-2021/

1 Introduction

1.1 Variation to the Special Access Undertaking

17. NBN Co intends to submit a variation to its special access undertaking (**SAU**) to the Australian Consumer and Competition Commission (**ACCC**) in 2022. This variation will propose a regulatory framework for use in periodic regulatory resets (replacement modules) that will apply from 2023 until the expiry of the undertaking in 2040.

18. The ACCC is required to assess the variation against the "reasonableness criteria" specified in Part XIC of the *Competition and Consumer Act 2010* (Cth) (**CCA**).[4] The reasonableness criteria include the long-term interests of end-users (**LTIE**) including whether the arrangements promote the efficient use of, and investment in, infrastructure, as well as promote the legitimate business interests of the access provider.

19. A key component of NBN Co's proposed regulatory framework for replacement modules is the development of a building block model (**BBM**). A BBM provides NBN Co with a means of recovering its efficient costs, through the recovery of 'building block' costs.

20. One of the building blocks is the return on capital -- the return that suppliers of equity and debt finance would require to invest in NBN Co's supply of core regulated services.[5]

1.2 Purpose of this report

21. Frontier Economics has worked with NBN Co to develop an appropriate methodology for determining a suitable return on capital that will be applied in regulatory resets to 2040 under the varied SAU.

22. This report documents the operation of the methodology as it has been incorporated into nbn's replacement module application and Supporting Submission, and describes how the methodology satisfies the reasonableness criteria including the promotion of the LTIE by facilitating the recovery of NBN Co's benchmark efficient financing costs.

23. The report also covers two other issues that are commonly considered alongside the return on capital:

    a the value of 'gamma' as in input into determining post tax cash flows from the BBM; and

[4] Subsection 152CBD(2) of the CCA requires that the ACCC must not accept an SAU unless the ACCC is satisfied that:

- the terms and conditions of the SAU are consistent with the Category B SAOs in section 152AXB;

- the terms and conditions of the SAU are reasonable; and

- the SAU is consistent with any Ministerial pricing determinations.

[5] Core regulated services are distinct from Competitive Services as defined in the SAU. References in this report to RAB and ABBRR should be read as references to the Core Services RAB Portion and the Core Services ABBRR as defined in the SAU.

b the forecast of inflation that is used to the index the regulatory asset base and determine real straight-line depreciation.

24. The report proceeds as follows:

- In section 2, we describe the approach to determining a suitable return on capital methodology for NBN Co, based on the weighted average cost of capital for a benchmark firm;
- In section 3, we outline the proposed approach to estimate of the return on equity;
- In section 4, we outline the proposed approach to estimate the return on debt;
- In section 5, we consider gearing - the proportion of debt vs. equity financing;
- In section 6, we consider the value of gamma;
- In section 7, we set out estimates for the first regulatory cycle; and
- In section 8, we outline the inflation forecasting methodology.

2 Approach to developing a return on capital methodology

2.1 Key principles and statutory criteria

2.1.1 The role of the return on capital allowance

25. The return on capital allowance is one of the 'building block' allowances that form the basis of the Australian regulatory system. Investors in any business, including a regulated business such as NBN Co, require a return that is sufficient to compensate them for the opportunity costs and risks they bear when committing capital to the firm. The minimum return that a business must pay its investors, in order to attract and retain the capital necessary to finance efficient and prudent investments, is the 'market cost of capital' associated with that investment.

26. The Australian regulatory framework recognises that there are broadly two types of capital investment – equity and debt. Each type of capital requires a particular return, commensurate with the risk of that type of capital investment. The standard approach for estimating the total required return on capital is via the weighted-average cost of capital (WACC), that is defined as:

$$WACC = Return\ on\ equity \times (1 - Gearing) + Return\ on\ debt \times Gearing$$

where:

- $Return\ on\ equity$ represents the cost of equity capital – the return that investors must expect to receive in order to commit equity capital to the firm;
- $(1 - Gearing)$ represents the relative proportion of equity capital;
- $Return\ on\ debt$ represents the cost of debt capital – the return that investors must expect to receive in order to commit debt capital to the firm; and
- $Gearing$ represents the relative proportion of debt capital.

27. This approach for determining the allowed return on capital is well-accepted among Australian regulators, and we consider that it also should be adopted in the SAU.

2.1.2 Guidance from statutory criteria

28. Section 152CBD of the Competition and Consumer Act 2010 sets out the criteria for accepting an access undertaking. This section requires, among other things, that an access undertaking can only be accepted if its terms and conditions are "reasonable." The reasonableness of terms and conditions is addressed in section 152AH, which provides as the first matter to which regard must be had: "whether the terms and conditions promote the long-term interests of end-users of carriage services or of services supplied by means of carriage services."[6]

[6] Competition and Consumer Act 2010 (Cth), s 152AH. The other criteria to which regard must be had are:

- the legitimate business interests of the carrier or carriage service provider concerned, and the carrier's or provider's investment in facilities used to supply the declared service concerned;

29. The central role of the long-term interests of consumers and the economic efficiency of the regulated service closely resembles the National Electricity Objective (NEO)[7] and National Gas Objective (NGO)[8] that guides the operation of the AER's regulatory process. The AER has recently considered the approach to the allowed return on capital that best promotes the long-term interests of consumers, concluding that the allowed return should be set at the best possible estimate of the market cost of capital:

- If the allowed rate of return is set below the firm's true cost of capital, then it will be unable to attract the capital required to make the prudent and efficient investments to deliver the regulated services; and
- If the allowed rate of return is set above the firm's true cost of capital, that would result in consumers paying more than is required in order to deliver the regulated services.

30. On this point, the AER has recently stated that:[9]

> *Setting the expected rate of return in [sic] not a precise science and involves uncertainty and judgement. Due to inevitable uncertainty, there is a risk that the estimated expected rate of return will be higher or lower than the actual market cost of capital. If the expected rate of return deviates from the market cost of capital then it may not promote efficient investment in, and use of, the service provider's energy network in the long term interests of consumers. Therefore, the best possible estimate of the expected rate of return, will promote efficient investment in, and efficient operation and use of, energy network services for the long term interests of consumers.*

31. The AER concluded that setting an allowed return above or below the market cost of capital is likely to be inconsistent with the long-term interests of consumers:[10]

> *Due to inevitable uncertainty, there is a risk that the estimated, expected rate of return will be higher or lower than the market cost of capital. If the expected rate of return deviates from the market cost of capital then the expected rate of return may not achieve the legislative objectives - it may not promote efficient investment in and use of the service provider's energy network for the*

- the interests of persons who have rights to use the declared service concerned;
- the direct costs of providing access to the declared service concerned;
- the operational and technical requirements necessary for the safe and reliable operation of a carriage service, a telecommunications network or a facility;
- the economically efficient operation of a carriage service, a telecommunications network or a facility.

7 National Electricity Law, s 7.

8 National Gas Law 23.

9 AER, May 2021, *Assessing the long-term interests of consumers*, p. 2.

10 AER, May 2021, *Assessing the long-term interests of consumers*, p. 8.

long term interests of consumers. That is, there may be costs associated with the expected rate of return being higher or lower than the market cost of capital.

32. The AER has also noted that the rationale for seeking the best possible estimate of the market cost of capital is that:

- Setting the allowed return too low would lead to inefficient underinvestment and would prevent regulated firms from recovering efficient costs; and
- Setting the allowed return too high would create an incentive for inefficient overinvestment and may lead to inefficient underutilisation of regulated assets.

33. In this regard, the AER has recently stated that:[11]

Each of these principles has an important guiding role when determining an appropriate way to calculate the rate of return in order to achieve the national gas and electricity objectives. For example, ***if the rate of return is set at a rate that is too low to promote efficient investment in infrastructure, it will lead to underinvestment****. It may not allow a provider a reasonable opportunity to recover at least its efficient costs in providing services or complying with regulatory obligations. It will not provide effective incentives for efficient investment in, or provision for, or use of services. It will not be a rate that provides for a return that is likely to be commensurate with the commercial and regulatory risks. It may lead to various economic costs and risks that might arise from under-investment in the network system. All of these factors would compromise the realisation of the national gas and electricity objectives.*

34. Similarly, if the rate of return is set too high, it will provide an incentive to over-invest in network infrastructure. It will not reflect a return that is commensurate with the regulatory and commercial risks. It will not promote efficient investment in the network system and it is likely to lead to underutilised investment in regulated assets.

35. In its recent Position Paper, the AER summed up its proposed approach in terms of 'an unbiased estimate':[12]

In our view, for the 2022 Instrument to advance the NEO and NGO to the greatest degree, the expected rate of return [i.e., the allowed return] should be an unbiased estimate of the expected efficient return, consistent with the relevant risks involved in providing regulated network services.

11 AER, 2018, *Rate of Return Instrument, Final Decision, Explanatory Statement*, pp. 30-31, emphasis added.

12 AER, May 2021, *Assessing the long-term interests of consumers*, p. 12.

If it does, then it will (all else being equal) promote both efficient investment in, and efficient use of, energy network services for the long term interests of consumers.

36. We agree with this analysis and support the conclusion that the allowed rate of return should be set equal to the best possible estimate of the market cost of capital.

2.2 Our approach and NBN Co's proposal

37. We propose that setting the allowed rate of return to the best possible estimate of the market cost of capital best promotes the long-term interests of users of the regulated service.

38. We also propose that:

- The WACC methodology should be capable of producing reliable estimates of the market cost of capital for a benchmark entity in a wide range of plausible market conditions; and
- The WACC methodology should promote stability in the allowed return on capital (and prices for consumers) over time.

39. The WACC formula, i.e. $WACC = Return\ on\ equity \times (1 - Gearing) + Return\ on\ debt \times Gearing$, requires estimates of three components:

- The required return on equity capital;
- The required return on debt capital; and
- Gearing, being the relative proportion of debt capital.

40. The following sections set out our proposed approach, which has been accepted by NBN Co and incorporated into replacement module application and NBN Co's Supporting Submission, to the methodology for deriving these estimates.

3 The return on equity

3.1 The Capital Asset Pricing Model (CAPM)

41. The return on equity allowance represents an estimate of the minimum return that equity investors would require in order to commit capital to a benchmark efficient business delivering the regulated services provided by NBN Co, and to leave that capital invested in the business rather than allocating it to another investment opportunity of comparable risk.

42. The return on equity cannot be observed because it represents a forward-looking, expected/required return. It must therefore be estimated using financial models. In practice, the most common approach to estimating the required return on equity is the Capital Asset Pricing Model (CAPM):

$$Return\ on\ equity = Risk\text{-}free\ rate + Equity\ beta \times Market\ risk\ premium$$

43. where:

- $Risk\text{-}free\ rate$ represents the 'risk-free rate of return.' This is the return that is available to investors on an investment that is completely free of risk. Commonwealth government bonds are usually assumed to be such a risk-free investment;
- $Market\ risk\ premium$ represents the amount of extra return (over and above the return on a risk-free asset) that investors would require for investing in an asset with an average level of risk; and
- $Equity\ beta$ represents the 'equity beta,' which indicates the extent to which the particular investment has more or less risk than average. For example, an equity beta of 0.7 indicates that the investment in is 30% less risky than average, in which case it would require a risk premium that is 30% less than would be required for an investment of average risk.

44. The CAPM is used extensively in practice. For example, all economic regulators in Australia, including the ACCC, routinely use the CAPM to estimate the required return on equity capital. For this reason, we submit that the CAPM should be used to determine the allowed return on equity.

3.2 Internally consistent estimates

45. When implementing the CAPM, it is important to ensure that parameters are estimated in an internally consistent manner. In particular, the risk-free rate and market risk premium parameters can each be estimated as prevailing, forward-looking parameters or as long-run average parameters.

46. It is well-known and well-accepted that both of these parameters vary over time. Risk-free rates (estimated as the yield on government bonds) vary over market conditions. For example, in different market conditions the yield on 10-year government bonds has been higher than 10% and lower than 1%. Similarly, the premium that investors require for risk is materially higher during financial crises than during periods of sustained economic growth.

47. In order to obtain internally consistent and economically meaningful outputs from the CAPM, it is important to ensure that parameters are estimated on a consistent basis. For example:

- Prevailing estimates of the risk-free rate and market risk premium will produce an estimate of the prevailing, forward-looking return that investors require; and
- Long-run average estimates of the risk-free rate and market risk premium will produce an estimate of the long-run average of the returns that investors might require from time to time.

48. When parameters are estimated inconsistently, the result is an output that is not economically meaningful. For example, using a prevailing, forward-looking estimate of the risk-free rate and a long-run historical average estimate of the market risk premium produces an output that has no obvious economic interpretation. Moreover, such an approach produces implausible outcomes over time. For example, government bond yields tend to decline markedly during financial crises (such as the global financial crisis (GFC), European debt crisis, and COVID crisis) as investors move funds to investments with low risk and high liquidity such as government bonds. Thus, pairing the prevailing risk-free rate with the (essentially constant) long-run historical average market risk premium implies that the required return on equity *falls* during financial crises. This is clearly implausible and is therefore not a reasonable basis for setting regulatory allowances.

