

Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks

Revised Draft Decision

28 November 2014

Economic Regulation Authority

WESTERN AUSTRALIA

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Invitation to make submissions

Interested parties are invited to make submissions on this revised draft decision by **4:00 pm (WST) Friday 20 February 2015** via:

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STATUS OF PREVIOUS SUBMISSIONS

The Authority notes that a number of parties made submissions in response to the original draft decision, which was released on 5 June 2014. The Authority will take those submissions into account, where they remain relevant. Therefore stakeholders need not necessarily review material in this revised draft decision that has not changed.

However, interested parties may make additional submissions on any material in this revised draft decision, which the Authority also will take into account.

Changes between the original draft decision and this revised draft decision are highlighted in grey shading, with the key changes in sections:

- the process for conducting this review – section 1.2;
- the averaging period for estimating components of the return on debt – section 6.2.3;
- the method for estimating the debt risk premium – chapter 9;
- the method for estimating the market risk premium – chapter 11;
- the method for estimating the impact of imputation credits on the rate of return (gamma) – chapter 14; and
- the method for estimating inflation – chapter 15.

CONFIDENTIALITY

In general, all submissions from interested parties will be treated as being in the public domain and placed on the Authority's website. Where an interested party wishes to make a submission in confidence, it should clearly indicate the parts of the submission for which confidentiality is claimed, and specify in reasonable detail the basis for the claim. Any claim of confidentiality will be considered in accordance with the provisions of Section 50 of the *Railways (Access) Code 2000*.

The publication of a submission on the Authority's website shall not be taken as indicating that the Authority has knowledge either actual or constructive of the contents of a particular submission and, in particular, whether the submission in whole or part contains information of a confidential nature and no duty of confidence will arise for the Authority.

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Executive Summary

Clause 3 of Schedule 4 of the Railways (Access) Code 2000 (**Code**) requires the Economic Regulation Authority (**Authority**) to make an annual determination of a WACC to be applied in the determination of capital costs for each of:

- the railway infrastructure described in items 49, 50 and 51 in Schedule 1 (hereafter referred to as the **PTA network**);
- the railway infrastructure associated with the railways network described in other items in Schedule 1 (hereafter referred to as the **Brookfield Rail network**), except item 52;
- the railway infrastructure associated with that part of the railways network described in item 52 in Schedule 1 (hereafter referred to as the **TPI network**).

Clause 3 of Schedule 4 of the Code further requires that in every fifth year subsequent to 2003, the Authority undertake a public consultation program prior to determining the WACC values for that year.

The Authority has decided to revise and re-issue the rail WACC method review draft decision, which it previously released on 5 June 2014. Changes between the original draft decision and this revised draft decision are highlighted in grey shading in the document.

Indicative parameter estimates and WACC results for the three Western Australian regulated rail networks – derived through application of the Authority's revised approach as set out in this review, as at 6 November 2014 – are at Appendix 7. The indicative real pre-tax WACCs for the regulated networks are as follows:

- PTA – 4.56 per cent;
- Brookfield Rail – 8.02 per cent; and
- TPI – 13.30 per cent.

The broad regulatory framework

The Authority's primary task in developing the rail WACC estimates is to achieve the object of the *Railways (Access) Act 1998*. This implies that the prime consideration is to achieve rail WACC estimates that:

- are consistent with and deliver efficient use of and investment in railway facilities; and
- facilitate a contestable market for rail operations.

The rate of return framework

Components of the WACC

The Authority will retain the real pre-tax approach to estimating the rail WACC.

The nominal pre-tax WACC can be expressed as:

$$WACC = E(R_e) \times \frac{E}{V} \times \frac{1}{(1 - T_c(1 - \gamma))} + E(R_d) \times \frac{D}{V} \quad (3)$$

where:

$E(R_e)$ is the nominal post-tax expected rate of return on equity – the cost of equity;

$E(R_d)$ is the nominal pre-tax expected rate of return on debt – the cost of debt;

$\frac{E}{V}$ is the proportion of equity in the total financing (which comprises equity and debt);

$\frac{D}{V}$ is the proportion of debt in the total financing;

T_c is the tax rate; and

γ (gamma) is the value of franking credits created (as a proportion of their face value).

The Authority will retain the market transformation method for converting the nominal post-tax WACC to the real pre-tax WACC

With the market transformation method, the real pre-tax WACC is obtained by removing expected inflation π_e from the nominal pre-tax WACC:

$$WACC_{\text{real pre-tax}} = \frac{(1 + WACC_{\text{nominal pre-tax}})}{1 + \pi_e} - 1 \quad (4)$$

Term of the WACC

The Authority considers that a WACC with a term that is consistent with the long economic lives of the assets will best meet the requirements of the *Railways (Access) Act 1998* and the Code. Accordingly, the Authority will utilise the longest term reliable data to inform the rail WACC. Generally, this will be a 10 year term. However, where appropriate, longer term data may be used to inform the estimates (for example, the use of long term averages of the real return on equity).

The Authority notes that the longer term estimates developed for the rail WACC are not directly comparable to the 5 year forward looking estimate of the rate of return used for its gas decisions. The term of the gas rate of return is conditioned by the 5 year term of the regulatory period, which requires a 5 year term for the rate of return estimate in order to maintain the present value (“NPV=0”) condition. In contrast, the term of the rail WACC is conditioned by the economic lives of the rail assets, which are long term.

Point estimates or ranges for estimates?

The use of a single point estimate for the return on equity and the return on debt will lead to a single point estimate for the rate of return. The single point estimate of the rate of return will be facilitated by a single point estimate of the gearing level.

The benchmark efficient entity and risk

The benchmark efficient entity is defined as:

A 'pure-play' regulated rail facility operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services.

The Authority will base its estimates of efficient financing costs on the observations from a sample of comparator firms, with efficient financing costs, that are judged to be 'similar' to the rail services provider.

There are a range of costs and benefits to be evaluated when considering whether to adopt a domestic or international form of any particular model of the rate of return or its components. On balance, the Authority considers that there would likely be significant net costs with moving to a full international approach. Therefore, the Authority is of the view that it should continue to base its estimates of the rail WACC on domestic financial markets. This still allows for the influence of international investors in Australian markets for equity, or the influence of international lenders supplying debt finance directly to Australian firms.

However, in recognition of the small data sets for some parameters in the rail WACC – in particular for the gearing, credit rating and equity beta – the Authority will utilise international comparators for the gearing, credit rating and equity beta parameters.

Gearing

The Authority considers gearing of:

- 50 per cent, at the higher end of the observed gearing range, is appropriate for the PTA rail network;
- 25 per cent, consistent with the Australian average, to be the appropriate benchmark gearing level for the Brookfield Rail network;
- 20 per cent is appropriate for the TPI network, given its higher risk stemming from the broad reliance on a single commodity, iron ore, and the limited number of potential customers.

Return on debt

The Authority will base its estimates of the cost of debt on a risk premium over and above the risk-free rate, combined with a margin for administrative costs:

$$\text{Cost of Debt} = \text{Risk Free Rate} + \text{Debt Risk Premium} + \text{Debt raising costs}$$

The estimate of the cost of debt will be based on prevailing rates 'on-the-day' just prior to each determination of floor and ceiling costs.

The Authority will adopt a 40 business days averaging period for estimating the risk free rate and the debt risk premium for the rail WACC.

Risk free rate of return

The Authority will base its estimation of the nominal risk free rate on the observed yield of 10 year Commonwealth Government Securities (**CGS**) bonds. The 10 year term is consistent with the long term of the WACC estimate (see market risk premium section below).

The Authority will adopt a 40 business days averaging period, just prior to the final determination of the rail WACC, for the purpose of estimating the CGS risk free rate.

Benchmark credit rating

The Authority considers that the benchmark efficient rail entities would be able to sustain credit ratings of:

- A for the PTA network;
- BBB+ for the Brookfield Rail network;
- BBB- for the TPI rail network.

The Authority notes that these credit ratings are unchanged from the 2008 review.

Debt risk premium

The debt risk premium will be estimated consistent with a 10 year term. The Authority considers that this is the longest feasible term that can be reliably estimated from the observed data.

To this end, the Authority has developed an extended bond yield approach to estimate the 'regulated debt risk premium'. The regulated debt risk premium will be derived from the observed yields of relevant corporate bonds – taken from Bloomberg – that qualify for inclusion in the benchmark sample.

To estimate the regulated debt risk premium, the Authority will:

- extend the benchmark sample under the bond yield approach to: (i) include Australian corporate bonds denominated in domestic currency (AUD) and foreign currencies including USD; Euros; and British pounds; and (ii) exclude bonds issued by financial sectors including banks;
- identify the credit 'spread to swap' for each bond, in terms of the denominated currency, as a first step;
- convert the resulting spread to swap for each bond to AUD terms, by accounting for hedging costs;
- estimate a credit spread to swap yield curve in AUD equivalents – applying the Gaussian Kernel, the Nelson-Siegel and the Nelson-Siegel-Svensson techniques;
- use the simple average of these three yield curves' 10 year spread to swap estimate to arrive at the final estimate of the 10 year spread to swap;
- add the 10 year Australian swap rate to the resulting 10 year spread to swap, to determine the 10 year cost of debt;
- estimate the regulated debt risk premium as the 10 year cost of debt spread to the 10 year risk free rate.

For each of the rail networks, a separate bond sample will be developed, based on the corresponding benchmark efficient credit rating. The Authority will use the Bloomberg data service exclusively in order to construct each benchmark sample. Under the bond yield approach, the following criteria apply in order to select bonds to be included in each of the benchmark samples.

- credit rating of each bond must match that of the corresponding benchmark efficient entity, as rated by Standard & Poor's;
- the remaining time to maturity must be two years or longer;
- the bonds must be issued by Australian (non-financial) entities and denominated in AUD, USD, Euros or GBP;
- fixed bonds and floating bonds are eligible for inclusion;
- both bullet bonds and bonds with callable/puttable redemptions are eligible for inclusion; and
- there are at least 20 yield observations over the required 40 day averaging period.

Return on equity

Models of the return on equity

The model used by Australian regulators for quantifying the return on equity and associated risk to date has been the Sharpe Lintner Capital Asset Pricing Model (**CAPM**).

The Authority reviewed asset pricing approaches as part of its development of the gas rate of return guidelines. The Authority's conclusion from that assessment was that only the Sharpe Lintner CAPM model is relevant for informing the Authority's estimation of the prevailing return on equity for the regulated firm, at the current time. That conclusion is adopted for the rail WACC. The Authority will retain the Sharpe-Lintner CAPM model for estimating the return on equity for the rail WACC.

Other models and approaches are considered to be not relevant for determining the return on equity within the Australian context at the current time, at least without some new developments in terms of the theoretical foundations or in the empirical evidence.

A five step approach to estimating the return on equity

The Authority will adopt a five step approach for estimating the return on equity. The five steps are summarised in Table 16 in the main report.

This approach will allow the Authority to have regard to a wide range of material, taking account of relevant models for the return on equity, as well as a range of other relevant information. The Authority will give weight to each piece of information according to its merits at the time of each determination. This will enable it to provide a transparent and clear decision that meets the objectives and requirements of the *Railways (Access) Act 1998* and the Code.

Market risk premium

The Authority considers that it is appropriate to determine the *long term* market risk premium (**MRP**) – consistent with the economic life of the rail assets as required under the Code – as the difference between the forward looking long term estimate of the real return on equity

for the overall market and the 'on the day' estimate of the 10 year real risk free rate. This long term real return on equity will be consistent with that expected to be earned over the economic life of rail infrastructure assets.

This approach to estimating the MRP is consistent with the so-called 'Wright method'. The Wright method takes as its starting point the evidence that the real return on equity is 'stationary' over the long term. That is, the real return on equity is mean reverting, but the MRP (and the risk free rate) may be a random walk. This property of stationarity, or mean reversion, means that the historic mean of the real return on equity may be used to inform the future real return on equity (over a sufficiently long period).

Equity beta

PTA

Given the low level of systematic risk for the PTA rail network return, the Authority considers that an asset beta of 0.3 is appropriate.

Utilising a gearing of 50 per cent, this corresponds to an equity beta of the PTA network of 0.6.

Brookfield Rail

The Authority estimates the asset beta for the Brookfield Rail network as being 0.7. Utilising a gearing of 25 per cent, this corresponds to an equity beta of the Brookfield Rail network of 0.93.

TPI

The Authority considers that an asset beta of 1.25 reflects the higher risks associated with the returns of the TPI network. When combined with the benchmark gearing of 0.2, this results in an equity beta of 1.56.

Debt raising costs

The Authority is of the view that debt raising costs should be incorporated as a component in the rate of return on debt. However, these debt raising costs should only include the direct cost components. These costs will be recompensed in proportion to the average annual issuance, and will cover: (i) gross underwriting fees; (ii) legal and roadshow fees; (iii) company credit rating fees; (iv) issue credit rating fees; (v) registry fees; and (vi) paying fees.

The Authority considers that its 2013 estimate of 12.5 basis points per annum provides for a current estimate of debt raising costs for the benchmark efficient entity.

Gamma

The Authority will adopt a point estimate for gamma of 0.5.

This estimate is based on the product of a payout ratio of 0.7, and a utilisation rate of 0.7. The resulting estimate of 0.49 is rounded to 0.5, in acknowledgement that the estimate is derived from a fairly wide range, and subject to imprecision.

Inflation

Given the long term of the rail WACC estimates the Authority will adopt a forward looking estimate of inflation of 2.5 per cent. This is consistent with the mid-point of the Reserve Bank of Australia's inflation target, which is 2 to 3 per cent.

1 Introduction

1. The Authority is required to publish incremental and total costs each year for the below-rail operations of regulated rail networks. The forward looking rate of return, or weighted average cost of capital (**WACC**), is a key input to the determination of those costs.

1.1 The Code requirement

2. Clause 3 of Schedule 4 of the *Railways (Access) Code 2000* (**Code**) requires the Economic Regulation Authority (**Authority**) to make an annual determination of a WACC to be applied in the determination of capital costs for each of:
 - the railway infrastructure described in items 49, 50 and 51 in Schedule 1 (hereafter referred to as the **PTA network**)
 - the railway infrastructure associated with that part of the railways network described in item 52 in Schedule 1 (hereafter referred to as the **TPI network**)
 - the railway infrastructure associated with the railways network described in other items in Schedule 1 (hereafter referred to as the **Brookfield Rail network**)
3. The PTA network is the urban passenger network operated by the Public Transport Authority (**PTA**), which is an agency of the Western Australian Government.
4. The TPI network is operated by The Pilbara Infrastructure Pty Ltd (**TPI**) as the owner of the railway network that links Fortescue Metals Group's mines in the Pilbara to TPI's port facilities in Port Hedland.¹
5. The Brookfield Rail network is the freight network in the south-west of Western Australia operated by Brookfield Rail (formerly known as WestNet Rail), a wholly-owned subsidiary of Brookfield Infrastructure Partners L.P.
6. Clause 3 of Schedule 4 of the Code further requires that in every fifth year subsequent to 2003, the Authority undertake a public consultation program prior to determining the WACC values for that year.

1.2 The rail WACC method review

7. The Authority undertook a public consultation program prior to making its annual WACC determination for the regulatory year commencing 1 July 2013, with a view to also undertaking a review of the rail WACC method at that time. The Issues Paper, and submissions from stakeholders, can be found on the Authority's website.
8. However, the Authority chose to defer finalisation of the rail WACC review because at the time the Authority was undertaking a comprehensive review of its approach to determining the WACC under the National Gas Rules, which involved common issues. The Authority subsequently released the rate of return guidelines for gas

¹ The TPI railway was built under the *Railway and Port (The Pilbara Infrastructure Pty Ltd) Agreement Act 2004*, and has been included in the Western Australian rail access regime since 1 July 2008, when Part 3 of that Agreement Act was proclaimed.

transmission and distribution networks pursuant to the National Gas Rules in December 2013 (the gas rate of return guidelines).

9. The Authority then released a draft decision in relation to the rail WACC method review on 5 June 2014.
10. However, the Authority's rate of return approach has undergone further development during the course of the Authority's deliberations for the draft decision on the proposed revisions to ATCO's Mid-West and South-West Gas Distribution System (**GDS**) access arrangement, which was released on 14 October 2014. There is an overlap of issues between the draft rail WACC method and the revised rate of return method set out in the ATCO GDS draft decision, which needs to be clarified.
11. To incorporate the revised approaches, to clarify key differences, and to allow due process in terms of consultation with rail stakeholders, the Authority has decided to revise and re-issue the rail WACC method review draft decision, which it previously released on 5 June 2014. Changes between the original draft decision and this revised draft decision are highlighted in grey shading, and are as follows:
 - the process for conducting this review – section 1.2;
 - the averaging period for estimating components of the return on debt – section 6.2.3;
 - the method for estimating the debt risk premium – chapter 9;
 - the method for estimating the market risk premium – chapter 11;
 - the method for estimating the impact of imputation credits on the rate of return, gamma – chapter 14; and
 - the method for estimating inflation – chapter 15.
12. In the interim, the Authority based the 2014 rail WACC values on the 2013 method and parameters. The 2014 rail WACC determination was released by the Authority on 24 October 2014, and may be found on the Authority's website.
13. Following receipt of submissions on this revised draft decision, the Authority intends to release a final rail WACC method review decision in 2015.² The resulting updated method will apply for the determination of the rail WACC for the Freight and Urban Railway Networks for the regulatory year commencing 1 July 2015, and for subsequent years.
14. Indicative WACC results for the three Western Australian regulated rail networks – derived through application of the Authority's revised approach as set out in this review – are at Appendix 7.³

² As noted in the section 'Invitation to make a submission' on page vi, a number of interested parties have already made submissions in response to the original Draft Decision, which was released on 5 June 2014. The Authority will take those submissions into account. Therefore stakeholders do not necessarily need to review material in this revised draft decision that has not changed. However, interested parties may make additional submissions on any material in this revised draft decision, as they wish, which the Authority will also take into account.

³ All parameters contributing to the indicative WACC estimates in Appendix 7 accord with this revised draft decision, and are based on 18 trading days ending 6 November 2014.

2 The broad regulatory framework

16. The Western Australian rail access regime (**WARAR**) provides for light handed regulation of access to Western Australia's intrastate rail networks. The WARAR seeks to facilitate commercial negotiation between parties. Negotiation is facilitated through provision of information that is approved by the Authority, including on the reasonable costs of access, which are expressed as a range between incremental and total costs. The WARAR also provides for recourse to arbitration if the parties cannot agree.
17. The WARAR is linked to the National Access Regime, which is set out in Part IIIA of the Commonwealth's Competition and Consumer Act 2010 (**CCA**) and clause 6 of the Competition Principles Agreement (**CPA**). The WARAR was certified as effective by the Commonwealth Minister responsible for the CCA, following consideration by the National Competition Council (**NCC**). In making that decision, the NCC and the Minister:⁴
- considered the regime in light of the objects of Part IIIA of the CCA; and
 - assessed the effectiveness of the access regime by applying the principles contained in clause 6 of the CPA.
18. The objects clause of Part IIIA (s. 44AA) of the CCA establishes twin objectives for the National Access Regime:
- to promote the economically efficient operation of, use of, and investment in the infrastructure by which services are provided, thereby promoting effective competition in upstream and downstream markets; and
 - to provide a framework and guiding principles to encourage a consistent approach to access regulation in each industry.
19. Clause 6 of the CPA outlines a number of principles for the certification of an access regime. The Productivity Commission notes that:⁵
- These principles have the status of guidelines in the CCA (s. 44DA), and state that an effective access regime should, among other things:
- be limited to services that are provided by means of significant infrastructure facilities;
 - contain an objects clause that promotes the economically efficient use of, operation and investment in, significant infrastructure thereby promoting effective competition in upstream or downstream markets;
 - encourage negotiation between parties in the first instance, but where such agreement cannot be reached, governments should establish a right for persons to negotiate access to a service provided by means of a facility;
 - be consistent where more than one state or territory access regime applies to a service;

⁴ The most recent certification occurred for a period of five years. The Minister, in making that decision, noted (Bradbury D., *Decision to certify the Western Australian Rail Access Regime*, 11 February 2011):

My decision to certify did not reflect the final recommendation of the NCC. In reaching this decision, I considered advice from the Department of Treasury... Even though my decision is different to the NCC's final recommendation, I share some of their concerns about the way the WARAR is applied to new railways. I encourage the Western Australian Government to consider how greater certainty could be achieved, and the next review of the regime in 2014 is an appropriate opportunity for this to occur.

⁵ Productivity Commission, *National Access Regime*, Report No. 66, 25 October 2013, p. 60.

- have an appropriate dispute resolution framework. The dispute resolution body should consider a range of factors in determining the terms and conditions of access (such as the owner's legitimate business interests and the benefits to the public from having competitive markets).
20. The WARAR is given power through the Western Australian *Railways (Access) Act 1998* and its subsidiary Code.
21. The object of the *Railways (Access) Act 1998* is to:
- ...establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations.⁶

2.1 Considerations of the Authority

22. With regard to the rail WACC, the Authority notes that Clause 2 of Schedule 4 of the Code sets out the key requirements for its determination:⁷

2. Railway infrastructure

- (1) In this Schedule —
- capital costs means the costs comprising both the depreciation and risk adjusted return on the relevant railway infrastructure.
- (2) For the purposes of this clause, railway infrastructure includes a cutting or embankment made for any reason after the commencement of this Code.
- (3) Capital costs (other than capital costs under subclause (5)) are to be determined as the equivalent annual cost or annuity for the provision of the railway infrastructure calculated in accordance with subclause (4).
- (4) The calculation is to be made by applying —
- (a) the Gross Replacement Value (**GRV**) of the railway infrastructure as the principal;
 - (b) the Weighted Average Cost of Capital (**WACC**) as the interest rate; and
 - (c) the economic life which is consistent with the basis for the GRV of the railway infrastructure (expressed in years) as the number of periods,
- where —
- GRV is the gross replacement value of the railway infrastructure, calculated as the lowest current cost to replace existing assets with assets that —
- (i) have the capacity to provide the level of service that meets the actual and reasonably projected demand; and
 - (ii) are, if appropriate, modern equivalent assets;
- and
- WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.

⁶ *Railways (Access) Act 1998*, Part 1, s. 2A.

⁷ *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

23. Clause 4 of Schedule 4 of the Code defines the nature of the costs as:

The costs referred to in this Schedule are intended to be those that would be incurred by a body managing the railways network and adopting efficient practices applicable to the provision of railway infrastructure, including the practice of operating a particular route in combination with other routes for the achievement of efficiencies.

2.1.1 Regulatory objective

24. Any regulatory decision with regard to the rail WACC necessarily needs to determine the approach that is considered to best deliver the object of the *Railways (Access) Act 1998*. This implies that the prime consideration is to achieve estimates that:
- are consistent with and deliver efficient use of and investment in railway facilities; and
 - facilitate a contestable market for rail operations.
25. The Code, unlike the National Gas Rules, does not explicitly prescribe a rate of return objective. Nevertheless, in order to account for efficient use and investment in railway facilities, the Authority considers that it needs to estimate the rail WACC commensurate with the efficient financing costs of efficient entities with a similar degree of risk in respect of the provision of the rail services.⁸ The current regulatory approach assumes that efficient firms with efficient financing provide a 'benchmark' for each regulatory decision.
26. Such efficient financing will contribute to the efficient use of the railway networks and efficient investment. The resulting efficient input costs and output prices will facilitate contestability in the provision of railway services. The Authority considers that outcomes that are observed in contestable markets are in the long term interests of consumers, as these deliver desired goods and services at least cost over time.

2.1.2 Criteria

27. The Authority considers that 'criteria' can help to articulate its reasoning where it is applying regulatory discretion in determining the best approach for estimating the rate of return, thereby increasing clarity for stakeholders.
28. Stakeholders in submissions on the Issues Paper were generally supportive of the Authority establishing criteria for considering alternative WACC methodologies, particularly where such criteria were informed by the WARAR objectives.
29. A number of stakeholders suggested additional criteria. Brockman proposed that it is desirable if the WACC estimates are:
- ...consistent with the application of the existing instruments under the Code or, where this is not the case, identifies what changes are required to ensure a change to the

⁸ This statement is similar to the allowed rate of return objective in the National Gas Rules. Where relevant and appropriate, the Authority considers that the approach to estimating the rail WACC should be consistent with the determination of the rate of return in gas. Accordingly, this review refers extensively to the development of the gas rate of return guidelines, undertaken in 2013. For more detail, see Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013.

WACC methodology does not have consequences that are incompatible with the objectives of the rail regime.⁹

30. The Authority's rationale for criteria were developed as part of the gas rate of return guidelines.¹⁰ The Authority considers that it is desirable that it adopt the same criteria for the rail WACC decision, particularly given the similarity in the objectives between the two regimes.
31. The Authority considers that the criteria are consistent with the objectives of the *Railways (Access) Act 1998*.

2.2 Draft decision

32. The Authority's primary task in developing the rail WACC estimates is to achieve the object of the *Railways (Access) Act 1998*. This implies that the prime consideration is to achieve rail WACC estimates that:
 - are consistent with and deliver efficient use of and investment in railway facilities; and
 - facilitate a contestable market for rail operations.
33. The Authority considers it desirable if the WACC estimates are:
 - driven by economic principles:
 - based on a strong theoretical foundation, informed by empirical analysis;
 - fit for purpose:
 - able to perform well in estimating the cost of debt and the cost of equity over the regulatory years of the access arrangement period;
 - implemented in accordance with best practice;
 - supported by robust, transparent and replicable analysis that is derived from available, credible datasets:
 - based on quantitative modelling that is sufficiently robust as to not be unduly sensitive to small changes in the input data;
 - based on quantitative modelling which avoids arbitrary filtering or adjustment of data, which does not have a sound rationale;
 - capable of reflecting changes in market conditions and able to incorporate new information as it becomes available;
 - supportive of specific regulatory aims; and thereby:
 - recognise the desirability of consistent approaches to regulation across industries, so as to promote economic efficiency;
 - seek to achieve rates of return that would be consistent with the outcomes of efficient, effectively competitive markets;

⁹ Brockman Mining Australia, *Submission in response to Issue Paper*, 15 March 2013, p. 5.

¹⁰ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 9.

- as far as possible, ensure that the net present value of returns is sufficient to cover a service providers' efficient expenditures (the 'NPV=0' condition);
- provide incentives to finance efficiently;
- promote simple approaches to estimating the rate of return over complex approaches, where appropriate;
- promote reasoned, predictable and transparent decision making;
- enhance the credibility and acceptability of a decision.

3 The WACC framework

34. The WARAR requires that the component of costs relating to invested capital be calculated as an annuity. The annuity method requires the application of the Weighted Average Cost of Capital (**WACC**) to the Gross Replacement Value (**GRV**) of the asset as the principal, over the economic life of the assets.¹¹

3.1 Current approach

35. The current approach for estimating the rail WACC has its origins in the 1999 review of the WACC methodology by Macquarie Bank, which was undertaken for the Western Australian Rail Access Regulator.¹² Macquarie Bank recommended the adoption of:
- separate estimates for WACC for the urban and freight networks, to reflect the different risks in the provision of below-ground rail services;
 - gearing based on a benchmark capital structure;
 - a cost of debt based on the sum of estimates of the risk free rate and a relevant debt risk premium, determined from benchmark entities with similar risk, with a term based on 10 years;
 - a return on equity derived from the Capital Asset Pricing Model;
 - a value for imputation credits (gamma); and
 - a corresponding estimated real pre-tax WACC for use in the annuity calculation.
36. This broad approach has remained in place since that time, essentially unchanged, although:
- a margin for debt raising costs was added to the estimate of the cost of debt in 2008;
 - the Authority's bond yield approach was used to estimate the debt risk premium component of the cost of debt from 2011:
 - the bond yield approach substituted for the previous yield margin approach, which was based on Bloomberg and CBA Spectrum yield curves;
 - the bond yield approach was revised in 2012 to be based on the 'joint weighted' approach,¹³ following comments made in the Australian Competition Tribunal's decision in 2012 on an application by WA Gas Networks; and

¹¹ *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2 (see paragraph 22 for the relevant text quote).

¹² Macquarie Bank, *Western Australia Rail Access Regime: Independent Assessment of Maximum Rate of Return on Rail Infrastructure*, 23 August 1999.

¹³ The 'joint weighted' approach weights the estimate of the observed bond yields by the 'amount issued', in addition to the foregoing single weighting on the 'term to maturity'.

- a value of gamma of 0.25 was adopted in 2013, instead of the value of 0.5 used previously, reflecting the Australian Competition Tribunal's decision in 2011, following application by Energex Ltd.¹⁴

3.2 Considerations of the Authority

3.2.1 Form of the WACC

37. Consultants to previous reviews of the rail WACC in 2003 and 2008 recommended, as a matter of preference, use of a nominal post-tax (vanilla) framework for estimating the WACC.
38. An advantage associated with the use of a post-tax nominal vanilla WACC is that it is based directly on the observed data. There is no need to transform observed estimates from nominal to real or from post to pre-tax. Australian regulators have progressively moved to adopt the post-tax approach. This removes a source of bias in the estimates.¹⁵
39. Nevertheless, the consultants to previous reviews of the rail WACC in 2003 and 2008 also recognised that the application of the nominal post-tax approach to the rail WACC may not be justified in terms of the additional complexity and regulatory cost involved with separately estimating tax cash flows.
40. The Australian Rail Track Corporation (**ARTC**) submitted to this review a preference for the use of a pre-tax, real framework as the estimation of future tax liabilities may not be consistent with the light handed nature of the Code and the determination of the asset base on a GRV basis. ARTC submitted that the determination of future tax liabilities for a company represents a substantial regulatory burden without providing, in ARTC's view, significant benefits. ARTC noted that, despite the ACCC's

¹⁴ Australian Competition Tribunal, *Application by Energex Limited (Gamma) (No. 5)*, 12 May 2011, A Comp T 9.

¹⁵ To convert from a nominal post-tax WACC to a real pre-tax WACC, the most commonly used approach by Australian regulators has been the 'market transformation approach', which can be summarised in the following sequence:

Nominal post-tax (after tax and imputation) → [gross up by tax] → nominal pre-tax → [minus inflation] → real pre-tax.

An alternative method is the 'reverse transformation approach' which changes the sequence of conversions as follows:

Nominal post-tax (after tax and imputation) → [minus inflation] → real post-tax → [gross up by tax] → real pre-tax.

The market transformation approach adjusts the pre-tax WACC estimate for inflation. However, it has been recognised by regulators that the resulting WACC estimates are upwardly biased, or in other words overly generous. This is because the depreciation schedules for tax and regulatory purposes differ.

Under the Australian tax system, depreciation for tax purposes is based on nominal historic cost accounting. On the other hand, with real regulatory approaches, the implicit approach to regulatory depreciation involves (real) current cost accounting. The differences in the two schedules lead to regulated service providers being over-remunerated for their tax liabilities with the market transformation method for estimating the real pre-tax WACC, and under remunerated with the reverse transformation method.

The extent of bias will depend on the degree of difference between the two depreciation schedules, and on the tax rate and the rate of inflation. Davis has estimated that the resulting WACC bias typically will be up to 3 basis points.

See Davis K., *Journal of Regulatory Economics*, Access regime design and required rates of return: pitfalls in adjusting for inflation and tax effects, January 2006, Vol. 29, Issue 1, pp. 103-122.

preference for a post-tax nominal framework, ARTC continues to use a pre-tax real framework for its regulatory compliance assessments in the Hunter Valley.

41. On the other hand, both Brockman and Flinders Mining noted the trend of Australian regulators to adopt post-tax estimates. Brockman stated that if this occurred for the rail WACC, then the tax allowances made should reflect the actual tax position of the business and not apply an assumed corporate tax rate. Flinders considered that there would be a regulatory cost in obtaining accurate data on tax liabilities and the imputation of franking credits, but that the benefit would be a more accurate estimate of tax liability applying to a specific railway.
42. The Authority considers that, if it were to apply a post-tax approach, the tax cash flows in the post-tax approach would be based on a tax asset base calculated for the standalone entity.¹⁶ The implication is that the post-tax approach would add considerable complexity to the estimation process. Further, the additional complexity may not be warranted as the Code requires the estimation of total costs through an annuity that provides for the return on and of the cost of building a new railway, rather than through a building block approach that is based on a written down asset.
43. For these reasons, the Authority considers that it is reasonable to retain the real pre-tax approach in order to estimate the rail WACC. On the basis that the market transformation approach has had near uniform acceptance by Australian regulators and stakeholders where the pre-tax approach has been adopted, the Authority will continue to use the market transformation approach in converting the nominal post-tax WACC to the real pre-tax WACC.

3.2.2 Components of the rate of return

44. The estimate of the pre-tax return on assets can be expressed, following Officer, as:¹⁷

$$WACC = E(R_e) \times \frac{E}{V} \times \frac{1}{(1 - T_c)(1 - \gamma)} + E(R_d) \times \frac{D}{V} \quad (1)$$

where:

$E(R_e)$ is the nominal post-tax expected rate of return on equity – the cost of equity;

$E(R_d)$ is the nominal pre-tax expected rate of return on debt – the cost of debt;

$\frac{E}{V}$ is the proportion of equity in the total financing (which comprises equity and debt);

$\frac{D}{V}$ is the proportion of debt in the total financing;

¹⁶ That tax position could account for carry forward of losses, and also accelerated depreciation.

¹⁷ Officer R.R., The cost of capital of a company under an imputation tax system, *Accounting and Finance*, 1994.

T_c is the tax rate; and

γ (gamma) is the value of franking credits created (as a proportion of their face value).

45. This approach to estimating the overall rate of return is a 'bottom up' approach, which combines separate estimates for the cost of equity and the cost of debt.
46. As noted above, with the market transformation method, the real pre-tax WACC is obtained by removing expected inflation π_e from the estimate of the nominal pre-tax WACC:

$$WACC_{\text{realpre-tax}} = \frac{(1 + WACC_{\text{nominalpre-tax}})}{1 + \pi_e} - 1 \quad (2)$$

47. The resulting WACC for a benchmark efficient entity represents the competitive rate of return that an entity must earn on its existing asset base in order to satisfy its creditors, shareholders and other providers of capital.
48. The approach to estimating the gearing (or proportion of debt in total financing), the return on equity and the return on debt are discussed in more detail in the following chapters.

3.2.3 The term of the WACC

49. The *Railways (Access) Code 1998* states that the:

...WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.¹⁸
50. The WACC must remunerate the efficient financing costs of the rail service provider over the (long term) *economic life* of the assets.¹⁹ This contributes to maintaining the financial value of an investment in present value terms over its life. With this financial capital maintenance, investors can expect to recover the opportunity cost of employing their capital, given the associated risks, as well as the real value of their initial investment, over time.
51. This accords with the 'NPV=0', or present value principle. The present value principle requires that the present value of a service provider's revenue stream match the present value of the expenditure stream.
52. Importantly, the Authority is required to determine the *long term* rail WACC, consistent with clause 2 of Schedule 4 of the Code. A long term WACC is consistent with the need to estimate incremental and total costs derived from an annuity over the economic life of the rail assets (see paragraph 22).²⁰ Therefore, the Authority

¹⁸ *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

¹⁹ See footnote 11 above.

²⁰ The annuity time horizon for the rail WACC differentiates it from the other WACC resets undertaken by the Authority. In the case of the WACC for gas access arrangements, the Authority considers that the correct term is five years, as this accords with the five year time horizon which is the term of the regulatory period (for more detail on why five years is the correct term for five yearly regulatory resets, see Lally M., *The risk free rate and the present value principle*, 2012, www.aer.gov.au, p. 8). In that case, the NPV=0 principle requires that the term be aligned with the term of the regulatory period, which is five years. See also Lally

- considers that it needs to incorporate a term for the WACC which accounts for the long term return on equity and the long term cost of debt.
53. For the return on equity, a term of 10 years is commonly accepted as a means to estimate the long term return in Australia. The 10 year term allows components of models of the return on equity to be estimated from reliable data. So for example, in the case of the risk free rate, the component may be estimated from the observed yield on 10 year Commonwealth Government Securities (CGS).²¹ In addition, the Authority considers that the long economic life of rail assets means that the long term average real return on equity may be used to inform the market risk premium (see chapter 11).
 54. For the cost of debt, the Authority considers that the long term should also account for the longest practical term of available data. Again, use of the 10 year term CGS provides reliable data, and would also be consistent with the term for the risk free rate used for the return on equity.
 55. The term of the debt risk premium (DRP) component of the cost of debt should also reflect long term debt financing practice. The Authority considers that its revised bond yield approach provides the best estimate of the DRP for the Australian finance market.
 56. However, the limited sample size of such benchmark bonds in Australia preclude robust estimation of the DRP for rail-specific or even infrastructure-specific firms. Instead, the Authority's benchmark sample includes a large range of firms in different industries, albeit with the target credit rating. As a consequence, the Authority considers that it is appropriate to use the information contained in the broad bond yield benchmark sample – relating to each credit rating – as a means to inform each benchmark DRP.
 57. The Authority's extended bond yield approach develops an estimate of the 10 year credit spread estimate (see chapter 9), based on the yields of the observed benchmark samples of bonds for each credit rating.
 58. For the foregoing reasons, the Authority has determined that it will adopt a rail WACC, with a term that is consistent with the long economic lives of the assets.²² Accordingly, the Authority will utilise the longest term reliable data to inform the rail WACC. Generally, this will be a 10 year term. However, where appropriate, longer term data may be used to inform the estimates (for example, the use of the long term averages of the real return on equity, as noted in paragraph 53).

3.2.4 Point estimates or ranges for estimates?

59. The Authority will need to exercise judgment, in order to ensure that the WARAR objective is achieved. This exercise of judgment may extend to the determination of

M, *The Appropriate Term for the Risk Free Rate and the Debt Margin*, Report for the Queensland Competition Authority, April 2010.

²¹ Commonwealth Government Securities with a 10 year term to maturity are commonly used to estimate the long term risk free rate. Estimating over significantly longer terms is potentially less robust, as the market for longer dated CGS is relatively less liquid compared to that for the 10 year CGS (see aofm.gov.au).

²² The Authority notes that the longer term estimates developed for the rail WACC are not directly comparable to the 5 year forward looking estimate of the rate of return used for its gas decisions. The term of the gas rate of return is conditioned by the 5 year term of the regulatory period, which requires a 5 year term for the rate of return estimate in order to maintain the present value ("NPV=0") condition. In contrast, the term of the rail WACC is conditioned by the economic lives of the rail assets, which as noted above, are long.

point estimates within potential ranges. The option of using ranges, or judgment to determine point estimates within ranges, can occur at different 'levels' of the estimation process.

60. The key 'levels' are the estimation of the:
- parameter values;
 - return on equity or the return on debt;
 - overall rate of return.
61. The Authority considers each of these levels in what follows. This analysis is identical to that set out in the gas rate of return guidelines.²³

3.2.4.1 *The parameter level*

62. The Authority has in the past utilised ranges to inform estimates at the parameter level. For example, the Authority in its Western Power decision, considered ranges for the benchmark credit rating, the market risk premium and the equity beta.
63. In this context, ranges have either been used to combine estimates from a number of different approaches, or to represent uncertainty determined through statistical analysis.
64. For example, in estimating the market risk premium, the Authority in its recent decision on Western Power's access arrangement considered four different approaches. These approaches gave overlapping estimates, which together delivered a range, from which the Authority selected a single point estimate for use in estimating the return on equity.²⁴
65. Similarly, in estimating the equity beta, the Authority undertook statistical analysis of market data for a sample of benchmark comparators, from which it established a range. The Authority then used its judgment to select a single point estimate.²⁵
66. A range is not always required. For example, the gearing ratio has been based on a single point estimate derived from the average of observations from comparator firms.
67. The Authority notes that other Australian regulators adopt similar approaches for determining parameter estimates.
68. The Authority considers that establishing ranges for parameters may be appropriate in some circumstances, while elsewhere a single point estimate may be readily obtained. The Authority considers that it is reasonable to continue with this approach at the parameter level.

²³ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, p. 18.

²⁴ Economic Regulation Authority 2012, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, www.erawa.com.au, p. 379.

²⁵ Economic Regulation Authority 2012, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, www.erawa.com.au, p. 398.