49. IPART has reached the same view, noting that: [13]

> *In relatively stable market conditions, there may be little difference between long-term historic and current market implied estimates of the expected market risk premium. Since the GFC, market conditions have become significantly more volatile. Estimates of the market implied expected market risk premium are currently above the historic long-term average of 6%.*
>
> *The application of the CAPM using a stable historic market risk premium (of 6%) and a prevailing market rate for the risk free rate means that the cost of equity will move in synchronicity with the risk free rate for a given level of equity beta. If the risk free rate fluctuates significantly so will the cost of equity.*
>
> *In late 2008/early 2009, and then again from late 2011, the risk free rate fell to a 50-year low. The overall effect is that the regulatory cost of equity has fallen and may underestimate the cost of equity for regulated businesses when the risk free rate is low. Conversely, it may overestimate the cost of equity when the risk free rate is high.*

50. IPART went on to explain that:[14]

[13] IPART, *Review of method for determining the WACC: Dealing with uncertainty and changing market conditions*, December 2012 (**IPART discussion paper**) p. 55.

[14] IPART discussion paper, pp. 57-58.

...estimated risk premiums are not stable through time. Risk premiums tend to move in the opposite direction to the risk free rate. As investors may respond to recent losses on riskier assets by shifting to safer assets, prices of those assets are likely to fall, increasing the expected rate of return for a given flow of future dividends. In periods of high risk aversion there is a flight from risky assets to safe assets (such as the risk free rate). This tends to push up the price of safe assets, thereby pushing down their yields. Thus, in these circumstances, a falling risk free rate tends to be associated with rising equity risk premiums (and vice versa).

51. To the extent there is a negative relationship between the risk-free rate and the risk premiums on listed equities, the required return of the equity market (being the sum of risk-free rate and the market risk premium) is relatively more stable than its individual components.

52. In circumstances where the prevailing risk-free rate and market risk premium are negatively correlated, the total required return on equity is more stable than each component – any fall in one tends to be offset by a rise in the other. In these circumstances, the inconsistent pairing of a prevailing risk-free rate with a long-term average market risk premium will tend to:

- Overstate the true required return on equity when risk-free rates are high (as the average market risk premium overstates the true prevailing market risk premium, which tends to be lower when risk-free rates are high); and
- Understate the true required return on equity when risk-free rates are high (as the average market risk premium understates the true prevailing market risk premium, which tends to be higher when risk-free rates are low).

53. In a recent report commissioned by the AER, CEPA investigates the relationship between the prevailing risk-free rate and market risk premium and concludes that: [15]

In the period since 1993, we consider there is a strong and convincing negative relationship between the implied [market risk premium] and the [risk-free rate].

The relationship that we find for Australia is consistent with the data from the US published by Damodaran.

54. CEPA further concludes that there is "no good evidence" to support an approach that pairs a prevailing risk-free rate with a long-run average market risk premium within the CAPM.[16]

55. The desire to avoid an approach that mixes prevailing and long-run average parameters and which produces implausible outcomes over time has led IPART to adopt an approach that involves:

[15] CEPA, June 2021, *Relationship between RFR and MRP*, p. 6, emphasis added.

[16] CEPA, June 2021, *Relationship between RFR and MRP*, pp. 6, 44.

- Deriving an estimate of the cost of equity using only current market data, whereby a contemporaneous estimate of the risk-free rate is coupled with a contemporaneous estimate of the market risk premium. IPART refers to this estimate as the 'current' cost of equity.
- Deriving an estimate of the cost of equity using only long-term historical averages, whereby a long-term average risk-free rate is coupled with a long-term average market risk premium. IPART refers to this estimate as the 'long-term' or 'historic' cost of equity.
- As a default position, determining the allowed cost of equity by giving equal weighting to the current and long-term average estimates.

56. In a subsequent review of its approach to setting allowed returns, IPART has affirmed its approach, noting the problems that arise from pairing inconsistent parameter estimates within the CAPM:[17]

> *We consider it would be invalid to combine a current risk-free rate with a historic market risk premium, because the result of that calculation would not represent the state of the equity market at any point of time. By combining a current estimate of the risk-free rate with a current market risk premium estimate, we can approximate the current market price of equity. Likewise, by combining a historic estimate of the risk-free rate with a historic market risk premium estimate, we can approximate the historic average market price of equity. Either of these benchmarks would be a valid point of reference. When we combine the risk-free rates and market risk premium estimates in this time-consistent way, the current cost of equity is closer to the historic average cost of equity than either of them is to the time-inconsistent sum.*

57. In a recent submission to ESCOSA's review of SA Water's regulated prices, IPART further explained why the approach of pairing a prevailing risk-free rate with a long-run average market risk premium is likely to produce unreasonably low return on equity allowances in the current market conditions. IPART submitted that:[18]

> *As spot risk free rates are very low right now and the long-term [market risk premium] is lower than the current [market risk premium], this procedure gives a low estimate of the cost of equity…*
>
> *This approach will generate biased estimates of the market cost of equity because it combines incompatible short term and long term market observations. As you note in your statement of reasons (p 156) Frontier Economics recommended that, because there is an inverse relationship between the [market risk premium] and risk-free rate, it is important to adopt an approach to*

[17] IPART, *Review of our WACC methodology*, February 2018, pp. 51-52.

[18] IPART, *Submission on Draft Report, SA Water Regulatory Determination 2020*, 3 April 2020, pp. 2-3.

estimating the required return on equity that pairs the risk-free rate consistently with the [market risk premium]. We agree with Frontier on this point.

58. Our approach avoids the possibility of bias that arises when the two parameters are estimated inconsistently. Both current and long-term average cost of equity estimates employ matched market risk premium and risk-free rate observations. It is highly significant that our current and long-term average cost of equity estimates are quite similar to each other.

59. We submit that:

- When implementing the CAPM, it is important to ensure that parameters are estimated in an internally consistent manner. For example, pairing an estimate of the prevailing risk-free rate with the long-term average market risk premium is likely to produce estimates that are biased and even implausible in some market conditions.
- The allowed return on equity should be set using the (internally consistent) IPART approach of:
  - Pairing prevailing, forward-looking estimates of the risk-free rate and market risk premium to produce a prevailing estimate of the required return on equity;
  - Pairing long-term average estimates of the risk-free rate and market risk premium to produce a long-term average estimate of the required return on equity; and
  - Applying 50% weight to each estimate.

3.3 Prevailing risk-free rate

60. The prevailing risk-free rate represents the prevailing rate of return available to investors on an investment with zero risk. It is standard commercial and regulatory practice to estimate the risk-free rate using the yields on government bonds. This leaves only the question of the term that should be used. The standard approach among Australian regulators is to estimate the risk-free rate as the yield on 10-year government bonds. This approach is currently used by the AER, ACCC, IPART, QCA, ICRC, ESCOSA and ESCV.

61. Although the AER is currently considering a 5-year term as part of its process for the *Rate of Return Instrument*, it has used a 10-year term in all of its decisions to date on the basis that a 10-year term:

- Reflects the actual practices of investors;
- Is more consistent with the theory of the SL CAPM; and
- Best reflects well accepted academic literature.

62. For example, the AER has concluded that: [19]

We consider the use of a 10 year term will lead to an overall rate of return that will better contribute to the achievement of the NEO and NGO. We consider a 10 year term is consistent with the theory of the Sharpe-Lintner CAPM which is a single period equilibrium model, estimating the returns an

[19] AER, *Rate of Return Instrument Explanatory Statement*, December 2018, p. 126.

investor requires over a long-term investment horizon. The 10-year term also reflects the actual investor valuation practices and academic works.

63. In relation to consistency with the theory of the SL CAPM, the AER explained that the standard approach is to adopt a term that reflects the life of the assets: [20]

We use the CAPM to estimate how an investor will value the potential returns from an investment in an infrastructure business with long-lived underlying assets. Equity investors seek out efficient returns for their diversified investment portfolio over long-term investment horizons. Although reinvestments may be [made] more frequently, they are still being made with reference to a long-term equilibrium rate of return. This will reflect the excess return required for bearing the systematic risk of the investment over the return on a long-term riskless asset.

64. The AER has also noted that the standard approach adopted by market practitioners, and advocated in the academic literature, is a 10-year term: [21]

We find support for using a 10 year term in actual investor valuation practices, and academic works. The 2013 and 2017 KPMG market practitioner surveys indicate around 85 per cent of practitioners use 10 year CGSs as a proxy for the risk free rate. Academic works by Pratt & Grabowksi (2010), and Damodoran (2008) also argued that 10 year CGS yields were appropriate proxies for the risk free rate, as they reflect the long-term nature of the underlying assets.

65. For example, the leading Berk and DeMarzo textbook indicates that:[22]

*When discounting risk-free cash flows we **match the maturity of the interest rate to that of the cash flows**. It is common to do the same when applying the CAPM…For example, where valuing a*

[20] AER, *Rate of Return Instrument Explanatory Statement*, December 2018, p. 127.

[21] AER, *Rate of Return Instrument Explanatory Statement*, December 2018, p. 127.

[22] Berk, J. and P. DeMarzo, 2020, *Corporate Finance: Global 5th edition*, pp. 447-448.

> *long-term investment with an indefinite horizon, such as a stock, most financial analysts report using the yields of **long-term (10-30 year) bonds** to determine the risk-free interest rate.*

66. And the well-known McKinsey corporate valuation manual also recommends the use of long-term bonds:[23]

> *Use longer-term bonds; they will be better in line with the time horizon of corporate cash flows.*

67. Independent expert valuation reports, issued in conjunction with major corporate transactions, also adopt a 10-year risk-free rate as standard practice. For example, the recent KPMG expert report in relation to the Spark Infrastructure transaction states that: [24]

> *The risk-free rate of return is the return on a risk-free security, typically for a long-term period. In practice, long dated government bonds are accepted as a benchmark for a risk-free security. In Australia, the spot yield to maturity of 10-year Australian Government Bonds has traditionally been accepted as a proxy for the risk-free rate in determining a cost of equity under the CAPM. Further, the market in 10 year Australian Government Bonds is liquid such that, in our view, the current yield on government bonds represents the best indicator of the risk free opportunity cost of the assets for the forthcoming 10 year period at any particular point in time.*

68. Similarly, the Grant Samuel expert report in relation to the recent AusNet Services transaction observes that: [25]

> *The ten year bond rate is a widely used and accepted benchmark for the risk free rate.*

69. For all of the above reasons, we submit that the prevailing risk-free rate should be estimated as the prevailing yield on 10-year government bonds.

70. In relation to the technical estimation of the prevailing 10-year government bond yield, we propose that the approach adopted by the AER should be used. This involves:

23 Koller, T., M. Goedhart and D. Wessels, 2015, *Valuation*: 6th University Edition, Wiley, p. 290.

24 KPMG, *Independent expert report for Spark Infrastructure*, October 2021, p. 101.

25 Grant Samuel, *Independent expert report for AusNet Services*, December 2021, Appendix 3, p. 4.

- Interpolating between the Australian government bonds with just less, and just more than, 10 years to maturity to obtain an estimate of the yield with precisely 10 years to maturity;
- Converting the quoted semi-annual yield to an annual basis using the conversion formula:
  - $Annualised\ yield = \left(1 + \frac{Semi-annual\ yield}{2}\right)^2 - 1$; and
- Taking an average of the annualised yields over the 40 business days prior to the date of the regulatory determination.

71. This approach is illustrated in the AER's risk-free rate model.[26]

3.4 Long-run risk-free rate

72. The long-run risk-free rate represents the long-run average rate of return that investors would expect to receive on a risk-free investment. For the reasons set out above, NBN Co proposes that the yield on 10-year government bonds should be used as a proxy for the risk-free rate. Thus, what is required is an estimate of the long-run average yield on 10-year government bonds.

73. The Commonwealth Government's *2021 Intergenerational Report* considers three scenarios for the future evolution of the 10-year government bond yield. These scenarios were developed by the Reserve Bank of Australia and the Commonwealth Treasury. In all three scenarios, the rate is assumed to "converge to a long-run rate of around 5 per cent, consistent with the nominal GDP growth rate." The scenarios differ only in terms of the length of time taken for that convergence, projecting that the yield will remain at about 5% indefinitely thereafter.[27]

74. Consequently, we submit that the long-run risk-free rate should be fixed to 5% in accordance with the RBA/Commonwealth Treasury projections set out in the *2021 Intergenerational Report*.

75. After feedback from stakeholders, we have further considered whether it might be appropriate to estimate the long-run risk-free rate as the average over some historical period. We agree that this would be an appropriate approach to estimating the long-run risk-free rate (and would expect that it would be similar to the future long run projections).

76. We consider it appropriate to begin that historical period in April 1993 on the basis that:

    a The charter of the Reserve Bank of Australia changed in March 1993. Since that time, the RBA has used interest rate settings to target inflation outcomes within a 2-3% band. Consequently, earlier data (including periods of very high rates in the 1980s) are less relevant to long-run forward-looking expectations; and

    b The period beginning in 1993 overlaps largely with the period from 1988 which is used when estimating the historical average MRP. It is important that the long-run estimates of the risk-free rate and MRP are broadly consistent in this manner.

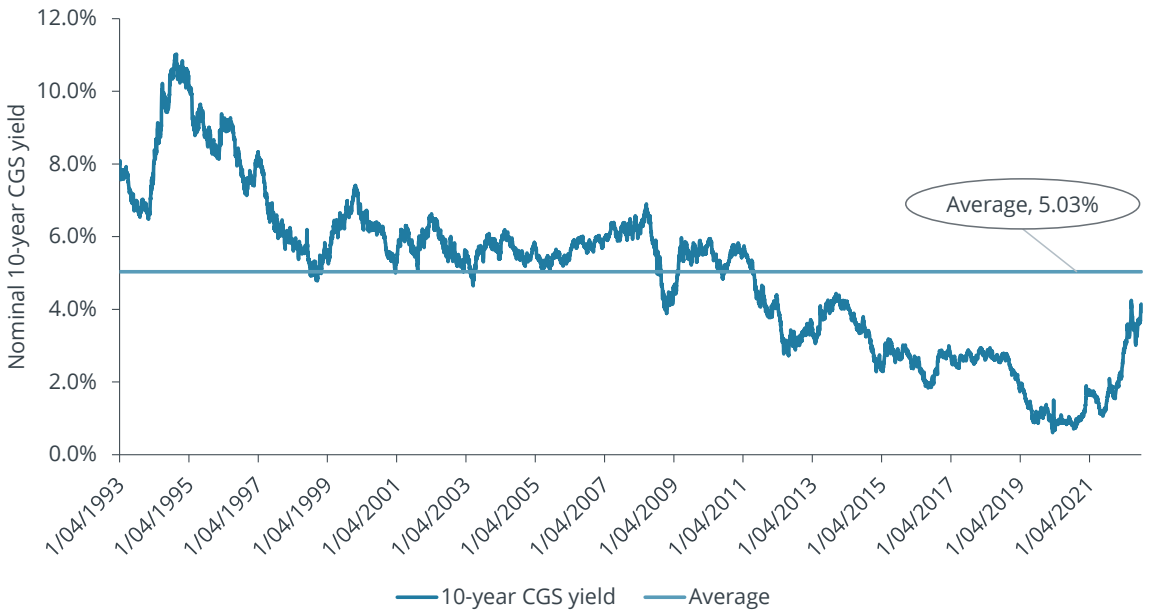
77. We have estimated the average yield on 10-year government bonds between April 1993 and December 2021, and note that the average is slightly above 5%, as shown in **Figure 1** below. We

[26] See, for example, https://www.aer.gov.au/system/files/AER%20-%20Final%20decision%20ActewAGL%20-%20Rate%20of%20return%20Risk%20free%20rate%20model%20-%20May%202016.XLSX.

[27] Commonwealth of Australia, *2021 Intergenerational Report*, June 2021, Chart 6.5, p. 85.

note that this is consistent with the estimate set out in the *Intergenerational Report*, so we maintain that 5.0% estimate throughout this report.

Figure 1: Historical 10-year government bond yields



Source: Reserve Bank of Australia

3.5 Prevailing market risk premium

78. The prevailing market risk premium represents the return that investors would currently require, over and above the prevailing risk-free rate, to provide equity capital for an investment of average risk. It is a forward-looking estimate of the market risk premium to be paired with the prevailing risk-free rate.

79. The sum of the prevailing risk-free rate and the prevailing market risk premium provides an estimate of the prevailing total return on equity required for an investment of average risk. In the regulatory setting, this is frequently referred to as the prevailing 'total market return' (TMR). Thus:

$$Total\ market\ return = Risk\text{-}free\ rate + Market\ risk\ premium.$$

80. The standard approach to estimating the prevailing TMR is via a dividend growth model (DGM). A DGM estimates the TMR as the rate of return that equates the present value of forecasted dividends with the currently observable price for a broad stock market portfolio. The general mathematical specification of the DGM is as follows:

$$Current\ price = \frac{Forecast\ Dividends\ in\ Year\ 1}{(1+TMR)^{0.5}} + \frac{Forecast\ Dividends\ in\ Year\ 2}{(1+TMR)^{1.5}} + \cdots$$

where:

- $Current\ price$ represents the observable price for a broad stock market index such as the ASX 200 or All Ordinaries index;

- $Forecast\ Dividends\ in\ Year\ 1$ represents the dividends that an owner of the portfolio of stocks that make up the relevant index would expect to receive over the forthcoming year;
- $Forecast\ Dividends\ in\ Year\ 2$ represents the dividends that an owner of the portfolio of stocks that make up the relevant index would expect to receive over the subsequent year;
- Dividends for each year are discounted back from the middle of that year – consistent with the assumption that dividends are paid uniformly throughout the year; and
- TMR represents the total market return. It is the discount rate that equates the present value of forecasted dividends with the observed current price.

81. The DGM has a strong theoretical foundation in that it simply requires that the current asset value must equal the present value of the future cash flows that the asset owner would expect to receive. For example, the leading corporate finance textbook by Berk and DeMarzo refers to the DGM as the "fundamental approach," explaining that:[28]

> *We can take a fundamental approach toward estimating the market risk premium. Given an assessment of firms' future cash flows, we can estimate the expected return of the market by solving for the discount rate that is consistent with the current level of the index.*

82. In this regard, the AER has stated that: [29]

> *DGMs are recognised financial models that are commonly used in practice,*

and that: [30]

> *DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches,*

and that: [31]

28 Berk, J. and P. DeMarzo, 2020, *Corporate Finance:* Global 5th edition, p. 449.

29 AER, 2013, *Rate of Return Guideline, Explanatory Statement*, p. 96.

30 AER, 2013, *Rate of Return Guideline, Explanatory Statement*, Appendices, p. 85.

31 AER, 2013, *Rate of Return Guideline, Explanatory Statement*, p. 96.

DGMs are suited to the estimation of the rate of return from current market information, as demonstrated by US regulators using them for this purpose.

83. In a recent report commissioned by the AER, Brattle noted that it was common for economic regulators to use the DGM approach to inform their estimates of the market risk premium.[32] By way of example, the US Federal Energy Regulatory Commission (FERC) has identified the merits of the DGM approach (which is called the 'discounted cash flow' approach in the US) as follows:[33]

The market risk premium, which is where most CAPM studies diverge, can be estimated either using a backward-looking approach, a forward-looking approach, or a survey of academics and investment professionals. A CAPM analysis is backward-looking if its market risk premium component is determined based on historical, realized returns. A CAPM analysis is forward-looking if its market risk premium component is based on a DCF study of a large segment of the market. In a forward-looking CAPM analysis, the market risk premium is calculated by subtracting the risk-free rate from the result produced by the DCF study.

84. The implementation of the DGM approach differs in terms of the methods used to forecast future dividends. This leads to the possibility that different specifications of the DGM might produce somewhat different estimates of the market risk premium at any point in time. IPART addresses this issue by estimating three well-established specifications to inform its estimate of the forward-looking market risk premium. IPART explains the rationale for using multiple specifications of the DGM as follows:[34]

An implied [market risk premium] estimate is likely to be sensitive to the specific model chosen by us, since each model makes certain underlying assumptions. We consider that employing a number of models to estimate the implied [market risk premium] reduces these concerns and enhances the robustness of our implied [market risk premium] estimate, leading to a better and more robust estimate of the cost of equity using current market data.

85. The three DGM specifications adopted by IPART are:

- Damodaran (2013);[35]

32 Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020.

33 FERC Opinion 531B, Paragraph 108.

34 IPART, *WACC methodology: Draft report*, September 2013, p. 15.

35 Damodaran, A., *Equity risk premiums (ERP): Determinants, estimation and implications – The 2013 edition*, 2013, pp 63-73.

- Bank of England (2002);[36] and
- Bank of England (2010).[37]

86. The formal mathematical specifications for these three approaches are set out in the Final Report from IPART's 2013 WACC Review. [38]

87. We submit that these three approaches should be used to inform the estimate of the prevailing market risk premium.

88. We also submit that the 'calibrated DGM' approach recently proposed by Energy Networks Australia (ENA) should also be used. ENA has proposed an approach that is based on the AER's preferred specification of the DGM with one amendment – the assumed long-term dividend growth rate is selected to ensure that the average market risk premium estimate produced by the model over an historical period equates with the average observed market risk premium over the same period. This specification of the DGM is set out in a submission to the AER.[39]

89. In the AER's 2018 Rate of Return Instrument review, the AER identified two principal concerns with the DGM approach. The AER considered that:

- DGM estimates of the market risk premium could be systematically upwardly biased—for instance, due to the 'stickiness' of dividends, and because analysts' earnings forecasts (an input to the DGM) may be systematically over-optimistic; and
- There is considerable uncertainty over the appropriate long-run growth rate estimate to apply in the DGM.

90. The calibrated DGM approach proposed by ENA seeks to address both of these concerns directly and simultaneously by calibrating (i.e., selecting) the long-run growth rate such that the average market risk premium estimate over a long historical period is equal to the observed average market risk premium over that same period (i.e., 6.5% below).

91. Feedback from stakeholders has also indicated that NBN Co should consider whether all of the forward-looking estimates of the market risk premium should be calibrated to ensure that they are consistent, on average, with the estimate of the long-run average market risk premium. We agree that it is appropriate to ensure that all estimates are calibrated in this way.

92. We perform the calibration for each of the four specifications by selecting the (unique) long-run dividend growth rate that equates:

    a The average DGM estimate from 1988 to 2021; and

    b The average observed MRP over that same period.

93. For the three IPART specifications, the required data is available only back to 2000. For this reason, we perform a 'back-casting' exercise to reconstruct estimates from 1988 to 2000. This back-casting exercise is implemented by:

36 Bank of England, *Analysts' earnings forecasts and equity valuations*, 2002.

37 Bank of England, *Interpreting equity price movements since the start of the financial crisis*, 2010.

38 IPART, *WACC methodology: Final report*, December 2013, pp. 33-35.

39 Energy Networks Australia, *Estimating the cost of equity*, September 2021, available at https://www.aer.gov.au/system/files/ENA%20-%20Submission%20-%20Equity%20-%203%20September%202021.pdf.

a Regressing the MRP from the specification in question on the MRP from the AER-style calibrated DGM using data from 2000 to 2021. This yields an estimate of the relationship between the estimates from the two approaches.

b We then use the fitted relationship to determine the expected estimate from the specification in question, conditional on the observations from the AER-style calibrated DGM for the 1988 to 2000 period.

94. We estimate the prevailing MRP for each of the four models as at December 2021, all calibrated to be consistent with the average observed MRP over the 1988 to 2021 period. We report results using the adopted gamma estimate of 0.585, for the reasons set out in Section 6 below. These estimates are set out in **Table 3** below, although we note that they will be updated to reflect data prevailing at the time of the ACCC's determination.

Table 3: Prevailing forward-looking estimates of the MRP as at October 2022

DGM specification	MRP
AER 3-stage	6.73%
Damodaran	7.95%
Bank of England 2002	8.91%
Bank of England 2010	7.95%
Average	7.89%

Source: Frontier Economics analysis.

3.6 Long-run average market risk premium

95. The long-run average market risk premium can be estimated by taking the average excess market return over a long historical period. The excess market return for each year is computed by taking the total return on a broad stock market index (such as the ASX 200 or All Ordinaries Index) and subtracting the yield available on 10-year government bonds that year. The long-run average of these excess returns provides an indication of the market risk premium that investors might expect on average over the long run.[40]

96. **Table 4** below presents long-run average historical excess returns over different averaging windows considered by the AER. Because the assumption on gamma also affects the estimates of historical excess returns, we present estimates using our adopted gamma estimate of 0.585. Based on these historical averages, we conclude that an estimate of 6.5% for the long-run average market risk premium is reasonable.

[40] For clarity, both the prevailing and long run average approaches are estimates of a long-run MRP. The first is conditional on current market conditions and the second is the unconditional average.

Table 4: Historic Excess Returns based market risk premium estimates

Historic period	MRP
1883-2021	6.41%
1937-2021	6.21%
1958-2021	6.74%
1980-2021	6.80%
1988-2021	6.51%
2000-2021	6.78%

Source: S&P, RBA, AER data; Frontier Economics analysis.

3.7 Equity beta

3.7.1 Use of standard regression analysis applied to comparator firms

97. The standard approach to estimating equity beta involves a regression analysis to quantify the relationship between stock returns and market returns using a sample of comparator firms.[41] For each comparator firm, a series of historical stock returns is regressed against a corresponding series of returns from a broad stock market index, such as the ASX 200 index in Australia. The slope of the regression line is an estimate of the equity beta for that comparator. Estimates for a number of comparator firms are then used to inform the beta to be adopted for the particular regulated business in question.

3.7.2 Selection of comparator firms

98. The SAU proposes (clause 2G.2.4) that the rate of return will be determined by estimating a WACC commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to NBN Co in providing the NBN Access Service, Ancillary Services and Facilities Access Service (the regulated services). This means that, in considering the composition of a sample of comparator firms for the estimation of the equity beta, we should pay particular attention to whether the benchmark comparator firms face a similar degree of risk to NBN Co when it provides the regulated services.

99. In the March Variation, NBN Co proposed that the comparator sample should be drawn from the sample adopted by the ACCC in its 2015 Final Access Determination in relation to Telstra's fixed line services delivered by Telstra's copper network, expanded by adding firms identified by the New Zealand Commerce Commission (the Commerce Commission) in a recent pricing determination for Chorus. The key rationale for this was that the core regulated services provided by NBN Co are very similar (in terms of their risk characteristics) to the fixed line services that were the subject of

[41] It is also sometimes feasible to directly estimate a particular firm's equity beta. However, NBN Co is not listed and so it is not feasible to include its equity beta estimate in the comparator set.

that 2015 ACCC determination (copper fixed line services) and those of Chorus (fibre fixed line services).