3.2.4.2 *The return on equity and the return on debt*

69. The Authority's practice to date has been to establish single point estimates for each parameter, which are then utilised to estimate the return on equity and the return on debt.
70. The alternative could be to utilise ranges for parameters, which then inform a range for the return on equity and the return on debt.
71. The Authority considers that use of single point estimates for parameters is preferred. Point estimates allow stakeholders to readily compare outcomes with other reference points, for example from other sources. In the case of a particular estimation method or financial model, this use of point estimates for parameters would then necessarily lead to a single point estimate for the return on equity and the return on debt. The Authority considers that this gives greater clarity in terms of the means used to estimate the return on equity and the return on debt, which might otherwise be lost if the point estimate was determined at the higher level.
72. However, where multiple estimation methods, financial models, market data or other evidence are used, then this could lead to a range for the return on equity or the return on debt. In this case, the Authority considers that it would determine a point estimate at the level of the return on equity or the return on debt. Again, such point estimates would provide for ready comparison between sources, and for clarity of approach.
73. The Authority therefore will establish point estimates at the parameter level, whether determined from within a range, or derived directly. Such point estimates would then facilitate a single point estimate outcome from each estimation method or financial model.
74. Similarly, the Authority will seek to establish point estimates at the level of the return on equity and the return on debt, whether these are derived from a single point estimate, or from a range informed by multiple estimation methods, financial models, market data or other evidence.
75. Where single point estimates are derived from a range, the Authority recognises that it may be appropriate in some circumstances to adopt a formal weighting approach to inform the final estimate. In other cases, the Authority will need to exercise its judgment, articulating any reasons that inform its decisions.

3.2.4.3 *The overall rate of return*

76. The development of single point estimates for the return on equity and the return on debt will lead to a single point estimate for the rate of return for each benchmark efficient entity. A single point estimate will be facilitated by the single point estimate of the gearing level.

3.3 **Draft decision**

3.3.1 *Components of the WACC*

77. The Authority will retain the real pre-tax approach to estimating the rail WACC.

78. The nominal pre-tax WACC can be expressed as:

$$WACC = E(R_e) \times \frac{E}{V} \times \frac{1}{(1 - T_c(1 - \gamma))} + E(R_d) \times \frac{D}{V}$$

where:

$E(R_e)$ is the nominal post-tax expected rate of return on equity – the cost of equity;

$E(R_d)$ is the nominal pre-tax expected rate of return on debt – the cost of debt;

$\frac{E}{V}$ is the proportion of equity in the total financing (which comprises equity and debt);

$\frac{D}{V}$ is the proportion of debt in the total financing;

T_c is the tax rate; and

γ (gamma) is the value of franking credits created (as a proportion of their face value).

79. The Authority will also retain the market transformation method for converting the nominal post-tax WACC to the real pre-tax WACC.
80. With the market transformation method, the real pre-tax WACC is obtained by removing expected inflation π_e from the nominal pre-tax WACC:

$$WACC_{\text{real pre-tax}} = \frac{(1 + WACC_{\text{nominal pre-tax}})}{1 + \pi_e} - 1$$

3.3.2 Term of the WACC

81. The Authority considers that a WACC with a term that is consistent with the long economic lives of the assets will best meet the requirements of the *Railways (Access) Act 1998* and the Code. Accordingly, the Authority will utilise the longest term reliable data to inform the rail WACC. Generally, this will be a 10 year term. However, where appropriate, longer term data may be used to inform the estimates (for example, the use of long term averages of the real return on equity).

3.3.3 Point estimates or ranges for estimates?

82. The Authority will establish point estimates at the parameter level. These point estimates may be determined from within a range, or derived directly. Such point estimates would then inform a single point estimate for an estimation method or financial model.

83. Similarly, the Authority will seek to establish point estimates at the level of the return on equity and the return on debt. These point estimates may be derived from a single estimation method, or from a range informed by multiple estimation methods, financial models, market data or other evidence.
84. Where single point estimates are derived from a range, the Authority recognises that it may be appropriate in some circumstances to adopt a formal weighting approach to inform the final estimate. In other cases, the Authority will need to exercise its judgment, articulating any reasons that inform its decisions.
85. The use of a single point estimate for the return on equity and the return on debt will lead to a single point estimate for the rate of return. The single point estimate of the rate of return will be facilitated by a single point estimate of the gearing level.

4 The benchmark efficient entity and risk

86. The object of the *Railways (Access) Act 1998* is to:
- ...establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations.²⁶
87. Given the object, the Authority considers that it needs to estimate the efficient financing costs of efficient entities with a similar degree of risk in respect of the provision of the rail services (see 2.1.1). This approach will ensure the efficient use of, and investment in, railway facilities.
88. The Authority's current regulatory approach assumes that efficient firms with efficient financing, with a similar degree of risk as the railway facilities, provide 'benchmarks' for its regulatory decisions. The composite of such benchmarks are used to derive an estimate of the financing costs of the 'benchmark efficient entity'.

4.1 Current approach

89. Previous rail WACC determinations accounted for the risk of the regulated entities by identifying businesses of comparable risk in order to establish gearing, credit rating and equity beta parameters.²⁷

4.2 Considerations of the Authority

4.2.1 Risk and the benchmark efficient entity

90. The need to consider risk is an implied requirement of the *Railways (Access) Code 1998*, which states that the:
- ...WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.²⁸
91. The WACC 'appropriate' to the railway infrastructure will be conditioned by the level of risk associated with the particular railway infrastructure in question.
92. Modern portfolio theory (**MPT**) suggests that investors seek to minimise risk for a given level of expected return. In MPT, an asset's return is modelled as a random variable with a finite mean and variance. The variance of an asset's return measures the likely divergence from the expected return, and is taken as the measure of risk arising from holding the asset. MPT assumes, among other things, that investors are rational and that markets are efficient.
93. In consequence, the rate of return for an investment based on efficient financing costs may be compared with those for alternative competing investments, once adjusted for risk. Riskier investments have higher costs of funding, both for equity and debt.

²⁶ Railways (Access) Act 1998, Part 1, s. 2A.

²⁷ See for example, Economic Regulation Authority, Final Determination 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks, 23 June 2008, p. 17.

²⁸ *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

94. A corollary is that a necessary, but not sufficient condition, for financing costs to be efficient is that they be consistent with efficient financing costs applying elsewhere in the economy, taking account of risk. The regulator, in seeking to achieve the requirements of the object, may look to financial markets and prevailing conditions for evidence as to 'benchmark' financing costs of entities with comparable risks. This has been the Authority's practice to date.
95. In practical terms, as there is no formal definition of the benchmark efficient entity in the *Railways (Access) Act 1998*, there is a need to quantify the key characteristics of such an entity. Generally, this involves establishing a conceptual definition for the benchmark efficient entity, and then gathering evidence from actual 'comparator' entities which resemble the conceptual entity, as a means to inform the benchmark parameters for the cost of equity and the cost of debt.

4.2.2 Defining risk

96. Under MPT, the risk factors influencing the expected returns of a benchmark efficient entity can be separated into systematic risks and non-systematic risks. This is an important risk categorisation, which helps to inform those risks which need to be compensated in the rate of return and those which do not.
97. Systematic risk relates to factors exogenous to firms – often associated with prevailing economic conditions – which will have an impact on all firms, to a greater or lesser degree.²⁹ Regulators need to be concerned with systematic risk in setting the rate of return for regulated entities, as this risk exposure is non-diversifiable and will influence the risk adjusted returns required by investors seeking to invest in the regulated firm. Systematic risks are key to the determination of the cost of equity.
98. Non-systematic risk, or diversifiable risk, on the other hand, relates to risks that are specific to the firm itself, or to the firm as part of a broader industry segment, and which can be either wholly or partially offset by an investor through an appropriate diversified portfolio.³⁰ Diversifiable non-systematic risks will not be included in the return on equity required by investors.
99. However, non-systematic risks are included in a firm's cost of debt. Benchmarks for the debt risk premium will capture both the systematic and the non-systematic (idiosyncratic) risk elements required to be recompensed in the cost of debt.³¹
100. The key issue then in assessing risk is to identify whether a risk is systematic or non-systematic, and the degree to which it may be offset.³²

²⁹ Under portfolio theory, the measure of systematic risk for a particular asset is its co-variance with the overall market portfolio. This reflects the portion of variance in the asset's returns that are explained by the variance of the overall market. For example, this covariance, as a proportion of the overall market variance, informs the beta of the firm in the CAPM.

³⁰ Some non-diversifiable risks may be managed by the firm itself, for example through purchase of insurance. Such expenditure could be explicitly recognised in operational expenditures, and hence in the cash flow of the regulated firm. Risks managed in this way would *not* need to be compensated through the rate of return.

³¹ The Authority considers that firms in the same notch credit rating would have similar levels of aggregate risk, irrespective of the composition of the contributing risks. With regard to the debt risk premium, the Authority considers therefore that a railway facility is likely to have a similar overall level of systematic and non-systematic risk compared to other firms within the same credit rating band.

³² A consideration by the Authority of the various types of risk, including distinctions between systematic and non-systematic risk – faced by regulated entities – may be found at Economic Regulation Authority,

4.2.3 Conceptual definition of the benchmark efficient entity

101. In the gas rate of return guidelines, the Authority considered that the following definition of the benchmark efficient entity was appropriate to inform its estimation of the WACC:

An efficient 'pure-play' regulated gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.³³

102. The Authority considers that a definition of the benchmark efficient entity for the rail WACC could align with that for gas. Each subsequent element of the proposed definition is considered in what follows.
103. First, the inclusion of the term 'pure-play' works to exclude non-regulated activities (including by the regulated business itself) where it is practical to do so. The Authority considers this is appropriate as non-regulated activities may have a different risk profile.
104. Second, the term 'regulated rail facility' is intended to account for the specific type of business activity being dealt with, and that the business activity is regulated.
105. Third, 'operating in Australia' is intended to account for country specific factors such as the currency, the level of economic growth and laws affecting business. The Authority considers that this is consistent with its intention to ensure that the rate of return is consistent with the costs of finance in domestic financial markets.³⁴
106. Fourth, the element 'without parental ownership' is intended to recognise that some risks associated with the provision of the rail services cannot be eliminated, and thus must be compensated. In this event, 'without parental ownership' allows for explicit recognition of those risks, to ensure that these are not simply transferred to the parent, in a way that is not transparent and accountable. However, the Authority notes that this relates only to risks that are systematic, and therefore which are not diversifiable. Risks that are diversifiable may be offset by an investor holding an appropriate portfolio. That investor may be either the parent or an independent investor.
107. Fifth, the element 'a similar degree of risk' is intended to recognise that while the composition of contributing risks may differ between entities, the overall systematic risk may be the same. Other entities – for example involved in the provision of other types of infrastructure or even other types of goods or services in the economy more broadly – could have a similar degree of risk.³⁵

Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, pp. 37 - 43.

³³ Energy Networks Association 2013, *Authority Consultation Paper – Rate of Return Guidelines*, www.erawa.com.au, Attachment, p. 15.

³⁴ The Authority notes that it will need to trade off this consideration in the case of rail in order to ensure there is sufficient benchmark data. See section 4.2.4.3.

³⁵ For example, there may be particular types of risk – such as credit risk – where a range of firms in the economy might be judged to have the same level of risk as the service provider, even though the scope and scale of activity are entirely different.

Furthermore, comparisons based on similar entities outside of regulated infrastructure can be beneficial in breaking the circularity issues that can result from comparing one regulated entity with another. Circularity arises where observations of the market's valuation for the comparator are strongly influenced by a regulator's decision.

108. Accordingly, the Authority considers that the following definition for the benchmark efficient entity for its rail determinations would be consistent with the requirements of the *Railways (Access) Act 1998* and the Code:

A 'pure-play' regulated rail facility operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services.

109. In its submission to the Issues Paper, Brockman recognised the complexities of establishing the cost of equity for an unquoted business that is part of a wider group that may be engaged in a range of activities and may have a variety of divisions. Brockman considered that finance theory clearly suggests that the cost of capital should reflect the risk of the project or business in question, and not the risk of the firm that holds the rights to those projects, and therefore that the Authority should seek to establish a cost of equity in its WACC determination that reflects the risks of a standalone efficient multi-user infrastructure owner.

110. In response, the Authority considers that its definition of the benchmark efficient entity is clear that there needs to be a similar degree of risk. The number of users of an infrastructure facility will have an influence on the risk of a railway facility. The Authority considers that the number of users should not be assumed, but rather determined on a basis that relates to the particular facility under consideration.

4.2.4 Implementation issues

111. The efficient finance practices of the benchmark efficient entity should reflect the actual practices of comparator firms operating in the market with efficient financing costs.³⁶

112. In its most recent decisions, for example, the Authority has based its estimates of efficient financing costs on benchmark results from the average of a sample of comparator firms, for:

- gearing;
- the equity beta;
- the credit rating – and the associated debt risk premium.

113. It is desirable that the benchmark not be hypothetical. This means that the benchmark must, as far as possible, reflect achievable financing practices, which reflect the practices of efficient firms exposed to a similar degree of risk as the regulated firm. Importantly, by reflecting achievable efficient financing practices, the benchmark will allow the service provider 'reasonable opportunity' to achieve the efficient parameters determined for the benchmark entity.

4.2.4.1 Public or private ownership

114. The Authority does not consider that a distinction should be made between public or private ownership. It is important to recognise that the requirement for economic efficiency leads to the interpretation of efficient financing costs as defining the opportunity cost of capital. Efficiency requires that this be the same for all firms in the economy, once adjusted for risk.

³⁶ This approach draws on the regulatory literature relating to yardstick competition, whereby the prices of the regulated firm are based on the costs of an average of other similar firms.

115. Competitive neutrality principles that apply to state owned utilities reflect this view. State Treasuries are required to adjust the cost of debt to ensure that debt neutrality or government guarantee fees are incorporated in the yield.
116. Such adjustments recognise that without the passing of risk to the government parent, the state owned regulated firm would face the same cost of debt as a private sector regulated firm. This highlights that introducing a distinction between public and private ownership would violate the term ‘without parental ownership’.

4.2.4.2 *A single benchmark or multiple benchmarks*

117. The Authority recognises that rail services are clearly differentiated on the basis of their operations and network infrastructure. The WACC benchmark needs to account for these differences, in recognition that the associated risks in each case differ. In particular, given the differences in the services provided by the three regulated rail networks, the Authority considers that a single benchmark rail entity is inappropriate to adequately capture the divergent risks faced by each network.
118. The Authority notes that the previous advice of Macquarie Bank and Charles River Associates International (**CRA**) distinguishes each of the rail networks on the basis of its infrastructure and operations.
119. In its 1999 report on the Maximum Rate of Return on Western Australian Rail Infrastructure, Macquarie Bank distinguished urban and freight infrastructure on the following basis:³⁷
- there is no foreseeable change in the operational risks of Western Australian urban passenger rail services because it is expected that they will continue to be borne by the State Government;
 - the location of the urban passenger service ameliorates ownership risk due to a low likelihood of asset stranding, obsolescence, regulatory changes, declining demand or volatility in demand forecasting;
 - freight services do not receive community service obligation payments; and
 - freight services are not directly regulated and are open to competition from road transport.
120. CRA differentiated TPI from the general infrastructure business related to the movement of freight in light of the following:
- the ‘short line railroad’ industry is a better approximation to TPI than large trans-national railroad networks; and
 - the expectation that there would be some increased risk for independent ore-carrying railways given their reliance on a small number of mining customers creates an expectation that the asset beta would be higher than that of general freight.
121. The Authority also notes that TPI’s railway is relatively new, with a customer base that is significantly less diversified than the Brookfield railway and has low prospects for diversification given its remote location and the associated economic base.

³⁷ Macquarie Bank, Western Australia Rail Access Regime: Independent Assessment of Maximum Rate of Return on Rail Infrastructure, 23 August 1999, p. 6.

122. In addition, there are distinct classification frameworks for railway systems on the basis of their operations and infrastructure. In the United States, the Surface Transportation Board classifies rail networks by their operating revenues and whether or not they primarily perform switching services and/or furnish trackage to where freight either terminates or originates.³⁸
123. As a consequence, the Authority considers it appropriate to develop multiple benchmarks that are specific to each of the rail networks' infrastructure and operations. Utilising the same benchmark for all three rail networks would not adequately capture their divergent risks, and therefore the efficient financing costs of each of the rail entities. Therefore, the Authority considers it appropriate to estimate gearing, equity beta and credit rating separately for each of the rail networks.

4.2.4.3 Domestic or international financial markets

124. In seeking to observe the efficient financing costs of rail service providers operating in Australia, the question arises as to the degree to which international capital markets influence the cost of capital in Australia. Relevant considerations include the degree to which:
- foreign investors seek to invest equity in Australian firms, augmenting domestically-sourced investment;
 - Australian firms seek to raise capital for their Australian investments on overseas capital markets, to supplement capital raisings in Australia; and
 - there is arbitrage between Australia's financial markets and those overseas.
125. These different strands reflect the extent to which foreign investors participate within the Australian domestic capital market.
126. The Authority considers that, ideally, where a particular finance market boundary is adopted, then it is desirable that the same boundary be applied across the full rate of return calculation, so as to ensure internal consistency. So for example, the gas rate of return guidelines concluded that efficient finance costs should be based on the Australian domestic capital market.
127. ARTC in its submission supported this view, stating that the rate of return should reflect the rate of return that an investor would require, rather than the theoretical return that an investor would command in either a fully segmented or fully integrated market, neither of which ARTC considers is an appropriate representation of the current market reality. Therefore, ARTC considers that the domestic CAPM should be used to determine the cost of equity, estimated through the use of readily observable market data that may be influenced by the presence of foreign investors.
128. On the other hand, Brockman submitted that it is appropriate to consider a fully integrated (international) version of the CAPM. Nevertheless, Brockman

³⁸ Class I carriers are those with operating revenues of 250 million dollars or more, Class II those with revenues in excess of 20 million (1991 US) dollars and Class III, those with revenues of up to (1991 US) 20 million dollars. All switching and terminal companies are classified as class III regardless of their operating revenues (US Government Printing Office, 'Electronic Code of Federal Regulations, Title 49: Transportation, Part 1201-Railroad Companies, Instruction 1-1(b)(1)' <http://www.ecfr.gov/cgi-bin/textidx?SID=27113a9126de08a7a3eae834b3efcd5e&node=49:9.1.1.1.3&rgn=div5>, 2014, (accessed 20 May 2014)). Class II and III lines are known as short lines and regional railroads Association of American Railroads, 'Class II and Class III' <http://freightrailworks.org/network/class-ii-and-class-iii/>, 2014, (accessed 23 May 2014).

acknowledged that most regulators around the world which apply the CAPM assume segmented (local) capital markets.

129. Flinders considered that a domestic version of the CAPM would lack sufficient depth to the extent that it could distort the cost of equity. As rail infrastructure investments are global, as is evidenced by the foreign investor up-take in the Queensland Freight Rail float, Flinders supports a fully integrated (international) version of the CAPM.
130. Under the Authority's recent approaches to estimating the rate of return, observations of finance market outcomes have had a bearing on:
- for the cost of equity:
 - the risk free rate;
 - the expected market risk premium;
 - the equity beta;
 - for the cost of debt:
 - the nominal risk free rate;
 - the expected debt risk premium; and
 - the assumed utilisation of imputation credits (gamma).

131. For the gas rate of return guidelines, the Authority concluded that while an expansion of the boundaries to allow international data could have benefits, there would likely be significant costs, as well as potential for error. On balance, the Authority was of the view that it should continue to constrain the estimation boundaries to domestic financial markets.³⁹ However, this did allow for the influence of international investors and lenders within the 'domestic' boundary:

In summary, the Authority's position is that the boundary should account for the full domestic data set, including any direct influences on the cost of capital for Australian domiciled firms. This may include the influence of international investors in Australian markets for equity, or the influence of international lenders supplying debt finance directly to Australian firms.⁴⁰

132. To the extent that the boundary is expanded to encompass international data, then ideally all these estimates would need to be based on the wider data set. However, the Authority agrees with the Australian Competition Tribunal when it stated:

...the Tribunal observes that if a regulator like the ERA had to consider a swathe of Australian and overseas markets in order to estimate the cost of debt and the DRP, the regulator's task would be of considerably greater dimensions and the scope for disagreement over allocations would likewise be considerably greater.

133. Nevertheless, it is clear that in rail there is a shortage of benchmark comparators for determining gearing, credit rating and equity beta. The practice of the Authority in its past rail determinations has been to utilise international comparators for some of the parameters in the rail WACC estimate.⁴¹

³⁹ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 29.

⁴⁰ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 30.

⁴¹ Australian Competition Tribunal, *Application by DBNGP (WA) Transmission Pty Ltd (No 3)*, ACompT 14, 2012, p. 59.

134. A number of stakeholders agreed with this approach:
- Brockman submitted that international benchmarks would assist in taking the ‘Pilbara effect’ – that is sole use infrastructure with limitations in access, creating a barrier to entry for new market entrants – out of the financing cost evaluation. Brockman considered that when selecting appropriate comparator samples, the Authority should strive towards benchmarking an efficient multi-user infrastructure owner, and use the broadest sample possible that is consistent with this objective.
 - Flinders submitted that debt and equity raising costs can vary significantly depending on the capital requirements and overall risk profile of a corporation. Flinders considered that, while it would seem ideal for correlation purposes that these be benchmarked against stand-alone railway infrastructure providers, these are rare in Australia. Therefore, there is a need for inclusion of overseas railways and in particular the USA freight railways.
135. Overall, the Authority considers that not strictly adhering to the internal consistency of the estimation method – by basing some estimates on a mix of domestic and international estimates – is reasonable in the circumstances in order to enhance the robustness of the parameter estimates.
136. In this context, the Authority considers that some parameters are likely to be more independent of jurisdiction than other parameters. For instance, gearing, credit rating and equity beta (notwithstanding differences in, for example, tax treatment) are likely to be more independent of jurisdiction than are the risk free rate and market risk premium, which will be closely related to country conditions.
137. The Authority therefore considers that it is reasonable to utilise international data for estimating the benchmark gearing, credit rating and equity beta of rail facilities in Australia. This is contrary to the Authority’s preference for estimates based solely on domestic financial data, but is considered warranted given the shortage of comparators.⁴² The Authority does not consider that this should create a general precedent for other determinations, where adequate domestic data is available.

4.2.4.4 *Developing criteria for benchmarks*

138. The Authority defines each of the benchmark efficient rail entities as follows:
- A ‘pure-play’ regulated rail facility operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services.
139. In order to estimate the relevant risks faced by investors in each of the rail networks, benchmark samples of comparable efficient businesses are constructed. These benchmark samples will have similar risk, and will allow estimation the required equity beta, credit rating and gearing of each of the *benchmark efficient* rail entities.
140. Brockman submitted that the nature of the product being freighted is not the most relevant consideration for the benchmarking process. Brockman suggests that instead it is the investment category – that is, rail infrastructure - that should be the focus. Given the challenge of securing a suitable benchmarking sample, Brockman

⁴² The Authority considers that the use of international bonds in the enhanced bond yield approach is consistent with its definition of ‘domestic’ financial data, as these bonds are issued by Australian firms. See section 9.2.1.

suggests exploring benchmarks from non-rail infrastructure investments. In addition, Brockman suggests that when selecting the benchmark sample, regard should be given to efficient multi-user infrastructure businesses. Brockman submits that the key consideration is that the comparators should be long-life asset businesses.⁴³

141. The Authority disagrees with Brockman's submission regarding sample selection. In particular, the Authority considers that the risks faced by each of the rail networks is sufficiently different to warrant defining multiple benchmark efficient entities. Therefore, broadly defining a single investment category such as 'rail infrastructure' will not be able to sufficiently capture the divergent risks faced by each of the railway operators.
142. The Authority notes that choosing a relevant benchmark sample for the Public Transport Authority (**PTA**), Brookfield Rail and The Pilbara Infrastructure (**TPI**) is difficult due to the lack of close comparators of rail infrastructure trading on the Australian Stock Exchange. Only one directly comparable company is available in Australia, Aurizon (ASX:AZJ), which was floated on the ASX in July 2010 as QR National. A single comparable firm leaves the Authority with an insufficient sample on which to estimate regulated cost of capital parameters.
143. For its 2008 rail determination for the PTA and Brookfield (then Westnet), the Authority based its decision on advice from the Allen Consulting Group (**ACG**). ACG reviewed the 2003 methodology and constructed benchmark samples of comparable businesses for passenger and freight.⁴⁴ The benchmark samples for the Authority's 2009 TPI determination were developed by CRA.⁴⁵
144. In light of the continuing lack of sufficient Australian listed comparators, the Authority will augment the sample using companies recommended for inclusion by ACG and CRA.
145. As noted above, the Authority will continue to adopt multiple benchmarks in order to capture the differential risk present between PTA, Brookfield Rail and TPI. This requires the construction of multiple benchmark samples, so as to estimate the credit rating, gearing and equity beta of the benchmarks for each of the differing service providers. Furthermore, given the lack of close comparators to each of the rail networks, the Authority considers that significant regulatory judgement based on additional relevant information is necessary in order to properly reflect the risks faced by each benchmark firm.
146. In their advice to the Australian Energy Regulator on equity beta, McKenzie and Partington outline the qualitative theoretical determinants of systematic risk, which include economic conditions, political and social considerations, market structure and a firm's competitive position.⁴⁶ The Authority considers that these five broad categories should be used in order to construct a benchmark sample for the regulated rail entities. That is, any comparator company should be comparable to the regulated rail entities with respect to these five factors in order to belong to the corresponding

⁴³ Brockman Mining Australia Pty Ltd, Submission in response to Issues Paper- Railways (Access) Code 2000: Weighted Average Cost of Capital WACC Determination – Railway Networks, February 2013.

⁴⁴ Economic Regulation Authority, Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks, 2008.

⁴⁵ Economic Regulation Authority, The Pilbara Infrastructure (TPI) Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network, 2009.

⁴⁶ McKenzie M. and Partington G., Estimation of the Equity Beta (Conceptual and Econometric Issues) for a gas regulatory process in 2012, 2012, p. 5.

benchmark sample. Again, the Authority notes that categorising a firm in terms of these five factors requires significant regulatory judgement.

4.2.4.5 *Public Transport Authority benchmark sample*

147. The PTA is an urban passenger network owned by the Western Australian Government. The Authority notes that the PTA network's main service is to transport passengers across the Perth metropolitan area. As a consequence, any comparable company must provide a similar service to that of the PTA. The Authority has previously accepted advice that toll road companies are an appropriate comparator firm to the PTA.⁴⁷ In addition, the Authority's predecessor, the Rail Access Regulator, previously accepted the use of British passenger operations in its WACC determination.⁴⁸ The Authority considers that toll road companies are an acceptable proxy to a passenger rail network in that their business model of charging a fare for urban transportation is similar, and have large capital bases. Other comparable firms include commercial passenger transport companies operating services similar to rail such as buses or trams. Given the lack of new comparator firms to the PTA available in Australia since the previous determination in 2008, the Authority considers that the previous methodology for selecting the benchmark sample is necessary and appropriate for the purposes of this determination.
148. The Authority notes that a relevant comparator company must be located in a similarly developed country to Australia in order to adequately capture the risks faced by PTA. In addition, any relevant proxy must be located in a reasonably densely populated area to replicate the risks faced by the PTA network. The Authority considers developed OECD countries, such as the United States, United Kingdom, New Zealand or Canada are an acceptable proxy to the risks faced by an Australian passenger rail operator. These countries have similar economic, political and social conditions to that of Australia. In addition, the Authority considers that only companies that are mature with limited growth opportunities should be included in the benchmark sample. Companies with aggressive growth strategies will have a higher level of risk relative to the PTA and are therefore not appropriate comparators.
149. The Authority considers that a firm must satisfy the following in order to belong to the PTA benchmark sample:
- provide a service similar to passenger rail, for example toll road or commercial passenger transportation companies;
 - be located in Australia or a similar OECD economy;
 - be mature, hence have limited growth opportunities;
 - be of similar size to the PTA.
150. The Authority has used the Bloomberg terminal in order to identify comparable companies for the PTA. The following filters were applied in the Bloomberg terminal using the Equity Screening function⁴⁹. Selected companies will:
- belong to the OECD;⁵⁰

⁴⁷ The Allen Consulting Group, Railways (Access) Code 2000: Weighted Average Cost of Capital Report to the Economic Regulation Authority, 2007.

⁴⁸ Network Economics Consulting Group, Review and Determination of Weighted Average Cost of Capital for Rail Infrastructure Operated by WestNet Rail and Western Australian Government Railway Commission: Final Report for the Office of the Rail Access Regulator, June 2003, p. 67.

⁴⁹ Bloomberg function EQS.

⁵⁰ The Authority considers that these countries are sufficiently comparable to Australia.

- provide a reference service similar to that of the PTA (toll roads and/or commercial passenger transportation across suburban areas);
- be well established with limited growth opportunities; and
- have sufficient pricing data in order to estimate equity beta and gearing.

151. The comparator companies selected using this method are set out in Table 1.

Table 1 Comparator companies for PTA as returned by Bloomberg.

Company Name	Country	Bloomberg Ticker	Company Description ⁵¹
Transurban Group	Australia	TCL AU Equity	Transurban Group is involved in the operation of the Melbourne City Link and the Hills Motorway M2 toll roads. The Group is also involved in developing and operating electronic toll systems.
Atlantia SPA	Italy	ATL IM Equity	Atlantia S.P.A is a holding company with responsibility for portfolio strategies in the transport and communications infrastructures and network sectors.
Vinci SA	France	DG FP Equity	Vinci SA builds roads, offers electrical, mechanical, and civil engineering and construction services, and operates toll roads. The Company builds and maintains roads and produces road construction materials, builds electricity and communications networks, installs fire protection and power and ventilation systems, and operates toll highways, bridges, parking garages, and a stadium.
Abertis Infraestructuras S.A	Spain	ABE SM Equity	Abertis Infraestructuras S.A. is an international group which manages mobility and telecommunications infrastructures through three business areas: toll roads, telecommunications infrastructures and airports. The group is present in Europe and the Americas.
Macquarie Atlas Roads Group	Australia	MQA AU Equity	Macquarie Atlas Roads Group manages toll roads. The Company operates toll highways in the United Kingdom, France, and the United States.

Source: Bloomberg Terminal, Economic Regulation Authority analysis.

152. The initial screening of companies returned Toll Holdings Limited, which has the transportation of freight as its primary service. The Authority considers that Toll Holdings is not a relevant comparator company to the PTA network due to the higher systematic risk of freight transportation relative to commercial passenger transportation. As a consequence, Toll Holdings has been excluded from the benchmark sample of companies for the PTA rail network.
153. In addition, two British companies were excluded: Stagecoach Group and FirstGroup, based on their high historical growth rates.
154. The remaining companies in the sample are considered the most relevant comparator companies to the PTA rail network as they involve some form of passenger transportation across suburban areas. However, it is noted that the Authority considers the risks faced by these companies only approximate the risks faced by the PTA network.
155. The Authority considers that the risk present in the benchmark sample is expected to overestimate the risk present in the PTA rail network. In particular, the Authority considers the risk of a passenger rail network located in a metropolitan area to be lower than that of a Toll Road company. As a consequence, the Authority will employ

⁵¹ Bloomberg field: CIE_DES.

its regulatory discretion to select the relevant benchmark equity beta, credit rating and gearing with the expectation that the above sample overstates the risks faced by the benchmark efficient entity representing the PTA network.

4.2.4.6 *Brookfield Rail benchmark sample*

156. The Brookfield Rail network is a freight rail network located in the south-west of Western Australia. The Brookfield Rail network primarily transports commodities such as iron ore, grain, coal alumina and interstate freight. The Authority previously, and before that the Rail Access Regulator, utilised overseas rail networks in order to construct a benchmark sample for the Brookfield freight rail network, due to the lack of similar comparator companies in Australia at the time.^{52,53}
157. The Authority notes that since the previous rail WACC determination, Aurizon (formally Queensland Rail) has been listed on the ASX. The Authority considers that Aurizon is a comparator company for the Brookfield Rail network as it is located in Australia and transports freight via rail. It is noted by the Authority that the Standard & Poor's credit rating agency considered Brookfield Rail in Western Australia a suitable comparator to the Aurizon network in their credit rating report of the latter.^{54,55} However, the regulatory regime differs between Brookfield and Aurizon in that Brookfield is subject to a negotiate-arbitrate regulatory regime, while the Aurizon network is subject to a revenue cap system. In addition, the use of only one comparator company may not adequately capture the risks faced by the Brookfield Rail network. Therefore, the Authority considers it necessary to continue to utilise overseas comparators in constructing the benchmark sample despite having a close comparator in Australia.
158. The Authority considers that a firm must satisfy the following conditions in order to belong to the Brookfield Rail benchmark sample. The firm should be:
- primarily involved in the transportation of goods via across comparable distances;
 - located in Australia or a similar developed economy;
 - involved in the transportation of similar commodities to those transported on the Brookfield Rail network.
159. The Authority has used the Bloomberg terminal in order to identify comparable companies for Brookfield (Table 2).

⁵² Economic Regulation Authority, *Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks*, 2008, p. 25.

⁵³ Network Economics Consulting Group, *Review and Determination of Weighted Average Cost of Capital for Rail Infrastructure Operated by WestNet Rail and Western Australian Government Railway Commission: Final Report for the Office of the Rail Access Regulator*, June 2003, p. 67.

⁵⁴ Incenta Economic Consulting, *Aurizon Network: Review of benchmark credit rating and cost of debt*, 2013, p. 20.

⁵⁵ In addition, S&P considered APT pipelines and DBNGP Trust a suitable peer to Aurizon.

Table 2 Comparator companies for Brookfield Rail as returned by Bloomberg.

Company Name	Country	Ticker	Company Description ⁵⁶
Genesee & Wyoming Inc.	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The Company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transportation company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products, and finished goods primarily in the Southeast, East, and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class 1 transcontinental railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centers in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulfur, and fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and railcars.
Toll Holdings Limited	Australia	TRH NZ Equity	Toll NZ Ltd. provides freight transport and distribution services. The Company offers transportation, long-haul bulk freight, warehousing, and freight forwarding services. Toll NZ also operates passenger and freight transport vehicles that provides relocation and priority delivery services. Toll NZ conducts its business in New Zealand and internationally.
Aurizon Holdings	Australia	AZJ AU Equity	Aurizon Holdings Ltd is a rail freight company. The Company provides coal, bulk and general freight haulage services, operating on the Central Queensland Coal Network (CQCN) and including specialised track maintenance and workshop support functions.
Asciano Limited	Australia	AIO AU Equity	Asciano Limited is a provider of essential transport services in the rail and ports and stevedoring industries in Australia and New Zealand. The Company operates container terminals, bulk export port facilities and container and bulk rail haulage services.
Auckland International Airport Limited	New Zealand	AIA NZ Equity	Auckland International Airport Limited owns and operates the Auckland International Airport. The Airport includes a single runway, an international terminal and two domestic terminals. The Airport also has commercial facilities which includes airfreight operations, car rental services, commercial banking center and office buildings.
Infratil Limited	New Zealand	IFT NZ Equity	Infratil Limited is an infrastructure investment company. The Company invests in airports, energy such as renewable and waste-energy, and public transportation.
Port of Tauranga	New Zealand	POT NZ Equity	Port of Tauranga Limited activities include the provision of wharf facilities, back up land for the storage and transit of import and export cargo, berthage, cranes, tug and pilotage services for exporters, importers and shipping companies and the leasing of land and buildings. The Group also operates a container terminal and has bulk cargo marshalling operations.

Source: Bloomberg Terminal, Economic Regulation Authority analysis.

160. The following filters were applied in the Bloomberg terminal using the Equity Screening function, that the firm:⁵⁷
- operates in an OECD country that has similar political, economic and geographical similarities to Australia;⁵⁸
 - belongs to the ICB Subsector: Railroads; and
 - provides sufficient pricing data to allow calculation of its equity beta and gearing.
161. In addition, the Authority has included comparator companies that were included in its previous WACC determinations for the Brookfield Rail network.⁵⁹ The Authority has previously accepted advice that Australian and New Zealand transport companies are relevant to inform the required equity beta, credit rating and gearing for the Brookfield Rail network.⁶⁰ The Authority considers non-rail operators to be less relevant proxy companies compared to rail network operators. Nevertheless, they provide some information of value, particularly given the small size of the sample, so are retained.
162. The Authority considers that Aurizon is the best comparator company to the Brookfield Rail network given that it operates in Australia and transports similar freight. Furthermore, the Authority's *a-priori* expectation is that overseas rail operators will possess a higher level of risk, relative to an Australian railway operator, as American and Canadian railway operators for example are expected to face higher degrees of competition from alternative forms of transportation, such as roads. The Authority will therefore employ significant regulatory discretion when determining appropriate benchmark parameters for the Brookfield Rail network, with a view that its risks are at the lower end of overseas railway operators, and at the higher end of Australian and New Zealand transport companies.

4.2.4.7 The Pilbara Infrastructure sample:

163. The TPI railway transports iron ore from Fortescue Metal Groups (**FMG**) Cloud Break iron ore mine in the East Pilbara to TPI's port facilities at Anderson Point, Port Hedland.
164. Of the three Western Australian rail networks, TPI has the least number of direct comparators. Unlike, the PTA and Brookfield Rail, TPI lacks diversification and exclusively services the mining industry exposing it to the relatively high volatility of minerals markets.

⁵⁶ Bloomberg field: CIE_DES.

⁵⁷ Bloomberg function EQS.

⁵⁸ The Authority considers that Australia, Canada, the United States and countries belonging to the European Union satisfy this criterion. In particular, countries such as the United Kingdom, New Zealand and Japan are not considered relevant comparator countries as commercial railroads in these countries do not transport over comparable distances to Brookfield and TPI, and face more competition from other forms of freight transport such as roads.

⁵⁹ Economic Regulation Authority, *Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks*, 2008, p. 25.

⁶⁰ The Allen Consulting Group, *Railways (Access) Code 2000: Weighted Average Cost of Capital 2008 WACC determinations*, October 2007.

165. The Authority previously considered the construction of a benchmark sample for TPI in its 2009 WACC determination.⁶¹ There, the Authority noted that TPI's reliance on a single commodity – iron ore – transported across one large distance, significantly differentiates it from the Brookfield Rail network. As a consequence, not all of the companies in the Brookfield sample are appropriate as comparators to TPI.
166. The Authority considers that only overseas railway operators are able to adequately capture the risks faced by the TPI rail network (Table 3).

Table 3 Comparator companies for TPI Network

Company Name	Country	Ticker	Company Description ⁶²
Genesee & Wyoming Inc.	United States	GWR US Equity	Genesee & Wyoming Inc., through its subsidiaries, owns and operates short line and regional freight railroads and provides related rail services. The Company also provides railroad switching and related services to United States industries with extensive railroad facilities within their complexes. Genesee operates in the United States and Australia.
Union Pacific Corporation	United States	UNP US Equity	Union Pacific Corporation is a rail transportation company. The Company's railroad hauls a variety of goods, including agricultural, automotive, and chemical products. Union Pacific offers long-haul routes from all major West Coast and Gulf Coast ports to eastern gateways as well as connects with Canada's rail systems and serves the major gateways to Mexico.
Norfolk Southern Corporation	United States	NSC US Equity	Norfolk Southern Corporation provides rail transportation services. The Company transports raw materials, intermediate products, and finished goods primarily in the Southeast, East, and Midwest and, via interchange with rail carriers, to and from the rest of the United States. Norfolk Southern also transports overseas freight through several Atlantic and Gulf Coast ports
Kansas City Southern	United States	KSU US Equity	Kansas City Southern, through its subsidiary, is the holding company for transportation segment subsidiaries and affiliates. The Company operates a railroad system that provides shippers with rail freight services in commercial and industrial markets of the United States and Mexico.
CSX Corporation	United States	CSX US Equity	CSX Corporation is an international freight transportation company. The Company provides rail, intermodal, domestic container-shipping, barging, and contract logistics services around the world. CSX's rail transportation services are provided principally throughout the eastern United States.
Canadian Pacific Railway	Canada	CP CN Equity	Canadian Pacific Railway Limited is a Class 1 transcontinental railway, providing freight and intermodal services over a network in Canada and the United States. The Company's mainline network serves major Canadian ports and cities from Montreal to Vancouver, and key centres in the United States Midwest and Northeast.
Canadian National Railway	Canada	CNR CN Equity	Canadian National Railway Company operates a network of track in Canada and the United States. The Company transports forest products, grain and grain products, coal, sulfur, and fertilizers, intermodal, and automotive products. Canadian National operates a fleet of locomotives and railcars.

Source: Bloomberg Terminal, Economic Regulation Authority analysis.

⁶¹ Economic Regulation Authority, The Pilbara Infrastructure (TPI) Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network, 2009.

⁶² Bloomberg field: CIE_DES.