100. Feedback to NBN Co has sought further explanation and consideration of the risks (and particularly the systematic risks[42]) faced by NBN Co and the degree to which these are similar to those faced by (i) comparators that might be drawn from the telecommunications sector and (ii) comparators that might be drawn from outside of the telecommunications sector, such as energy or water network providers.

First principles analysis

101. There are two steps that regulators typically follow when estimating beta (and gearing) for regulated businesses:

    a The first step is to consider the systematic risk profile of the benchmark efficient entity. This typically involves identifying the characteristics of the entity's cost and demand structure that determine how much systematic risk it is likely to bear. This is sometimes called a 'first principles' analysis.

    b The second step is to determine a comparator sample that best represents the likely risks for that firm, taking into account the systematic risk profile of the regulated business, as identified by the first principles analysis.

102. We emphasise that the steps are not a simple exercise of finding a benchmark firm or firms that have the most similar risk profile to NBN Co. There is a trade-off that must be made between the benefits of identifying comparator firms that have a very similar risk profile and the statistical benefits associated with larger samples of comparator firms. Small samples tend to produce estimates that vary considerably over time due to random statistical noise rather than true changes in underlying systematic risk. Therefore, restricting the sample to a small number of the most comparable firms would likely produce estimates that are statistically unreliable.

103. This means that in order to obtain reliable estimates of beta (and gearing), one needs to expand the comparator sample to include more firms. However, in practice, it is very challenging to find a large number of comparator firms with very similar risk characteristics to the firm being regulated. This typically means that the stricter the requirement to select only closely comparable peer firms, the smaller will be the sample of comparators. However, the smaller the sample of comparators used to estimate gearing and beta, the lower will be the statistical reliability of those estimates. In order to improve statistical precision, a pragmatic compromise often needs to be made, whereby a broader set of peer firms are permitted into the sample, but no so broad as to include firms that share few risk characteristics.

A first principles analysis of relevant risks

104. In undertaking this first step, we seek to identify the key elements of the benchmark entity's services that determine how its net cash flows (revenues less operating costs) might be to correlated to movements in the broader economy. That is, we seek to identify characteristics that are associated with the level of systematic risk pertaining to the benchmark entity.

105. Many business characteristics could potentially be relevant to systematic risk. Some that are commonly considered by regulators include demand or revenue risks, operating leverage, growth opportunities and the nature of the regulatory framework. In **Table 5**, we discuss the rationale for

[42] As it is only the systematic, or market-related, risks that are compensated for in the CAPM.

the further consideration of these factors, although we emphasise that the empirical evidence supporting the significance of particular systematic risk factors on observed betas is often absent.[43]

Table 5: Potential factors affecting business systematic risk

Risk factor	Rationale
Demand / revenue risk (income elasticity)	Services with relatively higher income elasticity of demand (which measures how consumption changes with incomes) are hypothesised to have higher asset betas (other things being equal), as demand for their services and products are likely to be more sensitive to fluctuations in economic conditions. Note also that the extent of a firm's exposure to systematic demand risk may also be determined by the regulatory framework they operate within (if any), the nature of contracts with their customers, and price structure. For example, long-term "take or pay" contracts are likely to smooth revenues and so may reduce the firm's exposure to such risks. Revenue caps are thought to smooth the returns of regulated businesses compared to price caps, and are also therefore thought to reduce exposure to systematic risk. However, the empirical evidence for this is mixed at best. Charges with high fixed components and low usage components may also reduce risk.
Growth opportunities	Higher growth opportunities may increase beta, because future investments are more affected by the economic cycle than firms with mature businesses.
Operating leverage	Operating leverage represents the ratio of fixed (operating) costs to variable costs. Other things being equal, firms with higher operating leverage are more affected by economic cycles because it is more difficult for a firm with high fixed costs to reduce its costs during an economic downturn. Consequently, firms with high operating leverage tend to have higher betas, other things being equal.
Competition and market power	Other things being equal, firms facing less competition may have lower betas. However, the evidence on the extent of the effect appears to be inconclusive. For example, it may depend on whether a firm can use its market power to structure returns to reduce risk (e.g., through take or pay contracts to reduce volume risk). This effect can be related to asset stranding risk where competition means that downturns can lead to substitution to (cheaper) sources of supply.
Asset stranding	Asset stranding refers to the risk that a sustained downturn in demand may result in the firm being unable to fully recover the value of its investments. Other things being equal, firms that are more exposed to asset stranding are expected to have higher betas. This arises because asset stranding is more likely to occur during market downturns.

[43] In undertaking this assessment we have had regard to the relative risk assessment of consultants to the Commerce Commission, CEPA, in *Cost of capital for regulated fibre telecommunication services in New Zealand: Asset beta, leverage and credit rating*, May 2019.

Risk factor	Rationale
Company size	Other things being equal, smaller firms may have higher asset betas, although this hypothesis has limited academic or regulatory support.
Long-lived investments	Longer-lived investments may bear more risk as the investment will be affected by uncertain macroeconomic risks over a longer period of time.

Source: Frontier Economics

Demand and revenue risk

106. With respect to demand and revenue risk for a benchmark entity, it is pertinent to note the following characteristics of NBN Co's services:

    a NBN Co offers broadband services for access to its high speed fixed line, wireless and satellite networks, together with ancillary and facilities access services.

    b Most of NBN Co's revenues are derived from monthly payment services sold to RSPs which sell directly to residential end users (i.e. via a wholesale arrangement).

    c There are no longer-term or take-or-pay contracts that insulate NBN Co from demand risk; that is, NBN Co relies on retail demand for broadband services, and cannot shield itself from systematic fluctuations in retail demand any more effectively than retail service providers.

    d Prices have fixed and variable usage components, although the balance is shifting towards fixed monthly payments with the eventual removal of CVC charges. These fixed charges do however vary by speed and/or quality.

    e All of NBN Co's services are regulated, with most Core Services proposed to be under a weighted-average price control with sub-caps.

    f Demand and revenue risk for NBN Co can arise from (i) loss of customers or (ii) shifting of customers to cheaper, lower speed or quality products. The extent of this risk is challenging to assess empirically, as NBN Co has been in a growth phase that is unrelated to changes in economic activity. The extent to which broadband services more generally are income elastic is unclear, with our opinion being that very high speed services likely to be more elastic than lower-speed, basic broadband service. This opinion is informed by the expectation that newer and faster broadband internet services are likely to be perceived more as "luxury" goods. This perhaps explains why historic estimates of broadband income elasticity were relatively high (close to 1)[44] and why more recent elasticity estimates show a positive relationship between elasticity and speed (i.e. services with higher speeds show higher demand elasticities).[45]

107. These features indicate that, although broadband may increasingly be seen as an essential service, the nature of NBN Co's supply arrangements do not protect or insulate it from systematic risks.

[44] In particular, it would be expected that newer and faster broadband internet services are likely to be perceived more as "luxury" goods. This perhaps explains why historic estimates of broadband income elasticity were relatively high (close to 1). See for example Cadman and Dinean (2009) *Price and income elasticity of demand for broadband subscriptions: a cross sectoral model of OECD countries*, Strategy and Policy Consultants Network Ltd.

[45] See V. Lindlacher, "Low demand despite broad supply: Is high-speed Internet an infrastructure of general interest?", *Information Economics and Policy*, Volume 56, September 2021.

Further, given NBN Co's supply arrangements, we do not see any evidence that there would be a substantive difference between the systematic risk of (a) suppliers of wholesale and retail broadband services, and (b) a wholesale-only entity such as NBN Co. The market conditions that would result in a retail service provider losing customers or volumes would likely have the same effect on NBN Co.

Growth opportunities

108. NBN Co has growth opportunities related to increased usage of its network and the upgrading of its network to full-fibre and then to higher speed fibre services. We would expect such opportunities to be similar to other telecommunications firms, but higher than firms operating in more mature utility industries such as water and energy.

109. We recognise that some energy networks (notably electricity networks) are currently undergoing rapid growth as many economies embark on ambitious decarbonisation programs. However, this is a very recent development—meaning that any effect of new growth opportunities being experienced by some energy networks will not be reflected in the historical returns required to estimate betas.

Operating leverage

110. NBN Co has very high operating leverage, with high fixed operating costs relating to network operation and maintenance. This is reflected in EBITDA margins that are approaching 60%. It is also reflected in NBN Co's annual revenue growing by 21% between June 2020 and June 2021 as a result of a 13% increase in premises connected while operating expenses actually fell by 1%, suggesting that operating expenses are largely fixed.[46]

Competition risk

111. NBN Co faces a considerable degree of competition risk from alternative suppliers of broadband services. These risks are highlighted in Part A, Chapter 3 of NBN Co's supporting submission accompanying the SAU. While we do not repeat all of these arguments it is sufficient to note that NBN Co estimates that, as at October 2022, approximately 2.9 million (or 26%) of about 10.4 million residential premises are connected to a competing non-nbn broadband network with 2.4 million using a competing fixed wireless or mobile network alone for broadband services. Of course, even this understates the true potential for substitution as one would also need to consider what would happen if NBN Co was to increase its prices (i.e., noting that NBN Co is already constrained in its pricing by competition).

112. The international comparator set contains a number of entities that operate mobile as well as fixed broadband networks. This raises the question of whether the systematic risk of mobile and fixed network suppliers is likely to be higher or lower than for a benchmark entity that operates a fixed network alone. We have not seen any recent evidence that the beta associated with the supply of mobile broadband services is higher than that associated with the supply of fixed broadband services.[47] While it is true that suppliers of mobile services may face more competition, in an

[46] https://www.nbnco.com.au/content/dam/nbn/documents/media-centre/media-statements/2021/nbn-co-fy21-full-year-results-presentation.pdf

[47] As noted in Schmitt and Neu, it may well have been the case that historically the systematic risk associated with mobile services was higher, but it is no longer clear this is the case: "Historically, regulators have specified different costs of capital for regulated fixed network and mobile services. The reason for setting a higher cost of capital for mobile operations was risk that was assumed to be higher for mobile operations, as mobile services were seen as a "luxury good" with a relative high immaturity when first introduced." See Schmitt, Stephan; Neu,

environment where mobile penetration in most mature economies exceeds 100%, it seems very unlikely that consumers are likely to respond to downturns in the economic cycle by disconnecting from mobile networks entirely, or by otherwise reducing their demand for mobile services in a manner that is very different to fixed broadband services. That is, aggregate retail demand for mobile services is unlikely to be very sensitive to economic cycles in a similar way to fixed broadband services. Indeed, this also seems consistent with more recent empirical evidence.[48]

Stranding risk

113. It is difficult to specifically identify the systematic component of stranding risk, but it is pertinent to note that NBN Co already faces material stranding risks as exemplified by its inability to recover the full amount of the ICRA to the period 2040 as originally envisaged. It seems likely that more of these accumulated losses are likely to be written down when economic conditions are challenging than when they are buoyant. Thus, there would appear to be a systematic element to this stranding risk.[49]

Company size

114. NBN Co is a moderately large firm. However, its revenues are lower than some of its customers including Telstra, Singtel and only slightly larger than those of TPG Telecom. Further, its revenues are relatively small in comparison to other firms in the comparator set of international telecommunications firms.

Long-lived investments

115. NBN Co's investments in its networks are likely to be moderately long-lived, although this varies by technology. Also, NBN Co's networks are being upgraded over time, which would limit this systematic risk. A key reason why telecommunications firms need to upgrade their networks relatively more frequently than firms operating in other infrastructure sectors (e.g., energy and water) is because telecommunications assets are more prone to rapid technological advances and technical obsolescence. This adds to the stranding risks faced by telecommunications firms, compared to firms in other infrastructure sectors.

Comparison with firms in other sectors

116. We have also considered whether it may be appropriate to expand the sample of telecommunications comparators used to estimate a benchmark gearing and beta to include firms from other sectors, such as energy networks and water utilities. This might be helpful for two

Werner (2017) : *The beta in the WACC for regulated fixed and mobile telecommunications services: Its role and robust estimation*, 28th European Regional Conference of the International Telecommunications Society (ITS): "Competition and Regulation in the Information Age", Passau, Germany, 30th July - 2nd August, 2017, International Telecommunications Society (ITS), Calgary.

48 ibid.

49 See Commerce Commission, *Fibre input methodologies: main final decisions – reasons paper*, 13 October 2020, from p. 541. We observe the Commerce Commission stated at [6.1038] that "…stranding risk can possibly have a systematic component when the drivers for stranding risk have some correlation with the overall market. In this case, the firms in the sample set we use to calculate the asset beta would also face stranding risk, and this would be captured in our estimate of the asset beta for regulated FFLAS (ie in this case, the cost of equity that is derived from the CAPM would provide some compensation for stranding risk)." The implication is that although stranding risk can be difficult to identify as a systematic risk, to the extent that there are systematic risks they should be captured through estimation of beta using a sample of entities that face similar stranding risks. It is further pertinent to note that the Commerce Commission allowed for certain regulatory changes including an ex ante allowance to account for the non-systematic component of Chorus's stranding risks. NBN Co has not sought a similar *ex ante* allowance.

reasons (i) if there were certain key risk characteristics of NBN Co that were very similar to those of energy networks (or other kinds of utilities) or (ii) if there were insufficient comparators within the telecommunications industry to produce a statistically reliable beta estimate.[50]

117. For this to be a reasonable approach, it would be necessary for any additional comparators drawn from outside the telecommunications industry to share very similar systematic risk characteristics to NBN Co. If those additional firms have dissimilar risk characteristics to NBN Co, then one would expect the inclusion of those firms in the comparator sample to introduce bias into estimates of gearing and beta, rather than improve the estimates of those parameters. By way of example, the Australian Energy Regulator (AER) expressly ruled out consideration of non-energy firms as comparators. For instance, the AER states that:

> *Different sectors of the economy are expected to have different characteristics which will lead to different risk profiles. By limiting the benchmark to energy network businesses we are limiting the possibility that risks will be dissimilar due to sectoral differences.*[51]

118. Therefore, it would be sensible to, on a first principles basis, consider how the risk characteristics of energy networks compare to the characteristics of broadband network firms such as NBN Co.

119. We conclude from this analysis that energy networks do share some risk characteristics with NBN Co – energy networks have high operating leverage, are of a similar size, and may have growth opportunities related to decarbonisation (although—as discussed above, those growth opportunities have emerged only very recently). However, we note that there are a number of important differences:

- Most electricity networks in Australia are regulated under revenue caps, whereas NBN Co has proposed to be regulated under price caps. This means that NBN Co would face materially greater volume risk than electricity networks in Australia. Price caps are applied to gas distribution networks and so volume risks would be more comparable.
- Energy networks are widely considered to provide an essential service with a very low income elasticity, whereas there is less convincing evidence of the essentiality and income elasticity associated with broadband services, particularly for the very high speed services which NBN Co needs to sell to earn its ABBRR.
- Energy networks have historically not faced significant competition or stranding risk. These risks have emerged relatively recently for gas networks due to the gradual adoption of new technologies and the introduction of decarbonisation policies by State and Federal Governments. Given that these developments have occurred very recently and pertain specifically to gas networks, the historical data that is available to estimate gearing and beta

[50] We are aware that sometimes regulators include firms in a comparator set to estimate gearing and beta that are drawn from outside the industry of the regulated firm. Our approach has always been to begin with domestic comparators in the particular industry. If that produces too small a sample, we consider international comparators from the same industry. Only if that produces too small a sample (or if international evidence is excluded for other reasons) do we then consider expanding the domestic comparator set to include other industries.

[51] AER, *Explanatory Statement: 2013 Rate of Return Guideline*. p. 35. The AER maintained this position in its 2018 Rate of Return Instrument and its Draft 2022 Rate of Return Instrument.

for energy would not reflect these risks in any meaningful way. Moreover, some of the energy network comparators relied on by the AER have been delisted for several years—before those companies could have faced any emergence of competition or stranding risk. By contrast, the telecommunications firms in the ACCC's and Commerce Commission's comparator samples have faced significant competition and stranding risks for many years and the systematic component should be observable in the betas of these firms.

120. In our view, these important differences suggest that there is a very weak case for including energy network firms in the sample of comparators used to estimate gearing and beta for a fibre network company such as NBN Co—particularly since there is a large sample of more relevant comparators (drawn from the telecommunications sector) with which to perform that task.

121. There is also another problem with the use of domestic energy network comparators – there is currently only one such firm listed on the ASX. Moreover, that firm is APA Group, which operates gas pipelines and distribution networks, most of which are unregulated or under light-handed regulation. Therefore, we do not consider that the reliability of beta and gearing estimates would be improved via:

- The inclusion of single firm that has very different regulatory arrangements from those applying to NBN Co or, indeed, to other energy networks; or
- The inclusion of energy network firms that no longer exist, and whose estimates are frozen, reflecting the historical market conditions at the time they de-listed.

Comparison with other telecommunications firms

122. We have further considered whether we could use the results from a first principles analysis of NBN Co's risk characteristics to inform its point estimates of gearing and beta from within the range of estimates for that comparator sample.

123. Taking all of the above benchmark characteristics into account, we would expect that NBN Co faces similar risks on average to the firms in the telecommunications industry that form part of the ACCC and Commerce Commission samples. For example, the sample includes a diverse range of firms supplying broadband services to wholesale and retail customers, across different kinds of networks and under various kinds of regulation (including no regulation). It also includes firms that we would expect to be lower risk than NBN Co on a first principles basis, such as mobile network tower companies which predominantly operate under long-term fixed contracts with mobile operators.[52]

124. This is essentially the approach that the Commerce Commission followed when determining its estimates of gearing and beta for Chorus and other fibre networks in New Zealand. The Commerce Commission ultimately concluded from that analysis that the best point estimates were the average of its comparator sample of telecommunications firms.[53] Based on the available evidence, we are of the opinion the Commerice Commission's conclusion remains is and remains reasonable.

.

[52] Grant Thorton notes that: "Tower investments generally carry less risk than investments in downstream retail telcos. This is due to the long-term, contractual nature of their cash flows and high barriers to entry…Listed tower businesses tend to have lower asset beta than listed telcos. This supports relatively low costs of equity. Stable, predictable cash flows also support low borrowing costs, meaning low overall costs of capital." See https://www.grantthornton.co.uk/insights/understanding-value-drivers-in-telco-tower-valuations/.

[53] ibid, at p. 432.

3.7.3 Choice of comparator firms

125. We have estimated equity betas using a sample of 77 firms supplying telecommunications services, based on combining partly-overlapping samples from ACCC (2015) and Commerce Commission (2020).[54] We provide a full list of these firms in Appendix A.

3.7.4 Statistical estimation of equity betas

126. When performing regression analysis to estimate equity beta, there is no standard approach for determining the length of the historical data period to use or the frequency with which returns should be recorded. For this reason, it is common to report results for a number of different periods and frequencies – see the Annex for further explanation. The tables below contain figures for:

- Weekly and monthly stock returns.
- 5-year and 10-year historical periods.
- All possible reference days.
- Liquid stocks only.

3.7.5 Statistical estimation of gearing

127. Gearing of each comparator was calculated by taking the average value of total debt divided by total debt plus market capitalisation over the sample window for each comparator.

3.7.6 Re-levering to ensure like-with-like comparisons

128. The equity beta reflects the systematic risk of an investment in the shares of the particular company. Thus, the equity beta reflects:

- The systematic risk of the activities of the firm; and
- The firm's gearing.

129. Other things being equal, the equity beta will be higher:

- For firms whose activities are risky – in the sense that performance is highly correlated with the general state of the economy; and
- For firms with high gearing – as relatively more debt finance, with a claim that ranks ahead of equity, increases the risk faced by residual equity holders.

130. Selecting a set of comparator firms is designed to control for the first component of risk – the nature of the activities of the firm. Comparable firms are selected to ensure that the systematic risk of the activities of the various firms are similar to that of the regulated firm in question.

131. However, some of these comparable firms may have gearing that differs from that adopted by the regulator for the regulated firm in question. For this reason, it is standard practice to 're-lever' the

[54] While we initially included additional firms from NBN Co to form a larger sample, these were later dropped by applying various geographic and other filters so that the final consists only of firms that are in the combined Commerce Commission and ACCC sample.

equity beta estimates for the comparator firms to match the gearing adopted for the regulated firm in question. For example, if the regulator adopts 40% gearing for the regulated firm but a comparator firm has gearing of 50%, the beta estimate of the comparator firm will be re-levered (using an asset beta) to provide an estimate of what its beta estimate would have been if it had 40% gearing.

132. All Australian regulators perform this re-levering exercise as part of their task of determining the allowed equity beta. For example, the ACCC identified the need to re-lever equity beta estimates "in order to compute comparable estimates of the equity beta" in its 2015 Telstra FAD. [55]

133. The process for re-levering is as follows:

$$\beta_{re-levered} = \beta_{raw} \frac{1 - gearing_{comparator}}{1 - gearing_{regulated\ firm}}.$$

3.7.7 Current estimates

134. In **Table 6** and **Table 7**, we summarise updated gearing equity beta estimates for the various historical periods and sampling frequencies set out above.

135. We consider the sample estimates for gearing support a value of 37%.

136. The beta estimates are first presented in **Table 7** as re-levered using the comparator average gearing (so that they are presented on a consistent basis within each sample), and then we present these estimates when the comparators are re-levered at the benchmark 37% gearing.

137. Asset betas and gearing for individual comparators for the various historical periods and sampling frequencies are provided in Appendix A.

Table 6: Gearing estimates

Sample period	Gearing
2012-2022	35%
2017-2022	38%
Average	**37%**

Source: Bloomberg; Frontier Economics analysis.

[55] ACCC, *Public inquiry into fixed access determinations for fixed line services: Final decision*, October 2015, p. 81.

Table 7: Equity beta estimates

	10 years to October 2022		5 years to October 2022		Average
	Weekly	Monthly	Weekly	Monthly	
Relevered at sample average gearing^	0.68	0.65	0.66	0.63	
Relevered at benchmark gearing#	0.70	0.67	0.65	0.62	**0.66**

Source: Bloomberg; Frontier Economics analysis.

Notes: ^ Betas are first de-levered using the comparator's actual gearing, then re-levered using the average gearing of the comparator sample. # Betas are first de-levered using the comparator's actual gearing, then re-levered using the benchmark gearing.

138. We submit that the current estimates set out above support an equity beta of 0.66, re-levered at 37%.

4 The return on debt

4.1 Proposed regulatory approach

139. The return on debt allowance represents the minimum cost of debt that would be incurred by a benchmark efficient business delivering the regulated services provided by NBN Co, if it were to manage its debt portfolio in an efficient and prudent manner.

140. Our proposed approach to determining the efficient return on debt allowance for NBN Co involves:

- First identifying an efficient and prudent debt management strategy for a benchmark efficient business with characteristics similar to NBN Co; and
- Then identifying the cost of debt commensurate with that efficient and prudent debt management strategy.

4.2 Rationale for the 'trailing average' approach

141. NBN Co notes that Australian economic regulators have generally adopted one of two approaches for setting the return on debt allowance:

- The 'rate on the day' approach assumes that the firm would issue all of its debt in a single tranche at one point in time. All of that debt would then mature at a single point in time and be refinanced in another single tranche.
- The 'trailing average' approach assumes that the firm would stagger the issuance of debt so that only a small proportion of debt falls due and has to be refinanced each year. Under this approach, each year one tranche of debt (representing a relatively small proportion of total debt) would mature and be refinanced.

142. We submit that, for any infrastructure business with a large debt portfolio, it would be prudent and efficient to issue fixed-rate debt on a staggered maturity basis. The on-the-day approach that has previously been used by some Australian regulators assumes implicitly that regulated businesses will refinance their entire debt portfolios at once (or within a very short timeframe) at the beginning of each regulatory period. This means that the entire debt portfolio will be subject to refinancing risk at the same time. Regulated businesses tend to have very large debt portfolios, which means that they face significant exposure to refinancing risk under the on-the-day approach.

143. To avoid this refinancing risk, infrastructure businesses tend to stagger their refinancing of debt by issuing debt such that only a portion of their total debt portfolio matures each year. The trailing average approach mimics this pattern of debt management because it assumes implicitly that only a portion of a regulated business's debt portfolio is refinanced each year rather than the entire portfolio all at once—thus minimising refinancing risk.

144. The key benefit of the trailing average approach is that it allows a regulated business that adopts an efficient staggered debt management approach to match its borrowing costs closely to the regulatory allowance. This, in turn, would prevent regulated businesses being over/undercompensated (and consumers over/underpaying the efficient cost) in each regulatory period.

145. This was recognised by the AER when it adopted the trailing average approach in 2013:[56]

> *We propose to apply a trailing average portfolio approach to estimate the return on debt. This approach means that the allowed return on debt more closely aligns with the efficient debt financing practices of regulated businesses and means that prices are likely to be less volatile over time. The trailing average would be calculated over a ten year period. The annual updating of the trailing average should also reduce the potential for a mismatch between the allowed return on debt and the return on debt for a benchmark efficient entity. This should reduce cash flow volatility over the longer term.*

146. The AER maintained its use of the trailing average approach in its 2018 WACC Review and has recently reiterated the benefits of the trailing average approach in its 2022 WACC Review.[57]

147. ESCOSA made a similar observation when it adopted the trailing average approach in 2016:[58]

> *The 10 year trailing average cost of debt approach avoids over reliance on prevailing market rates, whereby the resultant cost of debt could be significantly different to the efficient costs that would form part of an ongoing business debt portfolio. The risk that the cost of debt is under or over stated during the regulatory period is reduced, providing a downward influence on the benchmark cost of equity.*

148. The ESC in Victoria also noted that there were several benefits to the trailing average approach when it adopted the method in 2016:[59]

> *We approve Melbourne Water's proposed WACC method with minor amendments. Moving to a trailing average approach to estimating the cost of debt and WACC reduces price volatility, aligns the regulatory allowance for financing costs with the actual costs faced by the water business, and reduces refinancing risks. We note that changing from the on-the-day approach to estimating the*

56 AER, *Rate of return guideline: Explanatory statement*, final decision, December 2013, p. 12.

57 AER, *Draft debt omnibus paper*, July 2021, pp. 3-18 to 3-19.

58 ESCOSA, *SA Water Regulatory Determination 2016, Final determination*, June 2016, p. 117.

59 ESC, *Melbourne Water price review 2016*, Final decision, June 2016, p. XII.

cost of debt, to a trailing average approach, does not materially impact on Melbourne Water's prices.