167. Furthermore, the Authority considers that due to TPI's exposure to only a limited number of users in the mining industry, TPI's risks are likely to be at the upper end of those faced by the companies contained in the benchmark sample. In addition, the Authority considers that the US short-line rail operator Genesee & Wyoming Inc. is likely to be the best comparator for TPI.⁶³ This is primarily due to Genesee & Wyoming Inc. operating class III short-railway lines.

4.3 Draft decision

168. The benchmark efficient entity is defined as:
- A 'pure-play' regulated rail facility operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services.
169. The Authority will base its estimates of efficient financing costs on the observations from a sample of comparator firms, with efficient financing costs, that are judged to be 'similar' to the rail services provider.
170. There are a range costs and benefits to be evaluated when considering whether to adopt a domestic or international form of any particular model of the rate of return or its components. On balance, the Authority considers that there would likely be significant net costs with moving to a full international approach. Therefore, the Authority is of the view that it should continue to base its estimates of the rail WACC on domestic financial markets.
171. However, in recognition of the small data sets for some parameters in the rail WACC – in particular for the gearing, credit rating and equity beta – the Authority will utilise international comparators for the gearing, credit rating and equity beta parameters.

⁶³ Ibid, p. 39.

5 Gearing

172. Gearing refers to the proportions of a regulated business' assets assumed to be financed by debt and equity. Gearing is defined as the ratio of the value of debt to total capital (that is, including debt and equity), and is used to weight the costs of debt and equity when the WACC is determined. The relative proportions of debt and equity that a firm has outstanding constitute its capital structure. The capital structure choices differ across industries, as well as for different companies within the same industry.
173. Different firms have inherently different risk profiles and as a consequence have varying debt capacities.⁶⁴ The optimal capital structure is determined by the business risk inherent to firms in an industry and the expected loss if default occurs.⁶⁵ Given that the expected loss of default for the regulated entity is likely to differ from that of the comparable sample, the optimal capital structure of the entity is likely to differ as well. As such, it may be appropriate to adjust any estimate of gearing levels to reflect differences in the level of risk between railway networks.
174. In addition to being used to weight the expected returns on debt and equity to determine the regulated rate of return, the level of gearing of a benchmark efficient business may also be used: (i) for the purpose of adjusting the equity betas that are observed from a sample of comparator businesses when their gearing levels differ from the gearing level of the benchmark efficient business; and (ii) as a factor in determining an appropriate credit rating for deriving the debt risk premium (**DRP**).

5.1 Current approach

175. In its 2008 decision, the Authority determined that the appropriate gearing level for the Public Transport Authority was 35 per cent.
176. The estimate of the required gearing for PTA was based on the report prepared for the Authority by the Allen Consulting Group (**ACG**).⁶⁶ ACG considered market-based observations of capital structures for a set of comparable businesses containing a sample of mature toll road operators in Australia and overseas. The ACG sample, recommendation and determination are shown below in Table 4.

⁶⁴ Australian Competition & Consumer Commission, *Access Undertaking – Interstate Rail Network*, July 2008.

⁶⁵ Brealey, Myers and Allen, *Corporate Finance*, McGraw Hill, 1996, New York p. 476.

⁶⁶ The Allen Consulting Group, *Railways (Access) Code 2000: Weighted Average Cost of Capital 2008 WACC determinations*, October 2007.

Table 4 Public Transport Authority gearing: Allen’s Consulting Group’s sample recommendation and decision 2008.

Company	Country	Gearing (%)
Vinci SA	France	29
Albertis Infraestructuras SA	Spain	35
Atlantia SPA	Italy	48
Brisa Auto-Estradas-Priv SHR	Portugal	36
European Average		37
Macquarie Infrastructure Group	Australia	22
Transurban Group	Australia	39
Australian Average		31
Average		35
ACG Advice		30-50
Authority's Final Decision 2008		35

Source: Bloomberg and ACG Analysis

177. For the Brookfield Rail network (then under the ownership of WestNet), the Authority’s determination also was based on the advice provided by the Allen Consulting Group.⁶⁷
178. Due to the lack of suitable domestic comparators, a sample of international companies from the US, Canada and New Zealand was used by ACG to conduct the analysis. The Allen Consulting Group constructed a set of comparable businesses for the Brookfield Rail network containing the following:
- listed railways in the USA and Canada;
 - listed transport infrastructure and services firms in Australia and New Zealand; and
 - listed global toll-road operators.
179. ACG’s analysis is reproduced below in Table 5. A gearing level of 30 to 40 per cent was recommended. The Authority subsequently determined that a gearing level of 35 per cent was appropriate for the Brookfield Rail network.

⁶⁷ The Allen Consulting Group, October 2007, *Railways (Access) Code 2000: Weighted Average Cost of Capital 2008 WACC determinations*.

Table 5 WestNet Gearing: Allen's Consulting Group Sample Recommendation and Decision 2008

Company	Country	Gearing (%)
Kansas City Southern	United States	41
Union Pacific Corporation	United States	28
Rail America Inc.	United States	57
CSX Corporation	United States	44
Burlington Northern Santa Fe	United States	30
United States Average		40
Canadian Pacific Railway Ltd	Canada	22
Canadian National Railway Company	Canada	39
Canadian Average		31
Adsteam Marine Limited	Australia	39
Macquarie Infrastructure Group	Australia	36
Patrick Corporation	Australia	7
Toll Holdings Limited	Australia	18
Australian Average		25
Auckland International Airport Ltd	New Zealand	21
Infratil Ltd	New Zealand	39
Port of Tauranga Ltd	New Zealand	24
Toll NZ Ltd	New Zealand	42
New Zealand Average		31
Average		32
ACG Advice		30-40
Authority's Final Decision 2008		35

Source: Bloomberg and ACG Analysis

180. For TPI, the Authority adopted a gearing of 30 per cent in its 2013 rail WACC determination.⁶⁸ This was based on the observation that, unlike the PTA and Brookfield Rail networks, TPI lacks diversification and exclusively services a limited number of users in the mining industry. In addition, the Authority considered that a lower gearing for TPI relative to Brookfield was appropriate, consistent with a lower credit rating assumption for TPI relative to Brookfield. The Authority further noted that the US short-line rail operator Genesee & Wyoming Inc. was likely to be the best comparator for TPI.
181. The Authority also notes that the Australian Competition and Consumer Commission (**ACCC**) in its most recent Railway Access Undertaking – which applies to ARTC’s interstate rail networks – adopted a gearing ratio of 50 per cent.⁶⁹ The ACCC considered adopting a gearing of 60 per cent, given the regulatory precedent for other regulated industries in Australia, for example gas transmission and distribution. The ACCC noted that railway owners are likely to experience more volatile operating cash flows than other regulated firms, and as a consequence, railway owners would be expected to have a lower level of debt. The ACCC also considered the leverage of overseas railways and noted the average of gearing was 26.31 per cent. The ACCC noted that, while overseas rail operators are not ideal benchmarks, they are most likely the best proxies available.
182. The ACCC also stated that it considers trucking and shipping companies to be less than ideal proxies for the capital structure of regulated rail entities. Ultimately, the ACCC decided a 50 per cent gearing level was appropriate.
183. The Queensland Competition Authority adopted a gearing of 55 per cent in its 2010 Draft Access Undertaking for the Queensland Rail Network.⁷⁰ This adopted gearing was unchanged from its 2006 undertaking.

5.2 Considerations of the Authority

5.2.1 Theoretical Considerations

184. The Authority considers that, due to the lack of close comparators to regulated rail networks, significant regulatory discretion is needed in order to estimate the relevant benchmark efficient gearing for each rail network. In particular, this regulatory discretion should be informed by theoretical considerations regarding the capital structure of firms relative to the risks they are expected to face. The Authority considers that the modified Modigliani Miller (**MM**) proposition, which includes financial distress costs (further discussed below), is the most appropriate theoretical underpinning to inform the gearing of the benchmark efficient entity. Additional detailed discussion on other theoretical arguments regarding benchmark gearing can be found in the rate of return guidelines for gas distribution and transmission networks.⁷¹

⁶⁸ Economic Regulation Authority, July 2013, Final Determination; Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks.

⁶⁹ Australian Competition & Consumer Commission; *Access Undertaking – Interstate Rail Network*, July 2008.

⁷⁰ Queensland Competition Authority, *Final Decision, Queensland Rail Network’s 2010 DAU*, September 2010.

⁷¹ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines, 2013, p. 44.

185. The modified MM proposition (to include financial distress costs) suggests that a trade-off occurs in the value of a firm's capital structure: higher gearing can increase the value generated by the interest tax shield (which arises due to reduction in taxes paid as a consequence of the tax deductibility of interest payments); however, if the gearing level becomes too high, the firm will have difficulty meeting its interest payments and, as a consequence, will face significant financial distress costs.
186. The theory relating to this trade-off asserts that the value of a geared firm is equal to its value without leverage, plus the present value of the interest tax shield minus the present value of financial distress costs which can be expressed as follows:⁷²

$$V^L = V^U + PV(\text{InterestTaxShield}) - PV(\text{FinancialDistressCosts}) \quad (5)$$

where:

V^L is the total levered value of the firm;

V^U is the total unlevered value of the firm; and

PV is the 'present value'.

187. In particular, the present value of the interest tax shield is strictly increasing in the level of gearing, whilst the financial distress costs are nonlinear; increasing at a growing rate as the level of gearing rises. This ensures that a firm cannot maximise their value by arbitrarily increasing their gearing, being constrained by the increasing present value of its financial distress costs. As a consequence, an optimal value of gearing exists that allows a firm to maximise V^L , the total levered value of the firm by choosing an appropriate level of gearing that maximises equation (5).
188. The Authority considers that each of the benchmark efficient rail entities will maximise the trade-off that occurs between the interest tax shield and the present value of financial distress costs. Using regulatory discretion as to the risks faced by the regulated rail networks and its corresponding benchmark sample, a benchmark efficient gearing level can be inferred by observing the gearing of companies in the benchmark sample.

5.2.2 Regulatory Practice

189. The Authority considers it appropriate to determine different benchmark gearing levels for each of the rail networks, given their differing risk profiles. The Authority notes that, unlike for gas and electricity network determinations, there are few or no firms with readily available financial data or information in Australia that are comparable to each of the regulated networks.
190. With the exception of Aurizon, a new comparator to Brookfield Rail, no new domestic comparators are available for this determination. Therefore, the Authority considers that the use of overseas data continues to be necessary to inform the required benchmark gearing level of the three regulated rail networks.

⁷² Berk J., DeMarzo P., and Harford J., *Fundamentals of Corporate Finance*, Pearson International, 2008, p. 499.

191. Various estimation methods are available for determining benchmark gearing. These estimation methods were previously examined by the Australian Energy Regulator in its 2009 WACC review of regulated gas and electricity networks.⁷³ The Authority has also examined the alternative methods in its recent rate of return guidelines for gas transmission and distribution networks.⁷⁴ Each of these methods is discussed in turn below.
192. First, in its report to the AER in 2009 on the estimated value of equity beta, Associate Professor Henry from the University of Melbourne adopted the book value of net debt,⁷⁵ instead of using gross debt.
193. On this basis, gearing is determined as:

$$\overline{\text{Gearing}} = \frac{\overline{\text{Net Debt}}}{\overline{\text{Net Debt}} + \overline{\text{MV Equity}}} \quad (6)$$

where

MV represents the market values; and

BV represents book values.

194. Second, Standard and Poor's (**S&P**) has reported gearing levels using the book value of debt and the book value of equity. The book value of equity has been reported by Bloomberg as the balance sheet value. S&P's gearing is determined as below.

$$\overline{\text{Gearing}} = \frac{\overline{\text{BV Total Debt}}}{\overline{\text{BV Total Debt}} + \overline{\text{BV Equity}}} \quad (7)$$

195. Third, the market values of debt and equity could be used in determining benchmark gearing. However, as debt is traded infrequently, it is difficult to obtain the market value. As such, the book value of debt is used as a proxy for its market values. This method is also known as the hybrid approach adopted by Bloomberg. The benchmark gearing level for a benchmark efficient entity is defined as follows.

$$\overline{\text{Gearing}} = \frac{\overline{\text{BV Total Debt}}}{\overline{\text{BV Total Debt}} + \overline{\text{MV Equity}}} \quad (8)$$

196. In determining benchmark gearing for the regulated rail networks, the Authority considers that it is appropriate to rely on empirical evidence regarding the appropriate benchmark gearing level. For consistency between the Authority's estimates of equity beta and gearing, the Authority considers that the first gearing definition (equation (2)), proposed by Henry, is appropriate for this draft determination.

⁷³ Australian Energy Regulator, *Final Decision: Electricity transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters*, May 2009.

⁷⁴ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 2013, p. 44.

⁷⁵ Net Debt is calculated as: Short-term borrowings plus long-term borrowings less Cash & Near Cash items less Marketable Securities less Collaterals. It is noted that in the banking, financial services, and insurance formats, marketable securities are not subtracted to arrive at Net Debt.

197. The Authority considers that the use of equation (2) is the most appropriate for rail given the use of overseas comparator companies, and considers a market measure of a firm's capital structure to be more appropriate to inform the capital structure of an Australian company. The Authority considers that the most relevant estimate of the benchmark gearing level for each rail network is to utilise the benchmark samples derived in chapter 4.
198. Brockman submitted that the appropriate time period to estimate the gearing level should be consistent with the period over which other WACC parameters are estimated. For example, Brockman suggests that beta is normally estimated over a 2 to 5 year horizon, and the gearing level should be consistent with this.⁷⁶ Flinders submitted that the appropriate time periods should be at the review time frame (five years).⁷⁷ The Authority agrees that the time period of samples for related parameters should be consistent, which would be in line with previous regulatory practice and Professor Henry's advice.⁷⁸
199. The Authority has utilised the comparator companies described in chapter 4 to estimate the gearing level for each company in the corresponding sample. The Authority has used observations for each firm encompassing a five year period from 1 March 2009 to 28 February 2014, observing both the Net Debt and Market Value of Equity for the comparator firms. The observed gearing is then determined by application of equation (2). The Authority has also previously noted the need for regulatory discretion, given each of the benchmark samples only approximates the risks faced by each of the rail networks.

5.2.3 Empirical evidence regarding gearing

5.2.3.1 PTA rail network

200. The results for the estimated gearing level of each of the comparator companies to PTA are set out below (Table 6).
201. Table 6 shows that, for the European toll roads, gearing has increased by 14 per cent from the previous European average shown in Table 4. The Australian average gearing has increased by approximately 16 per cent. In aggregate, the overall sample average for comparator companies of the PTA has increased by 14 per cent from 35 per cent in 2008 to 49 per cent in 2014.
202. The Authority notes, however, that the Australian gearing is based on a sample of two companies, one of which was not in the sample last time, and one (Transurban) which has had a reduction in its gearing. This makes it difficult to ascertain whether the trend toward increased leverage observed in Europe is reflected in Australian toll road debt structures.

⁷⁶ Brockman Mining Australia Pty Ltd, Submission in response to Issues Paper- Railways (Access) Code 2000: Weighted Average Cost of Capital WACC Determination – Railway Networks, February 2013.

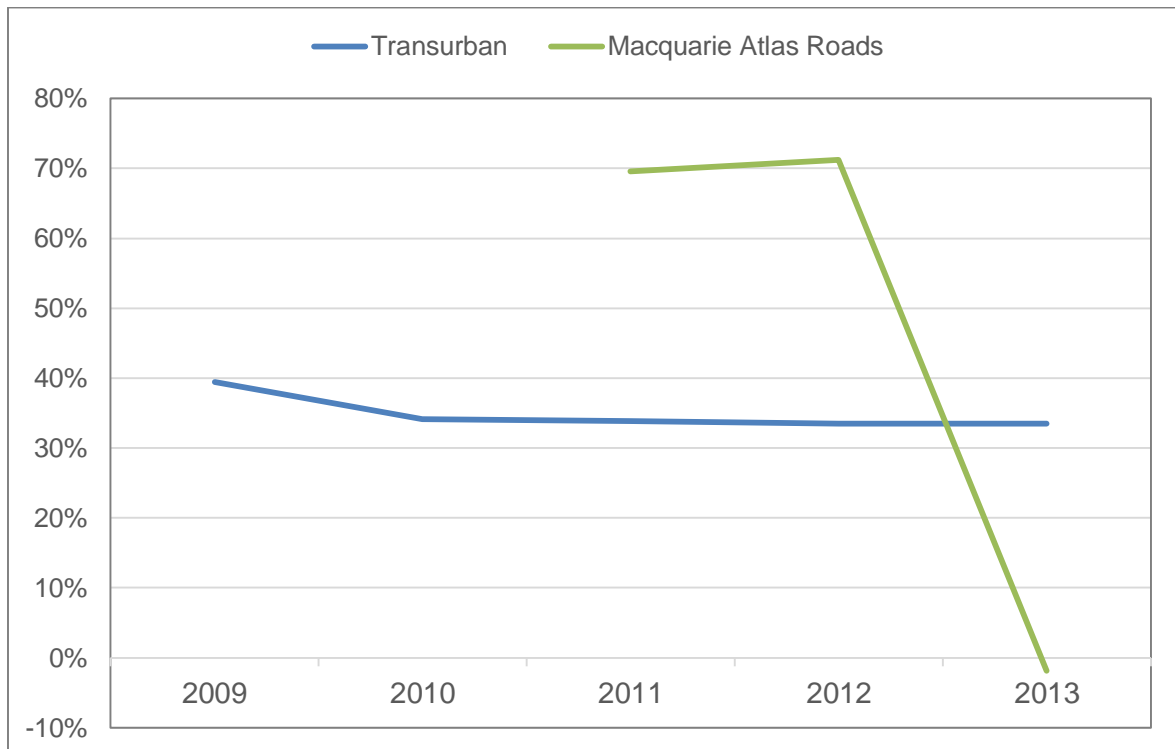
⁷⁷ Flinders Mines, *Submission to the Economic Regulation Authority In response to Issues Paper under Railways (Access) Code 2000: Weighted Average Cost of Capital*, February 2013.

⁷⁸ The term of the WACC is 10 years, consistent with the need to estimate a long term rail WACC (see section 3.2.30). However, data availability and relevance may imply shorter spans of time for the estimates of the benchmarks. In this case, internal consistency needs to be accounted for between related parameters.

Table 6 Public Transport Authority gearing sample 2014

Ticker	Country	Company Gearing (%)	Change from 2008 (%)
Vinci SA	France	40	11
Albertis Infraestructuras SA	Spain	58	23
Atlantia SPA	Italy	55	7
Europe Average		51	14
Macquarie Atlas Roads	Australia	60	-
Transurban Group	Australia	34	-5
Australian Average		47	16
Average		49	14

Source: Bloomberg and ERA analysis

Figure 1 Australian listed toll road company gearing trends

Source: Bloomberg and ERA analysis

203. The evidence above establishes a gearing range for the comparator companies of 34 per cent to 60 per cent. Both of these extremes come from the Australian sample. The lower end of the range is Transurban, a mature toll road operator with assets

largely in Australia. Conversely, Macquarie Infrastructure Group, providing the upper end of the range, has only been listed since January 2010. Both of these companies' levels of gearing have been declining, with Macquarie Atlas eliminating its debt altogether in 2013 (Figure 1). Therefore, the Authority considers that the calculated gearing of Macquarie Atlas is not adequately robust to inform the required gearing of the PTA network.

204. In light of this deleveraging and Macquarie Atlas's infancy on the ASX, the Authority considers that the European average would provide a more robust estimate of the upper bound of the gearing for PTA.⁷⁹ The Authority considers therefore that a range of 35 per cent to 50 per cent is appropriate for the PTA rail network being reflective of the business conditions faced by the operations of the PTA.

5.2.3.2 Brookfield Rail

205. Table 7 below shows the updated gearing for the Brookfield Rail sample. The Authority notes that the average gearing (as distinct from individual company gearing) for the Australian sample of companies has remained the same since the 2008 WACC determination. The US and Canadian samples have seen a fall in the level of gearing (40 down to 21 per cent for the US and 31 down to 20 per cent for Canada). The benchmark sample therefore provides mixed evidence as to whether gearing for the benchmark rail freight entity has remained the same or decreased.

5.2.3.3 TPI

206. The Authority considers that TPI's **current** reliance on a small number of **potential** customers transporting a single commodity across a large distance significantly differentiates it from the Brookfield Rail network. As a consequence, the Brookfield sample is inappropriate for the purpose of establishing a benchmark efficient gearing for TPI.
207. As discussed in chapter 4, the Authority considers the relevant benchmark sample for TPI is that containing only overseas railway operators. The results of the observed gearing level are set out in Table 8 below.

⁷⁹ Macquarie Infrastructure Group previously incorporated the foreign assets of Macquarie Atlas in addition to domestic assets.

Table 7 Brookfield Gearing sample 2014

Company	Country	Industry	Company Gearing (%)	Change from 2008 (%)
Genesee & Wyoming Inc.	United States	Rail Freight	22	-
Union Pacific Corporation	United States	Rail Freight	14	-14
Norfolk Southern Corporation	United States	Rail Freight	24	-
Kansas City Southern	United States	Rail Freight	20	-24
CSX Corporation	United States	Freight	26	-18
United States Average			21	-19
Canadian Pacific Railway	Canada	Rail Freight	24	2
Canadian National Railway	Canada	Rail Freight	16	-23
Canadian Average			20	-11
Toll Holdings Limited	Australia	Freight	20	2
Aurizon Holdings	Australia	Rail Freight	17	-
Asciano Limited	Australia	Freight	38	-
Australian Average			25	0
Auckland International Airport Limited	New Zealand	Airports	25	5
Infratil Limited	New Zealand	Infrastructure Investment (inc public transport)	59	19
Port of Tauranga	New Zealand	Ports and Cargo	13	-11
New Zealand Average			32	1
Average			24	-8

Source: Bloomberg and ERA analysis

Table 8 TPI Gearing sample 2014

Company	Country	Industry	Company Gearing (%)	Change from 2008 (%)
Genesee & Wyoming Inc.	United States	Rail Freight	22	-
Union Pacific Corporation	United States	Rail Freight	14	-14
Norfolk Southern Corporation	United States	Rail Freight	24	-
Kansas City Southern	United States	Rail Freight	20	-24
CSX Corporation	United States	Freight	26	-18
United States Average			21	-19
Canadian Pacific Railway	Canada	Rail Freight	24	2
Canadian National Railway	Canada	Rail Freight	16	-23
Canadian Average			20	-11

Source: Bloomberg and ERA analysis

5.3 Draft decision

5.3.1 PTA

208. The Authority considers that the risks faced by the PTA are substantially lower than those faced by the companies contained in the benchmark sample. This view is based on the consideration that the PTA network primarily transports passengers across the Perth metropolitan area, whilst companies in the benchmark sample are privately held toll companies. The Authority has previously noted in section 4.2.4.5 that toll road companies are only an approximation to the PTA network, and that toll roads face a larger amount of risk relative to passenger transport. As a consequence, the Authority considers the financial distress costs faced by the PTA are likely to be substantially lower than those faced by the companies in the benchmark sample. Therefore, the Authority considers that a benchmark efficient entity representing the PTA network will be able to sustain higher levels of gearing, in order to take advantage of the interest tax shield.
209. Overall, the Authority considers a gearing of 50 per cent, at the higher end of the observed gearing range, is appropriate for the PTA rail network.
210. The Authority notes that this represents an increase in the benchmark assumed gearing level of the PTA network since the previous WACC determination, in which the gearing level was determined to be 35 per cent.⁸⁰

⁸⁰ Economic Regulation Authority, *Final Determination; Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks*, July 2013.

5.3.2 Brookfield Rail

211. The Authority has previously noted in Chapter 4 that it considers the risks faced by Brookfield Rail are higher than the risks faced by the non-rail comparator companies, and lower than the risks faced by the overseas railway comparators.
212. The Authority notes the very broad range of gearings, with Union Pacific having a gearing of 14 per cent and Infratil Limited having a gearing of 59 per cent.
213. The Authority considers that a more representative gearing range is formed by using the average of overseas railway operators as a lower bound (approximately 20 per cent) and the Australian average as an upper bound (25 per cent).
214. Given that the Brookfield Rail network is likely to face less competition relative to overseas rail operators,⁸¹ the Authority considers the financial distress costs faced by Brookfield Rail to be lower than those faced by international comparators in the benchmark sample. As a consequence, it is expected that the benchmark efficient rail entity representing the Brookfield Rail network will be able to take on higher levels of gearing relative to overseas rail operators.
215. The Authority therefore considers a gearing of 25 per cent, consistent with the Australian Average, to be the appropriate benchmark gearing level for the Brookfield Rail network.
216. The Authority notes that this represents a decrease in the benchmark assumed gearing level of the Brookfield Rail network since the previous WACC determination, in which the gearing level was determined to be 35 per cent.⁸²

5.3.3 TPI

217. The Authority considers that as TPI is a single commodity railway in a remote location that exclusively serves a limited number of customers exposed to mining related export demand, TPI is likely to have a risk profile on the upper end of the above benchmark sample. As a consequence, the Authority considers that the gearing of TPI should be at the lower end of the benchmark sample, as TPI is expected to face a higher level of financial distress costs relative to its overseas comparators.
218. The Authority notes that both Union Pacific Corporation and Canadian National Railway, the companies with the lowest gearing in the table above, have undergone significant deleveraging since the last regulatory determination. In addition, the estimated asset betas calculated in chapter 12 indicate a lower level of systematic risk of these companies relative to the other comparator companies. As a consequence, the Authority considers the gearing of these companies to not be representative of the gearing of the benchmark efficient rail entity for TPI.
219. The Authority considers that Genesee & Wyoming Inc. is likely to be the best comparator to TPI.

⁸¹ The Authority notes that overseas railway operators face competition from other railway lines and alternative forms of transportation such as trucking.

⁸² Economic Regulation Authority, *Determination on the 2014 Weighted Average Cost of Capital for the Freight and Urban Railway Networks*, 24 October 2014.

220. Overall, the Authority considers that a benchmark gearing of 20 per cent is appropriate for the purposes of this decision.
221. The Authority notes that this represents a decrease in the benchmark assumed gearing level of the TPI rail network since the previous WACC determination, in which the gearing level was determined to be 30 per cent.⁸³

⁸³ Economic Regulation Authority, *The Pilbara Infrastructure (TPI) Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network*, 2009.

6 Return on debt

222. The Authority seeks to estimate the return on debt in a way that contributes to the achievement of the object of the *Railways (Access) Act 1998*.

6.1 Current approach

223. In its 2008 review of the method for determining the WACC, the Authority based its estimates of the cost of debt on a debt risk premium over and above the risk-free rate, combined with a margin for administrative costs:

$$\text{Cost of Debt} = \text{Risk Free Rate} + \text{Debt Risk Premium} + \text{Debt raising costs}$$

224. In subsequent annual determinations, the risk free rate was based on the return on the prevailing 10 year Commonwealth Government Security, based on a 20 trading day average just prior to the determination.

225. The Debt Risk Premium (**DRP**) has, since 2011, been estimated using the Authority's bond yield approach, using observations over the same 20 trading day average as for the risk free rate. The resulting sample of bonds has an average term to maturity which varies depending on the time of the sample, but which has in recent years averaged between five and six years.

226. Debt raising costs of 0.125 per cent were adopted, following the advice of the Authority's consultant for the 2008 review, the Allen Consulting Group.

6.2 Considerations of the Authority

227. Issues in estimating the cost of debt include:

- the broad approach to be adopted for estimating the cost of debt;
- the associated components contributing to the estimate; and
- the averaging period.

6.2.1 Approach to estimating the cost of debt

228. The Authority considered three broad alternative approaches to estimating the cost of debt as part of the development of the gas rate of return guidelines.⁸⁴ These were:

- observing the cost of debt of companies with comparable risk to the benchmark efficient entity in totality, reflecting either embedded debt costs or the yield on recent bond issuances;
- using analysts' forecasts of the cost of debt relating to the regulated firm;
- estimating the cost of debt for the benchmark efficient entity through a model of the contributing components to their overall cost of debt.

⁸⁴ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, Chapter 6: Return on debt.

229. The Authority concluded in the gas rate of return guidelines that an estimate based on a model of the cost of debt remains the best means to estimate efficient financing costs.
230. In addition, in the gas rate of return guidelines the Authority considered the relative merits of using an 'on-the-day' estimate of the return on debt, as opposed to a 'portfolio' approach:
- an 'on-the-day' approach estimates each of the components in the cost of debt around a single point in time, such as the period just prior to the WACC determination;
 - a 'portfolio' approach, on the other hand, takes a longer term average of the cost of debt by weighting a sequence of observations of the cost of debt from years prior to the determination.
231. Flinders submitted that the use of a 10 year (historic portfolio) average for the cost of debt, the cost of equity and inflation, would bring the averaging assumptions in line with each other and would be more consistent with actual funding practices. The Authority's concern with this approach, however, is that it does not reflect the efficient cost of debt at the time of the decision and may not reflect the cost of debt for a new replacement railway, as is implicit in the method under the Code.
232. In the gas rate of return guidelines, the Authority considered that the 'on-the-day' approach was preferable as:
- it has better prediction properties for the cost of debt in the future as compared to the portfolio approach; and
 - prediction matters because the efficient firm will apply the WACC to its operating and investment decisions, as the WACC will be its opportunity cost of debt.⁸⁵
233. Efficiency requires that the financing cost be the prevailing forward looking cost of debt. The corollary is that floor and ceiling costs be based on the same prevailing forward looking cost of debt. Otherwise, negotiated rates for access may result in returns to the service provider that are either too low or too high, potentially leading to inefficient decisions by parties on either side of the rail services negotiation, and associated economic inefficiency:
- service providers may either over or under-invest in rail service infrastructure; and
 - users may either consume too few or too many rail services.
234. Further, the Authority considers that such efficient use of, and investment in, railway facilities cannot be considered in terms of a single rail service provider or a single group of consumers. Such a partial approach may be efficient in isolation, but still leave net efficiency gains once the full general equilibrium considerations are considered. Rail service providers and consumers of rail services are engaged with the broader economy. Hence, efficiency considerations necessarily need to take into

⁸⁵ Further detail on the Authority's consideration of this issue may be found at Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 61.

account that engagement. This requires efficient pricing of rail services, consistent with outcomes that would be observed in effectively competitive markets.⁸⁶

235. From this perspective, economic efficiency can be characterised as follows:

- Productive efficiency is achieved when firms in the economy produce any given level of output at lowest input cost. Such output may include investment in capital goods, as well as production of goods and services from the existing capital stock. The following outcomes will contribute to the achievement of productive efficiency:
 - The regulated firm funds its investments utilising the lowest input cost of debt, which reflects the prevailing interest rates that are consistent with efficient financing costs.
 - As a corollary, the regulated firm delivers its investments in a way that results in the highest net present value, using a hurdle rate that incorporates the prevailing cost of funds at the time the investment decision was made.
 - The prevailing cost of capital will also influence the decisions made by the regulated firm with regard to its use of factors of production. While investments in major capital assets owned by the firm are sunk in the short run, it may be possible to substitute capital for labour – at the margin – over the medium term. Appropriate pricing for the cost of capital will contribute to efficient decision making in this regard.
- Allocative efficiency is achieved when the economy produces only those goods and services which are most valued by society. This occurs at the point where the marginal cost of producing a good or service equals the willingness to pay for that good or service, which will be reflected in marginal revenue.⁸⁷
 - The choice between investment and consumption in the economy needs to be based on the relative value of that investment to society as a whole. This requires that alternative investments throughout the economy, including by the regulated firm, are based on the prevailing cost of funds. The cost of capital used by regulated firms – when deciding to invest in additional infrastructure – needs to be updated as market conditions change.
- Dynamic efficiency is achieved when firms make those investments which maximise the returns to the firm and society as a whole over time.
 - The firm's investment decision should be based on the cost of capital expected to prevail over the life of the investment. Again, the cost of capital used by regulated firms – when deciding to invest in additional infrastructure – needs to be updated as market conditions change.

⁸⁶ The Authority notes that effectively competitive prices imply a notion of rivalry among incumbents, sufficient to constrain market power pricing (see for example Australian Competition Law 2013, *Competition*, www.australiancompetitionlaw.org/glossary/competition, accessed November). The Authority does not consider that this necessarily implies new entrant pricing.

⁸⁷ Users of the regulated firm's services - both upstream and downstream – make production decisions that are based on efficient prices for the regulated service. At any particular point in time, the capital used for producing the regulated firm's output is 'sunk', and therefore does not contribute to (variable) marginal costs. Use of a regulated firm's service therefore should not depend on the cost of debt.

236. The Authority considers that all three efficiency elements are important, and are therefore relevant considerations in achieving the object of the *Railways (Access) Act 1998*. Consistent with this view, the Authority notes that the Productivity Commission, in its recent draft report on the National Access Regime, explicitly identified these aspects when considering economic efficiency in relation to monopoly infrastructure.⁸⁸
237. The Authority also considers that the on-the-day approach does not create a barrier to firms adopting staggered debt portfolios as a means to manage refinancing risk. All firms in effectively competitive markets will tend to face some potential 'mismatch pricing' risk associated with their portfolio of debt, which may not be able to be eliminated completely, as interest rates fluctuate. The Authority considers that, as far as practicable, it should match the cost of debt signal provided by prevailing rates. The regulated firms will then have the maximum incentive to adopt efficient financing practices, similar to other firms in the economy.⁸⁹

6.2.2 Components of the cost of debt estimate

238. The Authority remains of the view that an estimate based on a model of the cost of debt is likely to best achieve the allowed rate of return objective. The Authority therefore will retain this approach for estimating the cost of debt.
239. Under this approach, the Authority will base the cost of debt on:
- the risk free rate; plus
 - a risk premium over and above the risk free rate; plus
 - an allowance for the administrative costs of issuing debt.
240. To reflect prevailing conditions, the Authority will use an estimate of the risk free rate derived just prior to the regulatory period, the so-called 'on-the-day' approach. In line with the analysis set out at section 3.2.3, the term of the risk free rate will be 10 years. The approach for estimating the risk free rate is considered further in Chapter 7.
241. The debt risk premium will be derived from the estimated 10 year credit spread for an observed sample of comparator firms with similar credit ratings as the benchmark efficient entity, through the Authority's enhanced bond yield approach. The approach for determining the benchmark credit rating is considered in chapter 8 and the method for estimating the debt risk premium is considered further in chapter 9.
242. Debt raising costs will continue to be based on an allowance for the direct costs of the average annual issuance. The approach for estimating debt raising costs is considered further in chapter 13.

6.2.3 The averaging period

243. The Authority has recently moved to a 40 day averaging period for estimating the components of the return on debt.⁹⁰

⁸⁸ Productivity Commission, *National Access Regime Draft Report*, 2013, p. 81.

⁸⁹ Further detail on the Authority's consideration of this issue may be found at Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 67.

⁹⁰ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 85.

244. The Authority considers that when setting the averaging period there is a trade off between efficiency and short term volatility considerations. The Authority conducted analysis during the development of the gas rate of return guidelines, concluding that an averaging period of 40 days would provide a good estimate of the prevailing rate of return on debt, while reducing the daily volume of transactions required to adjust larger debt portfolios, all other things equal.
245. The Authority will therefore move to adopt a 40 business days averaging period for estimating the risk free rate and debt risk premium for the rail WACC.

6.3 Draft decision

246. The Authority will base its estimates of the cost of debt on a risk premium over and above the risk-free rate, combined with a margin for administrative costs:
- $$\text{Cost of Debt} = \text{Risk Free Rate} + \text{Debt Risk Premium} + \text{Debt raising costs}$$
247. The estimate of the cost of debt will be based on prevailing rates 'on-the-day' just prior to each determination of floor and ceiling costs.
248. The Authority will adopt a 40 business days averaging period for estimating the risk free rate and the debt risk premium for the rail WACC.

7 Risk free rate of return

249. The risk-free rate of return is a key input to the Authority's approach to estimating the return on equity and the return on debt.
250. The risk-free rate is the rate of return an investor receives from holding an asset with a guaranteed payment stream, that is, where there is no risk of default. Since there is no likelihood of default, the return on risk-free assets compensates investors for the time value of money.

7.1 Current approach

251. In its previous determinations, the Authority determined a real risk free rate by:
- determining a nominal risk free rate as the average of implied returns on long term nominal Commonwealth Government Securities (**CGS**) with a 10 year term over a 20 day trading period;
 - determining a forecast value of inflation; and
 - calculating the real risk free rate by use of the Fisher equation.

7.2 Considerations of the Authority

252. The three key issues relating to estimation of nominal risk-free rates of return are:
- the choice of the proxy for "risk-free" assets;
 - the term to maturity; and
 - the averaging period.
253. The Authority reviewed each of the three approaches in developing the gas rate of return guidelines. The following sections summarise the views of the Authority, which are set out in more detail in the gas rate of return guidelines.⁹¹

7.2.1.1 *The choice of proxy for "risk free" assets*

254. The Authority considers that CGS bonds issued by the Commonwealth Government of Australia are the best proxy for the risk-free rate in Australia for the following reasons:
- CGS bonds are essentially free from default risk. The Australian Government has consistently received the highest possible credit rating from both Standard and Poor's and Moody's. Payments from these bonds are guaranteed by the Australian Government.
 - CGS bonds are the most liquid assets in Australia in terms of the volume at issuance, various terms to maturity, and narrow spreads between bid-ask yields.

⁹¹ For more detail, see Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 81.

- The observed yields of nominal CGS bonds are transparently recorded and reported by the Reserve Bank of Australia (**RBA**) on a daily basis.⁹²
255. Consistent with this view, Australian regulators have consistently adopted the observed yield to maturity of the CGS bonds as the best proxy for the nominal risk-free rate of return.⁹³
256. The Authority notes that in addition to CGS, there have also been proposals to use either:⁹⁴
- yields on Commonwealth government guaranteed bank debt;
 - yields on State government debt; or
 - the bank bill swap rate (**BBSW**) has been proposed as an alternative proxy of the risk free rate.
257. In its previous regulatory decisions on Dampier Bunbury Pipeline's proposed access arrangement revisions for the Dampier Bunbury Natural Gas Pipeline, the Authority considered these proposals.⁹⁵ The Authority concluded that there was insufficient evidence to depart from the use of CGS as a proxy for the risk-free rate of return, and therefore for regulatory consistency there should only be one proxy for the nominal risk free rate.
258. With regard to the use of BBSW, the Authority has concerns that available interest rate swap (**IRS**) market data on swap rates for longer maturities – such as beyond six months – are less reliable than short term BBSW.
259. The Authority notes that using observed market transactions of swap rates will result in estimates of the risk free rate that are biased upward. This is a consequence of the possible counter-party credit risk present in IRS,⁹⁶ and the implicit premium paid by those hedging when entering into a swap. This approach also relies on the assumption that longer maturity swap markets are sufficiently liquid.
260. Stakeholders responding to the Issues Paper were generally supportive of using estimates of the risk free rate that are based on the CGS.
261. Flinders however suggested that the Authority consider the option of switching the source of the 10-year risk free rate to the Bloomberg 10 year Commonwealth Government bond rate index, following the IPART's recent practice. In response, the Authority considers that its estimate, which is based on RBA data, produces

⁹² Given the adoption of the pre-tax real WACC for its rail determinations, the Authority is required to estimate the real risk free rate. However, the first step is to estimate the nominal risk free rate at the target term. The resulting yield may then be converted to a real yield by using the Fisher equation and an estimate of inflation over the term of the bond. For the Authority's approach to estimating inflation, see chapter 15.

⁹³ For the Authority's approach to estimating inflation, see chapter 15.

⁹⁴ Australian Energy Regulator, *Final Decision, Review of the weighted average cost of capital parameters for electricity transmission and distribution network service providers*, May 2009, pp. 136-140.

⁹⁵ Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, 14 March 2011, p.183.

⁹⁶ Hull J.C, *Options, Futures and other Derivatives*, Seventh Edition, Pearson Prentice Hall, 2009, p. 169.

essentially the same outcome.⁹⁷ The RBA data is publicly available. Therefore, the Authority sees no compelling rationale for change.

262. Overall, the Authority considers that it is appropriate to retain the use of CGS as the proxy for the risk free rate, as the longer dated rates may be more robustly estimated from CGS data.⁹⁸ The Authority therefore will retain the use of the nominal CGS risk free rate for the purpose of determining the rail WACC.

7.2.1.2 *The term of the risk free rate*

263. As discussed in section 3.2.3, the Authority considers that the implications of the requirement in the Code to estimate a 'long term' rail WACC necessitates the adoption of a 10 year term for the risk free rate.
264. The Authority notes that Brockman submitted that the term should be five years, as this corresponds to the period of the rail WACC review. However, the Authority considers that such an approach would be in error, given the requirement to estimate the annuity over the economic lives of the assets, which are generally more than ten years.
265. Accordingly, the Authority will base its estimation of the nominal risk free rate on the observed yield of 10 year CGS bonds.