149. More recently, the QCA clearly articulated the regulatory objective in relation to the return on debt allowance: [60]

when reviewing the relevant debt management strategy, we need to consider the likely debt management behaviour of an unregulated 'efficient' firm operating in a competitive market for similar services. We consider it appropriate to use this reference point, as the debt management strategy benchmark we are developing is to serve as a proxy for this hypothetical unregulated competitor—and such a competitor would have no reason to utilise an on-the-day strategy. Rather, we consider that the trailing average approach is representative of the debt management strategy adopted by a benchmark efficient firm operating in a competitive market.

150. The QCA went on to note that it has become standard for Australian regulators to adopt a trailing average return on debt allowance, as better reflecting the costs that would be incurred under a prudent and efficient debt management approach: [61]

it may be efficient for capital-intensive infrastructure firms to stagger their debt financing to avoid needing to refinance their entire debt portfolio over a relatively short window of time to manage refinancing risk. This has in part led many Australian regulators over the last decade to move to estimating the cost of debt using a form of trailing average debt management strategy. For example, the AER, ESC, ESCOSA and ICRC all have recently used a trailing average cost of debt approach.

151. There is now almost universal consensus between regulators in Australia that an efficient and prudent debt management strategy for regulated infrastructure businesses such as NBN Co is to stagger the issuance of debt so that only a small proportion of debt falls due and has to be refinanced each year. Consequently, it has become standard for Australian economic regulators to adopt the trailing average approach to setting the return on debt allowance. Under this approach, the regulated business is assumed to:

- Issue 10-year debt (which is the most common tenor of debt issuance by Australian corporates); and
- Refinance 10% of its debt portfolio annually.

60 QCA, *Rate of return review: Final report*, November 2021, p. 32.

61 QCA, *Rate of return review: Final report*, November 2021, p. 30.

152. At any point in time, the cost of debt faced by a regulated business that followed such a debt management approach would be a 10-year average of the prevailing rates at which the business had refinanced in each of the previous 10 years.

153. NBN Co proposes to adopt the 10-year trailing average approach for determining the return on debt allowance. Under this approach:

- The business is assumed to issue 10-year BBB-rated corporate debt—which is broadly consistent with the assumption adopted by most regulators in Australia when setting the return on debt allowance;
- The return on debt allowance for the first year of the Regulatory Cycle is derived by calculating an equal-weighted average of the prevailing 10-year yield on BBB-rated corporate debt in each of the 10 prior years.

4.3 Benchmark credit rating

154. The required return on debt will depend on the assumed credit rating – other things being equal, a higher rating implies a lower required return. The approach adopted by most Australian economic regulators is to adopt a standard benchmark credit rating for the firms they regulate.

155. For example, IPART adopts a BBB credit rating as the generic investment grade rating that it considers to be appropriate for the various infrastructure firms that it regulates. IPART explains this approach as follows: [62]

> *A BBB credit rating is most appropriate. We consider that the BBB credit rating is most appropriate because we consider that the BBB rating will, on average, provide an efficient estimate of the WACC. We can adjust the gearing ratio for individual firms because the gearing ratio and the credit rating are endogenous. A credit rating higher than BBB would mean the benchmark firm would need to rely on a higher proportion of relatively expensive equity. Conversely, if the benchmark firm was sub-investment grade, the increase in the debt margin would likely more than offset the reduction in equity costs.*

In its recent WACC Review, the QCA summarised the approach of Australian regulators as follows:[63]

- AER – 10-year term; BBB+ rating;
- ESC – 10-year term; BBB rating;
- IPART – 10-year term; BBB rating;
- ESCOSA – 10-year term; BBB rating;
- ERA – In-house methodology;
- OTTER – 10-year term; BBB rating;

62 IPART, *Review of our WACC method: Final report*, December 2013, p. 46.

63 QCA, *Rate of return review: Final report*, November 2021, Table 3, p. 33.

- ICRC – 10-year term; BBB rating.

156. We submit that a benchmark investment grade credit rating of BBB should be adopted, consistent with the approach generally adopted for the purpose of setting regulatory allowances for Australian regulated infrastructure businesses.

4.4 Data source for return on debt

157. The RBA publishes estimates of the yield on 10-year BBB corporate bonds issued by Australian companies on a monthly basis.

In its recent WACC Review, the QCA noted that the RBA estimates are used by the vast majority of Australian regulators.[64] In particular:

- QCA, ESC, IPART, ESCOSA and OTTER use the RBA estimates exclusively;
- AER and ICRC use the RBA estimates in conjunction with estimates from other data providers; and
- ERA uses its own in-house methodology.

158. We submit that the RBA estimates should be used to determine the yield on 10-year BBB corporate bonds, as required.

4.5 Debt raising costs

159. It is common for Australian regulators to make an additional allowance for debt raising costs. Whereas the return on debt allowance provides compensation for the interest payments that must be made in relation to the regulated firm's (efficient) debt portfolio, there are additional costs incurred every time a tranche of debt is refinanced. These costs include arrangement fees charged by investment banks as compensation for the management of the debt issuance process as well as legal fees, credit rating fees, registry costs, and the costs of cross-currency hedging where required.

160. Some regulators (e.g., AER) make a cash flow allowance, treating these debt raising costs as part of the firms operating expenses. However, most Australian regulators accommodate these costs by increasing the allowed return on debt. The efficient debt issuance costs are estimated, amortised over the assumed life of each tranche of debt (10 years), and expressed as an allowance in terms of basis points per annum.

161. As part of its recent WACC Review, the QCA has summarised the debt raising costs of Australian regulators as follows:[65]

- ESC – 15 basis points;
- IPART – 12.5 basis points;
- ESCOSA – 12.5 basis points;
- ERA – 10 basis points;

64 QCA, *Rate of return review: Final report*, November 2021, Table 3, p. 33.

65 QCA, *Rate of return review: Final report*, November 2021, Table 11, p. 50.

- OTTER – 10 basis points;
- ICRC – 12.5 basis points.

162. We submit that an allowance of 12.5 basis points per annum should be adopted, consistent with the average allowance made by other Australian regulators.

4.6 Return on debt true-up mechanism

163. Under the 10-year trailing average approach, the return on debt changes each year as one of the ten tranches of debt matures and is refinanced with a new tranche at a new rate of interest.

164. Some regulators manage these annual changes in the estimate of the required return on debt by updating the return on debt allowance, and consequently the WACC, each year. Under this approach, the return on debt allowance changes each year as yields on 10-year corporate bonds change. Thus, regulatory allowances, and consequently consumer prices, can rise or fall in each year of a regulatory period or cycle, depending on movements in interest rates.

165. The alternative approach is to fix the return on debt allowance for each regulatory year for the duration of the regulatory period and apply a true-up at the time of each new regulatory determination to account for differences between the expected return on debt (as used to set the return on debt allowance) and actual return on debt for each financial year. This approach has the benefit of the return on debt allowance for each regulatory year being fixed and known at the start of the regulatory period. The true-up then ensures that the regulated firm does not over- or under-recover relative to the efficient cost.

166. NBN Co has indicated its preference for us for the 'true-up' approach as it produces more stable prices within each regulatory period. We therefore propose that it should be adopted as follows:

- The return on debt allowance for the first year of the regulatory period is determined as the 10-year trailing average, computed as follows:

$$r_1 = \frac{1}{10}(y_{-9} + y_{-8} + \cdots + y_{-1} + y_0)$$

  - where y_0 represents the yield at the time of the regulatory determination, y_{-1} represents the yield for the previous year, and so on.

- The return on debt allowance for each subsequent year of the regulatory period assumes that the initial yield (y_0) remains fixed for the duration of the regulatory period. Thus, the regulatory allowance for the second year of the regulatory period would be computed as:

$$r_2 = \frac{1}{10}(y_{-8} + y_{-7} + \cdots + y_{-1} + y_0 + y_0),$$

- and the regulatory allowance for the third year of the regulatory period would be computed as:

$$r_3 = \frac{1}{10}(y_{-7}, + y_{-6} + \cdots + y_{-1} + y_0 + y_0 + y_0)$$

- and so on.

- At the end of the regulatory period, an NPV-neutral true-up would be applied in relation to each of years 2 to 5 of the regulatory period. This would involve computing the difference between the *allowed* return on debt and the *efficient* return on debt for each payment made in relation to the return on debt. For example, all return on debt payments made during year 2 would be made on the basis of an interest rate computed as:

$$r_2 = \frac{1}{10}(y_{-8} + y_{-7} + \cdots + y_{-1} + y_0 + y_0)$$

as shown above. The first step is to determine what that payment would have been if it had been computed using the efficient return on debt, computed as:

$$r_2^a = \frac{1}{10}(y_{-8} + y_{-7} + \cdots + y_{-1} + y_0 + y_1)$$

- where y_1 represents the actual yield observed at the end of the first year of the regulatory period. The difference between the payment that was made on the basis of the allowed return on debt, and the payment that would have been made if the efficient return on debt had been used, represents the amount of over- or under-recovery – relative to the efficient benchmark.

- The amount to be trued-up over a Regulatory Cycle will be calculated as:

$$TU_y = \sum_{t=x+1}^{y-1} (1 + R_x)^{y-t}(RAB_t \times G)(r_t^a - r_t)$$

where:

- RAB_t refers to the opening RAB or Core Services RAB, as applicable, for Financial Year (t) in the immediately preceding Regulatory Cycle.
- R_x refers to the allowed nominal rate of return that applied to the first Financial Year of the immediately preceding Regulatory Cycle commencing in Financial Year (x).
- G refers to the benchmark level of gearing.
- r_t refers to the forecast return on debt for each Financial Year of the immediately preceding Regulatory Cycle.
- x refers to the first Financial Year of the immediately preceding Regulatory Cycle.
- y refers to the first Financial Year of the Regulatory Cycle.
- r_t^a refers to the actual return on debt for each Financial Year of the immediately preceding Regulatory Cycle, calculated as:

$$r_t^a = \frac{1}{10}\left(\sum_{j=t-9}^{t} D_j\right)$$

where:

- D_j is the on-the-day rate of return on debt in Financial Year (j), which can be any year from (t – 9) to $y - 1$.

- The true-up amount TU_y is to be converted, in an NPV-neutral way, to an annual amount Z_t to be included in the Forecast Nominal ABBRR and Forecast Nominal Core Services ABBRR for each Financial Year of the Regulatory Cycle as follows:

$$Z_t = \frac{R_y \times TU_y}{1 - (1 + R_y)^{-L}}$$

where:

- R_y refers to the nominal rate of return applicable to Financial Year (y), being the first Financial Year of the Regulatory Cycle.
- L is the expected length (measured in Financial Years) of the Regulatory Cycle.

5 Gearing

5.1 Benchmark gearing estimated in market value terms

167. Gearing represents the proportion of the regulatory asset basis that is assumed to be financed with debt. The standard regulatory approach, adopted by all Australian regulators, is to determine a benchmark efficient level of gearing rather than adopting the actual gearing put in place by the regulated firm. That is, the regulator seeks an estimate of the prudent and efficient proportion of debt financing for a benchmark efficient entity, not an estimate of the actual financing structure put in place by the regulated firm.

168. For the purposes of estimating the WACC, gearing must be estimated in market value terms. The standard regulatory approach is to estimate market value gearing using the book value of debt (as a reasonable and easy to obtain proxy for the market value of debt) and the market value of equity (which is easy to obtain for any firm listed on a stock exchange). In particular, gearing is measured as:

$$Gearing = \frac{Book\ value\ of\ debt}{Book\ value\ of\ debt + Market\ value\ of\ equity}.$$

5.2 Benchmark gearing estimated using same beta sample data

169. It is also standard regulatory practice to estimate gearing using the same sample of firms that is used to estimate equity beta. The tables and figures below establish that an estimate of 37% is supported by the current evidence. This is slightly lower than the ACCC's estimate of 40% in its 2015 Telstra FAD.

170. As set out in Section 3.7, gearing estimates were derived over two sample windows (five years and ten years to 31 October 2022) for the comparator set described. Gearing of each comparator was calculated using total debt market cap as reported by Bloomberg, by taking the average value of total debt divided by total debt plus market cap over the sample window for each comparator. The figures in **Table 8** are the average of comparators included in the sample.

Table 8: Gearing estimates

Sample period	Gearing
2012-2022	35%
2017-2022	38%
Average	**37%**

Source: Bloomberg; Frontier Economics analysis.

6 Gamma

6.1 The role of gamma in the regulatory framework

171. In Australia, equity investors receive returns in three forms: dividends, capital gains, and dividend imputation franking credits. Dividends that are paid out of profits that have been taxed in Australia have franking credits attached to them. These franking credits can be used by resident investors to reduce personal taxes that they would otherwise be required to pay, so have some value to resident investors.

172. In this context, within standard Australian regulatory frameworks, the regulator:

- First estimates the total required return on equity; and then
- Deducts the regulator's estimate of the value of the dividend imputation franking credits that investors are expected to receive; and then
- Sets the regulatory allowance such that the firm is able to provide the balance to investors in the form of dividends and capital gains.

173. For example, if the regulator determines that equity investors should receive a total return of $100 and that they will receive franking credits that have a value of $10, the regulatory allowance will be set to enable the firm to provide $90 to its investors in the form of dividends and capital gains.

174. Franking credits are created by the payment of corporate tax within Australia. Every dollar of corporate tax paid to the Australian government creates a one-dollar franking credit that is available to be distributed to shareholders. The gamma parameter represents the extent to which investors value each dollar of franking credits that are created. There are two reasons why this value would be expected to be less than 100%:

- Some of the credits that are created are not distributed to investors. Under Australian taxation law, a company can only distribute 100% of the credits that it creates by distributing (as dividends) 100% of the profits that have been taxed in Australia. To the extent that a company does not distribute 100% of such profits, some credits will remain 'locked up' having no value to investors; and
- Investors are unlikely to value a dollar of franking credits as much as they value a dollar of dividends or capital gains. For example, credits distributed to non-resident investors have no value because they cannot be used to reduce their tax obligations.

175. Thus, within standard Australian regulatory frameworks:

- The regulator will estimate the amount of corporate tax to be paid by the regulated firm. This is also an estimate of the quantum of franking credits created;
- The quantum of franking credits is then multiplied by the regulator's estimate of gamma to provide an estimate of the value of those credits to investors;
- The regulator will then deduct that value from its estimate of the total required return on equity; and
- The regulatory allowance is then set such that the firm is able to provide the balance to investors in the form of dividends and capital gains.

6.2 The components of gamma

176. As noted above, there are two reasons why gamma is expected to be less than 100% (i.e., why investors would not value franking credits at the full face value when they are created):

- Some credits are not distributed to investors and remain locked-up within the firm; and
- Investors are unlikely to value a dollar of franking credits as much as they value a dollar of dividends or capital gains.

177. This has led all Australian regulators to estimate gamma as the product of two parameters:

- The first parameter is the distribution rate, representing the proportion of created imputation credits that are attached to dividends and distributed to shareholders; and
- The second parameter ('theta') is variously defined as "the value of distributed imputation credits" or as "the utilisation rate." This parameter represents the extent to which a dollar of distributed franking credits will be valued at less than a dollar of dividends or capital gains.

178. Thus: $Gamma = distribution\ rate \times theta$.

6.3 Competing approaches for interpreting and estimating gamma

179. Two methods for interpreting and estimating gamma have been proposed in the regulatory setting:

a The **market value approach** posits that gamma should be estimated from the observed prices of traded securities in the same way that other WACC parameters are estimated. This approach produces an estimate of the extent to which investors value franking credits relative to the dividends and capital gains that those credits will replace. It is an estimate of the amount of dividends and capital gains that investors would be prepared to give up in order to receive a dollar of franking credits.

b The **redemption or utilisation approach** posits that gamma should be estimated as the proportion of credits that are distributed to investors who might be able to redeem them. This approach has no regard to why it might be that investors might value credits less than the dividends and capital gains that they are replacing, other than that some of those credits will be distributed to non-resident investors who obtain no value from them.

180. The distinction between these two approaches may be illustrated using an analogy. Suppose a traveller, by means of an airline loyalty program, has accumulated 10,000 frequent flyer points. The fact that the traveller has 10,000 points available to redeem with their airline, on its own, provides no information about the economic value of those points to the traveller, since each point could be worth $0.10, $0.20, or $0.50. In order to determine the economic value of those points, one needs to know the amount by which the traveller is able to reduce their next fare if those 10,000 points were to be utilised. That, in turn, requires an understanding of the exchange rate between one point and one dollar of fare.

181. The redemption or utilisation rate approach would simply count up the number of frequent flyer points available to the traveller. By contrast, the market value approach would seek to determine the amount by which the traveller may reduce their next fare by redeeming the points accumulated.

182. Within the regulatory framework, what is required is an estimate of the extent to which allowed dividends and capital gains can be reduced in relation to each dollar of imputation credits. That is the role of gamma – it is an estimate of the amount of dividends and capital gains that investors would be prepared to give up in order to receive a dollar of imputation credits. This implies that a market value estimate is required – what is the market value of franking credits relative to dividends and capital gains.

183. In this regard, IPART has concluded that: [66]

> *the value of gamma should be interpreted as the market value of dividends and capital gains that investors would be willing to forgo in exchange for imputation credits.*

184. Our view is that gamma should be interpreted as the market value of franking credits (relative to the value of dividends and capital gains), and that a market value estimate should be used.

6.4 Gamma for the first replacement module

185. In the Australian regulatory setting, dividend drop-off analysis is the approach used to estimate the market value of franking credits. Dividend drop-off analysis is a form of regression analysis that is designed to estimate the market value of franking credits relative to dividends and capital gains.

186. Dividend drop-off analyses performed over the last 10 years have consistently concluded that the best market value estimate of gamma is 0.25. Australian regulators that have adopted the market value interpretation of gamma have consistently adopted the value of 0.25. For example, IPART has re-affirmed its adoption of a gamma parameter of 0.25 as follows: [67]

> *Further, we maintain our view that dividend drop-off studies are currently the best method to estimate the market value of gamma. Its advantage is that it measures the observed value of dividends and imputation credits by examining share price changes on ex-dividend days.*
>
> *Since the 2011 SFG study that we relied upon in our 2013 method, Frontier updated its analysis in 2013 and again in 2017. The latter study employed a large sample and improved econometric techniques to estimate the value of both cash dividends and distributed imputation credits using dividend drop-off analysis. Both of these studies reconfirmed that the best estimate of the market value of gamma was 0.25.*

187. Our view is that:

66 IPART, *Review of our WACC methodology*, February 2018, p. 83.

67 IPART, *Review of our WACC methodology*, February 2018, p. 83.

a The market value interpretation of gamma should be adopted – because that is consistent with the role of gamma within the regulatory process. Gamma represents the value of franking credits relative to the dividends and capital gains that they will replace; and

b The best available estimate of the market value of franking credits is a gamma of 0.25

188. However, we are aware that the ACCC has invited NBN Co to consider, for practical purposes, adopting the AER's current 'utilisation' estimate of 0.585 and that NBN Co now proposes, in order to remove as many points of contention as possible, utilise that estimate for Module 3 .

189. Our view remains that it is the market value interpretation of gamma that is consistent with its role in the regulatory process and that 0.25 remains the most appropriate estimate of gamma. Consequently, we recommend that, if the ACCC seeks to retain the 'utilisation' interpretation in future reviews, it should identify how that interpretation is consistent with the role gamma plays within its regulatory process.

190. However, given NBN Co practical position for Module 3 noted above, and the estimates of the market risk premium depending, in part, on the estimate of gamma, we report two sets of estimates – based on each of the alternative estimates of gamma. Our primary WACC calculations, set out below, are based on the 0.585 'utilisation' estimate of gamma that NBN Co has adopted for Module 3.[68]

[68] In particular, a utilisation rate ('theta') of 0.65 is used in determining the market risk premium.

7 Estimates for the first regulatory cycle

7.1 WACC for the first regulatory cycle

191. The following Table presents the individual rate for return parameter estimates, and overall rate of return estimates, to be applied for the first regulatory cycle.

192. Note that these estimates have been produced as at November 2022, and will continue to be updated up until the commencement of the regulatory cycle. Updates to reflect the latest available data relating to risk-free rates, market risk premiums, inflation forecasts and the cost of debt will occur, and these are marked as 'placeholder parameters' in **Table 9**.

Table 9: Estimates for first replacement module, 2023-24 - 2025-26

Approach	'Current' estimate	'Long-term' estimate	Midpoint estimate	Placeholder parameter
Risk-free rate	3.9%	5.0%	4.5%	*
Equity beta	0.66	0.66	0.66	
Market risk premium	7.9%	6.5%	7.2%	*
Return on Equity (nominal, post-tax)	9.1%	9.3%	9.2%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2024)	5.0%	5.0%	5.0%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2025)	5.1%	5.1%	5.1%	*
Return on Debt (nominal, pre-tax; incl. allowance for debt raising costs; FY 2025)	5.3%	5.3%	5.3%	*
Gearing	37%	37%	37%	
Nominal vanilla WACC (FY 2024)	**7.6%**	**7.7%**	**7.7%**	*
Nominal vanilla WACC (FY 2025)	**7.6%**	**7.8%**	**7.7%**	*
Nominal vanilla WACC (FY 2026)	**7.7%**	**7.8%**	**7.8%**	*
Inflation (3-year regulatory period)	3.7%	3.7%	3.7%	*
Gamma^	0.585	0.585	0.585	

Source: Frontier Economics

Notes: ^ not likely to be relevant in the first replacement module.

8 Inflation forecasting

8.1 The role of inflation forecasts

193. In the Australian regulatory framework, the regulator's inflation forecast plays an important role in determining the allowed return on capital over a regulatory period. The relevant steps in the regulatory process are as follows:

- The regulator first determines the total required return on capital;
- The regulator then reduces the allowed return each year by the expected amount of RAB indexation that year, computed as the product of expected inflation and the value of the RAB at the beginning of the year; and
- The regulator then indexes the RAB according to actual inflation observed each year.

194. The process describe above is consistent with the framework for determining the ABBRR for Core Services proposed by NBN Co in the SAU variation.

195. Thus:

- The regulator 'takes out' expected RAB indexation based on forecast inflation; and
- Then 'adds back' actual RAB indexation based on observed inflation.

196. The AER has recently concluded that it is important to 'take out' what it expects to 'put back in' so that the deduction equals what is expected to be added back:[69]

> *It is appropriate to target an approach where 'we take out what we expect to put back in'.*

197. This concept of taking out what is expected to be put back in has been adopted by a number of Australian regulators that have conducted regulatory inflation reviews over the last two years.

198. Since the regulator will 'put back in' (via RAB indexation) amounts that are based on actual inflation over the term of the regulatory period, what is required is the best possible estimate of inflation be in each year of the regulatory period.

8.2 Regulatory methods for forecasting inflation

199. Prior to the recent round of regulatory reviews into inflation forecasting methods, it was common for Australian regulators to use a 10-year geometric mean approach to setting the regulatory inflation parameter. This approach involves taking the geometric mean of 10 numbers where the first is the RBA 1-year forecast of inflation, the second is the RBA 2-year forecast of inflation and the other eight are set to 2.5%, being the mid-point of the RBA target band of 2-3%.

[69] AER, *Regulatory treatment of inflation*, December 2020, p. 45.

200. The recent round of regulatory reviews has highlighted the fact that this method violates the 'take out what you expect to put back in' principle. In no sense can the above 10-year geometric mean be considered to be the best, or even a reasonable, forecast of the average inflation over the 5-year term of a regulatory period that will be 'put back in.' Consequently, nearly all Australian regulators have now abandoned exclusive reliance on this 10-year geometric mean estimate in favour of approaches that provide better forecasts of average inflation over the term of the regulatory period.

201. In this regard, the AER has adopted a 5-year glide path approach whereby RBA forecasts are used for years 1 and 2, the mid-point 2.5% figure is used for year 5, and linear interpolation is used to determine the figures for years 3 and 4.[70]

202. The more recent QCA review has proposed a small improvement to the AER approach. The QCA's analysis indicates that the assumption of inflation always returning to 2.5% by year 5 is a strong one. During periods of persistently high or low inflation outside the RBA target band of 2-3%, it may take longer for the RBA to guide inflation back to 2.5%. This has led the QCA to adopt the following modified 5-year glide path approach:[71,72]

> *Our position is to use short-term RBA forecasts for the first two years of the regulatory period and derive forecasts up to the fifth year ahead, using a linear glide path—from the RBA's short-term forecast in year 2 to a rules-based anchor-point forecast in the fifth year ahead. Specifically, if the second-year forecast of headline inflation is:*
>
> - *less than or equal to 2 per cent, the anchor point would be set at 2.25 per cent*
> - *between 2 per cent and 3 per cent, the anchor point would be set at 2.5 per cent*
> - *greater than or equal to 3 per cent, the anchor point would be set at 2.75 per cent.*

203. The QCA explains that:[73]

> *The lower-range anchor point is consistent with recent economic conditions where the second-year forecast has repeatedly been less than or equal to 2 per cent. Noting that RBA forecasts are rounded to the nearest quarter-percent, it is likely that a second-year forecast that is clearly within the target range (i.e. 2.25, 2.5 or 2.75%) would be consistent with expectations converging to the midpoint of the target range by the fifth year ahead. A second-year forecast that was not clearly within the*

70 AER, *Regulatory treatment of inflation*, December 2020, Section 9.

71 QCA, *Inflation forecasting: Final position paper*, October 2021, p. 41.

72 The midpoint of the RBA's target rand (2.5%) would be applied beyond the fifth year. See QCA, *Inflation forecasting: Final position paper*, October 2021, p. 41.

73 QCA, *Inflation forecasting: Final position paper*, October 2021, p. 37.

target range could signal persistently low or high inflation, with a corresponding effect on expectations. This rules-based approach would apply symmetrically during periods of persistently low or high inflation.

204. We submit that the QCA approach is the best available method for determining the regulatory inflation parameter and that approach should be used throughout the SAU.

8.3 Inflation for the first replacement module

205. The most recent Reserve Bank of Australia Statement of Monetary Policy provides forecasts of CPI inflation out to December 2024; we have prepared the WACC estimates for December 2022.[74] We have used as placeholder estimates:

- The year one inflation forecast was provided as 4.75% as the RBA forecast for the year ended December 2023.[75]
- The year two inflation forecast was provided as 3.25% as the RBA forecast for the year ended December 2024.[76]
- Applying a linear interpolation between 3.25% in year two and 2.75% in year five (as per the QCA method), we obtain 3.08% as the forecast for year three.