7.2.1.3 *The averaging period*

266. As noted at section 6.2.3, the Authority will adopt a 40 day averaging period for estimating the risk free rate.
267. Stakeholders generally supported a longer term for the averaging period. Flinders for example submitted that a period of greater than 20 days may eliminate some of the volatility in the data around the time the WACC is set.
268. There is a different balance of considerations for the optimum averaging period in rail than in gas. In gas, hedging to the regulated rate is a key consideration; in rail, hedging is not a consideration, so the prime consideration is to develop the best predictor for the future.⁹⁹ Nevertheless, the Authority considers that the 40 day averaging period has satisfactory prediction properties.
269. The Authority will therefore move to adopt a 40 business days averaging period, just prior to the final determination of the rail WACC, for the purpose of estimating the CGS risk free rate.

⁹⁷ The Bloomberg GACGB10:IND figures are mid-yields. On the basis that Bloomberg compound the semi-annual payments, the 40 day average to 14 May 2014 of GACGB10:IND is one bp higher, at 4.11 per cent, than the Authority's corresponding estimate of 4.10 per cent using interpolated RBA data.

⁹⁸ This arises because the debt risk premium estimated by the Authority, against a CGS base, will be larger than the debt risk premium over and above the swap rate. Then, to the extent that firms use the swaps market to hedge movements in the base, some of the Authority's estimate of the debt risk premium will also be hedged. The additional amount hedged will be the spread of swaps.

⁹⁹ The Authority does not consider that an allowance for hedging costs is warranted for the rail WACC. Hedging costs relate to the costs involved in undertaking interest rate swaps to match the regulated risk free rate. The Authority considers that as rail service providers have control over the term of the contract negotiated with users, they are able match their preferred capital term. Further, as the rail WACC is the long term WACC, firms which adopt a shorter term than 10 years for their debt would have lower costs. As such, the interest rate risk associated with the term is not considered to be significant, and should not be recompensed through the WACC by means of a hedging cost allowance.

270. The Authority's indicative estimate of the 10 year risk free rate, as at 5 November 2014, is 3.33 per cent (see Appendix 7).

7.3 Draft decision

271. The Authority will base its estimation of the nominal risk free rate on the observed yield of 10 year Commonwealth Government Securities (**CGS**) bonds.
272. The Authority will adopt a 40 business days averaging period, just prior to the final determination of the rail WACC, for the purpose of estimating the CGS risk free rate.

8 Benchmark credit rating

273. The benchmark credit rating is a key input for estimating the debt risk premium (**DRP**). The credit rating is defined as the forward-looking opinion provided by a ratings agency of an entity's credit risk. Credit ratings provide a broad classification of a firm's probability of defaulting on its debt obligations. As a consequence, credit ratings represent the risk present in holding a debt instrument.
274. As a general rule, the DRP is higher when the credit rating is lower, and vice versa. This is because lenders require increased compensation before they commit funds to the debt issuer with a lower credit rating. A lower credit rating can be associated with the higher risk of default which leads to the higher DRP.
275. The Authority considers that a credit rating based on the benchmark sample of each of the regulated rail networks is appropriate for the purpose of determining each of the benchmark efficient entity's credit rating for the purposes of this determination. In particular, this credit rating must be consistent with the level of gearing and perceived level of risk present in each of the benchmark efficient rail entities.

8.1 Current approach

276. In its 2008 determination for the freight and urban railway networks, the Authority concluded that a BBB+ credit rating for the freight network and an A credit rating for the urban network best reflected the risks of the relevant benchmark efficient entities.¹⁰⁰ This conclusion was based on the advice from the Allen Consulting Group, which observed available credit ratings for comparable overseas and domestic comparators.¹⁰¹
277. The Authority, in its 2009 WACC determination, decided that a credit rating of BBB- was appropriate for the TPI rail network. The Authority rejected arguments which proposed that the benchmark credit rating of the regulated entity, in this case TPI, should reflect the credit rating of its main customer, Fortescue Metals Group (**FMG**).¹⁰² The Authority has consistently rejected the argument that the systematic risk of an infrastructure owner necessarily reflects that of its customer base.¹⁰³
278. However, the Authority considers that as the TPI rail network demand is less diversified than Brookfield – in terms of product base and number of customers – and has relatively limited potential for diversifying its customer base, the credit rating should be below that of BBB determined for Brookfield. On the other hand, the Authority also notes that iron ore transport contracts are likely to be based on long term commitments, which reduce the credit risk faced by TPI. In light of this, TPI's

¹⁰⁰ Economic Regulation Authority, *2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision*, June 2008.

¹⁰¹ The Allen Consulting Group, *Railways (Access) Code 2000: Weighted Average Cost of Capital*, October 2007.

¹⁰² Economic Regulation Authority, *The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network*, June 2009, p. 24.

¹⁰³ The systematic risk of an infrastructure owner does not directly equate to the systematic risk of its customers, given it is also dependent on a number of other factors, including the nature of the contractual arrangements between the infrastructure owner and customers (see for example, Economic Regulation Authority, *Final Decision on GGT's Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 13 May 2010, p. 49).

railway is not viewed by the Authority as falling into the speculative grade credit rating band (below BBB-). The Authority determines that a BBB- rating, the lowest rating in the investment grade spectrum, is appropriate.

279. The Authority notes that the Australian Competition and Consumer Commission in a recent decision determined a BBB credit rating for the ARTC in the Hunter Valley, the Queensland Competition Authority determined a BBB+ credit rating for the QR Network (now Aurizon) and the Independent Pricing and Regulatory Tribunal determined a BBB credit rating for the Hunter Valley network.^{104,105,106}

8.2 Considerations of the Authority

8.2.1 Methodology used to estimate credit rating

280. The Authority considers that any approach to estimating the relevant credit rating for each of the rail networks must be carried out with a focus of benchmarking the efficient financing costs of the benchmark efficient entity. That is, it assumed that each of the benchmark efficient entities representing each of the rail networks will ensure its capital structure minimises its cost of capital. As a practical consequence, the Authority considers that the determined credit rating for each of the rail networks may diverge from that of either the parent who owns the rail network,¹⁰⁷ or the actual awarded credit rating from a credit rating agency.
281. Brockman submitted that estimates of the cost of debt for access providers should not be linked to their actual credit ratings.¹⁰⁸ Brockman suggested that this creates perverse incentives for the businesses to not maintain an efficient and appropriate level of creditworthiness; a degradation of the credit rating, combined with an approach that allowed the firm to recover a cost of debt that matches its credit rating, would result in a WACC estimate that is inefficiently high. Brockman also submitted that it supports the use of a notional credit rating approach (irrespective of the actual credit rating of the access provider or its parent).
282. Flinders submitted that the two existing freight railways under the regime clearly have different credit ratings for the parent entity and the railway.¹⁰⁹ Credit ratings for the below-rail businesses are not issued separately as there is no individual debt issue paper for their activities. Therefore, Flinders' view is that, as a proxy, the credit rating of a particular debt instrument (if available) should be considered in preference to the credit rating for the entire entity. If such data was available then this data should be used to test the universally accepted regulatory credit rating of BBB/BBB+.

¹⁰⁴ Australian Competition & Consumer Commission, *Position Paper in relation to the Australian Railtrack Corporation's proposed Hunter Valley Rail Network Access Undertaking*, 2010.

¹⁰⁵ Queensland Competition Authority, *Final Decision, Queensland Rail Network's 2010 DAU*, 2010.

¹⁰⁶ Independent Pricing and Regulatory Tribunal, *New South Wales Rail Access Undertaking – Review of the rate of return and remaining mine life from 1 July 2009*, 2009.

¹⁰⁷ For example, the PTA benchmark credit rating will be different to that of the Western Australian government, and similarly TPI's benchmark credit rating will diverge from that of FMG.

¹⁰⁸ Brockman Mining Australia Pty Ltd, *Submission in response to Issues Paper- Railways (Access) Code 2000: Weighted Average Cost of Capital WACC Determination – Railway Networks*, February 2013.

¹⁰⁹ Flinders Mines, *Submission to the Economic Regulation Authority In response to Issues Paper under Railways (Access) Code 2000: Weighted Average Cost of Capital*, February 2013.

283. The Authority mostly agrees with the above submissions from Brockman and Flinders, and notes that this concurs with the benchmarking approach adopted by Australian regulators, including the Authority, most recently in the WACC guidelines for gas transmission and distribution networks.¹¹⁰ However, the Authority disagrees with Flinders' submission that the applicable regulatory credit rating is automatically that of BBB/BBB+, as the benchmark efficient rail entity may have a risk profile different to that of BBB/BBB+.
284. The Authority notes that various approaches for determining a benchmark credit rating were previously examined by the Australian Energy Regulator in its 2009 weighted average cost of capital (WACC) Review.¹¹¹ These techniques included: (i) ordinary least squares (OLS) regression techniques (as proposed by Associate Professor Lally); (ii) sample means; (iii) probit and logit regression models; (iv) sample medians; and (v) best comparators approach.
285. The Authority has previously addressed these methodologies in the rate of return guidelines for gas distribution and transmission networks.¹¹² The Authority notes that due to the lack of close comparator companies, and as a consequence the need to employ significant regulatory judgement, the Authority cannot rely on any of the above methodologies to accurately determine the appropriate credit rating for each of the three benchmark efficient rail entities. As a consequence, significant regulatory judgement must be used to determine the appropriate credit rating for each of the rail entities.
286. The Authority notes that credit rating agencies such as Standard & Poor's (S&P) and Moody's explicitly take economy wide and company specific factors into account when assigning credit ratings to debt securities. For example, S&P determines the credit rating by evaluating the business risk (qualitative assessment) and financial risk (quantitative assessment) faced by holders of debt securities. Table 9 presents the S&P risk profile to determine the credit rating for a particular business.

Table 9 Standard and Poor's Risk Profile Matrix

Business Risk Profile	Financial Risk Profile					
	Minimal	Modest	Intermediate	Significant	Aggressive	Highly Leveraged
Excellent	AAA	AA	A	A-	BBB	-
Strong	AA	A	A-	BBB	BB	BB-
Satisfactory	A-	BBB+	BBB	BB+	BB-	B+
Fair	-	BBB-	BB+	BB	BB-	B
Weak	-	-	BB	BB-	B+	B-
Vulnerable	-	-	-	B+	B	CCC+

Source: S&P

287. The Authority considers that, by utilising the above Standard and Poor's Risk Profile Matrix, in conjunction with the observed credit ratings of relevant comparator

¹¹⁰ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 30.

¹¹¹ Australian Energy Regulator, Final Decision, *Electricity transmission and distribution network service providers, Review of the weighted average cost of capital (WACC) parameters*, May 2009.

¹¹² Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 44.

companies, regulatory judgement can be exercised in order to determine the appropriate benchmark efficient credit rating for each of the rail networks.

8.2.2 Construction of the benchmark sample

The Authority has obtained, where available, the S&P credit rating for the comparable companies of each of the rail networks via Bloomberg.¹¹³ The Authority considers that the long term issuer credit rating is the most appropriate indicator of the required benchmark credit rating for each of the rail networks, given the focus on estimating the long term WACC in the Code.¹¹⁴ The results are set out below (Table 10, Table 11 and Table 12).

Table 10 Comparator companies for the PTA network as selected by the Authority

Company Name	Country	Bloomberg Ticker	S&P Credit Rating
Atlantia SPA	Italy	ATL IM Equity	BBB+
Vinci SA	France	DG FP Equity	A-
Abertis Infraestructuras S.A	Spain	ABE SM Equity	BBB

Source: Bloomberg

Table 11 Comparator companies for Brookfield Rail as selected by the Authority

Company Name	Country	Bloomberg Ticker	S&P Credit Rating
Genesee & Wyoming Inc.	United States	GWR US Equity	BB-
Union Pacific Corporation	United States	UNP US Equity	A
Norfolk Southern Corporation	United States	NSC US Equity	BBB+
Kansas City Southern	United States	KSU US Equity	BBB-
CSX Corporation	United States	CSX US Equity	BBB+
Canadian Pacific Railway	Canada	CP CN Equity	BBB
Canadian National Railway	Canada	CNR CN Equity	A
Aurizon Holdings	Australia	AZJ AU Equity	BBB+
Asciano Limited	Australia	AIO AU Equity	BBB-
Auckland International Airport Limited	New Zealand	AIA NZ Equity	A-
Port of Tauranga	New Zealand	POT NZ Equity	BBB+

Source: Bloomberg

¹¹³ Obtained via Bloomberg on 9 May 2014, 2013.

¹¹⁴ *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

Table 12 Comparator companies for TPI as selected by the Authority

Company Name	Country	Bloomberg Ticker	S&P Credit Rating
Genesee & Wyoming Inc.	United States	GWR US Equity	BB-
Union Pacific Corporation	United States	UNP US Equity	A
Norfolk Southern Corporation	United States	NSC US Equity	BBB+
Kansas City Southern	United States	KSU US Equity	BBB-
CSX Corporation	United States	CSX US Equity	BBB+
Canadian Pacific Railway	Canada	CP CN Equity	BBB
Canadian National Railway	Canada	CNR CN Equity	A

Source: Bloomberg

8.3 Draft decision

8.3.1 PTA

288. The Authority noted above that it considers the risks faced by the PTA to be substantially lower than that of the companies contained in the PTA benchmark sample. Based on the evidence which can be observed regarding the credit rating of these companies (albeit limited), a credit rating interval of BBB to A- can be inferred. However, the Authority notes that this interval is based on evidence derived exclusively from European toll road operators, which are considered to be a poor proxy for the credit risk faced by the PTA Rail Network.
289. Furthermore, the Authority notes that the observed gearing of these toll road operators is on average 50 per cent,¹¹⁵ equal to the benchmark assumed gearing of the PTA network. As a consequence, the Authority considers that the financial risk can be considered to be *approximately* equal, whilst the business risk for the PTA rail network can be considered lower.
290. With reference to the above S&P credit matrix (Table 9), this suggests a higher credit rating than that of the BBB to A- interval derived from the PTA benchmark sample.
291. The Authority considers that based on this assessment, the benchmark efficient rail entity would be able to sustain a credit rating of A. The Authority notes that the credit rating of A is unchanged from its 2008 decision regarding the PTA rail network.¹¹⁶

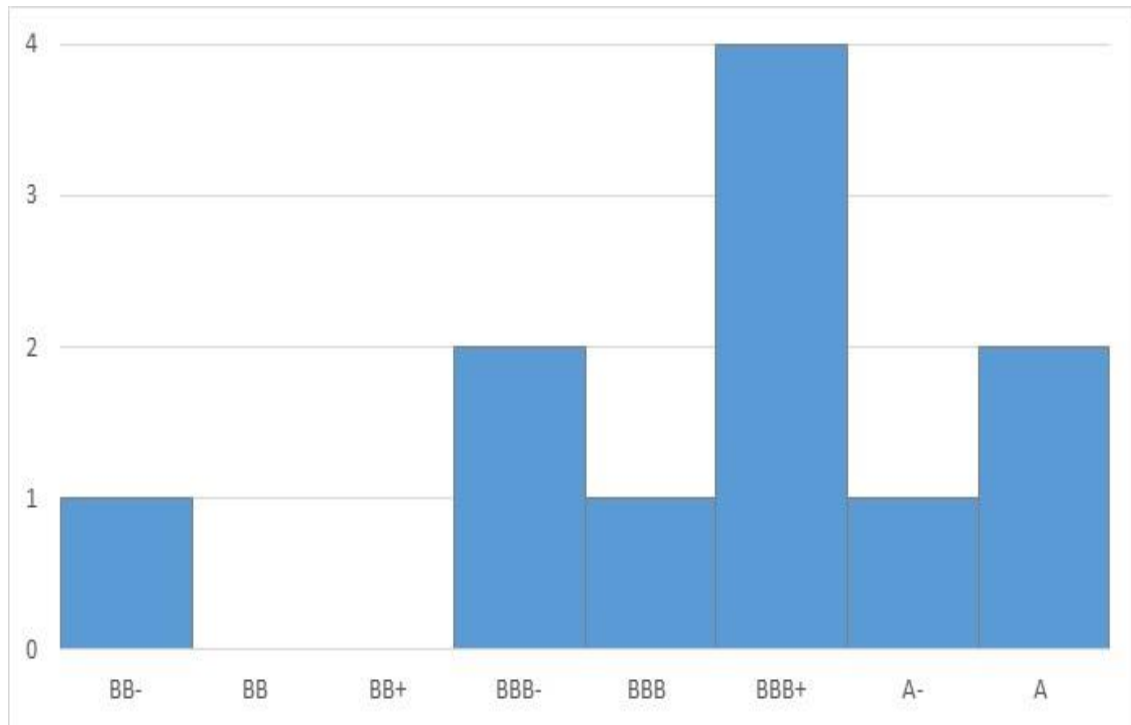
¹¹⁵ Refer to Table 6 in Chapter 5 - Gearing.

¹¹⁶ Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008.

8.3.2 Brookfield Rail

292. A graphical representation of the frequency of the observed credit ratings for the Brookfield Rail benchmark sample is presented below. The Authority notes that the credit rating of BBB+ is both the median and mode of the observed credit ratings for the benchmark credit rating sample for Brookfield Rail.

Figure 2 Brookfield Rail benchmark sample observed credit ratings frequency



Source: Bloomberg, Economic Regulation Authority analysis

293. The Authority considers that Aurizon (with a credit rating of BBB+) is likely to be the best comparator for Brookfield Rail, given that it operates in Australia and transports similar freight.
294. The Authority also considers that the risk faced by Brookfield Rail is less than that faced by overseas freight railway operators. The Authority's *a-priori* expectation is that overseas rail operators will possess a higher level of risk, relative to an Australian railway operator. American and Canadian railway operators, for example, are expected to face higher degrees of competition from alternative forms of transportation, such as roads. In particular, the Authority considers that the risks faced by Genesee & Wyoming Inc. exceed that of Brookfield Rail, and therefore that the credit rating of BB- cannot be used to inform the appropriate credit rating range for Brookfield Rail.
295. Despite this expectation, the Authority notes that the comparator companies Canadian National Railway and Union Pacific Corporation have credit ratings of A. However, both companies have gearings of approximately 15 per cent, significantly lower than the benchmark assumed gearing of 25 per cent. For that reason, the Authority does not consider that these two companies should be used as comparators for the benchmark credit rating.

296. Taking the foregoing into account, the Authority considers that the most appropriate interval of credit ratings for Brookfield Rail is BBB- to BBB+, which is based on the range formed by the remaining Brookfield Rail comparator companies.
297. The Authority considers it appropriate to choose a credit rating at the upper end of the BBB- to BBB+ credit rating interval. The Authority notes that a credit rating of BBB+ would be consistent with the credit rating of Aurizon.
298. The Authority also notes that the Brookfield Rail network is rated as BBB by Standard and Poor's.¹¹⁷ The Authority further notes that, whilst a BBB+ determination would diverge slightly from the credit rating assigned by S&P, this divergence would be consistent with Brookfield Rail having a higher level of gearing relative to the benchmark assumed gearing ratio of 25 per cent (the Authority also notes that S&P has assessed Brookfield Rail's financial risk profile as "significant").¹¹⁸
299. Therefore, the Authority considers a credit rating of BBB+, in conjunction with an assumed benchmark gearing ratio of 25 per cent, is appropriate for the Brookfield Rail network. The Authority notes that this credit rating is unchanged from its 2008 determination.¹¹⁹

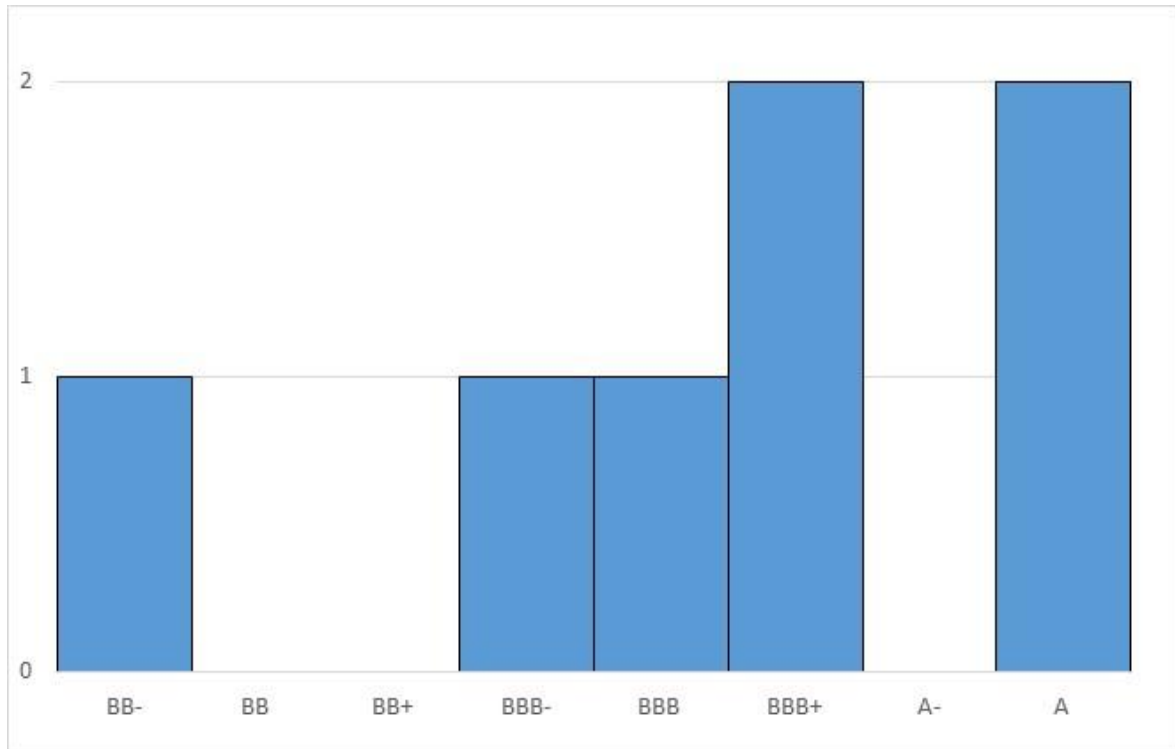
8.3.3 TPI

300. A graphical representation of the frequency of the observed credit ratings for the TPI rail benchmark sample is shown below (Figure 3). The Authority considers that the most appropriate comparators for TPI are the overseas railway operators Genesee & Wyoming Inc. and Kansas City Southern as both companies have comparable gearing levels, and both are considered to have similar levels of risk to that of TPI. As a consequence, the Authority considers that the most appropriate credit rating interval is that of BB- to BBB- based on the comparator companies in the TPI benchmark sample.

¹¹⁷ Standard & Poor's, Ratings Direct – Aurizon Network Pty Ltd, 15 May 2013.

¹¹⁸ Standard & Poor's, Research Update: Rating on Brookfield WA Rail Affirmed At 'BBB/Stable', with an SACP of 'BBB' and Moderately Strategic Group Status, 31 March 2014.

Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008.

Figure 3 TPI benchmark sample observed credit ratings frequency

Source: Bloomberg, Economic Regulation Authority analysis

301. The Authority has previously considered that Genesee & Wyoming Inc. is the best comparator company to the TPI rail network. However, the Authority considers that a credit rating of BB- is inappropriate for the benchmark efficient rail entity representing the TPI network. In its credit rating rationale for Genesee & Wyoming Inc., Standard and Poor's noted that:¹²⁰

The ratings on Genesee & Wyoming Inc. reflect the company's significant debt levels (pro forma from the transaction, the ratio of debt to EBITDA will be 4.4x and funds from operations (FFO) to total debt will be about 18%), capital intensity, and acquisitive growth strategy.

Standard & Poor's characterizes the company's business risk profile as "fair", its financial risk profile as "aggressive" and liquidity as "adequate".

302. The Authority considers that the above rationale for Genesee & Wyoming Inc.'s credit rating does not apply to the TPI network. In particular, the Authority notes that the TPI railway network is not expected to expand in the medium term at a similar rate to Genesee & Wyoming Inc.'s 'acquisitive growth strategy'. In addition, while the Authority has calculated a gearing of 22 per cent for Genesee & Wyoming Inc., S&P considers that its financial risk profile is 'aggressive'. This was primarily based on high funds from operations and EBITDA to debt ratio.
303. Therefore, while the Authority considers Genesee & Wyoming Inc. the best comparator company for the TPI rail network, it also considers that the credit rating of BB- is inappropriate. Given that the benchmark efficient entity is assumed to minimise its cost of capital, the Authority considers that the benchmark efficient entity would organise its capital structure to ensure an investment grade credit rating.

¹²⁰ Reuters, *TEXT-S&P rates Genesee & Wyoming Inc.*, 29 August 2012, www.reuters.com/article/2012/08/29/idUSWNA426420120829, accessed 13 May 2014.

Allowing a credit rating below investment grade would expose the benchmark efficient entity to greater financing costs than would be efficient.

304. As a consequence, the Authority considers that Kansas City Southern's credit rating of BBB-, the lowest possible investment grade rating, is the appropriate benchmark credit rating for the TPI rail network. The BBB- credit rating is also at the lower end of credit ratings for the TPI benchmark sample, consistent with the Authority's prior reasoning that the TPI rail network will face a higher level of risk relative to the comparators in its benchmark sample.
305. The Authority notes that a credit rating of BBB- for the TPI rail network is unchanged from its 2009 determination.¹²¹

¹²¹ Economic Regulation Authority, The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network, June 2009, p. 24.

9 Debt risk premium

306. The debt risk premium (**DRP**) is the margin above the risk free rate of return, required to compensate holders of debt securities for the risk in providing debt finance. The debt risk premium compensates holders of debt securities for the possibility of default by the issuer.
307. The DRP provides compensation to lenders for the additional risk associated with providing debt capital, over and above the risk-free rate. As such, the extent of the compensation, or 'credit spread', is closely related to the risk of the business. When issuing debt in the form of bonds, a credit rating can be assigned which reflects the probability of default of the issuer, and hence the risk present in the bond. Chapter 8 – Benchmark credit rating discusses the credit rating of each of the benchmark efficient rail entities.

9.1 Current Approach

308. In the 2008 Weighted Average Cost of Capital for the Freight and Urban Rail Networks review, the Authority estimated the debt margins for both the PTA and Brookfield Rail network (then Westnet) utilising the CBA Spectrum fair value yields.¹²² This approach was based on the advice of the Allen Consulting Group.¹²³ In the 2009 WACC determination for the TPI network, the Authority used debt risk premiums derived from the use of Bloomberg fair value curves.¹²⁴
309. The Authority notes that it has ceased utilising the CBA Spectrum and Bloomberg fair value curves in estimating the debt risk premium for regulated utilities since the previous WACC determinations in rail.¹²⁵ This was primarily as a consequence of the large divergence between the observed yields of Australian corporate bonds and the estimates produced by CBA Spectrum and Bloomberg fair value curves. The Authority's view is that this divergence is primarily due to the lack of liquidity in the Australian corporate bond market, in addition to the extrapolation of the yield curves to a longer maturity. More recently, CBA Spectrum has ceased publication. The Authority developed the bond yield approach in response to the view that the above methods did not adequately reflect the prevailing market conditions for funds in the Australian corporate debt market. The history of estimating the debt risk premium calculation, and derivation of the bond yield approach can be found in the gas rate of return guidelines.¹²⁶

¹²² Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008, p. 20.

¹²³ The Allen Consulting Group, Railways (Access) Code 2000: Weighted Average Cost of Capital, October 2007.

¹²⁴ Economic Regulation Authority, The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network, June 2009, p. 31.

¹²⁵ Economic Regulation Authority, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline, 31 October 2011.

Economic Regulation Authority, Final Decision on Proposed Revisions to the Access Arrangement for the Mid West and South-West Gas Distribution System, Feb 2011.

Economic Regulation Authority (Western Australia), Final decision on proposed revisions to the access arrangement for Western Power, 2012.

¹²⁶ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines, p. 109.

9.2 Considerations of the Authority

310. The DRP of a given bond is calculated by observing the difference between the observed yield of the bond and risk free rate of same maturity as the bond. The yield of corporate bonds reflects the discount rate of the cash flows arising from the purchase of a bond, and as a consequence reflects the promised return of the bond. Because cash flows are constrained by the promised coupons and face value, the promised yield can be directly observed via the traded price of the bond, and is quoted by financial services such as Bloomberg.¹²⁷ Subtracting the risk free rate results in the DRP, and represents the risk premium bond holder's demand for incurring the risk of default.
311. Brookfield submitted that the most appropriate method to estimate the ten year yield on BBB rated bonds is to extrapolate the Bloomberg seven year yield to ten years.¹²⁸ The seven year bonds are chosen due to liquidity issues with ten year bonds. The Authority disagrees with Brookfield's submission, based on the analysis conducted in the gas rate of return guidelines, which highlighted the lack of confidence the Authority has in deriving estimates of the DRP from the Bloomberg fair value curves.¹²⁹
312. Brockman submitted that it broadly supports the Authority's existing process.¹³⁰ However, Brockman notes that the debt premium estimated by the Authority should be linked to the benchmark credit rating. Flinders submitted that the benchmark debt margin for utilities should be consistent with:¹³¹
- any directly observable yields on long-dated Australian corporate bonds during and around the time of the relevant measurement period;
 - reasonable views based on market evidence regarding:
 - the term structure of Australian corporate bond yields at the benchmarked credit rating of BBB+; and
 - credit spreads (that is, the sensitivity of yields to variations in credit ratings) of non-bank Australian corporate bonds of the same maturity.
313. In response to these submissions, the Authority considers that any method used to estimate the DRP must first rely on a sample of corporate bonds with a similar degree of risk. The DRP for the benchmark efficient firm can then be estimated by first observing the debt risk premium of bonds with the same credit rating as that of the relevant benchmark efficient entity. A benchmark sample of corporate bonds is expected to capture the characteristics of the benchmark firm because they have the same credit rating assigned by an international rating agency such as Standard & Poor's (**S&P**). Therefore, the benchmark sample of corporate bonds is seen to possess a similar level of risk to that faced by the benchmark efficient entity, and thus have the same level of expected return.

¹²⁷ By setting the price of the bond equal to the promised cash flows of the bond, and solving for the discount rate.

¹²⁸ Brookfield Rail, Review of the WACC to apply to rail networks under the Railways (Access) Code 2000.

¹²⁹ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines, p. 109.

¹³⁰ Brockman Mining Australia Pty Ltd, Submission in response to Issues Paper- Railways (Access) Code 2000: Weighted Average Cost of Capital WACC Determination – Railway Networks, February 2013.

¹³¹ Flinders Mines, Submission to the Economic Regulation Authority In response to Issues Paper under Railways (Access) Code 2000: Weighted Average Cost of Capital, February 2013.

314. Given this, the Authority considers that the bond yield approach, regularly applied in previous utility determinations,^{132,133,134} is appropriate for estimating the required DRP for each of the benchmark efficient entities representing the rail networks.

9.2.1 Revisions to the Authority's bond yield approach

315. The Authority acknowledges that it may not be possible for the DRP to be hedged efficiently due to the absence of a liquid credit default swaps market. In consequence, the Authority considers that the estimate of the DRP should be developed consistent with the average term at issuance of the debt issued by the benchmark efficient entity.¹³⁵
316. The Authority previously considered that the bond yield approach provided a reasonable estimate of the term of the DRP. The bond yield approach was based on a joint weighted average term to maturity of bonds observed in the benchmark sample, which had a term of around 6 years.
317. However, the Authority has recently accepted that a term of 10 years for the estimate of the debt risk premium is consistent with the typical financing practices for infrastructure firms.¹³⁶ This reflects the long lived nature of infrastructure assets, and the need for infrastructure firms to manage associated refinancing risks.
318. Estimation of credit spreads for a term of 10 years requires development of a yield curve. To this end, the Authority evaluated two approaches for estimating the 10 year debt risk premium:

- the Reserve Bank of Australia's (RBA) newly developed estimates of credit spreads; and
- the Authority's bond yield approach, augmented to allow estimation of a yield curve.

9.2.1.1 The RBA's corporate credit spread

319. The RBA announced its credit spread estimates in December 2013.¹³⁷ The credit spreads are estimated with respect to both the return on Commonwealth Government Securities and Bank Bill Swap rates, at various target tenors.¹³⁸

¹³² Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, 31 October 2011.

¹³³ Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid West and South-West Gas Distribution System*, February 2011.

¹³⁴ Economic Regulation Authority), *Final decision on proposed revisions to the access arrangement for Western Power*, January 2012.

¹³⁵ The gas rate of return guidelines examined this issue in detail (see Economic Regulation Authority, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, Appendix 2). In particular, the work of Lally suggests that while a DRP based on the average term at issuance of the regulated firm's issued debt would violate the 'NPV=0' present value principle, the violation would be small (Lally M, *The Appropriate Term for the Risk Free Rate and the Debt Margin*, April 2010, p. 14

¹³⁶ Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*, 14 October 2014, p. 189.

¹³⁷ Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013.

¹³⁸ Reserve Bank of Australia, *Interest rates: aggregate measures of Australian corporate bond spreads and yields*, Table F3, www.rba.gov.au/statistics/tables/index.html.

320. A starting point for the RBA's estimation approach is the development of the samples of Australian corporate bonds that are used to estimate the spreads for the A and BBB credit rating bands respectively. The RBA adopts the following selection criteria to filter the corporate bonds for each of the respective benchmark samples:¹³⁹

- a credit rating of A-rated band or BBB-rated band;
- a remaining term to maturity of 1 year or longer;
- an amount at issuance of A\$100 million or greater;
- inclusion of bonds denominated both in Australian dollars and foreign currencies; including US dollars and Euros;
- inclusion of bullet bonds and bonds with embedded options, such as callable bonds; and
- all bonds identified by Bloomberg that were outstanding after 1 January 1990 and were issued by non-financial corporates (NFCs) incorporated in Australia.¹⁴⁰

321. Once the benchmark sample is developed, the aggregate credit spreads for A-rated and BBB-rated Australian NFCs are estimated for a given target tenor as the weighted average of the Australian dollar equivalent credit spreads over the swap rate. The method is applied to the cross-section of bonds in the sample that have the desired credit rating.

322. The RBA estimates are determined by the Gaussian kernel method. This approach assigns a weight to every observation in the bond sample – informed by the distance of the observation's residual maturity from the target tenor – according to a Gaussian (normal) distribution.¹⁴¹ The RBA notes that this method recognises that the observed spreads on bonds with residual maturities close to the target tenor contain more information about the underlying spread at that tenor than spreads on bonds with residual maturities further away. The RBA also argues that:

The advantage of the Gaussian kernel over parametric methods that have been popularised in the literature on the estimation of government yield curves, is its simplicity. Also, it does not impose a particular functional form on the credit spread curve but allows the observed data to determine its shape.^{142,143}

¹³⁹ Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 17.

¹⁴⁰ Non-financial corporations are identified based on their classification by Bloomberg in a group other than banking, commercial finance, consumer finance, financial services, life insurance, property and casualty insurance, real estate, government agencies, government development banks, governments regional or local, sovereigns, supra-nationals and winding-up agencies.

¹⁴¹ Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 20.

¹⁴² Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 20.

¹⁴³ The RBA note (Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 20):

'A number of estimation methods were investigated. These methods produced very similar estimates of credit spreads across tenors and broad credit ratings. These methods included a range of parametric models estimated by least squares regressions applied to the cross-section in each period. In particular, the Nelson and Siegel (1987) method was examined in detail owing to its wide use in practice for estimating government yield curves (BIS 2005); this method has also been adapted for the estimation of corporate bond yield and spread curves (Xiao 2010). However, the RBA notes that in its sample these models displayed spurious statistical properties, producing very high model fit but largely statistically insignificant coefficients. Other studies have also found evidence of possible over-fitting of the data using parametric methods, particularly in the case of the Nelson and Siegel model (Annaert et al 2013).'

323. Formally, the Gaussian kernel average credit spread estimator $S(T)$ at target tenor T (say, 5 years) for a given broad rating (say, BBB-rated bonds) and date is:

$$S(T) = \sum_{i=1}^N w_i(T; \sigma) \times S_i$$

where:

- $w_i(T; \sigma)$ is the weight for the target tenor T of the i^{th} bond in the sub-sample of bonds with the given broad rating; and
- S_i is the observed spread on the i^{th} bond in the sub-sample of N bonds with the given broad rating.
- The parameter σ (sigma), which is measured in years, controls the weight assigned to the spread of each observation based on the distance between that bond's residual maturity and the target tenor. Sigma is the standard deviation of the normal distribution used to assign the weights. It determines the effective width of the window of residual maturities used in the estimator, with a larger effective window producing smoother estimates.

324. The weighting function is as follows.

$$w_i(T; \sigma) = \frac{K(T_i - T; \sigma) \times F_i}{\sum_{j=1}^N K(T_j - T; \sigma) \times F_j}$$

where:

- $K(T; \sigma)$ is the Gaussian kernel function giving weight to the i^{th} bond based on the distance of its residual maturity from the target tenor $(|T_i - T|)$.
- F_i is the face value of the i^{th} bond.

325. The Gaussian kernel is finally defined as below:

$$K(T_i - T; \sigma) = \frac{1}{\sqrt{2\pi} \sigma} \exp\left[-\frac{(T_i - T)^2}{2\sigma^2}\right]$$

326. The Gaussian kernel method provides for a degree of flexibility in weighting the observations around the target tenor through the choice of the value of the smoothing parameter, σ .

327. The RBA then selects a smoothing parameter of 1.5 years for both A-rated bonds and BBB-rated bonds.

328. The RBA concluded that the Gaussian kernel method produces effective weighted average tenors that are very close to each of the target tenors. The exception is the 10 year tenor, where the effective tenor is currently 8.6 years. The RBA argues that this difference reflects the dearth of issuance of bonds with tenors of 10 years or more.

329. The Authority has evaluated the estimates developed by the RBA and has concerns that they are not the best means to deliver the estimate of the DRP that meets the object of the *Railways (Access) Act 1998*.
330. First, the Authority is of the view that there is a need for consistency in the term estimates (that is, the estimates for the target tenors). The Authority notes that the RBA approach does not necessarily achieve this outcome, particularly at the 10 year target tenor. As noted above, the RBA method produces an estimate that is 8.6 years.
331. Second, the Authority notes that the RBA estimates are only available for the BBB and A bands. However, Australian economic regulators, including the Authority, have adopted various other combinations of credit ratings for their regulatory decisions. For the rail WACC, the credit ratings are A-, BBB+ and BBB-. The Authority considers it should not be constrained in its credit rating evaluation by a limited set of estimates of the related debt risk premia, as the resulting estimate would be unlikely to be consistent with the object of the *Railways (Access) Act 1998*.
332. Third, the RBA estimates are reported as the month-end estimates of the debt risk premium using relevant swap rates or Commonwealth Government Security (CGS) rates. The resulting estimates are less than ideal because Australian regulatory practice is to adopt an average over a period between 20 or 40 trading days, so as to avoid significant fluctuation of the estimates on any particular day.
333. On this basis, the Authority is of the view that it is more appropriate to develop its own yield estimates. To this end, the Authority has extended its bond yield approach with two additions: (i) the benchmark sample is extended to recognise the importance of Australian bonds denominated in foreign currencies; and (ii) various curve fitting techniques are adopted to allow the estimation of the debt risk premium at various tenors.

9.2.1.2 Extending the benchmark sample for the bond yield approach

334. In its bond yield approach discussion paper in December 2010, the Authority considered the trade-off between the 'market relevance' and the 'accuracy' of the approach to be adopted in estimating the proxy for the cost of debt/the debt risk premium for a benchmark sample of Australian corporate bonds.¹⁴⁴ The Authority considered that a bond price (or its observed yield) is determined by the markets, not by the companies or the regulators. As a result, the Authority was of the view that relying on market data will provide the best means of estimating the proxy for the cost of debt. This means that observed bond yields play a fundamental role in the method of estimation.
335. In addition, the Authority places emphasis on market relevance. This takes account of the fact that new bond issuers consider the prevailing market conditions prior to the issuance of the bonds. In particular, issuers will consider issuing longer term bonds in a 'normal' market situation, whereas shorter term bonds may be more appropriately issued during very unstable market conditions. As a result, the observed yields of bonds currently traded in the market will reflect the nature of the prevailing market conditions prior to the issuance of the bonds.

¹⁴⁴ Economic Regulation Authority, *Measuring the debt risk premium: bond-yield approach*, 30 November 2010.

336. The Authority notes that Australian domiciled firms are increasingly choosing to issue bonds denominated in offshore markets and currencies.¹⁴⁵ As long as the majority of bond issuances of the various markets and currencies can be captured, then the associated outcomes are 'market relevant', and ideally should be included in the benchmark sample.
337. The decision to issue bonds in the Australian or overseas financial markets lies with firms. There may be a cost advantage in issuing bonds overseas taking into account all possible risks associated with the process such as exchange rate risk. Alternatively, it may be more convenient to issue longer term bonds and/or bonds with larger amounts at issuance in overseas markets given the Australian financial market is generally considered a smaller market in comparison with the US, European, and UK markets.
338. An initial search on the Bloomberg terminal, as at 18 June 2014, indicates that Australian corporate bonds are largely denominated either in Australian dollars, US dollars (**USD**), Euros, or British pounds (**GBP**).

Table 13 Australian corporate bonds denominated in various currencies

Currency	No of bonds	Percentage	Amount (in relevant currency)	Exchange rate as at 18 June 2014	Amount (in A\$)	Percentage
AUD	74	39%	20,531,775,500	1.0000	20,531,775,500	21%
CAD	2	1%	521,370,000	1.0148	513,766,259	0.52%
CHF	3	2%	492,910,000	0.8399	413,995,109	0.42%
EUR	14	7%	10,805,920,000	0.6893	15,676,657,479	15.81%
GBP	12	6%	6,196,342,000	0.5504	11,257,888,808	11.36%
JPY	2	1%	109,813,500	95.4700	1,150,241	0.0012%
NZD	3	2%	771,090,000	1.0778	715,429,579	0.72%
SGD	1	1%	217,903,000	1.1704	186,178,230	0.19%
USD	78	41%	46,539,000,000	0.9337	49,843,632,859	50.28%
Total	189	100%	86,186,124,000		99,140,474,063	100%

Source: ERA analysis based on data obtained from Bloomberg and the RBA (for exchange rate), June 2014

339. The above table indicates that if only Australian corporate bonds denominated in Australian dollars are included in the benchmark sample, then only 39 per cent (in terms of number issued) and 21 per cent (in terms of value at issuance) of bonds are covered. However, when foreign currencies such as USD; Euros; and GBP are included, the benchmark sample captures relevant information relating to 93 per cent of all debt (in terms of the number of bonds issued) and 98 per cent of all debt (in terms of the amount at issuance).
340. It is clear then that the majority of Australian corporate bonds are denominated in foreign currencies.¹⁴⁶ Furthermore, overseas markets have assumed greater importance for the longer end of the yield curve.
341. In conclusion, the Authority considers that Australian corporate bonds denominated in selected foreign currencies should be included in the benchmark sample, given the changing nature of debt markets, and the clear trend to foreign issuance. Doing so

¹⁴⁵ Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 16.

¹⁴⁶ Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 17.

will increase the sample size of the benchmark sample, which leads to a more robust estimate of the debt risk premium.

342. The Authority will include Australian bonds denominated in USD; Euros; and GBP in the benchmark sample under its bond yield approach. The Authority notes that as at August 2014, bonds denominated in AUD; USD; Euros and GBP cover the majority of debt issued by Australian corporates. Should the debt market evolve in the future and other currencies play a more significant role, the choice of currencies may need to change. The Authority considers that provided the bond sample covers at least 90 per cent of both the number of bonds and the amount at issuance, then its estimates are likely to be sufficiently representative of actual debt issuing practices.
343. As a further consideration, the Authority notes that it is standard practice to exclude firms operating in the financial sector, because these firms have a different capital structure.¹⁴⁷ Exclusion of bonds issued by firms in the financial sector may reduce the sample size. However, given the approach to include bonds denominated in foreign currencies, this reduction in the sample size does not have an effect on the robustness of the estimates.
344. In summary, the Authority considers that it is appropriate to include Australian corporate bonds denominated in key foreign currencies in the benchmark sample, as well as domestic issuance in Australian dollars. The Authority also considers it appropriate to exclude bonds issued by financial entities. The resulting sample approach of the Authority then bears similarities to that of the RBA corporate credit spread approach (Table 14).

Table 14 A comparison: the ERA's bond sample approach versus the RBA's approach

Criteria	ERA's approach	RBA's approach
Remaining term	> 2 years	> 1 year
Amount at issuance	N/A	A\$100 million
Denominated currency	AUD, USD, EUR and GBP	AUD; USD and EUR
Industry of issuers	Non-financial corporates only	Non-financial corporates only

Source: ERA analysis

9.2.1.3 Techniques to estimate the debt risk premium

345. The Authority investigated methods for the purpose of estimating the debt risk premium at tenors beyond 5 years.
346. The Authority notes that there are different curve fitting techniques that could be used for this purpose. However, the following three techniques are widely used:
- the Gaussian Kernel;
 - the Nelson-Siegel methodology; and
 - the Nelson-Siegel-Svensson methodology.

¹⁴⁷ The Authority notes that the RBA estimates exclude financial sector bonds.

347. Each of these techniques is discussed in turn below.

Gaussian Kernel

348. This methodology was discussed in detail previously under the discussion of the RBA's approach.

The Nelson-Siegel methodology

349. The Nelson-Siegel methodology assumes that the term structure of the DRP has the following parametric form:

$$y_t(\tau) = \beta_{0t} + \beta_{1t} \frac{1 - \exp(-\lambda\tau)}{\lambda\tau} + \beta_{2t} \left(\frac{1 - \exp(-\lambda\tau)}{\lambda\tau} - \exp(-\lambda\tau) \right)$$

where:

$y_t(\tau)$ is the credit spread (debt risk premium) at time t for maturity τ ; and

$\beta_{0t}, \beta_{1t}, \beta_{2t}, \lambda$ are the parameters of the model to be estimated from the data.

350. The Nelson-Siegel methodology uses observed data from the bond market to estimate the parameters $\beta_{0t}, \beta_{1t}, \beta_{2t}, \lambda$ by using the observed debt risk premium and maturities for bonds. With the estimated parameters $\beta_{0t}, \beta_{1t}, \beta_{2t}, \lambda$, a yield curve is produced by substituting these estimates into the above equation and plotting the resulting *estimated* debt risk premium $\hat{y}(\tau)$ by varying the maturity τ . $\hat{y}(\tau)$ has the interpretation of being the *estimated* debt risk premium for a benchmark bond with a maturity of τ for a given credit rating.

The Nelson-Siegel-Svensson methodology

351. The Nelson-Siegel-Svensson yield curve fitting method is an extension to the Nelson-Siegel method. The following parametric form is fitted by minimizing the sum of squared residuals between the fitted form and the bond yield observations:¹⁴⁸

$$\hat{y}(\tau) = \beta_0 + \beta_1 \frac{1 - e^{-\tau\lambda_1}/\lambda_1\tau}{\lambda_1\tau} + \beta_2 \left[1 - e^{-\tau\lambda_1}/\lambda_1\tau - e^{-\tau\lambda_1} \right] + \beta_3 \left[1 - e^{-\tau\lambda_2}/\lambda_2\tau - e^{-\tau\lambda_2} \right]$$

where:

$\hat{y}(\tau)$ is the estimated yield as a function the remaining term to maturity τ ; and

$\beta_0, \beta_1, \beta_2, \beta_3, \lambda_1$ and λ_2 are the estimated parameters that result in the minimum sum of squared residuals.

¹⁴⁸ M. Dahlquist and L.Svensson, 'Estimation of the Term Structure of Interest Rates with Simple and Complex Functional Forms: Nelson & Siegel vs. Longstaff & Schwartz', *Institute for International Economic Studies, Seminar Paper Number 565*, February 1994.

352. The estimated function can then be used to calculate yields, or in the present case, the spreads to swap, based on a given term to maturity as an input.

Using the ERA's revised bond yield approach to estimate the regulated debt risk premium

353. On the basis of the above considerations, the Authority has determined that it will utilise a revised bond yield approach for the purpose of estimating the regulated debt risk premium.

354. To estimate the regulated debt risk premium, the Authority will:

- extend the benchmark sample under the bond yield approach to: (i) include Australian corporate bonds denominated in domestic currency (AUD) and foreign currencies including USD; Euros; and British pounds; and (ii) exclude bonds issued by financial sectors including banks;
- estimate the credit 'spread to swap' for each bond, in terms of the denominated currency, as a first step in estimating the regulated debt risk premium;
- convert the resulting spread to swap for each bond to AUD terms, by accounting for hedging costs;
- estimate a credit spread to swap yield curve in AUD equivalents – applying the Gaussian Kernel, the Nelson-Siegel and the Nelson-Siegel-Svensson techniques;
- use the simple average of these 3 yield curve's 10 year spread to swap estimate to arrive at the final estimate of the 10 year spread to swap;¹⁴⁹
- add the 10 year Australian swap rate to the resulting 10 year spread to swap, to determine the 10 year cost of debt;
- estimate the regulated debt risk premium as the 10 year cost of debt spread to the 10 year risk free rate.

355. The following sections summarise these steps in more detail.

Step 1: Determining the benchmark sample

356. The criteria to determine the benchmark sample in the Authority's bond yield approach has been revised. The following characteristics will be applied to select corporate bonds to be included in the benchmark sample:¹⁵⁰

- credit rating of each bond must match that of the benchmark efficient entity, as rated by Standard & Poor's;
- time to maturity of 2 years or longer;
- bonds issued where the country of risk is Australia (except by the financial sector) and denominated in AUD; USD; Euros; and GBP;¹⁵¹

¹⁴⁹ The Authority intends to adopt the average, because there is no strong evidence to suggest that one approach outperforms the others. It is likely that the average will show less variability under a range of prevailing conditions.

¹⁵⁰ Economic Regulation Authority, Discussion Paper – Measuring the Debt Risk Premium: A Bond Yield Approach, December 2010, p. 11.

¹⁵¹ Country of risk is based on Bloomberg's methodology using four factors listed in order of importance; management location, country of primary listing, country of revenue and reporting currency of issuer. This criteria allows for the largest sample of bonds that reflect an Australian risk premium.

- inclusion of both fixed bonds¹⁵² and floating bonds;¹⁵³
- inclusion of both bullet and callable/puttable redemptions;¹⁵⁴ and
- at least 50 per cent of observations for the averaging period is required (that is, 20 yield observations over the required averaging period of 40 trading days are required).¹⁵⁵

357. For the Standard and Poor's (**S&P**) A credit rating 20 corporate bonds met the revised criteria and were included in the benchmark sample.¹⁵⁶ For the S&P BBB- credit rating 20 bonds met the criteria and for the BBB+ 20 bonds also met the criteria. The benchmark sample of bonds is listed at Appendix 6.

Step 2: Estimate the spread to swap in the denominated currency and in AUD terms

358. The Authority will estimate the 'spread to swap' for each bond. The relevant basis swap rate is the interest rate swap – of equivalent tenor to the yield to maturity of each bond in the extended benchmark sample – in the denominated currency of each bond. Subtracting this swap rate from the bond yield isolates the credit spread, giving the 'spread to swap' in the denominated currency.

359. This denominated currency credit spread is then converted to AUD terms by accounting for hedging costs.¹⁵⁷

Step 3: Apply curve fitting techniques

360. All three curve fitting techniques, including (i) Gaussian Kernel methodology; (ii) the Nelson-Siegel methodology; and (iii) the Nelson-Siegel-Svensson methodology, are used to determine yield curves for the benchmark sample. Figure 4 below presents the average of the three different methodologies based on 18 days up until 6 November 2014.

¹⁵² This is a long term bond that pays a fixed rate of interest (a coupon rate) over its life.

¹⁵³ This is a bond whose interest payment fluctuates in step with the market interest rates, or some other external measure. Price of floating rate bonds remains relatively stable because neither a capital gain nor capital loss occurs as market interest rates go up or down. Technically, the coupons are linked to the bank bill swap rate (it could also be linked to another index, such as LIBOR), but this is highly correlated with the RBA's cash rate. As such, as interest rates rise, the bondholders in floaters will be compensated with a higher coupon rate.

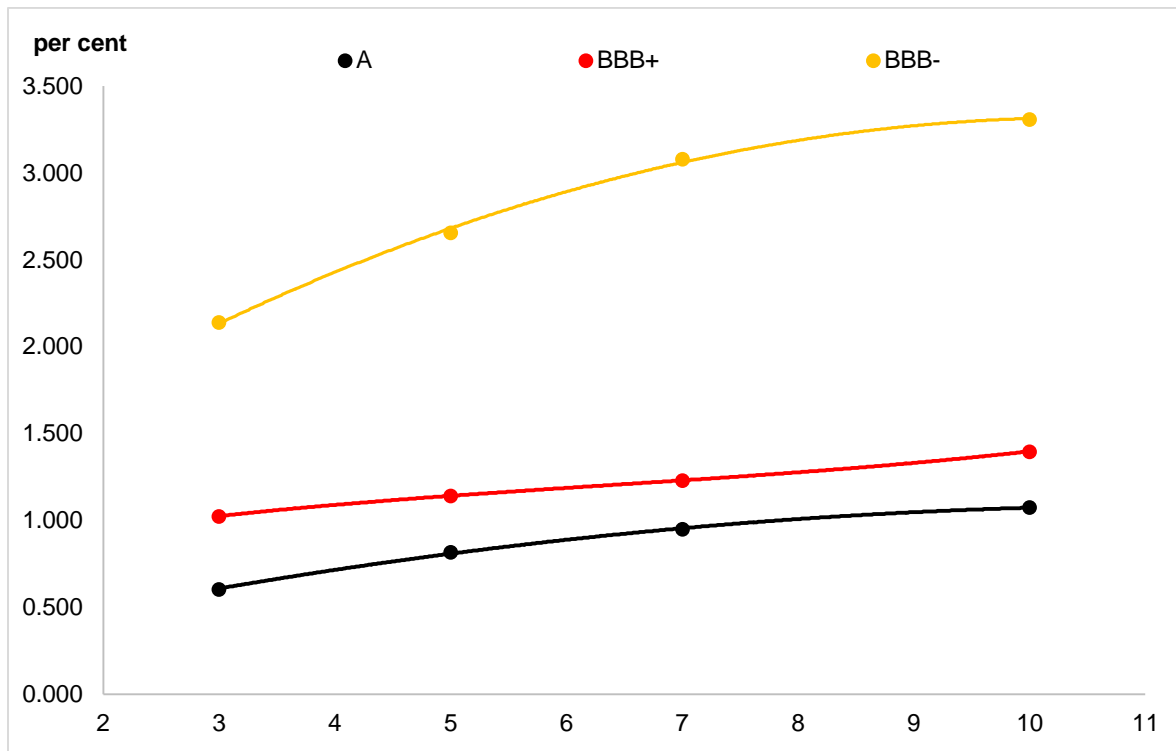
¹⁵⁴ A callable (puttable) bond includes a provision in a bond contract that give the issuer (the bondholder) the right to redeem the bonds under specified terms prior to the normal maturity date. This is in contrast to a standard bond that is not able to be redeemed prior to maturity. A callable (puttable) bond therefore has a higher (lower) yield relative to a standard bond, since there is a possibility that the bond will be redeemed by the issuer (bondholder) if market interest rates fall (rise).

¹⁵⁵ The Authority notes that there is a tendency for fewer bonds to be available on the long end of the yield curve. If circumstances arise where this criteria results in a paucity of bonds such that curve fitting is impractical the Authority may exercise judgement to determine whether exclusion of bonds based on this criteria is appropriate. For the purposes of producing an indicative figure for this draft determination this criteria was not applied due to only 18 days of observations being available – the criteria for at least 50 per cent of 40 days of observations could not be met in this circumstance.

¹⁵⁶ The observed (indicative 7 day average) yields for all bonds included in the benchmark sample for the period of 7 trading days ending on 9 September 2014 are sourced from Bloomberg.

¹⁵⁷ The Authority accounts for the cross-currency basis swap and the interest rate swap, as per the RBA's method, but not the conversion factor. The cross-currency basis swap is generally the most significant hedging cost. See Reserve Bank of Australia, 'New Measures of Australian Corporate Credit Spreads', *Bulletin*, December quarter 2013, p. 25.

Figure 4 Fitted yield curves – A, BBB+ and BBB- bands



Source: Economic Regulation Authority's analysis

361. A summary of spreads to swap for the BBB-, BBB+ and A rated bands at various terms of 3; 5; 7; and 10 years is presented in Table 15 below.
362. The values in column 4 of Table 15 present the estimated 10 year spread to 10 year interest rate swaps (**IRS**) for the extended benchmark sample.

Step 4: Estimate the regulatory debt risk premium

363. Given the current absence of a liquid Credit Default Swaps market in Australia, the Authority is of the view that the term of the debt risk premium needs to be set at 10 years.¹⁵⁸ To this end, the Authority has developed estimates of the 10 year spread to swap (see the preceding section). However, there is a need to estimate a regulatory debt risk premium – with a term of 10 years – that accords with the intention to set the risk-free rate on the basis of Commonwealth Government Securities with a ten year term.
364. There is a need to account for the difference between the IRS rate and the risk-free rate (**RFR**) on Commonwealth Government Securities (**CGS**). Adding the '10 year IRS spread to 10 year RFR' to the 10 year spread to swap gives the 10 year debt risk premium (**DRP**). The 10 year **DRP** is thus defined as the credit spread to the 10 year risk-free rate, rather than the spread to 10 year IRS.

¹⁵⁸ The Authority will reassess the conditions for this CDS market in future decisions. Should this market return to more normal conditions, then the term for estimating the spread to swap would be revised to 5 years in order to be consistent with the term of the risk-free rate and the 'NPV = 0' present value principle.

Table 15 Spreads to swap in equivalent Australian Dollar: A, BBB+ and BBB--rated band 18 trading days average as at 06 November 2014

Term	3	5	7	10
A				
ERA Gaussian Kernel	0.606	0.850	0.984	1.037
Nelson-Siegel	0.574	0.752	0.928	1.192
Nelson-Siegel Svensson	0.633	0.843	0.931	0.993
	0.605	0.815	0.948	1.074
BBB+				
ERA Gaussian Kernel	1.064	1.186	1.290	1.583
Nelson-Siegel	0.978	1.098	1.218	1.398
Nelson-Siegel Svensson	1.032	1.138	1.181	1.210
	1.025	1.141	1.230	1.397
BBB-				
ERA Gaussian Kernel	2.128	2.650	3.401	3.568
Nelson-Siegel	2.389	2.554	2.718	2.962
Nelson-Siegel Svensson	1.906	2.761	3.125	3.394
	2.141	2.655	3.081	3.308

Source: Economic Regulation Authority's analysis

Estimating the regulated debt risk premium

365. In conclusion, based on the above considerations, the Authority has determined that it will continue using its bond yield approach with two additions: (i) the benchmark sample is extended to recognise the importance of Australian bonds denominated in foreign currencies; and (ii) various curve fitting techniques are adopted to ensure that the estimated cost of debt/debt risk premium is at the target tenor of 10 years.
366. Based on its analysis, the Authority estimates the 10-year 'spread to swap' at 1.074, 1.397 and 3.308 per cent for the A, BBB+ and BBB- credit rating bands respectively using the Authority's extended sample bond yield approach (Table 15). This estimate is indicative, and is based on the most recent 18 trading day average ending on 6 November 2014 (the annual determination estimates will be based on a 40 day average ending as close practicable to the 30 June estimate date).
367. For this draft decision, the Authority has converted the 10 year spread to swap estimates for each of the three credit bands into a 'regulated debt risk premium', which includes the spread of the 10 year IRS to the 10 year RFR. This is illustrated in the following steps.
368. First, the Authority recognises that the:

$$10 \text{ year Cost of Debt} = 10 \text{ year Spread to Swap} + 10 \text{ year IRS rate}$$

369. An 'indicative' estimate of the 10 year AUD IRS rate from Bloomberg (as at 6 November 2014) is 3.678 per cent.¹⁵⁹ Therefore, the:

A rated 10 year Cost of Debt = $1.074 + 3.678 = 4.752$ per cent

BBB+ rated 10 year Cost of Debt = $1.397 + 3.678 = 5.075$ per cent

BBB- rated 10 year Cost of Debt = $3.308 + 3.678 = 6.986$ per cent

370. Second, deducting the estimated 10 year risk free rate of 3.335 per cent from the estimated 10 year cost of debt gives the indicative 'regulated debt risk premium' (as at 6 November 2014):

A rated Regulated Debt Risk Premium = $4.752 - 3.335 = 1.417$ per cent

BBB+ rated Regulated Debt Risk Premium = $5.075 - 3.335 = 1.740$ per cent

BBB- rated Regulated Debt Risk Premium = $6.986 - 3.335 = 3.652$ per cent

371. The Authority will adopt the foregoing method for estimating the DRP. The indicative estimate of the 'regulated debt risk premium' (as at 6 November 2014) is 1.417, 1.740 and 3.652 per cent as its estimate for the A, BBB+ and BBB- credit rating bands respectively (see Appendix 7 for indicative rail WACCs).

9.2.1.4 *Averaging period for the debt risk premium*

372. The Authority is of the view that a 40 business day period prior to a regulatory determination is appropriate to be used in order to estimate the required risk free rate of return. The rationale for doing so is to trade off short term volatility, without compromising the Authority's desire for predictive efficiency.¹⁶⁰ For internal consistency, the Authority will also adopt a 40 day averaging period in order to estimate the DRP for each bond in the benchmark sample.

373. Given the lack of pricing data regarding the Australian corporate bond market, the Authority has previously employed a criteria that removes bonds that contain less than 50 per cent of observations over the averaging period.¹⁶¹ Requiring bonds to have 100 per cent observed yields during the sample period would significantly reduce the number of bonds in the benchmark sample. Given the Authority's adoption of a 40 day averaging period, the Authority therefore requires each bond to have at least 20 days of pricing data in this 40 day averaging period in order to be included in the benchmark sample.¹⁶²

¹⁵⁹ Based on the 18 day average to 6 November 2014, being the indicative averaging period for this draft decision.

¹⁶⁰ In rail, hedging is not a consideration, so the prime consideration is to develop the best predictor for the coming year. The Authority considers that the 40 day averaging period has satisfactory prediction properties (see section 7.2.1.3).

¹⁶¹ Economic Regulation Authority (Western Australia), Final decision on proposed revisions to the access arrangement for Western Power, 2012.

¹⁶² The Authority notes that there is a tendency for fewer bonds to be available on the long end of the yield curve. If circumstances arise where this criteria results in a paucity of bonds such that curve fitting is impractical the Authority may exercise judgement to determine whether exclusion of bonds based on this criteria is appropriate.

9.3 Draft Decision

374. The Authority will use the extended bond yield approach to estimate the 'regulated debt risk premium'. The regulated debt risk premium will be derived from the observed yields of relevant corporate bonds, taken from Bloomberg, that qualify for inclusion in the benchmark sample.

375. To estimate the regulated debt risk premium, the Authority will:

- extend the benchmark sample under the bond yield approach to: (i) include Australian corporate bonds denominated in domestic currency (AUD) and foreign currencies including USD; Euros; and British pounds; and (ii) exclude bonds issued by financial sectors including banks;
- estimate the credit 'spread to swap' for each bond, in terms of the denominated currency, as a first step;
- convert the resulting spread to swap for each bond to AUD terms, by accounting for hedging costs;
- estimate a credit spread to swap yield curve in AUD equivalents – applying the Gaussian Kernel, the Nelson-Siegel and the Nelson-Siegel-Svensson techniques;
- use the simple average of these three yield curves' 10 year spread to swap estimate to arrive at the final estimate of the 10 year spread to swap;
- add the 10 year Australian swap rate to the resulting 10 year spread to swap, to determine the 10 year cost of debt;
- estimate the regulated debt risk premium as the 10 year cost of debt spread to the 10 year risk free rate.

376. For each of the rail networks, a separate bond sample will be developed, based on the corresponding benchmark efficient credit rating. The Authority will use the Bloomberg data service exclusively in order to construct each benchmark sample. Under the bond yield approach, the following criteria apply in order to select bonds to be included in each of the benchmark samples.

- credit rating of each bond must match that of the corresponding benchmark efficient entity, as rated by Standard & Poor's;
- the remaining time to maturity must be two years or longer;
- the bonds must be issued by Australian (non-financial) entities and denominated in AUD, USD, Euros or GBP;
- fixed bonds and floating bonds are eligible for inclusion;
- both bullet bonds and bonds with callable/puttable redemptions are eligible for inclusion; and
- there are at least 20 yield observations over the required 40 day averaging period.

10 Return on equity

377. There are no readily observable proxies for the expected return on equity. Estimating a forward-looking return on equity – sufficient to provide regulated firms with reasonable opportunity to recoup their prevailing equity financing costs – requires the use of models. Generally, these models seek to explain the required return on equity through a relationship with some ‘portfolio’ of risk factors, or else in terms of the present value of the expected stream of future cash flows.
378. In this chapter, the Authority sets out the approach which it will use for estimating the return on equity. The chapter also identifies the points at which the Authority considers it may need to draw on its judgment when determining the return on equity. The approach follows that developed for the gas rate of return guidelines.¹⁶³

10.1 Current approach

379. The Authority has in previous WACC determinations under the Code applied the Capital Asset Pricing Model (**CAPM**) to estimate the cost of equity. For the 2008 review, the Allen Consulting Group recommended that the Authority continue to apply this method, for reason that it is uniformly applied by Australian economic regulators and was broadly accepted by regulated businesses.
380. For the treatment of taxation, the Authority determined and applied pre-tax rates of return using the “Officer WACC” model, with an assumption of the effective taxation rate of the rail businesses being equal to the statutory rate of corporate income tax.

10.2 Considerations of the Authority

381. The Authority considers that, in estimating the return on equity, regard needs to be given to relevant estimation methods, financial models, market data and other evidence. The question then arises as to which of the possible alternative financial models meet this requirement, while also meeting the broader requirements of the object of the *Railways (Access) Act 1998* and the Code.

10.2.1 Theoretical considerations for determining the return on equity

382. The estimate of the rate of return on equity is required to be forward looking; investors make investments based on their expectations of the stream of net cash flows that those investments will generate over the future period. This leads to a number of considerations.
383. First, the equity investor is principally concerned with the risks relating to the expected future stream of net cash flows. If an investor could expect to achieve the same return elsewhere at lower risk, then it would be irrational to invest in the regulated asset, as the expected present value would be lower than for the alternative investment. The efficient rate of return should just compensate the investor for the

¹⁶³ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013.

additional risk of holding the asset, over and above the 'risk free' asset. This is the key insight of the Markowitz portfolio theory, as well as of the CAPM.¹⁶⁴

384. However, not all risks will be compensated in the return on equity. Theory suggests that only those risks that are systematic are 'priced'. Specifically, the exposure of the asset to systematic risks will drive the covariance of the return of the specific asset with respect to the variance of the returns on the overall market for securities.
385. Non-systematic or 'idiosyncratic' risks for the return on equity may be diversified away. Where idiosyncratic risks influence the variance of the expected returns to the asset, then this may be exactly offset through holding other assets in the efficient market portfolio with corresponding offsetting risk and variance.
386. However, models of the return on equity, such as the CAPM, tend to assume that systematic risks are symmetric, providing equal chance of out-performance as under-performance. As a consequence, risks that are not symmetric may be unpriced.¹⁶⁵
387. Where asymmetric systematic risks can be established, the Authority considers that there may be a case to amortise these identified risks in the operating/overhead costs of the floor and ceiling cost calculations.
388. Second, estimates of the return on equity need to be based on the expected returns of securities with similar risks, as the actual risks of the underlying assets of any firm are rarely observable.¹⁶⁶ Provided that the risks of the underlying asset and the observed securities are similar, then the observed returns on equity from those securities should reflect the opportunity costs of investing in the underlying assets.
389. As discussed in chapter 4, the Authority considers that the benchmark efficient entity needs to have a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services. The Authority interprets a 'similar' degree of risk as allowing for reasonable differences in the degree of risk among firms informing the benchmark, which recognises the significant uncertainties in the risks and the associated confidence intervals.
390. Third, there is a need to consider prevailing conditions for the return on equity.¹⁶⁷ McKenzie and Partington succinctly capture the rationale for the need to consider prevailing conditions:¹⁶⁸

In principle then, what we first need to do is to measure the risk of the investment. We then discount the expected future cash flows from the investment at the *current* equilibrium expected return in the capital market, for securities with the investment's level of risk. The word 'current' is important here. In any required return calculation we should be using current values because if capital markets are efficient current values contain the best information available on future values. In particular historic values for the rate of return on equity, or interest rates, are not relevant *except* to the

¹⁶⁴ Brealey R.A. and Myers S.C., *Principles of Corporate Finance*, McGraw Hill, 1996, p. 173.

¹⁶⁵ An example of an asymmetric systematic risk would be the business failures of a significant proportion of users of a facility in an economic downturn. While generally such risks are likely to be small, the Authority recognises that some rail freight networks may be more exposed to asymmetric systematic risks of this type than say, passenger rail networks. The risk may be significant where there are only a few major customers, where those customers are involved in a similar business segment, and where contractual arrangements are relatively short term.

¹⁶⁶ McKenzie M. and Partington G., *Risk, Asset Pricing and the WACC*, Report to the AER, 2013, p. 6.

¹⁶⁷ NGR 87(7).

¹⁶⁸ McKenzie M. and Partington G., *Risk, Asset Pricing and the WACC*, Report to the AER, 2013, p. 6.

extent that they help us estimate the *current* rates. Since current interest rates are readily observable, historic interest rates typically have no place in determining the required rate of return. If the current interest rates differ from historic rates then there will have been windfall gains or losses that are already reflected in the current value of equity.

391. The prevailing return on equity will fluctuate. As noted in the recent paper outlining the reasons for the 2013 Nobel Prize award for economics, a range of evidence suggests that ‘the volatility and predictability of stock, bond and foreign exchange returns can only be consistent with arbitrage-free [that is, efficient] markets if the expected return, i.e., the discount factor, is highly variable over time’.¹⁶⁹ The implication is that the expected return on equity is not constant through time.
392. However, the Authority’s analysis for the gas rate of return guidelines suggests that the return on equity is mean reverting, over the longer term.¹⁷⁰ It may be recalled that the Code requires that the term of the WACC be consistent with estimating the rate of return applicable over the economic life of the railway infrastructure.¹⁷¹ The Authority notes the long economic life of the major rail infrastructure assets.¹⁷² The length of these lives means that it is reasonable to assume that the real return on equity will approach its long term average.
393. The Authority will estimate the prevailing return on equity in a way that seeks to compensate investors for holding securities with similar risk of return as the regulated asset, over the term of the economic lives of the rail infrastructure assets. In what follows the Authority considers the tools that may be used to establish estimates for the prevailing rate of return on equity.

10.2.2 Models of the return on equity

394. The model used by Australian regulators for quantifying the return on equity and associated risk to date has been the Sharpe Lintner Capital Asset Pricing Model (**CAPM**).
395. Other asset pricing models in the CAPM family build on the standard Sharpe-Lintner CAPM, including:
- the Black and Empirical CAPM;
 - the Consumption CAPM; and
 - the Inter-temporal CAPM.
396. There is also an extensive range of other models which seek to estimate the return on equity, including:
- the Arbitrage Pricing Theory family of models;
 - the Fama-French Three-Factor Model and its extensions;

¹⁶⁹ The Royal Swedish Academy of Sciences, *Understanding Asset Prices*, 2013, p. 20.

¹⁷⁰ Economic Regulation Authority, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, Appendix 16 – Is the return on equity stable? The Authority’s analysis in this reference to Appendix 16 relates the nominal return on equity. However, similar analysis on the same data set suggests that the real return on equity is also stationary over the long term.

¹⁷¹ See paragraph 22 in section 2.1 of this draft decision for the requirements of clause 2 of schedule 4 of the Code.

¹⁷² See for example, Economic Regulation Authority, *Ceiling costs to apply to seven terminal end sections of the South West Main Line*, 5 July 2004, p. 4.

- the Dividend Growth Model family (**DGM** – both single-stage and multi-stage);
 - the Residual Income Model;
 - Market Risk Premium approaches; and
 - the Build-up Method.
397. In addition, there are approaches that are not based on modelling per se, but rather on available data from a range of comparators or analysts' reports. These include:
- estimated market returns on comparable businesses;
 - brokers' reports and the Dividend Yield approach.
398. The Authority reviewed these approaches in the development of the gas rate of return guidelines. The Authority's conclusion from that assessment was that only the Sharpe Lintner CAPM model is relevant for informing the Authority's estimation of the prevailing return on equity for the regulated firm, at the current time.¹⁷³
399. Other models and approaches were considered to be not relevant within the Australian context at the current time, at least without some new developments in terms of the theoretical foundations or in the empirical evidence.
400. In response to the Issues Paper, Brockman submitted that the CAPM is accepted by regulators as a reasonable approach to determining the return on equity.
401. Flinders submitted that it supports the continued use of the Sharpe-Lintner CAPM model. Flinders also noted that IPART considered the use of the Fama-French three factor model and rejected it.
402. The Authority considers that its extensive review for the gas rate of return of guidelines is directly applicable to rail. Therefore, the Authority will retain the Sharpe-Lintner CAPM model for estimating the return on equity for the rail WACC.
403. The Authority does not expect it likely that there would be significant new developments prior to the next review, which is due in 2018; the Authority expects to be able to rely on this review when making its rail WACC decisions over the next four years. However, the Authority recognises that further development of models or empirical support may arise at some future point, which might make them relevant. In this event, the Authority would review its position in each five yearly review.

10.2.3 A five step approach to estimating the return on equity

404. The Authority will adopt a five step approach for estimating the return on equity.¹⁷⁴ The five steps are summarised in Table 16 below. This approach will allow the Authority to have regard to a wide range of material, taking account of relevant

¹⁷³ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 127.

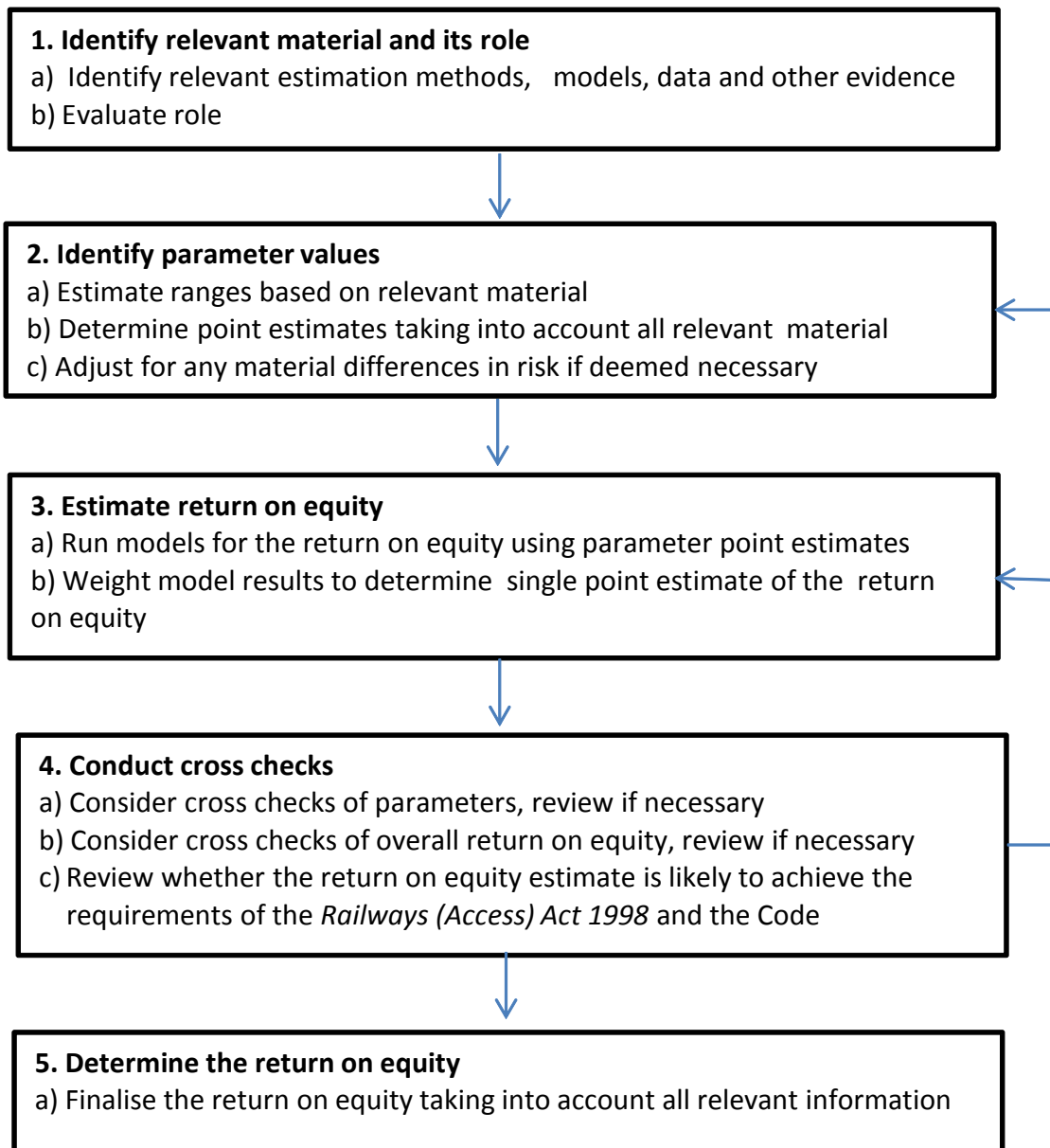
¹⁷⁴ In what follows:

- 'approach' refers to the overall framework or method for estimating the return on equity, which combines the relevant estimation methods, financial models, market data and other evidence;
- 'estimation material' refers to any of the relevant estimation methods, financial models, market data and other evidence that contribute the 'approach';
- an 'estimation method' is considered to primarily relate to the estimation of the parameters of financial models, or to the technique employed within that model to deliver an output.

models for the return on equity, as well as a range of other relevant information. The Authority will have regard to each piece of information according to its merits at the time of each determination. This will enable it to provide a transparent and clear decision that meets the object of the *Railways (Access) Act 1998*.

405. The following provides the detail of each step in the estimation approach.

Table 16 Proposed approach to estimating the return on equity



10.2.3.1 Step 1: identify relevant material and its role

406. The first step would be to identify the relevant material to be used to inform the estimate of the return on equity.

407. The relevance of estimation methods, financial models, market data and other evidence would be assessed based on the degree to which that material would contribute to the achievement of the objectives and requirements of the *Railways (Access) Act 1998* and the Code. Where the Authority exercised its judgment with

regard to that assessment, it would articulate its reasoning based around the framework provided by the criteria.

408. At the same time, the role of that relevant material – in terms of its ability to contribute to the objectives and requirements of the *Railways (Access) Act 1998* and the Code – would be evaluated.

Models for the return on equity

409. As noted above, the Authority's analysis for the gas rate of return guidelines concluded that only the Sharpe Lintner CAPM model is relevant for informing the Authority's estimate of the return on equity at the current time.
410. All other models of the return on equity were judged to be not relevant at the current time.
411. Therefore, the Authority proposes to give full weight to the Sharpe Lintner CAPM when estimating the return on equity.

Other relevant material

412. A range of other relevant material would be used to inform the modelling estimates, and to inform the overall return which is judged to best meet the objectives and requirements of the *Railways (Access) Act 1998* and the Code. The gas rate of return guidelines provides a summary assessment of other relevant material.¹⁷⁵

10.2.3.2 Step 2: estimate parameter point estimates

413. The point estimates of the parameters to be used in the relevant return on equity models would be developed by drawing on the range of relevant material. Where these estimated parameters are subject to uncertainty or to multiple estimation approaches, the estimates would be first configured as ranges.
414. Where there are multiple ranges for any particular parameter, these would be combined into a single range using judgement, giving an overall upper and lower bound for the parameter range.
415. Once parameter ranges are identified, the point estimates for parameters for use in the relevant models would be determined from within the identified range. The Authority would use its judgment to develop the point estimate, informed by any relevant forward looking indicators.

Parameter ranges

416. The Authority will draw on the range of relevant material to determine the point estimates of the parameters to be used in the relevant return on equity models. As the Sharpe Lintner CAPM is judged to be the only relevant model at the current time, the following evaluations relate only to that model.
417. The parameters in the Sharpe Lintner CAPM model are the risk free rate, the equity beta and the market risk premium (MRP).

¹⁷⁵ Economic Regulation Authority, Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, Appendix 29.

418. The risk free rate is observed as a single point estimate from the Commonwealth Government Security (CGS) proxy, consistent with the 10 year term (see section 3.2.3).