206. The inflation forecast over the period July 2023 to June 2026 is therefore calculated as:

$$\pi = \left((1 + 4.75\%)(1 + 3.25\%)(1 + 3.08\%)\right)^{\frac{1}{3}} - 1 = 3.69\%.$$

207. These forecasts will be updated to reflect the most recent forecasts prior to the commencement of the first replacement module in July 2024.[77]

74 RBA, *Statement on Monetary Policy*, November 2022, p. 68.

75 RBA, *Statement on Monetary Policy*, November 2022, p. 68.

76 RBA, *Statement on Monetary Policy*, November 2022, p. 68.

77 For example, the November 2022 Monetary Policy statement uses forecasts of 4.25% for the year to June 2024.

A Comparator beta and gearing estimates

Summary of estimation approach

Method

208. We have estimated betas according to the following methodology:

- Use weekly and monthly returns data, estimating beta for each stock using each possible reference day. Weekly and monthly returns were employed by the ACCC in its 2015 Telstra FAD decision. The beta estimates derived using weekly and monthly returns data are obtained by estimating beta for each stock using each possible reference day, and then averaging the estimates over all reference days. For instance, for the 'weekly' betas, we have derived for each company a beta using returns measured from Monday to Monday, Tuesday to Tuesday, and so on. Then, each of these five beta estimates are averaged to obtain an overall beta estimate for the firm, making use of information provided by all the returns data, rather than a subset of the data (selected by arbitrarily choosing one of five possible reference days to compute historical stock and market returns). We have adopted the approach of using all possible reference days to estimate beta to minimise the risk of introducing sampling error into the estimation process by relying on a single reference day.[78] The approach of using all available reference days was recently adopted by IPART.[79]
- Use 5-year and 10-year historical periods. The ACCC considered 5-year historical periods in its 2015 Telstra FAD for fixed line services and the AER considers longer historical periods, noting that "we consider that placing most weight on the long-term estimates can lead to a more robust and statistically reliable equity beta estimate and better account for the cyclicality in factors affecting empirical equity beta estimates."[80] Consequently, the tables below set out estimates for two different historical periods.
- Impose a rule that a comparator must have at least 40 observations per year for weekly estimates, and 10 observations per year for monthly estimates in order to be included in the final comparator sample.
- We also apply liquidity requirements for an observation to be included:
  - at least 10 days must have trades recorded for a monthly return to be included, and at least 2 days must have trades recorded for a weekly return to be included. We also imposed a rule that a comparator must have at least 144 observations for weekly estimates and 36 observations for monthly estimates to be included in the final comparator sample. This requirement was added to ensure that sufficient data were available for each comparator to produce statistically robust beta estimates.
  - We apply the Amihud measure, which is designed to quantify the price impact of illiquidity – when a stock is thinly traded, a large transaction can have a material temporary effect on

78 This sampling error problem is referred to in the finance literature as the 'reference day risk' problem. See, for example, Acker, D., and N. W. Duck, 2007. "Reference-day risk and the use of monthly returns data," *Journal of Accounting, Auditing and Finance*, 22, 527–557.

79 IPART, *Estimating equity beta for the Weighted Average Cost of Capital*, Final Report, August 2020, p. 1.

80 AER, *Rate of return information paper*, December 2021, p. 22.

prices as it is absorbed by the market.[81] The Amihud filter seeks to identify observations where the price change is large relative to the liquidity in the market at the time – such observations being more likely to reflect price dislocation from an order being absorbed into a relatively illiquid market. We drop any observations if the associated Amihud measure exceeds 25 over the returns window. This approach was recently adopted by IPART.[82] The differences in final beta results is very minor and reduces the beta (< 1.3% for each estimate (weekly/monthly & 5/10 year).

- Calculate the gearing of each comparator using total debt and market cap as reported by Bloomberg, by taking the average value of total debt divided by total debt plus market cap over the sample window for each comparator.

Sample

209. The final sample of 77 firms is derived from combining:
    - The ACCC's 2015 sample;
    - The Commerce Commission's 2020 sample; and
    - Additional comparators identified by NBN Co.
210. From this broadest list of firms, we reduce the sample to reflect:
    - lack of relevant beta or gearing data;
    - firms not listed in New Zealand, the UK, North America, Eastern and Western Europe, Japan, Singapore and South Korea;
    - firms not primarily engaged in telecommunications activities (e.g., broadcasting); and
    - firms not earning most revenues in their home listed market.[83]
211. As noted above, additional comparators may be removed from samples when they do not pass observation and liquidity filters, although no more than 10 comparators are excluded from any estimation (i.e., minimum sample size is 67). This allows for us to keep delisted firms in the samples. Dropped comparator observations are shown as blanks in **Table 10**.

Results

Table 10: Asset beta and gearing estimates for individual comparators

		10 Year 2012-11 to 2022-10			5 Year 2017-11 to 2022-10		
Comparator	Ticker	Weekly	Monthly	Gearing	Weekly	Monthly	Gearing
SK Telecom Co Ltd	017670 KS Equity	0.32	0.34	35%	0.32	0.32	39%
KT Corp	030200 KS Equity	0.21	0.21	55%	0.23	0.21	54%
LG Uplus Corp	032640 KS Equity	0.29	0.25	47%	0.35	0.30	46%

81 Amihud, Y (2002), Illiquid and stock returns: cross-section and time-series effects, *Journal of Financial Markets*, Volume 5, pp. 31-56.

82 IPART, *Estimating Equity Beta for the Weighted Average Cost of Capital*, Final Report, August 2020.

83 As noted at footnote 54, the additional firms from the NBN Co sample ended up removed from the sample due to the application of the filters described.

Comparator	Ticker	10 Year 2012-11 to 2022-10			5 Year 2017-11 to 2022-10		
		Weekly	Monthly	Gearing	Weekly	Monthly	Gearing
Sejong Telecom Inc	036630 KS Equity	0.95	0.97	9%	1.02	1.07	10%
Nippon Telegraph & Telephone C	9432 JP Equity	0.40	0.34	37%	0.37	0.36	37%
KDDI Corp	9433 JP Equity	0.60	0.53	17%	0.49	0.39	17%
SoftBank Group Corp	9984 JP Equity	0.50	0.49	60%	0.54	0.49	64%
BCE Inc	BCE CN Equity	0.35	0.30	33%	0.38	0.31	34%
Bezeq The Israeli Telecommunic	BEZQ IT Equity	0.38	0.31	45%	0.32	0.25	52%
BT Group PLC	BT/A LN Equity	0.51	0.53	40%	0.41	0.44	54%
Cable One Inc	CABO US Equity	0.69	0.78	20%	0.74	0.82	21%
Cincinnati Bell Inc	CBB US Equity	0.28	0.22	71%	0.19	0.13	75%
Cogeco Communications Inc	CCA CN Equity	0.23	0.29	48%	0.23	0.29	47%
Crown Castle Inc	CCI US Equity	0.50	0.44	28%	0.51	0.49	27%
Cogent Communications Holdings	CCOI US Equity	0.50	0.35	26%	0.43	0.24	27%
Charter Communications Inc	CHTR US Equity	0.47	0.51	49%	0.49	0.54	47%
Cellnex Telecom SA	CLNX SM Equity	0.33	0.27	32%	0.30	0.23	34%
Consolidated Communications Ho	CNSL US Equity	0.37	0.36	68%	0.27	0.25	78%
Chorus Ltd	CNU NZ Equity	0.37	0.28	55%	0.33	0.22	49%
Deutsche Telekom AG	DTE GR Equity	0.36	0.36	52%	0.29	0.28	57%
Euskaltel SA	EKT SM Equity	0.22	0.26	51%	0.21	0.27	53%
Elisa Oyj	ELISA FH Equity	0.43	0.34	19%	0.33	0.28	15%
Eutelsat Communications SA	ETL FP Equity	0.26	0.31	49%	0.22	0.29	56%
Gamma Communications PLC	GAMA LN Equity	0.49	0.55	1%	0.56	0.64	1%
Hellenic Telecommunications Or	HTO GA Equity	0.51	0.47	32%	0.49	0.42	23%
IDT Corp	IDT US Equity	1.22	1.54	2%	1.37	1.77	2%
iliad SA	ILD FP Equity	0.39	0.30	26%	0.25	0.17	42%
Infrastrutture Wireless Italia	INW IM Equity	0.37	0.33	15%	0.38	0.27	19%
Koninklijke KPN NV	KPN NA Equity	0.36	0.33	45%	0.29	0.27	40%
Liberty Global PLC	LBTYA US Equity	0.42	0.45	58%	0.37	0.42	58%
Retelit SpA	LIT IM Equity	0.60	0.51	11%	0.53	0.36	19%
Masmovil Ibercom SA	MAS SM Equity	0.46	0.49	40%	0.50	0.45	40%
Netia SA	NET PW Equity	0.22	0.02	20%			
NETLINK NBN TRUST	NETLINK SP Equity	0.26	0.28	16%	0.26	0.29	16%
Telefonica Deutschland Holding	O2D GR Equity	0.46	0.47	25%	0.37	0.38	34%
Orange SA	ORA FP Equity	0.31	0.26	54%	0.22	0.19	55%
Proximus SADP	PROX BB Equity	0.42	0.44	26%	0.33	0.40	30%
Rogers Communications Inc	RCI/B CN Equity	0.30	0.26	39%	0.33	0.27	39%
SBA Communications Corp	SBAC US Equity	0.50	0.41	34%	0.48	0.39	31%
Swisscom AG	SCMN SW Equity	0.41	0.39	26%	0.37	0.31	26%
SES SA	SESG FP Equity	0.44	0.60	35%	0.45	0.66	43%
Shenandoah Telecommunications	SHEN US Equity	0.56	0.49	27%	0.51	0.42	25%
Siminn HF	SIMINN IR Equity	0.36	0.35	29%	0.38	0.37	24%
Shaw Communications Inc	SJR/B CN Equity	0.45	0.42	29%	0.52	0.46	28%
Superloop Ltd	SLC AU Equity	0.53	0.79	10%	0.58		13%
Spark New Zealand Ltd	SPK NZ Equity	0.67	0.52	17%	0.52	0.41	19%
Sunrise Communications Group A	SRCG SW Equity	0.34	0.31	34%	0.31	0.18	31%
Singapore Telecommunications L	ST SP Equity	0.67	0.70	17%	0.60	0.64	21%
StarHub Ltd	STH SP Equity	0.45	0.40	29%	0.47	0.41	32%
TELUS Corp	T CN Equity	0.36	0.40	33%	0.36	0.39	36%
AT&T Inc	T US Equity	0.38	0.29	40%	0.34	0.26	47%
TalkTalk Telecom Group Ltd	TALK LN Equity	0.57	0.59	30%	0.49	0.53	43%
TDC Holding A/S	TDC LI Equity	0.26		43%			
Telephone and Data Systems Inc	TDS US Equity	0.51	0.55	49%	0.40	0.43	57%
Telefonica SA	TEF SM Equity	0.39	0.41	60%	0.31	0.33	66%
Telenor ASA	TEL NO Equity	0.41	0.27	29%	0.25	0.09	35%
Tele2 AB	TEL2B SS Equity	0.51	0.42	23%	0.41	0.36	25%
O2 Czech Republic AS	TELEC CP Equity	0.39	0.27	12%	0.25	0.24	17%
Telia Co AB	TELIA SS Equity	0.39	0.33	35%	0.30	0.26	39%
Telecom Italia SpA/Milano	TIT IM Equity	0.29	0.30	72%	0.26	0.23	76%
Telekom Austria AG	TKA AV Equity	0.26	0.27	46%	0.26	0.24	42%

		10 Year 2012-11 to 2022-10			5 Year 2017-11 to 2022-10		
Comparator	**Ticker**	**Weekly**	**Monthly**	**Gearing**	**Weekly**	**Monthly**	**Gearing**
Telstra Group Ltd	TLS AU Equity	0.42	0.45	25%	0.35	0.38	30%
T-Mobile US Inc	TMUS US Equity	0.45	0.33	44%	0.45	0.35	39%
Telenet Group Holding NV	TNET BB Equity	0.35	0.34	50%	0.28	0.28	56%
TPG Corp Ltd	TPM AU Equity	0.59	0.50	12%			
Uniti Group Inc	UNIT US Equity	0.48	0.46	62%	0.41	0.41	67%
United States Cellular Corp	USM US Equity	0.49	0.48	37%	0.36	0.35	47%
United Internet AG	UTDI GR Equity	0.64	0.61	17%	0.59	0.58	22%
Vocus Group Ltd	VOC AU Equity	0.80	0.61	28%	0.85	0.65	38%
Vodafone Group PLC	VOD LN Equity	0.52	0.49	47%	0.41	0.40	58%
Verizon Communications Inc	VZ US Equity	0.29	0.24	37%	0.24	0.21	39%
Sample average		**0.44**	**0.43**	**35%**	**0.41**	**0.39**	**38%**

Source: Frontier Economics analysis of Bloomberg data

Frontier Economics

Brisbane | Melbourne | Singapore | Sydney

Frontier Economics Pty Ltd
395 Collins Street Melbourne Victoria 3000

Tel: +61 3 9620 4488
https://www.frontier-economics.com.au

ACN: 087 553 124 ABN: 13 087 553 124