419. The equity beta is subject to estimation uncertainty and multiple estimation approaches and is first derived as a range:

- The Authority has considered relevant material for the equity beta in chapter 12 - equity beta. The equity beta for each relevant benchmark entity is estimated initially as a range.

420. For the rail WACC, the MRP will be derived as the difference between the estimate of the return on equity for the market and the 'on the day' estimate of the risk free rate:

- The Authority has considered relevant material for the market return on equity and hence the MRP in chapter 11 – Market risk premium.

Parameter point estimates

421. The next step will be to draw on relevant information to determine the point estimates for use in the modelling framework. As the Sharpe Lintner CAPM is judged to be the only relevant model at the current time, the following evaluations relate only to that model.

Risk free rate

422. A point estimate will be determined for the risk free rate based on the average of the 10-year CGS observed yields over a 40 day period just prior to the regulatory determination (refer to section 3.3.2 and chapter 7). The Authority considers that a 10-year term for the risk free rate is consistent with the present value condition.

Equity beta

423. The point estimate of the equity beta within the estimated range would be determined. Absent other influencing factors, an estimate for the equity beta could be adopted consistent with the mid-point of the estimated range, as well as analyses undertaken in previous decisions.

424. The Authority notes that the estimates of the equity beta are for the benchmark efficient entity. In the event that the Authority considered that there were material and substantiated risk differences between the benchmark efficient entity and those faced by the service provider in delivering the relevant rail services, then the Authority may consider a further adjustment to the equity beta.

Market risk premium

425. The Authority is of the view that the MRP may vary in response to changes in the risk-free rate. The Authority considers that there is no evidence to support a consistent relationship between the two over the medium term (see chapter 11 – Market risk premium).

426. However, for the long term – consistent with the lives of rail infrastructure assets being considered here – the Authority considers that the real return on equity is mean reverting; the unconditional average real return on equity provides a sound basis for the future average outcome in real terms. The corollary is that, on average over the

longer term, the MRP will offset changes in the real long term risk free rate. The result is an estimate of the real return on equity for the market that is consistent with longer term averages.¹⁷⁶

427. The point estimate of the MRP will therefore be derived as the difference between the point estimate of the real return on equity for the market and the real risk free rate.¹⁷⁷

10.2.3.3 Step 3: Estimate the return on equity

428. The third step involves applying each relevant model to determine a related point estimate for the return on equity (only one model, the Sharpe Lintner CAPM, is considered relevant at the current time). The point estimates of the parameters relevant to each model, determined under Step 2, would be used as inputs.
429. The resulting range of point estimates would be weighted according to the Authority's judgment of their performance at the time, and a combined single point estimate of the return on equity would be produced. This weighting step is not necessary at the current time, as the Sharpe Lintner CAPM is judged to be the only relevant model for estimating the return on equity.

10.2.3.4 Step 4: Consider other relevant material

430. Checks informed by other relevant material will inform the reasonableness of the overall return on equity, and its ability to achieve the objectives and requirements of the *Railways (Access) Act 1998* and the Code.

431. Checks would include:

- estimates of the return on equity developed by other regulators and by market analysts, such as from independent expert reports related to takeover bids;
- ensuring that the return on equity exceeded the cost of debt, in recognition of the higher risk associated with equity investment.

10.2.3.5 Step 5: Determine return on equity

432. Taking account of all relevant information and analysis, the Authority will make its final determination on the return on equity, ensuring that the return on equity meets objectives and requirements of the *Railways (Access) Act 1998* and the Code.

10.3 Draft decision

10.3.1 Models of the return on equity

433. The model used by Australian regulators for quantifying the return on equity and associated risk to date has been the Sharpe Lintner Capital Asset Pricing Model (**CAPM**).

¹⁷⁶ This is the so-called 'Wright approach'. For further detail, see S. Wright, *Review of Risk Free Rate and Cost of Equity Estimates: A Comparison of UK Approaches with the AER*, 25 October 2012.

¹⁷⁷ Equivalently, the estimate of the MRP may be derived by converting the real return on equity to nominal terms – by applying the estimate of expected future inflation – and then subtracting off the nominal value of the risk free rate.

434. The Authority reviewed asset pricing approaches as part of its development of the gas rate of return guidelines. The Authority's conclusion from that assessment was that only the Sharpe Lintner CAPM model is relevant for informing the Authority's estimation of the prevailing return on equity for the regulated firm, at the current time. That conclusion is adopted for the rail WACC. The Authority will retain the Sharpe-Lintner CAPM model for estimating the return on equity for the rail WACC.
435. Other models and approaches are considered to be not relevant for determining the return on equity within the Australian context at the current time, at least without some new developments in terms of the theoretical foundations or in the empirical evidence.

10.3.2 A five step approach to estimating the return on equity

436. The Authority will determine a single point estimate for the forward looking return on equity for the benchmark firm.
437. Where there are multiple relevant estimation methods, financial models, market data and other evidence informing the return on equity, then the Authority will combine these to form ranges for relevant inputs. The Authority recognises that it may be appropriate in some circumstances to adopt a formal weighting approach for each estimation method or model, for the purpose of determining the range.
438. Where the return on equity is derived as a range, then the Authority will utilise other relevant information, and its judgment, to determine a single point estimate for the return on equity.
439. Similarly, parameter estimates contributing to the relevant estimation methods or models may initially be estimated as ranges, or derived directly as a point estimates. Where parameter estimates are derived as ranges, the Authority will then utilise other relevant information and its judgment to determine a single point estimate for input to relevant estimation methods and models.
440. The Authority will adopt a five step approach for estimating the return on equity. The five steps are summarised in Table 16. This approach will allow the Authority to have regard to a wide range of material, taking account of relevant models for the return on equity, as well as a range of other relevant information. The Authority will give weight to each piece of information according to its merits at the time of each determination. This will enable it to provide a transparent and clear decision that meets the objectives and requirements of the *Railways (Access) Act 1998* and the Code.
441. The Authority's indicative estimates of the forward looking return on equity, as at 6 November 2014, are set out at Appendix 7. The indicative estimates of the return on equity are based on the Sharpe Lintner Capital Asset Pricing Model and draw on the Authority's estimates of the risk free rate (chapter 7), market risk premium (chapter 11), beta (for the benchmark efficient entities – chapter 12) and gamma (chapter 14).

11 Market risk premium

442. The market risk premium (**MRP**) is the required return, over and above the risk free rate of return, on a fully diversified portfolio of assets. The MRP, a key component of the estimate of the required rate of return on equity, compensates an investor for the systematic risk of investing in the 'market' portfolio (see section 4.2.2).
443. The required rate of return on equity for future regulatory periods is a forward-looking concept. It is the expected return that is of importance when pricing capital in order to efficiently attract investment. While estimates of the cost of debt can be obtained by observing debt instruments, the financial markets do not provide a directly observable proxy for the cost of equity for either individual firms or the market as a whole.
444. In chapter 10, the Authority set out the framework which it will use for combining relevant material when determining the return on equity. Chapter 10 also identifies those points at which the Authority considers it may need to apply its judgment to ensure that the objectives and requirements of the *Railways (Access) Act 1998* and the Code are achieved.
445. The Authority concludes in chapter 10 that the Sharpe-Lintner Capital Asset Pricing Model (**CAPM**) is the only model which is relevant for informing the Authority's estimate of the return on equity at the current time. The MRP is a key input to the Sharpe-Lintner CAPM.
446. This chapter considers issues related to the estimate of the market risk premium.

11.1 Current approach

447. Since the MRP is not directly observable, the preferred approach of Australian regulators has been to estimate the MRP using historical data on equity returns from the Australian stock market.
448. In the 2003 Determination, the Rail Access Regulator adopted a MRP of 6 per cent taking into account capital market observations of historical returns to equity and precedent decisions of Australian regulators. The value of 6 per cent is consistent with almost all regulatory determinations on infrastructure pricing in Australia.
449. In 2008, the Allen Consulting Group recommended the Authority continue to use of a MRP of six per cent, with this recommendation based on consideration of capital market evidence that this value is at the upper end of a reasonable range. This evidence included:
- capital market observations of historical returns to equity;
 - studies on imputed expectations of the market risk premium;
 - surveys of opinions and assumptions of capital-market participants; and
 - qualitative consideration of factors that may cause the expected market risk premium to change over time and to vary from historically observed returns.
450. Accordingly, the Authority maintained the view that the value of the market risk premium should be determined taking into account a range of evidence (including

both historically observed equity premia and evidence for the current assumptions of market practitioners) and on this basis adopted a value of 6 per cent for the MRP.

11.2 Considerations of the Authority

451. The Authority conducted an extensive analysis of the MRP for the gas rate of return guidelines.¹⁷⁸ The Authority conducted various empirical studies, using different datasets and methodologies, to inform its understanding of the relationship between the MRP and risk free rate in Australia. In particular, the Authority conducted a study to examine the behaviour of return on equity, the risk-free rate, and the MRP using the longest possible dataset of 128 years from 1883 to 2010.
452. The findings of the analysis suggest that there is no statistically reliable relationship between the risk-free rate of return and the return on equity within the Australian context. Further, this analysis also supported the view that the risk-free rate is non-stationary, whilst the return on equity is 'stationary'.¹⁷⁹
453. The implication is that the historical mean and variance of the historical return on equity series provide meaningful information relating to future outcomes. However, the Authority notes that the return on equity still exhibits very high levels of volatility and is thus not considered 'relatively stable or constant'.
454. The above analysis supports the view that the return on equity is likely to be more stable than the MRP. As a consequence, this analysis provides evidence for a negative relationship between the risk free rate and the MRP. The Authority notes that studies based on overseas data – such as from Siegel (1998); Smithers and Co (2003); and Wright (2012) – present evidence to suggest that the return on equity is more stable than the market risk premium, which implies a negative relationship between the MRP and risk free rate.¹⁸⁰
455. A key consideration in the context of the rail WACC relates to the purpose. The estimate is required to contribute to the annuity that will deliver the value of the rail infrastructure assets, over their economic life. Given the length of the rail asset economic lives, the estimate is long term.
456. Given the long term of the estimate, the Authority considers it most likely that the real return on equity *for the market* will approach its long term real average. The Authority therefore is of the view that the real return on equity is the most reliable starting point for the estimate of the MRP. The corollary is that the MRP will move at any point in time to offset exactly current expectations for the long term risk free rate.¹⁸¹
457. In what follows, the Authority first develops an estimate of the long term return on equity for the market. The Authority then sets out the approach to estimating the

¹⁷⁸ For more detail, see Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, chapter 11.

¹⁷⁹ A stationary series is mean reverting over time, whereas a non-stationary series is a random walk, without discernable central tendency.

¹⁸⁰ Smithers and Co, *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK*, February 2003, p.v49; Siegel, J., *Stocks for the Long Run*, McGraw-Hill Second Edition, 1998; and Wright S, *Review of Risk Free Rate and Cost of Equity Estimates: A Comparison of UK Approaches with the AER*, University of London, 2012.

¹⁸¹ The Authority considers that the MRP is not mean reverting, and that therefore it is inappropriate to rely on the unconditional historic mean of the MRP for informing the future.

MRP, to be used as input to the return on equity estimates for each of the regulated businesses subject to the annual rail WACC update.

11.2.1 Estimating the return on equity for the market

458. Historical data provides estimates of the average return on equity for the market. Given that the historic return on equity is mean reverting, or 'stationary', it is reasonable to use an average historic estimate to inform the future, particularly over the longer term such as the periods of the rail asset economic lives to which the rail WACC applies.
459. Estimates of the nominal return on equity for the Australian stock market have been developed by Brailsford et al, by Handley, by NERA (which extends and adjusts the Brailsford et al data), and by Dimson et al (Table 17). Brailsford et al also provides estimates of historic inflation and the real return on equity.

Table 17 Estimates of the nominal and real grossed up return on equity in Australia

Study/Author	Period	Estimates of the nominal return on equity ^a (per cent)	Estimates of the real return on equity (per cent) ^a
Brailsford, Handley and Maheswaran ¹⁸²	1883 – 2010	11.8	8.5
	1900 – 2010	12.1	8.2
	1958 – 2010	14.0 (14.5 ^b)	8.7 (8.9 ^{b,d})
	1988 - 2010	12.2 (13.2 ^b)	8.9 (9.7 ^b)
Handley/ AER (2012) ¹⁸³	1958 - 2011	13.6	8.3 ^e
	1988 – 2011	11.4	8.0 ^e
NERA ¹⁸⁴	1883 – 2011	12.0	8.7 ^e
	1900 – 2011	12.1	8.2 ^{d,e}
	1958 – 2011	13.6	8.3 ^e
Dimson, Marsh and Staunton ¹⁸⁵	1900 - 2011	12.9 ^c	
	1900 - 2012	13.0 ^c	

Notes: a) All reported estimates are arithmetic mean estimates. b) Figures in brackets are the comparable grossed up returns for the relevant period, estimated by the Authority, allowing for gamma of 0.5. c) Estimates based on information contained in NERA (June 2013). d) Estimates used to establish the range of the estimated real return on equity are shaded in light blue. e) Given the common underpinnings of the Brailsford et al, Handley and NERA data, the Authority has used the Brailsford inflation data, updated to 2011, to estimate the real return on equity for the specified periods for Handley and NERA in column 4.

Source: Compiled by the Economic Regulation Authority

¹⁸² T. Brailsford, J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: post-GFC and 128 years of data*, Accounting and Finance, Vol.52, 2012, pp.237-247, Table 2.

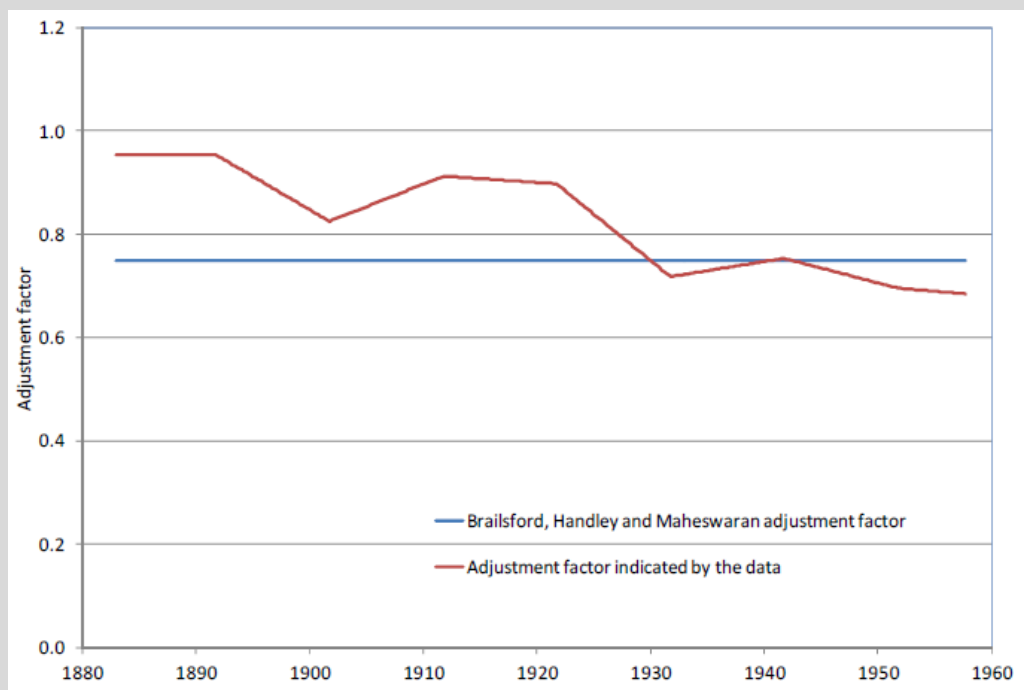
¹⁸³ J. Handley, *An estimate of the historical equity risk premium for the period 1883 to 2011*, A report prepared for the Australian Energy Regulator, 2012, Table 2, p. 6.

¹⁸⁴ NERA, *The Market, Size and Value Premiums*, June 2013.

¹⁸⁵ E. Dimson, P. Marsh and M. Staunton, *Credit Suisse Global Investment Returns Sourcebook 2012*, February 2012, reported in NERA, *The Market, Size and Value Premiums*, June 2013, p. 4; E. Dimson, P. Marsh and M. Staunton, *Credit Suisse Global Investment Returns Sourcebook 2013*, February 2013, reported by NERA, *The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines*, October 2013, p. ii.

460. The Handley data are identical to the Brailsford et al data, so may be used to extend parts of the latter data series to 2011 (although dividend yields are not available from Handley, so the grossed up values to 2011 for Handley's series cannot be calculated readily).
461. The Brailsford et al data provides the breakdown of dividend yield and capital appreciation, so may be used to adjust for the impact of imputation credits in the post 1988 period (Table 17 and Box 1).
462. NERA considers that the Brailsford data under-estimates the long run return on equity, given the adjustments made to historic returns by Brailsford et al.¹⁸⁶ The Brailsford et al adjustments aim to convert returns for stocks in the original (Lamberton) data – for the period between 1882 and 1958 – from an equal weighting to value weighting estimate. NERA considers that a single adjustment – based on the assumed 0.75 relationship between value and equal weighting – introduces inaccuracies. The 0.75 relationship was derived on the basis of comparison of return estimates for value and equal weighting for a single comparative year (1966).
463. NERA revisits the original Lamberton data, sampling returns for a number of years between 1891 and 1951. NERA then determines an alternative set of adjustment factors for each sample year, which allow for value weighting, which are then interpolated (Figure 5). This results in higher returns in the NERA series in the early years of the data series, when there were fewer stocks.

Figure 5 NERA adjustment factors



Source: NERA, *The Market, Size and Value Premiums*, June 2013, p. 14.¹⁸⁷

¹⁸⁶ NERA, *The Market, Size and Value Premiums*, June 2013, p. 7.

¹⁸⁷ J.C. Handley, *Further comments on the historical equity risk premium*, Report for the Australian Energy Regulator, 14 April 2009, pp. 16-17.

Box 1 Impact of imputation credits

A further consideration when comparing estimates relates to the treatment of imputation credits.

Average return on equity estimates that are based on data prior to 1987 – such as the long term 128 year average historic estimates referred to in Table 17 – will tend to overstate the average observed ‘market’ return on equity under the current imputation credit regime (that is, the return observed in the market arising from dividends and capital gains). This is because many investors in the post 1987 period receive a proportion of their required return on equity through imputation credits; this return is not observed in the market.

The return through imputation credits therefore accounts for a proportion of the overall return on equity, all other things equal. Hence the pre-1987 market observed return on equity is not comparable to the post 1987 observed return; the latter will be lower due to part of the required return coming from imputation credits. It is therefore important to ‘gross up’ any post 1987 observed market return to account for the impact of imputation credits, if the full return on equity is to be accounted for. As noted by Handley:¹⁸⁸

- The Officer model typically used to inform returns on equity in Australia under the CAPM has one before company tax and four after company tax WACCs. The four after tax company tax WACCs each differ, based on whether the interest tax shield and the value of imputation credits are included or otherwise in the definition of the corresponding after tax cash flows.
- Officer assumes the CAPM holds when returns are expressed on an ‘after company but before personal tax basis’. That is:

$$X_E = X_E' + \gamma T(X_O - X_D)$$

where:

X_O is the firm’s operating income (free cash flow) that is ultimately distributed to X_D (that is, to debt claimants), X_E (equity claimants) and X_G (government claimant through the tax rate T);

$X_E' = (1-T)(X_O - X_D)$ is the cash dividend distributed to equity investors;

$T(X_O - X_D)$ is the amount of franking credits distributed to investors;

$\gamma T(X_O - X_D)$ is the value of the franking credits redeemed by investors.

- X_E is the ‘grossed up’ value of the returns to investors which includes the value of franking credits. It is consistent with the value on an ‘after company before personal tax basis’. On the other hand, X_E' is consistent with the value on an ‘after company after some personal tax’ basis.

The amount of the gross up will depend on the assumptions relating to the impact of imputation credits in the Australian capital market. These are captured through the gamma term. The Authority’s estimate of gamma is 0.5 (see chapter 14). The observed return on equity on the Australian stock market, for the period since 1988, excluding dividend imputation, is around 100 basis points lower than the ‘grossed up’ estimate of the return on equity (Table 17).

The Authority adopts the grossed up value of the return on equity – which is consistent with X_E – for input to the rail WACC.

464. The adjusted NERA estimates may be combined with estimates of inflation provided by Brailsford et al to determine the real return on equity. The results of these calculations by the Authority are also reported (Table 17).
465. Based on the NERA and Brailsford data, it is apparent that the real return on equity for Australian stocks is in the range of 8.2 to 9.7 per cent, with lower bound reflecting the NERA results from 1900 to 2011, and the upper bound reflecting the ‘grossed up’ real return since 1988 from the Brailsford data.
466. There is a trade-off between the length of period of observed data and the quality of the data.
467. The Authority considers that the longer period of data – such as from 1883 or 1900 to the present – encompasses a broad range of economic conditions. The Authority notes that the lower of these two estimates – 8.2 per cent (based on the NERA adjusted estimates) – could form a lower bound for the estimate of the real return on equity.
468. However, the Authority notes that these longer time series include a significant component of pre-1958 data, which is of lower quality, being subject to interpolated adjustment.
469. The more recent data – since 1958 – is of better quality, particularly as it does not require the application of the adjustment factor.¹⁸⁹ However, the shorter period is more likely to reflect significant disequilibria caused by economic shocks, such as the inflation shock of the 1970s. In this context, the Authority also notes the sensitivity of estimates for the shorter periods to the choice of end point – whether that be 2010, 2011 or 2012 – and to whether the estimate is grossed up or not.
470. Nonetheless, the Authority considers that the estimate of 8.9 per cent, grossed up, based on the Brailsford data for the period 1958 to 2010, could provide a reasonable upper bound for returns.
471. With these factors in mind, the Authority considers that an estimate of 8.5 per cent, informed by the mid-point of the resulting range of 8.2 to 8.9 (rounded to the nearest 50 basis point increment), provides for the best estimate for the unconditional average real return on equity.
472. The next step is to convert the estimate into a forward looking nominal return. For the long run future, the Authority considers that an estimate of 2.5 per cent per annum is a reasonable expectation for average inflation going forward, given the Reserve Bank of Australia’s current target band for inflation in the 2 to 3 per cent rate.
473. Applying the Fisher equation, the expected real return on equity, of 8.5 per cent, translates to a nominal estimate of the return on equity for the market of 11.2 per cent. The Authority will utilise this estimate as the anchor for the expected long term return on equity for each benchmark rail business.

¹⁸⁸ J.C. Handley, *Further comments on the historical equity risk premium*, Report for the Australian Energy Regulator, 14 April 2009, pp. 16-17.

¹⁸⁹ T. Brailsford, J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: post-GFC and 128 years of data*, Accounting and Finance, Vol.52, 2012, p. 240.

11.2.1.1 Cross checks

474. A range of other material is considered relevant to provide a cross check on the Authority's estimate for the nominal return on equity for the market of 11.2 per cent:

- views of valuation experts and surveys;
- decisions of other regulators; and
- the relationship between the return on equity and the return on debt.

475. A threshold issue in any comparison involves ensuring that estimates are on a consistent 'apples with apples' basis. Key issues in this context involve:

- the term of the estimates; and
- the treatment of imputation.

476. First, it is important to ensure that the term of the estimates in any cross check is on a consistent basis. For example, the Authority's 5 year forward looking estimate of the return on equity, used for its gas decisions, is not directly comparable to the longer term 10 year/to perpetuity estimates developed for the rail WACC decision.¹⁹⁰ The term of the gas rate of return is conditioned by the 5 year term of the regulatory period.

477. Second, the treatment of imputation can make a difference to estimates. Where historic averages are used to inform the return on equity, the return observed in the market will underestimate the 'grossed up' return on equity, inclusive of imputation credits ((Box 1 and Table 17).

Views of valuation experts

478. Evidence of market analysts' views suggest that their expectations for the forward average market returns on equity are consistent with the longer term average of the forward looking return on equity estimated using the Authority's methodology.

479. An example is the recent WACC estimate by Grant Samuel used in discounting Envestra's cash flows:¹⁹¹

- Grant Samuel's estimate of the return on equity is informed by the Sharpe Lintner CAPM, with the risk premium and risk free rate then adjusted to have regard to a range of other evidence, including that from the Gordon Dividend Growth Model (DGM).
- Grant Samuel's initial estimate for the *market* return on equity derived using the Sharpe Lintner CAPM is 10.2 per cent. Grant Samuel states that:¹⁹²

The CAPM is probably the most widely accepted and used methodology for determining the cost of equity capital. There are more sophisticated multivariate models which utilise additional risk factors but these models have not achieved any significant degree of usage or acceptance in practice. However, while the theory underlying the CAPM is rigorous the practical application is subject to shortcomings

¹⁹⁰ For a detailed discussion of this issue, see Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Distribution System*, 14 October 2014, p. 174.

¹⁹¹ Grant Samuel, *Envestra: Financial Services Guide and Independent Expert's Report*, 3 March 2014, Appendix 3.

¹⁹² Grant Samuel, *Envestra: Financial Services Guide and Independent Expert's Report*, 3 March 2014, Appendix 3, p. 1.

and limitations and the results of applying the CAPM model should only be regarded as providing a general guide.

- This estimate is based on a long run historic MRP of 6 per cent, which is added to the prevailing 10 year risk free rate of 4.2 per cent. Grant Samuel notes that it:¹⁹³

...has consistently adopted a market risk premium of 6% and believes that this continues to be a reasonable estimate. It:

- is not statistically significantly different to the premium suggested by long term historical data;
 - is similar to that used by a wide variety of analysts and practitioners (typically in the range 5-7%); and
 - makes no explicit allowance for the impact of Australia's dividend imputation system.
- The Grant Samuel estimate is defined as a 'classical', after tax rate that is based on the estimated nominal ungeared after tax cash flows.¹⁹⁴ On this basis, it is defined consistent with Officer's after tax case (iv).¹⁹⁵ In this case, the k_E is identical to the k_E in case (iii), being the total return on equity from all sources, consistent with X_E .
 - Grant Samuel ultimately assesses an overall equity *market* return to be in the range of 10.7 to 15.2 per cent, an estimate that is higher than its CAPM-based estimate, which is 10.2 per cent, as noted above. The higher range accounts for:
 - first, estimates from other return on equity models, such as the Gordon DGM;
 - second, for Grant Samuel's view that equity investors have re-priced risk since the global financial crisis (lifting the MRP above 6 per cent); and
 - third, that bond rates are at unsustainably low levels (which Grant Samuel therefore 'normalise' by increasing the risk free rate from the observed current value around 4 per cent to 5 per cent).¹⁹⁶
 - The Grant Samuel WACC estimate disavows the impact of imputation credits.¹⁹⁷ The Authority considers that if Grant Samuel did account for the impact of imputation credits, then it would need to adjust its observed return on the market

¹⁹³ Grant Samuel, *Envestra: Financial Services Guide and Independent Expert's Report*, 3 March 2014, Appendix 3, p. 6.

¹⁹⁴ The Authority notes that Grant Samuel's 'classical WACC' differs from the 'nominal vanilla WACC' estimate.

The classical WACC reduces the cost of debt to account for the impact of the tax shield (that is, the cost of debt component is $D/V*(1-T)*R_d$), whereas the nominal vanilla WACC ignores the impact of the tax shield as this is accounted for in the cash flows. However, both approaches adopt the same estimate for the return on equity component (that is, $E/V*k_E$ using Handley's terminology).

¹⁹⁵ J.C. Handley, *Further comments on the historical equity risk premium*, Report for the Australian Energy Regulator, 14 April 2009, pp. 16-17.

¹⁹⁶ Authority estimate based on Grant Samuel data, assuming a nominal risk free rate of 5.0 per cent.

¹⁹⁷ Grant Samuel, *Envestra: Financial Services Guide and Independent Expert's Report*, 3 March 2014, Appendix 3, p. 9:

In Grant Samuel's view, however, the evidence gathered to date as to the value the market attributes to franking credits is insufficient to rely on for valuation purposes. More importantly, Grant Samuel does not believe that such adjustments are widely used by acquirers of assets at present... Accordingly, it is Grant Samuel's opinion, that it is not appropriate to make any adjustment.

estimate (k_E') accordingly (down).¹⁹⁸ The Authority considers that with a revised assumption of a positive γ , the resulting grossed up return on equity would likely be similar to Grant Samuel's current estimate of k_E , all other things equal.

- The Authority's comparable long run average return on equity of 11.2 per cent is within the Grant Samuel range of 10.7 to 15.2 per cent.

480. The survey by ATCO's consultant Ernst and Young of other analysts' estimates gives results that are broadly consistent with the Grant Samuel view. Ernst and Young note that in 2012, independent market experts' market cost of equity estimates averaged 10.7 per cent.¹⁹⁹ Ernst and Young also notes that independent experts typically do not assign a value to imputation credits, and that adjustment for this outcome would raise the estimate of independent brokers.²⁰⁰ However, the Authority considers that Ernst and Young is incorrect in this view. The 10.7 per cent is an estimate of the total return on equity (k_E), given that independent analysts tend to assume $\gamma=0$. As noted in footnote 198, in the event that a positive value was ascribed to γ , then independent analysts would need to rework their estimation approach.

481. On this basis, the Authority is satisfied that its current estimate is reasonable.

Views of other regulators

482. The Authority also considers other regulators' estimates.

483. First, with regard to the AER, the Authority notes that its equity return on the market is derived using the Sharpe Lintner CAPM.

484. Like equity analysts, the AER has the view that a longer term 10 year perspective is appropriate, based on the view that equity investors have long term investment horizons.²⁰¹

¹⁹⁸ See for example M. Lally, *The Estimation of Gamma*, Report for the AER, 23 November 2013, pp. 33-34: ...the correct position is that, so long as $E(R_m)$ or the MRP exclusive of the credits is correctly estimated, an analyst who does not make any explicit allowance for the credits will still produce valuations that are correct on average over firms because $E(R_m)$ will have fallen after imputation was introduced, and explicit adjustment for the credits is required only to deal with firms that are not typical. Thus the crucial issue is not whether practitioners make an explicit allowance for U but what value for U is embedded in market prices.

...This is the valuation model that would be used by those who don't make any (explicit) allowance for imputation credits anywhere in the formula. However this model will correctly allow for the effect of the credits on the equity value of the average firm, so long as $E(R_m)$ or the MRP is correctly estimated. For firms with a lower than average beta and a higher than average imputation-to-value ratio, the allowance via a lower value for $E(R_m)$ will be insufficient; otherwise, it will be too high. Furthermore, if an analyst believes that $U = 0$, ... it would also be necessary to adjust their estimate of $E(R_m)$ or the MRP to strip out the market's view about U that is impounded in $E(R_m)$, and this would clearly be difficult.

¹⁹⁹ ATCO Gas Australia, *Access Arrangement Information: 1 July 2014 – 31 December 2019*, 3 April 2014, Appendix 35, p. 23.

²⁰⁰ ATCO Gas Australia, *Access Arrangement Information: 1 July 2014 – 31 December 2019*, 3 April 2014, Appendix 35, pp. 14-15.

²⁰¹ S. Pratt and R. Grabowski, *Cost of Capital: Applications and Examples*, 4th edition, 2010, pp. 118–120; A. Damodaran, 'What is the risk free rate? A search for the basic building block', December 2008, pp. 9-10. Lally, M., *The risk free rate and the present value principle*, 22 August 2012. cited in Australian Energy Regulator, *Rate of Return Guidelines*, Explanatory Statement, p. 49.

485. Specifically, the AER (in December 2013) in its rate of return guidelines adopted:

- a term for the risk free rate of 10 years, with the estimated Commonwealth Government Securities (**CGS**) yield at the time of the guidelines around 4.1 per cent;
- a range for the MRP of 5.0 per cent to 7.5 per cent, identical to the Authority, with a point estimate of the MRP of 6.5 per cent at the time of the guidelines;²⁰² and
- a resulting overall estimate of the return on the market of 10.6 per cent (=4.1+6.5).

486. Second, with regard to IPART's estimates, the Authority notes that IPART uses an average of a current 40 day and 10 year term for the risk free rate. IPART proposes to adopt an estimate of the MRP which is informed by a range that is based on a range for historic estimates (5.5 per cent to 6.5 per cent) and a range based on other current market data approaches – including using DGMs – which fall in the range 7.4 per cent to 8.8 per cent, giving an overall range for the MRP of 6.0 per cent to 8.1 per cent (as at 31 July 2014). The mid-point of the assessed range – 7.0 per cent (as at 31 July 2014) – is then adopted (although IPART notes that the mid-point estimate could be adjusted to account for other strong evidence). Given an estimated mid-point risk free rate as at 1 July 2014 of 4.3 per cent, IPART's return on the market is estimated to be around 11.3 per cent.²⁰³

487. Similar to the AER, the Authority considers that IPART gives more weight to the Wright approach, given its approach of adopting a 10 year term, and choosing the mid-point of the estimated range.

488. The Authority has considered a range of estimates for the return on equity adopted by overseas regulators.²⁰⁴ The comparison indicates, for example:

- The most recent nominal market return on equity adopted by the Alberta Utilities Commission in Canada was 10.9 per cent, comprised of a 30 year term risk free rate of 3.6 per cent and a point estimate of the MRP of 7.3 per cent, which was set in December 2011.²⁰⁵
- The United Kingdom regulator Ofgem's recent estimate of the nominal return on the market is 9.1 per cent, comprised of a risk free rate of 3.8 per cent and a MRP of 5.3 per cent.^{206,207}
- The California Public Utilities Commission estimates the return on equity for the market at 10.7 per cent, comprising a risk free rate of 3.3 per cent, and a MRP of 7.4 per cent.²⁰⁸

²⁰² Australian Energy Regulator, *Explanatory Statement Rate of Return Guideline*, December 2013, p. 93.

²⁰³ Authority analysis, based on IPART, *Fact sheet – WACC update*, August 2014.

²⁰⁴ Economic Regulation Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*, 14 October 2014, Appendix 3.

²⁰⁵ Alberta Utilities Commission, *2011 Generic Cost of Capital*, 8 December 2011. Note that the AUC's rate of return was unchanged in 2012 and 2013, and was extended on an interim basis for 2014 pending an update of the overall estimate (Alberta Utilities Commission, *2013 Generic Cost of Capital*, 19 December 2013).

²⁰⁶ Ofgem, *R110-GD1: Final Proposals – Finance and uncertainty supporting document*, 17 December 2012, p. 22.

²⁰⁷ Most recently, for R110-ED1, it has been proposed to reduce the cost of equity marginally, by 0.3 per cent (Ofgem, *Decision on our methodology for assessing the equity market return for the purpose of setting R110-ED1 price controls*, 17 February 2014, p. 1).

²⁰⁸ California Public Utilities Commission, *Decision on Test Year 2013 Cost of Capital for the Major Energy Utilities*, 20 December 2012, docs.cpuc.ca.gov/PublishedDocs/Published/G000/M040/K655/.

489. In accounting for this evidence relating to the views of other regulators, the Authority considers that its longer term average estimate for the return on equity for the market, of 11.2 per cent, is similar to the estimates of other regulators.
490. The Authority therefore is of the view that its current estimate of the long term return on equity is reasonable.

11.2.2 Estimating the market risk premium

491. The Authority considers that the so-called 'Wright approach' provides the best estimate of the return on equity for the benchmark firm over the long term. The Wright approach adopts a constant real return on equity. Wright notes:²⁰⁹

Both the real market cost of equity and the MRP are inherently unobservable. But of necessity regulators have to commit themselves to a particular set of assumptions about these unobservable magnitudes. My view... is that regulators should work on the assumption that the real market cost of equity is constant. This approach is supported by quite strong evidence. For any firm with β reasonably close to one, the assumed real market cost of equity is by far the most important figure affecting the cost of capital for regulated companies. Thus this methodology has the added advantage of providing a stable regulatory regime...

As a direct implication, whatever assumption is made on the risk-free rate, the implied equity premium must move point by point in the opposite direction.

492. The starting point for estimating the MRP for the long term rail WACC is the Authority's estimate of the expected return on equity for the longer term, of 11.2 per cent. For the indicative estimate of the rail WACC (see Appendix 7), the 'on the day' estimate of the 10 year risk free rate is 3.3 per cent. It follows that the current estimate of the *long term* nominal MRP at the current time is $(11.2 - 3.3 \text{ per cent}) = 7.9 \text{ per cent}$.

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493. The Authority considers that it is appropriate to determine the *long term* MRP, consistent with the term for the rail WACC estimates, as the difference between the forward looking long term estimate of the return on equity for the market and the 'on the day' estimate of the 10 year risk free rate.

²⁰⁹ S. Wright, *Review of Risk Free Rate and Cost of Equity Estimates: A Comparison of UK Approaches with the AER*, 25 October 2012, pp. 2-3.

12 Equity beta

494. Under the capital asset pricing model (**CAPM**) model, the total risk of an asset is divided into systematic and non-systematic risk. Systematic risk is a function of broad macroeconomic factors (such as economic growth rates) that affect all assets and cannot be eliminated by diversification of the investor's asset portfolio.
495. The key insight of the CAPM is that the contribution of an asset to the systematic risk of a portfolio of assets is the correct measure of the asset's risk (known as beta risk) and the only systematic determinant of the asset's return, over and above the return on a risk free asset.
496. In contrast, non-systematic risk relates to the attributes of a particular asset. The CAPM assumes this risk can be managed by portfolio diversification. Therefore, the investor in an asset does not require compensation for this risk.
497. Formally, there are three main components of the Sharpe Lintner CAPM for measuring the return on an asset: (i) the market risk premium (MRP), which is the return on the market portfolio in excess of the risk free rate of return, (ii) the beta risk β , which correlates the return on the specific asset, in excess of the risk free rate of return, to the rise and fall of the return on the market portfolio and iii) the risk free rate of return. The most common formulation of the CAPM directly estimates the required return on the equity share of an asset as a linear function of the risk free rate and a component to reflect the risk premium that investors would require over the risk free rate:

$$R_e = R_f + \beta_e (R_m - R_f) \quad (5)$$

where:

R_e is the required rate of return on equity;

R_f is the risk-free rate;

β_e is the equity beta that describes how a particular portfolio i will follow the market which is defined as;

$\beta_e = \text{cov}(r_i, r_M) / \text{var}(r_M)$; and

$(R_m - R_f)$ is the market risk premium, MRP.

498. In the CAPM, the equity beta value is a scaling factor applied to the market risk premium, to reflect the relative risk for the return to equity of the firm in question. Two types of risks are generally considered to determine a value of equity beta for a particular firm: (i) the type of business, and associated capital assets, that the firm operates; and (ii) the amount of financial leverage (gearing) employed by the firm.

12.1 Current approach

499. The 2003 Weighted Average Cost of Capital Review, performed by the Authority's predecessor, the Rail Access Regulator, determined that an asset beta of 0.30 (which is equivalent to an equity beta of 0.46 for a gearing of 35 per cent) was appropriate

for the PTA rail network.²¹⁰ This determination was based on an analysis performed by Network Economics Consulting Group (**NECG**), who conducted an analysis of the required asset beta for passenger rail by utilising Bloomberg data based on a sample of overseas rail providers. The average unadjusted asset beta of the group was 0.32. NECG considered the contractual relations WAGR (now PTA) had with the State Government as being a factor that would lower WAGR's asset beta. NECG also noted WAGR officers' perceptions of a low beta being applicable to their operations. Consequently, an asset beta of 0.30 was adopted. In conjunction with an assumed gearing level of 35 per cent, an equity beta of 0.46 was determined.

500. In the Final Determination for the 2008 WACC, the Authority maintained the view that the equity beta of the PTA network should be set at 0.46.²¹¹ The Authority's method for deriving its equity beta estimates follows the advice from the Allen Consulting Group (**ACG**). This value was consistent with an asset beta of 0.30 which fell within the range determined by ACG and a gearing level of 35 per cent.
501. ACG used a sample of Australian and international toll road companies, for which Bloomberg raw equity betas were collected. These were de-levered using gearing levels calculated from Bloomberg data to arrive at asset betas. The results are shown below in Table 18. Based on the sample, a range of asset betas from 0.25 to 0.30 were recommended corresponding to a range of equity beta values from 0.38 to 0.46. The Australian average was above the upper end of this as a result of Macquarie Infrastructure Group having a substantially higher asset beta than the rest of the sample. A sample average of 0.25 was calculated on the sample without Macquarie forming the lower end of the range while the full sample average forming the upper end.
502. ACG recommended the application of beta values at the lower end of these ranges in light of the passenger rail system in Western Australia involving solely government-supported passenger services.

²¹⁰ Network Economics Consulting Group, Review and Determination of Weighted Average Cost of Capital for Rail Infrastructure Operated by WestNet Rail and Western Australian Government Railway Commission: Final Report for the Office of the Rail Access Regulator, June 2003, p. 67.

²¹¹ Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008 pp. 23-31.

Table 18 Public Transport Authority toll road asset beta sample

Company	Country	Asset Beta
Vinci SA	France	0.18
Albertis Infraestructuras SA	Spain	0.13
Atlantia SPA	Italy	0.33
Brisa Auto-Estradas	Portugal	0.32
European Average		0.24
Macquarie Infrastructure Group	Australia	0.58
Transurban Group	Australia	0.28
Australian Average		0.43
Average		0.30
ACG Advice		0.25-0.30
Authority's Final Decision 2008		0.30

Source: Bloomberg and ACG Analysis

503. In 2008 for the WestNet Rail (now Brookfield Rail) WACC determination, the Authority took the view that the equity beta for the freight network is 1.0.²¹² This was also based on the advice of ACG, who recommended a range of 1.0 to 1.15 based on 35 per cent gearing and an asset beta of 0.65 to 0.75. The sample of comparable firms included rail infrastructure businesses in the United States and Canada and listed transport infrastructure services firms in Australia and New Zealand. The results of ACG's analysis is shown in Table 19 below.

²¹² Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008 pp. 23-31.

Table 19 WestNet asset beta: Allen's Consulting Group's sample recommendation and decision 2008

Company	Country	Industry	Asset Beta
Kansas City Southern	United States	Rail Freight	0.74
Union Pacific Corporation	United States	Rail Freight	0.59
Rail America Inc.	United States	Rail Freight	0.69
CSX Corporation	United States	Freight	0.65
Burlington Northern Santa Fe	United States	Rail Freight	0.75
United States Average			0.69
Canadian Pacific Railway	Canada	Rail Freight	0.65
Canadian National Railway	Canada	Rail Freight	0.80
Canadian Average			0.73
Adsteam Marine Limited	Australia	Shipping Support Services	0.65
Macquarie Infrastructure Group	Australia	Freight	0.57
Patrick Corporation Limited	Australia	Rail Freight	0.99
Toll Holdings Limited	Australia	Freight	0.71
Australian Average			0.73
Auckland International Airport Limited	New Zealand	Airports	0.75
Infratil Limited	New Zealand	Infrastructure Investment (inc public transport)	0.78
Port of Tauranga	New Zealand	Ports and Cargo	0.67
Toll NZ Limited	New Zealand	Freight	0.45
New Zealand Average			0.66
Average			0.70
ACG Advice			0.65 - 0.75
Authority's Final Decision 2008			0.65

Source: Bloomberg and ACG Analysis

504. ACG's view was that an assumed asset beta in this range would overstate an asset beta for the freight rail system in Western Australia. This was because the above comparator companies were thought to have a higher proportion of revenues derived from intermodal traffic, which is expected to have a higher beta than the freight rail system in Western Australia. Accordingly, ACG recommended an asset beta of 0.6 at a 35 per cent gearing level giving an equity beta of 0.92.
505. The Authority also acknowledged submissions that the high operating leverage (ratio of variable to fixed costs) of the freight-network business may, all other things being equal, contribute to a relatively high sensitivity of profits to changes in levels of demand and a higher beta value for the freight network business. However, the Authority was of the view that the Western Australian freight network is likely to have a lower beta than the comparators due to the predominance of bulk grain and minerals freight which were found to have asset betas closer to 0.45.²¹³ Based on this, its view was that there was limited justification to adopt a beta value outside of the range derived from comparator businesses.
506. In the 2009 Final Determination for the TPI WACC, the Authority decided that an asset beta within the range of 0.7 to 1 was appropriate for TPI. A value of 0.69 was calculated by CRA as the average asset beta estimated for a sample of eight US and Canadian freight railways shown below in Table 20. An asset beta of 1.00, which was at the top of the range, was considered appropriate. This value with a gearing level of 30 per cent gave an equity beta of 1.43 for TPI.
507. The Authority considered that an appropriate asset beta for TPI's railway would be higher than the average overseas comparator. The Authority also noted that a single commodity railway in a remote location that exclusively serves mining related export demand is likely to have a higher level of risk than intermodal or general freight railway.²¹⁴ The Authority considered that Genesee & Wyoming Inc. was likely to be the best comparator for a short line railway operator such as TPI.

²¹³ Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008 pp. 23-31.

²¹⁴ Economic Regulation Authority, *The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network*, June 2009, pp. 36-45.

Table 20 The Pilbara Infrastructure asset beta: CRA International's sample, recommendation and decision 2008

Company	Country	Industry	Asset Beta
Kansas City Southern	United States	Rail Freight	0.75
Genesee & Wyoming Inc.	United States	Rail Freight	1.07
CSX Corporation	United States	Freight	0.76
Union Pacific Corp.	United States	Rail Freight	0.76
Norfolk Southern Corp.	United States	Rail Freight	0.77
Burlington Northern Santa Fe Corp	United States	Rail Freight	0.68
United States Average			0.80
Canadian Pacific Railway	Canada	Rail Freight	0.53
Canadian National Railway	Canada	Rail Freight	0.52
Canadian Average			0.53
Average			0.69
CRA Advice			0.77 - 0.79
Authority's Final Decision 2009			1.00

Source: CRA International analysis

508. The Authority notes that other Australian regulators have determined equity betas for other Australian railway networks. Recent regulatory decisions for rail are shown below (Table 21). The Authority notes, however, that this information has low relevance for this determination, given the differences in regulatory regime that exist and the differing characteristics of the rail networks.

Table 21 Equity Beta determinations by other Australian regulators

Regulator	Year	Rail network	Equity Beta
QCA ²¹⁵	2010	QR Network	0.8
ACCC ²¹⁶	2010	ARTC/HVCN	0.94
IPART ²¹⁷	2009	ARTC/HVCM	0.85

Source: ERA analysis

²¹⁵ Queensland Competition Authority, Final Decision, Queensland Rail Network's 2010 DAU, 2010.

²¹⁶ Australian Competition & Consumer Commission, Position Paper in relation to the Australian Railtrack Corporation's proposed Hunter Valley Rail Network Access Undertaking, 2010.

²¹⁷ Independent Pricing and Regulatory Tribunal, New South Wales Rail Access Undertaking – Review of the rate of return and remaining mine life from 1 July 2009, 2009.

12.2 Considerations of the Authority

12.2.1 The need for empirical evidence

509. The Authority considers that empirical evidence must be used to inform its judgment for equity beta, as no *a-priori* expectation exists for the equity beta of regulated railway networks, or the corresponding benchmark efficient rail entity. Therefore, the Authority believes that any estimate of equity beta must be informed by empirical evidence. As a consequence, estimates of equity beta using historical data are required in order to inform an appropriate range for the equity beta of the benchmark efficient firm. Australian regulators including the Authority and the Australian Energy Regulator (**AER**) have consistently acknowledged a high level of imprecision for any empirical estimates of equity beta.²¹⁸ The Authority considers that issues of imprecision are best addressed via the use of multiple models and statistical techniques to inform a possible range for any equity beta estimate. Therefore the primary evidence used to inform the value for the equity beta of a regulated rail entity should be based on quantitative evidence.
510. For the 2009 WACC review conducted by the AER, Associate Professor Henry of the University of Melbourne estimated the equity beta for electricity transmission and distribution network service providers. The initial analysis by Professor Henry has since been used as the basis for estimating the required equity beta of regulated utility networks in Australia.^{219,220} The Authority considers that the econometric framework introduced by Henry is appropriate for estimating the required equity beta for regulated rail networks. To this end, the Authority has conducted its own analysis primarily based on this advice. The Authority has largely reproduced the econometric procedure outlined in the rate of return guidelines for gas distribution and transmission networks.²²¹
511. The Authority notes that a key divergence between estimating the equity beta for rail and gas/electricity networks is the lack of Australian comparator companies for rail. This issue was previously highlighted and discussed in detail in chapter 4, the benchmark efficient rail entity. As a consequence, the Authority has relied on overseas railway network operators in order to form the benchmark samples for the estimation of the required equity beta for the PTA, Brookfield Rail and TPI railway networks.
512. Another divergence between beta estimation for rail and gas networks is the direct estimation of the firm's asset beta in rail, as opposed to the direct equity beta in gas. That is, the benchmark efficient rail equity beta is estimated by first estimating the relevant benchmark efficient firm's asset beta, with the equity beta arrived at by multiplying by the relevant benchmark gearing level using the Brealey-Myers formula as follows:

²¹⁸ Australian Energy Regulator, *Final decision: WACC review*, May 2009.

²¹⁹ Australian Energy Regulator, *Explanatory Statement Rate of Return Guidelines*, December 2013, p. 84.

²²⁰ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 165.

²²¹ *Ibid.*

$$\beta_a = \frac{E}{(D + E)} \beta_e \quad (10)$$

where:

β_e is the estimated equity beta;

β_a is the estimated asset beta;

E is the benchmark assumed level of equity; and

D is the assumed level of debt.

513. The Authority notes that this approach implicitly assumes a debt beta of zero. This has the consequence that each firm's *actual* gearing does not directly influence the estimates of equity beta (and as a consequence, inform the range of permissible equity beta values). Rather, the *assumed* benchmark efficient gearing is used to estimate the required equity beta, *after* the relevant benchmark sample asset beta has been determined.
514. Flinders submitted that given that the Authority is seeking to adopt uniform parameters and methodologies based on the gas sector, the Authority should adopt the method of estimating the equity beta as detailed in paragraph 157 of the Issues Paper.²²² Flinders suggests that if this method were adopted, then a diverse sample such as the ASX 200, use of the median may be more appropriate. Flinders further submitted that it is not aware of any viable alternative methods to the econometric evaluation of historic market returns for the purpose of estimating equity beta. However, the Authority considers that using the ASX 200 would by definition result in an equity beta of 1, which is not necessarily the equity beta of a railway network, and as a consequence rejects this proposal.

12.2.2 Benchmark sample issues for the estimation of beta

515. Brockman submitted that, on the basis that all benchmarks in a sample qualify as 'efficient', an average should be the most acceptable approach to estimating the equity beta.²²³ However, Brockman consider that, given the difficulty noted in the Issues Paper in arriving at suitable benchmarks, it seems inevitable that Authority will need to apply some discretion in the determination of suitable benchmark samples and any sample data that appears inconsistent with the general distribution. The Authority agrees.
516. Brockman also submitted that, to the extent that any of the comparators within the available sample may be 'outliers' or unrepresentative of the desired benchmark, a median may be more suitable to avoid any sample bias impact on the average. The Authority does not agree with this point, as it assumes that the centrally located

²²² Flinders Mines, Submission to the Economic Regulation Authority In response to Issues Paper under Railways (Access) Code 2000: Weighted Average Cost of Capital, February 2013.

²²³ Brockman Mining Australia Pty Ltd, Submission in response to Issues Paper- Railways (Access) Code 2000: Weighted Average Cost of Capital WACC Determination – Railway Networks, February 2013.

comparators are of equal risk to others. The Authority considers that judgment is required.

517. Brockman further submitted that the equity beta should not be derived from a particular company, as the WACC is being derived for a hypothetical replacement railway by an 'efficient' railway owner.²²⁴ The nature of the contracts (casual, periodic or take or pay) will influence the systematic risk of the benchmark firm. Brockman also suggests that investors in 'captive' infrastructure, such as facilities with take or pay contracts, should face lower risk and thus have equity betas less than one. The Authority agrees that contractual arrangements may influence risk, but within an estimated range, implying that the equity beta need not necessarily be less than one.
518. Flinders submitted that given that the equity beta should relate to the relevant industry, then the use of comparators from industries other than rail should only be considered if the overseas rail businesses do not correlate well with the regulated freight businesses.²²⁵ The Authority notes that it has included both overseas rail businesses, in addition to businesses from other sectors related to the provision of the relevant rail service. The Authority agrees evidence from rail networks will generally be superior to that from other sectors.
519. As discussed in chapter 4, Benchmark firm and risk, the Authority has constructed three benchmark samples to represent the three regulated rail networks. The Authority considers this is consistent with Brockman's submission to estimate the parameters of the WACC as being derived from a hypothetical replacement railway.
520. In summary, given the lack of directly comparable companies to the three regulated rail networks, the Authority considers it necessary to exercise significant regulatory judgement as to the relative systematic risk faced by the regulated entities and the corresponding benchmark sample. In particular, given the lack of comparable companies, the Authority cannot utilise a median approach, or select only comparator companies that have take or pay contracts as Brockman suggests. The Authority's selection of the relevant comparator companies for each of the rail networks is discussed in chapter 4.

12.2.3 Estimation of the required asset beta

521. The Authority's method for estimating the benchmark asset beta and associated equity beta is outlined in Appendix 1.
522. Given the use of overseas comparator companies, stock market indices were used as proxies for the relevant market portfolio for each of the corresponding countries (Table 22).

²²⁴ Ibid.

²²⁵ Flinders Mines, Submission to the Economic Regulation Authority In response to Issues Paper under Railways (Access) Code 2000: Weighted Average Cost of Capital, February 2013.

Table 22 Stock exchange Index for benchmark sample companies

Company Names	Bloomberg Tickers	Country	Stock Market Index	Bloomberg Ticker
Vinci SA	DG	France	CAC 40	CAC Index
Abertis Infraestructuras S.A.	ABE	Spain	IBEX 35	IBEX Index
Atlantia S.P.A	ATL	Italy	FTSE MIB	FTSEMIB Index
Transurban Group, Asciano Limited, Aurizon Holdings Ltd, Macquarie Atlas Roads Group, Toll Holdings Limited	TCL,AIO,AZJ,MQA,TOL,	Australia	All Ordinaries	AS30 Index
Genesee & Wyoming Inc., Union Pacific Corporation, Norfolk Southern Corporation, Kansas City Southern, CSX Corporation	GWR, UNP, NSC, KSU, CSX	United States	S&P 500	SPX Index
Canadian Pacific Railway Limited, Canadian National Railway Company, Clarke Inc.	CP,CNR, CKI,	Canada	Toronto Stock Index 300	TS300 Index
Asciano Limited, Infratil Limited, Port of Tauranga Limited	AIA, IFT, POT	New Zealand	New Zealand Exchange All Ordinaries Index	NZSE Index

Source: Bloomberg, Economic Regulation Authority analysis.

523. Price data used was the last price for all stocks provided by the Bloomberg Terminal. The Authority has used a data set from each firm encompassing a five year period from 1 March 2009 to 28 February 2014. Dividend data used in this analysis was gross dividends including cash distributions, but omitting unusual items such as stock distributions and rights offerings. The dividend was then added to the closing price on the Friday after the ex-dividend dates as this is the first day the price would reflect the payout of the dividend in the data. For each market index, which is taken as a proxy for each country's market portfolio, the gross last dividend per share was used, which includes the net dividend and any tax credit where applicable. No adjustments were made to historical volume in Bloomberg. It is noted that net debt information for all comparator companies is the sum of short and long-term borrowings less cash and near cash items, marketable securities and collaterals, as provided by Bloomberg. In addition, market capitalisation for all comparator companies was measured as the current monetary value of all outstanding shares stated in the pricing currency. Some adjustments were made to be consistent with Bloomberg's reporting of data. Further details can be found in Appendix 2. All regression results, associated standard errors and test statistics, were computed using R 2.13.2 open source software.

524. The results for each of the benchmark samples are as follows.²²⁶

12.2.3.1 PTA Regression Results

Table 23 Public Transport Authority asset beta sample 2014

Company	Country	Industry	OLS	LAD	MM	Thiel-Sen	Average Asset Beta	Change from 2008
Vinci SA	France	Toll Roads	0.65	0.69	0.67	0.66	0.67	0.49
Albertis Infraestructuras SA	Spain	Toll Roads	0.32	0.33	0.31	0.31	0.32	0.19
Atlantia SPA	Italy	Toll Roads	0.32	0.33	0.32	0.31	0.32	-0.01
European Average							0.43	
Macquarie Atlas Roads Group	Australia	Toll Roads	0.50	0.42	0.45	0.44	0.45	-
Transurban Group	Australia	Toll Roads	0.30	0.26	0.28	0.24	0.27	-0.01
Australian Average							0.36	
Average							0.41	

Source: Bloomberg and ERA analysis

12.2.3.2 Brookfield Regression Results

Table 24 Brookfield Rail asset beta sample 2014

Company	Country	Industry	OLS	LAD	MM	Thiel-Sen	Average Asset Beta	Change from 2008
Genesee & Wyoming Inc.	United States	Rail Freight	1.16	1.14	1.14	1.16	1.15	-
Union Pacific Corporation	United States	Rail Freight	1.01	1.02	1.01	1.02	1.02	0.43
Norfolk Southern Corporation	United States	Rail Freight	0.99	0.92	0.97	0.97	0.96	-
Kansas City Southern	United States	Rail Freight	1.40	1.34	1.40	1.38	1.38	0.64
CSX Corporation	United States	Freight	1.08	1.10	1.08	1.09	1.09	0.44
United States Average							1.12	
Canadian Pacific Railway	Canada	Rail Freight	0.83	0.73	0.81	0.76	0.78	0.13
Canadian National Railway	Canada	Rail Freight	0.62	0.65	0.63	0.62	0.63	-0.17
Canadian Average							0.71	
Toll Holdings Limited	Australia	Freight	0.92	0.88	0.87	0.90	0.89	0.18
Aurizon Holdings	Australia	Freight	0.65	0.67	0.68	0.70	0.67	-
Asciano Limited	Australia	Rail Freight	0.75	0.63	0.63	0.61	0.65	-
Australian Average							0.74	
Auckland International Airport Limited	New Zealand	Airports	0.72	0.70	0.67	0.70	0.70	
Infratil Limited	New Zealand	Infrastructure Investment (Inc. Public transport)	0.34	0.30	0.32	0.31	0.32	-0.46
Port of Tauranga	New Zealand	Ports and Cargo	0.60	0.52	0.56	0.53	0.55	-0.12
New Zealand Average							0.52	
Average							0.83	

Source: Bloomberg and ERA analysis

12.2.3.3 TPI Regression Results

Table 25 The Pilbara Infrastructure asset beta sample 2014

Company	Country	Industry	OLS	LAD	MM	Thiel-Sen	Average Asset Beta	Change from 2009
Genesee & Wyoming Inc.	United States	Rail Freight	1.16	1.14	1.14	1.16	1.15	0.08
Union Pacific Corporation	United States	Rail Freight	1.01	1.02	1.01	1.02	1.02	0.26
Norfolk Southern Corporation	United States	Rail Freight	0.99	0.92	0.97	0.97	0.96	0.19
Kansas City Southern	United States	Rail Freight	1.40	1.34	1.40	1.38	1.38	0.63
CSX Corporation	United States	Freight	1.08	1.10	1.08	1.09	1.09	0.33
United States Average							1.12	
Canadian Pacific Railway	Canada	Rail Freight	0.83	0.73	0.81	0.76	0.78	0.25
Canadian National Railway	Canada	Rail Freight	0.62	0.65	0.63	0.62	0.63	0.11
Canadian Average							0.71	
Average							1.00	

Source: Bloomberg and ERA analysis

525. In order to ascertain the statistical accuracy of each of the asset beta regression estimates set out above, the Authority has estimated the sampling distribution for each beta estimate using the Bootstrap approach. A discussion of the bootstrap procedure, and results, can be found in Appendix 3.

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526. The Authority has previously recognised that regulated firms face a range of different risks in the provision of reference services, as compared to the benchmark efficient entity (see chapter 4 – The benchmark efficient entity and risk). As a consequence, the Authority notes that significant regulatory judgment is required in order to determine the required systematic risk of each of the benchmark efficient rail entities.

527. The Authority considers that, given the substantial variation and imprecision inherent in beta estimation, empirical evidence concerning a suitable range is needed to inform its decision on appropriate asset betas. The Authority will take into account the outcomes from a range of statistical techniques, including the previously conducted bootstrap analysis, in order to inform the overall observed range of permissible asset betas.²²⁷ The Authority will then utilise the previously determined benchmark efficient gearing ratios for each rail operator to estimate the required equity beta.

12.3.1 PTA

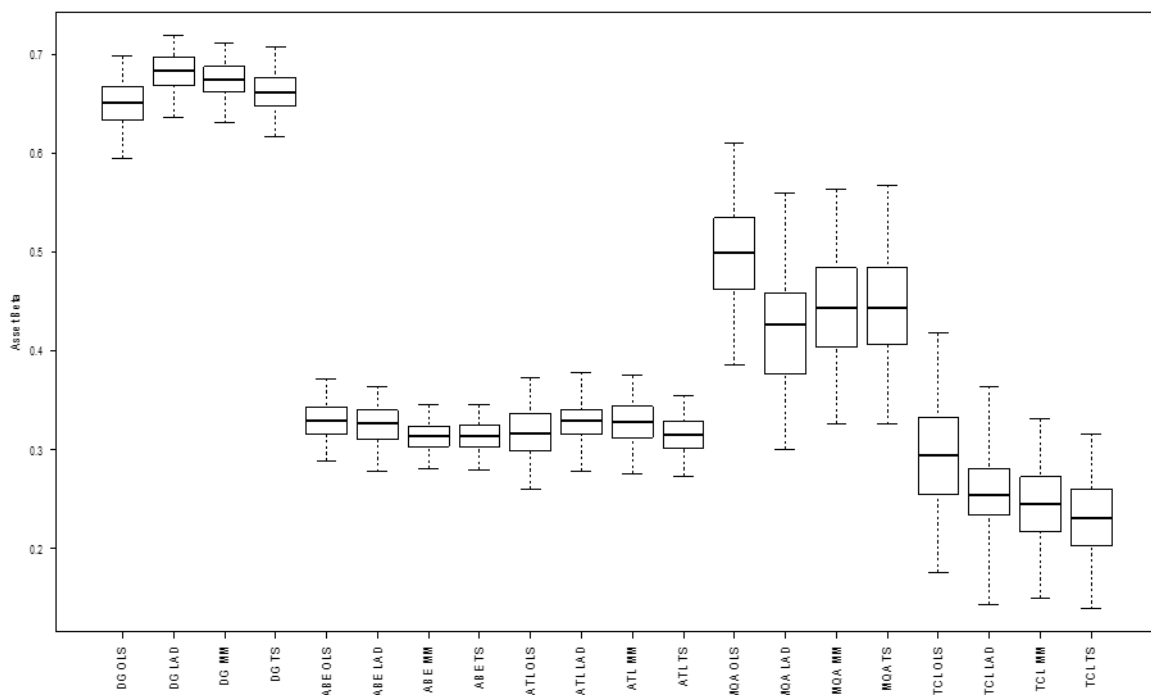
528. The Authority notes that the systematic risk present in the benchmark sample above is expected to be higher than that of the PTA rail network. The PTA rail network primarily transports passengers via rail across the Perth Metropolitan area. The

²²⁷ Bootstrapping is a statistical methodology for ascertaining the accuracy of an estimated quantity by re-sampling the data at hand.

Authority considers that comparing the service provided by the PTA and the comparator companies of the benchmark sample is likely to be inaccurate as toll road companies are only an approximation to the service provided by passenger rail. In particular, the Authority considers the systematic risk of a passenger rail network owned and operated by government, and located in a metropolitan area, to be far lower than that of a toll road company. As a consequence, the Authority will use its discretion to select a relevant asset beta at the lower end of the empirically estimated range derived from the relevant comparator companies.

529. In addition, the Authority notes that the comparator company Vinci SA provides other services, such as civil engineering and construction, and owns and operates bridges, parking garages and a stadium. As a consequence, the Authority considers that the systematic risk of Vinci SA to be substantially higher than that of the PTA network. Given this company was included in ACG's review in 2008, and acknowledging the limited number of comparator companies for the PTA network, the Authority has retained it for the purposes of this WACC determination.
530. Based on the above regression results contained in Table 23, the Authority notes that the average asset beta across comparable companies for PTA is 0.40. Excluding Vinci SA reduces the average asset beta of the remaining comparable companies to 0.34.
531. Figure 6 below plots the results of the asset beta bootstrapping analysis conducted in Appendix 3 for the PTA comparable companies. The Authority notes that the comparable companies' confidence intervals do not exhibit a clear representative asset beta for the PTA, with their combined ranges encompassing a range of asset betas from 0.14 to 0.72.

Figure 6 95 per cent confidence intervals for PTA comparator companies' asset betas



Source: Economic Regulation Authority analysis

532. Given the low level of systematic risk present in the PTA rail network the Authority considers that an asset beta on the lower end of this range is appropriate. Utilising regulatory discretion, the Authority considers that an asset beta of 0.3, at the lower end of this range and slightly lower than the average asset beta excluding Vinci SA is appropriate.
533. Utilising a gearing of 50 per cent, this corresponds to an equity beta of the PTA network of 0.6. This represents an increase of the equity beta of the PTA from the 2008 decision, in which the Authority determined that the equity beta of the PTA network should be set at 0.46.²²⁸ The Authority notes that this increase is due solely to the increase in gearing from 35 per cent to 50 per cent, with the asset beta unchanged from 0.3.

12.3.2 Brookfield Rail

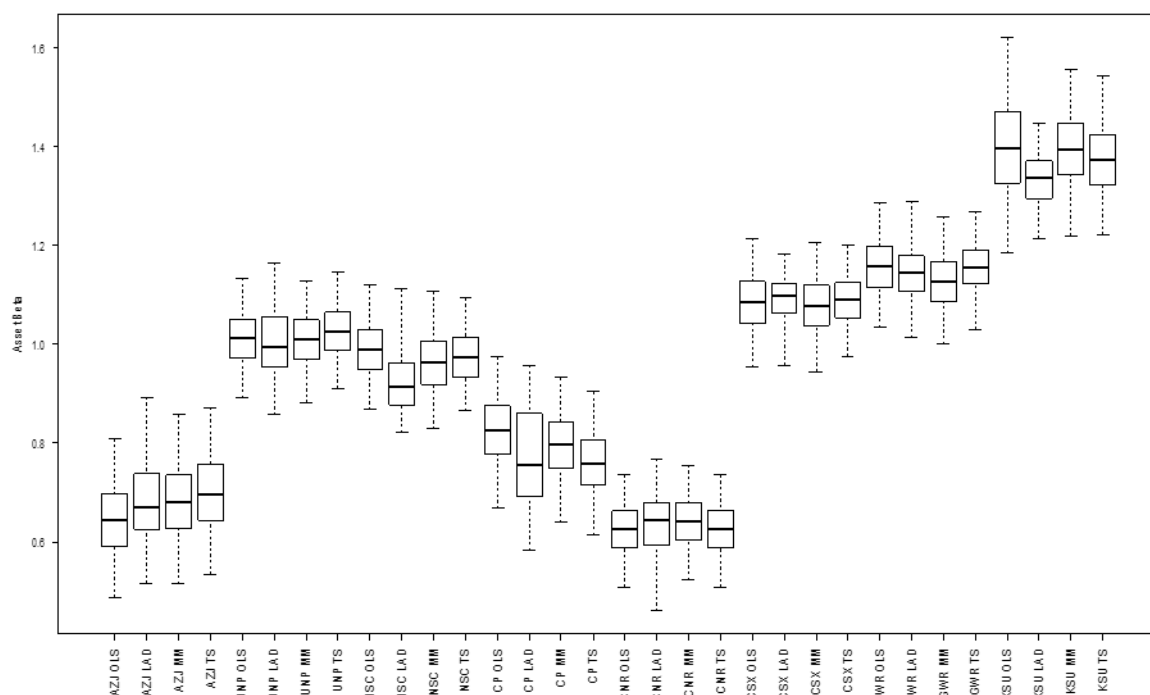
534. The Authority has previously noted that Aurizon is potentially the best comparator company to the Brookfield Rail network, given that it operates in Australia and transports similar freight. In addition, the Authority considers that non-rail operators are a less valid proxy company compared to rail operators. However, given they have been included in previous WACC determinations they have been retained for the purposes of this draft determination. Furthermore, the Authority has an *a-priori* expectation that overseas rail operators will possess a higher level of systematic risk, relative to an Australian railway operator, given that American and Canadian railway operators are expected to face higher degrees of competition from alternative forms of transportation such as roads. The Authority will therefore employ significant regulatory discretion when determining an appropriate asset beta for the Brookfield Rail network.
535. Based on the above regression results contained in Table 26, the Authority notes that the average asset beta across comparable companies for Brookfield Rail is 0.83. In particular, the Authority notes that across regression procedures the average asset beta estimate for Aurizon is 0.67.
536. Figure 7 and Figure 8 below plots the results of the asset beta bootstrapping analysis conducted in Appendix 3 for the Brookfield Rail comparable companies. In particular, the Authority notes that the range of confidence interval for the rail comparable companies covers asset betas from 0.49 to 1.62, whilst for non-rail the range of confidence intervals covers an interval from 0.2 to 1.4. The Authority notes that the comparable companies' confidence interval do not exhibit a clear representative asset beta for Brookfield, encompassing a wide range across the different comparator companies.
537. As noted previously, the Authority considers that the Brookfield Rail network will have a lower level of systematic risk relative to overseas rail operators, with Aurizon being the most comparable company in Brookfield's sample. The Authority considers that an asset beta of 0.7 for the Brookfield Rail network is consistent with the Authority's prior reasoning, being consistent with the observed asset betas of Aurizon, and being at the lower end of the observed confidence intervals of asset betas for overseas rail companies. In addition, this asset beta is consistent with the observed confidence intervals for the non-rail comparator companies in Australia and New Zealand,

²²⁸ Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008 pp. 23-31.

generally being at the upper end of these comparator company's confidence intervals.

538. Utilising a Gearing of 25 per cent, this corresponds to an equity beta of the Brookfield Rail network of 0.93. This is a decrease in the assumed equity beta for Brookfield, with the Authority determining that an equity beta of 1.0 was appropriate in its 2008 determination.²²⁹ The Authority notes that this is due to the reduction in the benchmark assumed gearing for Brookfield rail, falling from 35 per cent to 25 per cent in the current determination. Furthermore, the asset beta for the benchmark efficient entity representing Brookfield has increased from 0.65 to 0.7 between determinations.

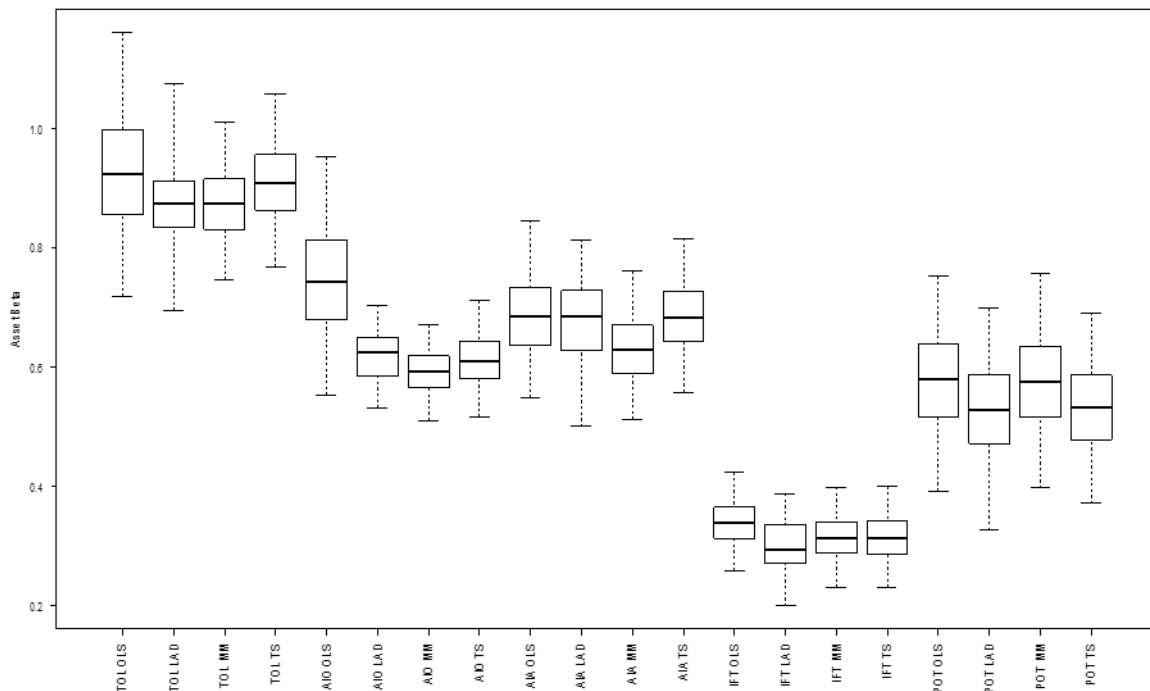
Figure 7 95 per cent confidence intervals for Brookfield Rail comparator companies – rail comparators' asset betas



Source: Economic Regulation Authority analysis

²²⁹ Economic Regulation Authority, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Rail Networks: Final Decision, June 2008 pp. 23-31.

Figure 8 95 per cent confidence intervals for Brookfield Rail comparator companies - non-rail comparators' asset betas

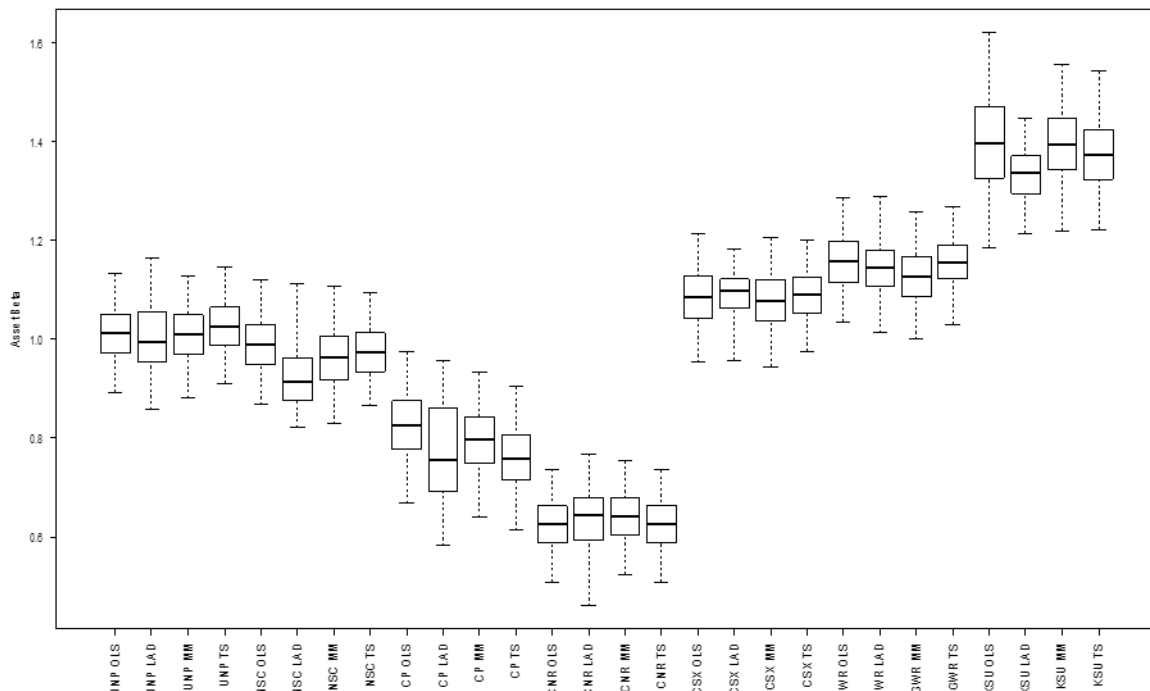


Source: Economic Regulation Authority analysis

12.3.3 The Pilbara Infrastructure

539. The Authority has previously noted that TPI's current reliance on a single commodity, iron ore, transported across one large distance significantly differentiates it from the Brookfield Rail line and as a consequence the Brookfield sample is inappropriate for TPI. The Authority also considers that an appropriate asset beta for TPI's railway network will be generally higher than that of the average overseas comparator rail network. It is noted that as TPI is a single commodity railway in a remote location that exclusively serves mining related export demand, it is likely to have a higher level of risk than intermodal or general freight railway.²³⁰ The Authority has previously noted that Genesee & Wyoming Inc. was likely to be the best comparator for TPI.
540. The Authority notes that the average asset beta for the companies included in TPI's benchmark sample is 1.06, whilst Genesee & Wyoming Inc.'s average Asset Beta across different regression procedures is 1.15. The Authority further notes that Kansas City Southern's asset beta has increased substantially since the previous determination, resulting in it having the highest asset beta in the benchmark sample. The range of confidence intervals across TPI's benchmark sample is 0.5 to 1.6. The Authority notes that the upper bound of 1.6 is a result of the large confidence intervals associated with the OLS estimator for Kansas City Southern, and when more robust estimators are employed this upper bound falls to 1.5.

²³⁰ Economic Regulation Authority, The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network, June 2009, pp. 36-45.

Figure 9 95 per cent confidence intervals for TPI comparator companies' asset betas

Source: Economic Regulation Authority analysis

541. An asset beta of 1.25, together with an assumed gearing of 0.2 results in an equity beta of 1.56. The Authority considers that this equity beta is appropriate for the TPI railway network. This represents an increase in the equity beta for TPI from the 2009 determination, in which an asset beta of 1.00 was determined. With a gearing of 30 per cent, an equity beta of 1.43 was obtained.²³¹
542. The Authority considers an asset beta of 1.25 best reflects the systematic risk of the TPI rail network, being at the upper end of the 95 per cent confidence interval of the asset beta for Genesee & Wyoming Inc., whilst being contained in the 95 per cent confidence interval for each of the regression estimators for Kansas City Southern. The Authority notes that this asset beta is consistent with the prior reasoning that TPI's asset beta should be at the upper end of systematic risk for overseas railway operators.

²³¹ Economic Regulation Authority, *The Pilbara Infrastructure (TPI): Final Determination on the 2009 Weighted Average Cost of Capital for TPI's Railway Network*, June 2009.

13 Debt raising costs

543. Debt raising costs are the administrative costs and other charges incurred by businesses in the process of raising or refinancing debt.²³²

13.1 Current approach

544. In the 2003 Determination, the Rail Access Regulator provided for an addition to the debt margin of 12.5 basis points as an allowance for the costs of raising debt finance.

545. The Authority in its 2008 review maintained the allowance of 12.5 basis points for debt raising costs, based on advice from the Allen Consulting Group (**ACG**).²³³

13.2 Considerations of the Authority

546. Regulators across Australia have typically included an allowance to account for debt raising costs in their regulatory decisions. Debt raising costs may include underwriting fees, legal fees, company credit rating fees and any other costs incurred in raising debt finance. A company has to pay debt raising costs over and above the debt risk premium. Such debt raising costs are likely to vary between each issuance of debt depending on the borrower, lender and market conditions.

547. The Authority considered debt raising costs in detail as part of the development of the gas rate of return guidelines.²³⁴ That analysis observed that the formative work on debt raising had been undertaken by ACG in 2004.

548. Based on the advice from the Allen Consulting Group, the Australian Competition and Consumer Commission (**ACCC**) in December 2004, concluded that debt raising costs were a legitimate expense that should be recovered through the revenues of a regulated utility.²³⁵

549. The costs included in the estimates of the debt raising costs, as indicated by the ACG in its 2004 estimate and adopted by the ACCC, are the direct costs outlined below:

- gross underwriting fee: this includes management fees, selling fees, arrangement fees and the cost of an underwriter for the debt;
- legal and roadshow fee: this includes fees for legal documentation and fees involved in creating and marketing a prospectus;

²³² The Authority does not consider that an allowance for hedging costs is warranted for the rail WACC. Hedging costs relate to the costs involved in undertaking interest rate swaps to match the regulated risk free rate. The Authority considers that as rail service providers have control over the term of the contract negotiated with users, they are able match their preferred capital term. Further, as the rail WACC is the long term WACC, firms which adopt a shorter term than 10 years for their debt would have lower costs. As such, the interest rate risk associated with the term is not considered to be significant, and should not be recompensed through the WACC by means of a hedging cost allowance.

²³³ The Authority did not provide an allowance for the equity raising costs, as it considered that this cost should be taken into account in the valuation of assets, rather than in the regulated rate of return.

²³⁴ For more detail, see Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, section 11.2.6.

²³⁵ The Australian Competition and Consumer Commission, 2005, Final Decision, *NSW and ACT Transmission Network Revenue Cap, TransGrid 2004/5 to 2008/9*, April 2005, p. 144.

- company credit rating fee: a credit rating is generally required for the issue of a debt raising instruments, a company is charged annually by the credit rating agency for the services of providing a credit rating;
 - issue credit rating fee: a separate credit rating is obtained for each debt issue;
 - registry fee: the maintenance of the bond register; and
 - paying fee: payment of a coupon and principal to the security holder on behalf of the issuer.
550. ACG's 2004 study determined debt raising costs based on long-term bond issues, consistent with the assumptions applied in determining the costs of debt for a benchmark regulated entity. Debt raising costs were based on costs associated with Australian international bond issues and for Australian medium term notes sold jointly in Australia and overseas. Estimates of these costs were equivalent to 8 to 10.4 basis points per annum when expressed as an increment to the debt margin.²³⁶
551. Based on the ACG study, the Authority and other Australian regulators, except the ACCC and AER, have consistently adopted an estimate of debt raising costs of 12.5 bppa in previous regulatory decisions. The ACCC and the AER on the other hand chose to incorporate the estimated costs in the operating expense cash flows.
552. The Authority is not aware of any new alternatives to the ACG method. Recent estimates of debt raising costs – including Deloitte's 2010 estimate²³⁷; PricewaterhouseCoopers' 2011 estimate²³⁸; the AER's 2013 estimate²³⁹; and the Authority's estimate in 2013²⁴⁰ – have all adopted the same approach as in ACG's 2004 estimate.
553. Therefore, the Authority is of the view that the approach set out in the ACG's 2004 study is appropriate for the purpose of estimating debt raising costs.
554. The Authority considers that its most recent 2013 estimate of debt raising costs – of 12.5 basis points per annum (bppa) (Table 26) – remains relevant.²⁴¹ The estimate continues the allowance for debt raising costs provided for in the Authority's previous rail WACC decisions.
555. The Authority notes that Flinders submitted that the Authority should survey financial institutions, as the ACG estimate cannot be updated. However, the Authority considers that its 2013 estimate provides for an update, so considers that this step is not required. Brockman supported the Authority's approach to estimating debt raising costs.

²³⁶ Allen Consulting Group, Debt and Equity raising transaction costs: Final report to ACCC, December 2004.

²³⁷ Deloitte, Envestra Limited: Debt Financing Costs, September 2010.

²³⁸ PricewaterhouseCoopers, 2011, Debt and Equity Raising Costs: Report for Powerlink Queensland, Appendix K, p. 20.

²³⁹ Australian Energy Regulator, Access arrangement final decision: SPI Networks (Gas): 2013-17, March 2013.

²⁴⁰ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, p. 202.

²⁴¹ The estimate is amortised over 5 years, so is conservative with respect to the 10 year term of the rail WACC.

Table 26 The Authority's estimate of debt raising costs (bppa), 2013

Fee	Explanation/Source	1 Issue	2 Issues	4 Issues	6 Issues	10 Issues
Total Amount Raised	Multiples of median MTN issue size (\$250m)	\$250m	\$500m	\$1,000m	\$1,500m	\$2,500m
Gross Underwriting Fees	Bloomberg for Australian international issues, upfront per issue, amortised	8.31	8.31	8.31	8.31	8.31
Legal and Roadshow	\$195K upfront per issue, amortised	1.85	1.85	1.85	1.85	1.85
Company Credit Rating	\$55K for the entire company, per year	2.20	1.10	0.55	0.37	0.22
Issue Credit Rating	4.5 bps up-front per issue, amortised	1.07	1.07	1.07	1.07	1.07
Registry Fees	\$4K upfront per issue, amortised	0.04	0.04	0.04	0.04	0.04
Paying Fees	\$9K per issue per year	0.36	0.36	0.36	0.36	0.36
Totals	Basis Points p.a.	13.8	12.7	12.2	12.0	11.8

Source: Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 202.

13.3 Draft decision

556. The Authority is of the view that debt raising costs should be incorporated as a component in the rate of return on debt. However, these debt raising costs should only include the direct cost components recommended by the Allen Consulting Group (ACG) in its 2004 report to the ACCC and accepted by Australian regulators since then. These costs will be recompensed in proportion to the average annual issuance, and will cover: (i) gross underwriting fees; (ii) legal and roadshow fees; (iii) company credit rating fees; (iv) issue credit rating fees; (v) registry fees; and (vi) paying fees.
557. The Authority considers that its 2013 estimate of 12.5 basis points per annum provides for a current estimate of debt raising costs for the benchmark efficient entity.

14 Gamma

558. Gamma is the parameter in the WACC that takes into account the value generated by the distribution of franking credits to investors. As a general rule, investors will accept a lower required rate of return on an investment that has franking credits compared with an investment that has similar risk and no franking credits. The precise value investors place on franking credits is ambiguous, given that individual investors have differing circumstances (e.g. differential marginal tax rates and eligibility). In addition, the distribution of franking credits by companies differs primarily as a result of differences in shares of profit that are liable for taxation and the proportion of profits paid as dividends. As a consequence of this variability, the precise value of gamma required for use in the rail WACC is difficult to identify.

14.1 Current approach

559. The Authority adopted a value for gamma of 0.5 in the 2008 Rail WACC Determination. At the time the Authority acknowledged that the valuation of taxation imputation credits in determining the WACC was complicated by unresolved theoretical issues. The Authority maintained the view that until the debate on the value of imputation credits was resolved, it was appropriate to apply a value of gamma of 0.5.

560. Subsequently, Strategic Finance Group's (SFG) 2011 study on the estimates of theta was adopted by the Australian Competition Tribunal's (ACT). This study has used a dividend drop off study to estimate the value of theta for Australia.

561. After the ACT decisions on the application by Energex Limited on the issues of distribution ratio and gamma, the AER and the ERA have adopted the payout ratio of 0.70²⁴² and a theta of 0.35,²⁴³ which produces a gamma value of 0.25²⁴⁴, to be consistent with the ACT's decision.

562. Other Australian regulators in relation to other industries have adopted different values of gamma. For example, the Essential Services Commission in Victoria adopted a gamma of 0.5. This figure is based on the assumption that only 80 per cent of imputation credits on average can be distributed and that the credits have a value of 60 cents per dollar.²⁴⁵

563. In the Authority's 2013 rail WACC Determination a gamma value of 0.25 was adopted.²⁴⁶

²⁴² Australian Competition Tribunal, *Application by Energex Limited (Distribution Ratio (Gamma))* (No. 3) [2010] AcompT 9, 2010.

²⁴³ Australian Competition Tribunal, *Application by Energex Limited (Gamma)* (No. 5), [2011] AcompT 9, 2011.

²⁴⁴ Economic Regulation Authority, September, Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network, 2012, p. 422.

²⁴⁵ Essential Services Commission Victoria, *2013 Water Price Review*, October 2011, p. 66.

²⁴⁶ Economic Regulation Authority, Determination on the 2013 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, July 2013, p. 5.

14.2 Considerations of the Authority

564. It is accepted practice to estimate gamma as the product of two components: (i) the payout ratio (F); and (ii) the market value of imputation credits (θ). This can be represented as follows:

$$\gamma = F \times \theta \quad (11)$$

565. The Authority considered its approach to estimating gamma in developing its gas rate of return guidelines.²⁴⁷

566. However, the Authority has become aware of relevant new information – since the publication of the Authority’s Rate of Return Guidelines – regarding the gamma parameter. As a consequence, the Authority considers that the method for estimating the gamma parameter warrants re-examination.

567. First, the Australian Energy Regulator (**AER**) commissioned an expert report by Lally which explores the theoretical underpinnings of the gamma and assesses the appropriateness of various methodologies for estimating gamma.²⁴⁸ Second, the Queensland Competition Authority (**QCA**) also commissioned work by Lally on the estimation of gamma. The Authority considers these reports add to the regulatory debate regarding the impact of imputation credits.

568. The Authority therefore has re-visited its estimate of the gamma parameter for the purposes of this draft determination. In the process, the Authority has taken into account:

- considerations relating to theoretical framework for estimating gamma;
- the Authority’s prior position, set out in the Rate of Return Guidelines, which accounted for stakeholder input and a range of consultants’ reports;
- Lally’s November 2013 report to the AER;
- Lally’s November 2013 report to the QCA, and his responses to submissions to the QCA on that report;
- the conclusions of the AER in responding to Lally’s report, set out in its gas rate of return guidelines;²⁴⁹
- the conclusions of the QCA in its recent cost of capital determination, which also considered the foregoing material, as well as additional material with regard to the estimation of gamma.²⁵⁰

569. The following summarises the Authority’s considerations in revising its estimate for gamma for the purpose of this draft decision – more detail may be found in Appendix 5.

²⁴⁷ For more detail, see Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, p. 207.

²⁴⁸ M. Lally, *The Estimation of Gamma*, Report for the AER, 23 November 2013.

²⁴⁹ Australian Energy Regulation, *Explanatory Statement – Rate of Return Guideline*, December 2013.

²⁵⁰ Queensland Competition Authority, *Final decision: cost of capital: market parameters*, August 2014.

14.2.1 Definition of the domestic capital market

570. In reconsidering its estimate of gamma, the Authority has taken account of the definition of the capital market used for determining the allowed rate of return, which is set out in section 4.2.4.3. In particular, the Authority has adopted a domestic CAPM, while allowing for the presence of foreign investors:²⁵¹

In summary, the Authority's position is that the boundary should account for the full domestic data set, including any direct influences on the cost of capital for Australian domiciled firms. This may include the influence of international investors in Australian markets for equity, or the influence of international lenders supplying debt finance directly to Australian firms.

571. Therefore, to maintain internal consistency, the Authority considers that the estimate of gamma needs to take into account the presence of international investors in the Australian domestic capital market.

14.2.2 Interpretation of gamma

572. The equation set out in paragraph 564 contributes to the estimation of the value of franking credits in the context of the Officer CAPM framework.²⁵² The benefit arising from imputation credits can be interpreted as the proportion (γ) of franking credits that are redeemed by the representative investor. Within the context of the Officer model, the 'value' of gamma is not a market value, but instead a 'numerical value' arising out of the degree to which imputation credits are utilised.²⁵³

573. The utilisation rate is a market-level parameter, meaning that the same value applies to all firms.²⁵⁴ Individual investors have differing utilisation rates; investors who are able to fully use tax credits are assigned a value of one whilst investors who cannot are assigned a value of zero. These individual utilisation rates may be weighted to produce the required market-level utilisation rate θ . Therefore θ 'is a complex weighted average over all investors holding risky assets, where the weights involve each investor's investment in risky assets and their risk aversion'.^{255,256}

14.2.3 Distribution rate

574. The gas rate of return guidelines adopted an estimate for the distribution rate, F , of 0.7. The estimate has been widely accepted in recent times; the Australian Competition Tribunal (ACT) for example concluded that a distribution ratio of 0.7 was supported by a range of evidence and submissions.²⁵⁷ The ACT concluded 'there is

²⁵¹ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, www.erawa.com.au, December 2013, p. 30.

²⁵² R.R. Officer, The Cost of Capital of a Company under an Imputation Tax System, *Accounting and Finance*, May 1994.

²⁵³ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 12.

²⁵⁴ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 11.

²⁵⁵ Ibid.

²⁵⁶ M. Lally. and T. van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, 2003, pp. 187-210.

²⁵⁷ Australian Competition Tribunal, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 2) [2010] ACompT7*, October 2010, para 57; Australian Competition Tribunal, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT9*, October 2010.

- no empirical data that is capable of supporting an estimated distribution ratio higher than 0.7'.²⁵⁸
575. However, Lally has developed an alternative estimate of the distribution rate F based on the financial reports of the top 20 ASX200 firms, of 0.84.²⁵⁹ The Authority agrees with the QCA that this provides a robust estimate of the distribution rate, albeit for listed firms.
576. This robustness contrasts with the estimates based on the ATO data, which are not entirely consistent, and which may have potential biases due to reporting omissions. The cumulative distribution rate drawn from tax statistics is 0.7.²⁶⁰ In addition, a five year average of recent annual estimates constructed from net tax and the change in the franking account balance is 0.7. However, a five year average of recent annual estimates constructed from net tax and franked dividends distributed is 0.53.²⁶¹
577. Nonetheless, the Authority considers it reasonable to conclude that the ATO data supports an estimate for the distribution rate across *all* equity of around 0.7.
578. It is desirable to have an estimate of gamma that is internally consistent. The Authority notes that its preferred measures of the utilisation rate (refer below), are based on estimates derived using all listed and unlisted equity. As noted, the ATO data covers both *listed* and *unlisted* firms.
579. Therefore, the Authority will adopt a distribution rate of 0.7, consistent with the broad definition of all equity.

14.2.4 Utilisation rate

580. The gas rate of return guidelines utilised estimates from dividend drop off studies for the purpose of estimating θ . The dividend drop off studies used to inform the estimated range were developed by SFG Consulting (estimate of 0.35 for θ), and by the Authority itself (range of 0.35 to 0.55 for θ).
581. Dividend drop off studies use econometric regression to determine the drivers for the change in the share price when a stock goes ex-dividend. The regression explains the resulting price change in terms of the value of the dividend itself, and the value of the franking credit. The inference in the gas rate of return guidelines was that the regression coefficient on the franking credits from dividend drop off studies provides a direct estimate of θ – as being the proportion of franked dividends that are utilised by investors for the purpose of redeeming imputation credits.
582. However, Lally has identified that the regression coefficient on franking credits estimated in dividend drop off studies may not necessarily equate to the utilisation rate θ , given that the tax rate on gross dividends diverges from capital gains. Rather, Lally argues that the regression coefficient on franking credits may be constituted as

²⁵⁸ Australian Competition Tribunal, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT9*, October 2010.

²⁵⁹ M. Lally, *Estimating Gamma*, Report for the QCA, 25 November 2013.

²⁶⁰ The tax statistics estimates were updated by NERA in 2013 and submitted by the Energy Networks Association as part of the Rate of Return Guidelines process (see NERA, *The Payout Ratio*, June 2013).

²⁶¹ *Ibid.*

- a product of the utilisation rate θ and the regression coefficient on the value of the dividend in determining the resulting share price drop off.²⁶²
583. It follows then, that in order to derive the required utilisation rate, θ , from dividend drop off studies, the estimated coefficient of the franking credit must be divided by the estimated coefficient of the cash dividend.
584. Adjusting the estimates utilised for the gas rate of return guidelines in this way, dividing the estimated regression coefficient on the franking credit by the estimated regression coefficient of the cash dividend, results in an estimate of θ of 0.4 from the SFG analysis,²⁶³ and a range of 0.38 – 0.69 from the robust results of the Authority's own analysis.²⁶⁴
585. SFG has noted that other factors may also be captured in the regression coefficient on franking credits from dividend drop off studies, casting further doubt on their application for the purpose of estimating θ .²⁶⁵
586. However, the Authority considers that applying the Lally adjustment may bring the estimate of θ derived from dividend drop off studies closer to its true value. Given the uncertainty associated with the adjustment, the Authority has only extended the estimated range for θ from dividend drop off studies at the upper bound, to a rounded 0.7, to account for the upper bound estimate of 0.69. The Authority has also rounded the lower bound estimate down to 0.3 to account for the uncertainty in the estimates. The Authority's resulting range for θ derived from dividend drop off studies is 0.3 to 0.7.
587. The Authority notes that dividend drop off studies provide for a market based measure. The Authority agrees with Lally that there are other reasons why estimates developed through dividend drop off studies may not correctly estimate the required utilisation rate required under the Officer framework, as, among other things:²⁶⁶
- The required utilisation rate under the Officer framework is a complex weighted average determined by the value of equity that investor's hold and their relative risk aversion. Dividend drop off studies, however, only estimate the value weighted utilisation rate around just two days, the cum-dividend and ex-dividend dates. As a consequence, they provide an estimate of the utilisation rate with a value weighting that reflects the composition of investors around the cum and ex-dividend dates, not the weighted average across the entire market over an entire year, as required.²⁶⁷

²⁶² Note that Lally refers to θ by the equivalent symbol U (see M. Lally, *Estimating Gamma*, Report for the QCA, 25 November 2013, p. 21).

²⁶³ SFG Consulting, *Dividend drop-off estimate of theta*, Final Report, 21 March 2011.

²⁶⁴ The upper bound of 0.69 is the division of the upper bound utilisation estimate of 0.53 by the coefficient on the cash dividend of 0.77 (see Table 5 in D. Vo, B. Gellard, S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013).

²⁶⁵ SFG Consulting, *An appropriate regulatory estimate of gamma*, Report for Aurizon Ltd, 16 January 2014.

²⁶⁶ M. Lally, *The Estimation of Gamma*, Report for the AER, 23 November 2013, p. 20.

²⁶⁷ The AER have observed that problems with dividend drop off studies include (Australian Energy Regulator, *Explanatory Statement – Rate of Return Guideline*, December 2013, p. 167):

- the problems of 'allocating' the effect of share price changes ex-dividend to a range of potential drivers, including the dividend, the franking credit, income taxes, capital gains taxes, discounting for the effect of time, and potentially some transactions costs, as well as other econometric challenges and issues;

- There are significant econometric challenges in estimating θ from dividend drop of studies. Trading around the ex-dividend date reflects a variety of different incentives and price movements. Dividend drop off studies may not accurately separate out the effect of the taxation incentive associated with imputation credits on the share price change.

588. For these reasons, the Authority has determined to place limited weight on the dividend drop off estimates, and on the range of applied market value estimates more generally.
589. The Authority has instead considered other approaches to estimating θ (for more detail, see Appendix 5).
590. In summary, the Authority considers that two estimation methods for determining the utilisation rate – the ‘equity ownership’ approach and the ‘taxation statistics’ approach – warrant primary consideration for the purposes of this draft decision. In addition, the Authority also gives weight to the so-called ‘conceptual goal posts’ approach. Each of these approaches is described in what follows.
591. First, the Authority notes that the equity ownership approach, can provide for an estimate of the utilisation rate that is consistent with Officer CAPM. This is because the majority of domestic investors will be eligible to redeem imputation credits (and therefore have an implied utilisation rate of 1), while foreign investors will not be eligible (with an implied utilisation rate of 0). The proportion of domestic ownership of capital investments therefore provides a simple and transparent estimate of the utilisation rate.
592. The Authority notes that resulting estimate does not account for the required risk weighting of utilisation rates. However, the Authority is not aware of any means to incorporate such a consideration.²⁶⁸ Therefore, the Authority accepts that current estimates of domestic investors’ equity ownership share – which suggest a proportion of around 0.56 for listed equity, and continue to support an estimate of 0.7 for listed and unlisted equity – provide relevant information for determining the value of θ .²⁶⁹
593. The Authority’s preference is to adopt an estimate based on the equity ownership of *listed and unlisted* equities, consistent with the approach adopted to estimate the distribution rate set out above. The Authority considered switching its estimation approach to be based on listed equity ownership only, as this underpins other parameter estimates for the rate of return. However, the resulting estimate of the utilisation rate, of 0.56, would fall outside the bounds for the utilisation rate, of 0.6 to

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- the price change not reflecting accurately the impact of the share going ex-dividend, due to market movements in the share price swamping the effect of the dividend and franking credit, bid-ask bounce effects (if the dividend is small relative to the spread between bid and asking prices) thin trading effects, or delays in relevant price movements being fully expressed in share prices.

²⁶⁸ Lally observes that ignoring risk weighting may be reasonable if it is assumed that individual investors’ risk aversion is uncorrelated with their utilisation rate (see M. Lally, *The Estimation of Gamma*, Report for the AER, 23 November 2013, p. 11).

²⁶⁹ Queensland Competition Authority, *Final Decision: cost of capital: market parameters*, August 2014, p. 98. The Authority notes that Hathaway has recently examined this data, finding figures closer to 0.8. However, as noted by the AER: ‘Given they are the primary authors of this data, the ABS reported figures might be considered more reliable.’ (Australian Energy Regulator, *Explanatory Statement – Rate of Return Guideline*, December 2013, p. 172).

- 1 inferred from the conceptual goal posts approach (see below), and is therefore rejected.²⁷⁰
594. Second, the Authority agrees with the AER that taxation statistics – which report the proportion of imputation credits redeemed by domestic investors – suggest a utilisation rate of 0.4 to 0.8. However, the Authority only gives low weight to this estimate, as there are relevant concerns with regard to the data quality and consistency. Hathaway, for example, has cautioned against use of this data, given the observed large discrepancies in relation to franking credits when comparing ATO taxation data to ATO company financial data. Accordingly, the Authority does not consider that the taxation statistics methodology can be given much weight in determining the required utilisation rate, θ .
595. Third, the Authority considers that the ‘conceptual goal posts’ approach provides an indicative guide for the determination of θ , given the presence of foreign investors in the domestic market. This approach recognises that the estimate of the rate of return required by investors in the domestic market (which allows for imputation) should lie between the bounds of an estimate related to a completely segmented domestic financial market (with a corresponding θ of close to 1) and a domestic market fully integrated with global market (with a corresponding θ of close to 0).
596. On this basis, the Authority notes – based primarily on the estimates of Lally – that θ should conceptually lie within the range of 0.6 to 1 (see Appendix 8).²⁷¹
597. The Authority therefore has considered a range of estimates for θ , based on:
- dividend drop off studies – which suggest an estimate of θ in the range of 0.3 to 0.7 – this is given low weight;
 - equity ownership – which suggests an estimate of θ of 0.7, based on the ownership of listed and unlisted equities – this estimate is given most weight;
 - taxation statistics – which suggest θ is in the range of 0.4 to 0.8 – these estimates are given low weight; and
 - the conceptual goal posts – which suggest θ is in the range of 0.6 to 1 – these estimates are given some weight.
598. The Authority has exercised its judgment across the resulting, somewhat divergent, set of estimates. The Authority considers that an estimate of 0.7 provides a most likely estimate of the utilisation rate that takes account of the various ranges, and the Authority’s weighting of their robustness.

²⁷⁰ That said, the Authority notes that the corresponding distribution rate for listed equities – as estimated by Lally – is 0.84. Together, the two (internally consistent) parameters indicate a value of gamma of 0.5 when rounded, which is identical to the estimate of gamma for this draft decision.

²⁷¹ In determining this range, the Authority has taken account of differences in the rate of return parameters utilised by Lally in his analysis and those adopted for this draft decision. The Authority has noted SFG Consulting’s contention that the Lally estimates are flawed due to the assumption of the same risk free rate in a fully segmented and fully integrated market (SFG Consulting, *An appropriate regulatory estimate of gamma*, Report for Aurizon Ltd, 16 January 2014, p. 23). The Authority has also accounted for Lally’s view that the CAPM assumes an exogenous risk free asset (M. Lally, *Review of Submissions to the QCA on the MRP, Risk-free Rate and Gamma*, 12 March 2014, p. 31). The Authority considers that there is some merit in SFG’s view that the risk free rate might differ between a fully segmented and a fully integrated capital market. However, the extent and direction of the difference is not clear, as it will depend on the relative supply and demand for risk free assets in each case. Given this, it is possible that the risk free rate could either increase or decrease the lower bound for the estimate of θ under the conceptual goal posts approach. For that reason, the Authority only gives some weight to this estimate, and notes its potential limitations.

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599. The Authority will adopt a point estimate for gamma of 0.5.
600. This estimate is based on the product of a payout ratio of 0.7, and a utilisation rate of 0.7. The resulting estimate of 0.49 is rounded to 0.5, in acknowledgement that the estimate is based on a fairly wide range, and subject to imprecision.

15 Inflation

601. Inflation is defined as the rate of change in the general level of prices of goods and services. A nominal WACC incorporates the 'real' rate of return, as well as a component rate that reflects expectations of inflation.
602. An estimate of the forecast rate of inflation is important for the rail WACC, as it allows conversion of nominal observed values to real values for input to the real pre-tax WACC calculation.

15.1 Current approach

603. Australian regulators have typically derived values of real and nominal risk free rates from capital-market observations of implied yields on long-term inflation-indexed Treasury bonds (real) and non-indexed (nominal) Commonwealth Government Securities. A forecast of inflation has then been derived from the difference in implied yields of the two types of bonds.
604. The Rail Access Regulator and the Authority adopted this so-called 'Treasury bond approach' for WACC determinations up to 2008. Inflation forecasts were updated annually for each rail WACC determination using this method.

15.2 Considerations of the Authority

605. The Authority has moved to adopt the Wright approach for determining the real return on equity and market risk premium (see chapter 11). In order to derive the estimate of the MRP, the real return on the market needs to be converted to nominal terms.
606. Furthermore, resulting nominal estimates for the return on debt and the return on equity need to be converted from nominal back to real estimates, for the purpose of developing the real pre-tax WACC.
607. Given the long term of the asset classes to which the rail WACC estimates apply – approaching 50 years or more – the Authority considers that the appropriate estimate for inflation going forward is the mid-point of the Reserve Bank of Australia's inflation target, which is 2 to 3 per cent.
608. The resulting forward looking estimate for inflation is therefore 2.5 per cent.

15.3 Draft decision

609. Given the long term of the rail WACC estimates the Authority will adopt a forward looking estimate of inflation of 2.5 per cent. This is consistent with the mid-point of the Reserve Bank of Australia's inflation target, which is 2 to 3 per cent

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Appendix 1 Econometric estimation of the required equity beta

1. In his advice to the AER, Henry outlined that beta is best estimated by applying regression analysis to the following equation:²⁷²

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t} \quad (12)$$

where

β_i is the required equity beta for asset i ;

r_{it} is the observed raw returns to asset i in year t ;

r_{mt} is the observed market returns in year t ;

α_i is a constant specific to asset i ; and

ε_{it} are the residuals.

2. Based on this advice, the Authority has adopted equation (12) as the basis for empirically estimating the equity beta for regulated rail networks. The Authority notes that equation (7) produces an estimate of a firm's equity beta. In order to arrive at an estimate of a firm's asset beta, the estimated equity beta is de-levered by the use of the Brealey-Myers formula as shown in equation (10). As discussed above, the Authority requires an estimate of each comparable firm's asset beta to inform the permissible range of asset betas for the regulated entities. After estimating the required asset beta for each of the regulated entities, the Authority will calculate the required equity beta by the use of equation (10) and assumed benchmark gearing level to re-lever the asset beta to the assumed level of gearing.
3. Returns employed in CAPM regressions are usually based on continuously compounded returns, which is presented in equation (13) below. Both the AER²⁷³ and Henry found no evidence that estimates obtained from discretely compounded data, as presented in equation (14), are manifestly different from those obtained from continuously compounded data.
4. As a consequence, the Authority has used continuously compounded returns as described in equation (3) for estimating equity beta.

²⁷² Henry, O, "Estimation Beta", *Advice Submitted to the Australian Competition and Consumer Commission*, www.accc.gov.au, 2009, p. 2.

²⁷³ Australian Energy Regulator, *Explanatory Statement Rate of Return Guidelines*, December 2013, p. 84.

$$r_{i,t}^c = \ln[(p_{i,t-1} + d_{i,t}) / p_{i,t-1}] \quad (13)$$

$$r_{i,t}^d = \frac{p_{i,t} - p_{i,t-1} + d_{i,t}}{p_{i,t-1}} \quad (14)$$

where

$r_{i,t}^c$ is the continuously compounded return for asset i in day t ; taking into account dividend d ;

$r_{i,t}^d$ is the discretely compounded return for asset i in day t ; taking into account dividend d ;

p_{it} is the price of asset i in day t ; and

d_{it} is the dividend payout to asset i on day t .

5. The Authority is of the view that weekly data is preferred to monthly data. It is noted that estimates of equity beta using monthly data create a smaller sample which is likely to result in a reduced statistical efficiency of the estimates. In addition, the Authority notes that estimates using monthly data are also vulnerable to the 'day-of-the-week effect'. This means that if prices are dependent on the day-of-the-week, then this effect is required to be controlled to ensure that returns are observed on the same weekday (Monday, Tuesday, Wednesday, Thursday, Friday). This effect cannot be controlled when monthly data is used because a calendar month can end on any day of the week. In his advice to the AER in 2008, Henry discussed the issue of daily versus monthly estimates.²⁷⁴ He then concluded that weekly data is an appropriate trade-off between noisy daily data and lack of degrees of freedom (due to smaller samples) using monthly data. The Authority therefore concludes that weekly intervals, ending on a Friday, are appropriate for equity beta estimation.
6. Formally, the beta coefficient of each comparator company, β , is estimated by utilising a regression estimator on the following equation:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t} \quad (15)$$

where

α_i is the return due to factors unrelated to market movements;

β_i is the equity beta; and

$\varepsilon_{i,t}$ is an error term.

²⁷⁴ Ibid.

7. The traditional regression estimator, the Ordinary Least Squares (**OLS**) estimator, is only appropriate if the Gauss-Markov conditions are satisfied. If equation (15) satisfies the conditions below (known as the Gauss-Markov assumptions), then the Best Linear Unbiased Estimator (**BLUE**) for equation (15) would be the Ordinary Least Squares estimator, with the following properties:²⁷⁵

$$E[\varepsilon_i] = 0.$$

$$\text{Var}[\varepsilon_i] = \sigma^2$$

$$\text{Cov}[\varepsilon_i, \varepsilon_j] = 0 \text{ if } i \neq j$$

$$\varepsilon_i \sim N(0, \sigma^2)$$

8. The statistical literature contains vast evidence describing the failure of OLS to correctly estimate regression coefficients in the situation where the Gauss-Markov assumptions are violated.²⁷⁶ The Authority notes that testing the validity of the Gauss-Markov assumptions can only occur after equation (15) has been estimated, and has proceeded to do so in Appendix 4.
9. In his analysis, Henry outlined the possibility of the existence of heteroscedasticity and outliers existing in the data used to estimate beta. Heteroscedasticity refers to the errors of a regression model being related to the current observation, $\text{Var}[\varepsilon_{i,t}] = \sigma_i^2$. This conflicts with the Gauss-Markov assumptions of a constant variance across the errors, $\text{Var}[\varepsilon_i] = \sigma^2$. In addition, the existence of outliers can cause traditional regression techniques to fail, and cause the resulting beta estimate to not reflect the bulk of the data. The existence of outliers in the data contradicts the Gauss-Markov assumption of normally distributed errors, or $\varepsilon_i \sim N(0, \sigma^2)$. It is noted that the Authority has previously rejected approaches which are used to remove outliers based on prior knowledge on the basis that they can be subjective.²⁷⁷
10. Evidence presented in Appendix 4 regarding OLS highlights the non-normality of data used for estimating equity beta. The Authority notes that it is also likely that the variance of the errors will change over time and the residuals are likely to be correlated. For example, during periods of high volatility, it is expected that larger errors would be observed. As a consequence, the Authority is of the view that the Gauss-Markov assumptions are violated when estimating the equity beta of rail comparator companies. As a consequence, utilising only the OLS estimator is inappropriate for beta estimation.
11. Henry suggested using the Least Absolute Deviations (**LAD**) estimator, to reduce the influence of outliers and heteroscedasticity on the resulting beta estimate. The Authority has employed the OLS and LAD methods, in addition to: (i) (**MM**) the robust regression methodology, and (ii) the Theil-Sen methodology in estimating the required beta. The use of these four regression estimators is a consequence of Andersen (2008), who notes that unless data is well behaved different robust estimators will give widely different results, and as a consequence suggests utilising

²⁷⁵ Hill R.C., Griffiths W.E, Lim G.C, *Principles of Econometrics*, 2008, p. 32.

²⁷⁶ Gross J., *Linear Regression*, Springer Publishing, 2003, p. 53.

²⁷⁷ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, December 2013, p. 165.

a variety of robust regression procedures in addition to OLS when undertaking regression analysis.²⁷⁸

12. The Authority notes that the use of robust regression is not primarily to reduce the influence outliers have on beta estimation. Rather, the introduction of “outlier-resistant” technique has been a consequence of the assumptions underpinning the OLS estimator being violated. The MM estimator has previously been utilised in studies which have been used in regulatory decisions with respect to gamma.²⁷⁹ The Authority has also adopted this MM method in its recent empirical study on the estimate of the market value of franking credits. The MM regression is a form of robust regression that has a high breakdown point (50 per cent) and high statistical efficiency (95 per cent). The MM regression has the highest breakdown point and statistical efficiency of robust regression estimators currently available, and for this reason, it was adopted in the Authority’s analysis of the equity beta for gas networks in 2013.²⁸⁰ A detailed discussion of the MM estimator can be found in Appendix 17 of the rate of return guidelines for gas.²⁸¹
13. Fabozzi (2013) suggests the use of the Theil-Sen estimator for estimating the appropriate value for beta.²⁸² Fabozzi proposes this estimator in response to the OLS estimator being acutely sensitive to outliers. Fabozzi suggests that outliers in financial data are far more common than is usually assumed, and that it is surprising that the Theil-Sen estimator is not more widely used and appreciated. This was one of the main reasons behind the Authority’s adoption of the method in its 2013 analysis.²⁸³ A detailed discussion of the Theil-Sen estimator can be found in Appendix 17 of the rate of return guidelines for gas.²⁸⁴

²⁷⁸ Andersen, R., *Modern Methods for Robust Regression*. Thousand Oakes: SAGE Publications, 2008, pp. 91-92.

²⁷⁹ SFG 2011, *Dividend drop-off estimate of theta*, A report to the Australian Competition Tribunal and the Australian Energy Regulator, Final Report, 21 March 2011.

²⁸⁰ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines, December 2013.

²⁸¹ Economic Regulation Authority, Appendices to the Explanatory Statement for the Rate of Return Guidelines, December 2013. p. 145.

²⁸² Fabozzi, F.J, *Encyclopaedia of Financial Models*, Wiley Publications, 2013, p. 442.

²⁸³ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines, December 2013.

²⁸⁴ Economic Regulation Authority, Appendices to the Explanatory Statement for the Rate of Return Guidelines, December, 2013, p. 145.

Appendix 2 Adjustments to Bloomberg's reporting of data

1. The Bloomberg terminal offers the ability to adjust reported stock prices for events such as stock splits, to keep prices movements comparable to the historical series. For example, if a two-for-one stock split occurs, a share in a particular company that was value at \$50, holding all other factors constant, is now valued at \$25. To maintain comparability to the past data, an adjustment can be made.
2. In the data set using historical pricing, adjustments were made to reflect company equity policy such as spin-offs, stock splits/consolidations, stock dividend/bonus, rights offerings/entitlement. Similarly, the price may drop as a result of dividend payouts which take many forms.
3. The last price was adjusted for all normal and abnormal cash dividend types except omitted, discontinued, deferred or cancelled.
4. Normal dividend adjustments included those dividends made for regular cash, interim, first interim, second interim, third interim, fourth interim, income, estimated partnership distribution, interest on capital, distribution and prorated dividends.
5. Abnormal dividend adjustments were made for special cash, liquidation, capital gains, long-term capital gains, short-term capital gains, memorial, return of capital, rights redemption, miscellaneous, return premium, preferred rights redemption, proceeds/rights, proceeds/shares and proceeds/warrants.
6. Bloomberg offers the ability to make adjustments for changes in volume; however, no such adjustments were made to the series used in this analysis.

Appendix 3 Bootstrap analysis of asset beta

1. Bootstrapping is the statistical procedure by which the sampling distribution of a relevant statistic is estimated by re-sampling the available data.²⁸⁵ The empirically observed or 'bootstrapped' distributions allow the Authority to more robustly check the statistical accuracy of each robust estimator with respect to the OLS estimator. This also allows more accurate confidence intervals to be calculated between the different regression estimators, allowing for direct comparisons between each estimation procedure.
2. This is in contrast to the conventional assumption which assumes a t-distribution for the equity beta coefficients. Given the lack of comparator companies for rail in Australia, and therefore the need to exercise significant regulatory judgment when determining the required beta, the Authority considers the construction of confidence intervals for beta necessary to inform the permissible range of beta values. As a consequence, the Authority considers that it is appropriate to use confidence intervals derived from the bootstrap approach to inform the Authority's judgement in relation to the appropriate range for asset beta. In addition to being able to ascertain the statistical accuracy of estimators, bootstrapping allows theoretical quantities of the sampling distribution to be calculated, such as the median, percentiles and standard error. A detailed discussion of the Bootstrap procedure used by the Authority can be found in the appendices to the rate of return guidelines for gas transmission and distribution networks.²⁸⁶
3. The Authority has used a data set from each firm encompassing a five year period from 1 March 2009 to 28 February 2014, using a weekly sampling interval ending on Friday. Exactly 10,000 bootstrap replications were calculated in order to estimate each sampling distribution. The results of the bootstrapping exercise are set out in the tables below (Table 27, Table 28, Table 29 and Table 30).

²⁸⁵ Fox J., *An R and S-PLUS Companion to Applied Regression*, Appendix p 1, Sage Publishing, 2002.

²⁸⁶ Economic Regulation Authority, *Appendices to Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, Appendix 23.

Table 27 Results of bootstrap analysis for rail comparator companies #1

	Vinci SA	Albertis Infraestructuras SA	Atlantia SPA	Macquarie Atlas Roads Group	Transurban Group
OLS Estimate	0.65	0.32	0.32	0.50	0.30
Mean	0.65	0.33	0.32	0.50	0.29
<i>bias_B</i>	0.00	-0.01	0.00	0.00	0.01
Median	0.65	0.33	0.32	0.50	0.29
95% Confidence Interval	[0.60,,.70]	[0.26,0.37]	[0.29,0.37]	[0.39,0.61]	[0.18,,.42]
Bootstrapped Standard Error	0.027	0.021	0.021	0.060	0.062
LAD Estimate	0.69	0.33	0.33	0.42	0.26
Mean	0.68	0.32	0.33	0.42	0.26
<i>bias_B</i>	0.01	0.01	0.00	0.00	0.00
Median	0.68	0.33	0.33	0.43	0.25
95% Confidence Interval	[0.64,0.72]	[0.28,0.38]	[0.28,0.36]	[0.30,0.56]	[0.14,0.36]
Bootstrapped Standard Error	0.022	0.024	0.024	0.069	0.050
MM Estimate	0.67	0.31	0.32	0.45	0.28
Mean	0.67	0.31	0.33	0.44	0.24
<i>bias_B</i>	0.00	0.00	-0.01	0.01	0.04
Median	0.67	0.31	0.33	0.44	0.25
95% Confidence Interval	[0.63,0.71]	[0.28,0.38]	[0.28,0.35]	[0.33,0.56]	[0.15,0.33]
Bootstrapped Standard Error	0.021	0.016	0.016	0.061	0.046
TS Estimate	0.66	0.31	0.31	0.44	0.24
Mean	0.66	0.31	0.32	0.45	0.23
<i>bias_B</i>	0.00	0.00	-0.01	-0.01	0.01
Median	0.66	0.31	0.32	0.44	0.23
95% Confidence Interval	[0.62,0.71]	[0.27,0.36]	[0.28,0.35]	[0.33,0.57]	[0.14,0.32]
Bootstrapped Standard Error	0.023	0.017	0.017	0.062	0.046

Source: Economic Regulation Authority analysis

Table 28 Results of bootstrap analysis for rail comparator companies #2

	Union Pacific Corporation	Norfolk Southern Corporation	Canadian Pacific Railway	Canadian National Railway	CSX Corporation
OLS Estimate	1.01	0.99	0.83	0.62	1.08
Mean	1.02	0.99	0.83	0.63	1.09
<i>bias_B</i>	-0.01	0.00	0.00	-0.01	-0.01
Median	1.02	0.99	0.83	0.63	1.08
95% Confidence Interval	[0.89,1.13]	[0.87,1.12]	[0.67,0.98]	[0.51,0.74]	[0.95,1.22]
Bootstrapped Standard Error	0.061	0.064	0.077	0.059	0.067
LAD Estimate	1.02	0.92	0.73	0.65	1.10
Mean	1.01	0.93	0.77	0.63	1.09
<i>bias_B</i>	0.01	-0.01	-0.04	0.02	0.01
Median	0.99	0.92	0.76	0.64	1.10
95% Confidence Interval	[0.86,1.17]	[0.82,1.11]	[0.58,0.96]	[0.46,0.77]	[0.96,1.18]
Bootstrapped Standard Error	0.081	0.071	0.111	0.078	0.056
MM Estimate	1.01	0.97	0.81	0.63	1.08
Mean	1.01	0.96	0.79	0.64	1.08
<i>bias_B</i>	0.00	0.01	0.02	-0.01	0.00
Median	1.01	0.96	0.80	0.64	1.08
95% Confidence Interval	[0.88,1.13]	[0.83,1.10]	[0.64,0.93]	[0.52,0.76]	[0.95,1.21]
Bootstrapped Standard Error	0.063	0.071	0.075	0.059	0.067
TS Estimate	1.02	0.97	0.76	0.62	1.09
Mean	1.03	0.98	0.76	0.62	1.09
<i>bias_B</i>	-0.01	-0.01	0.00	0.00	0.00
Median	1.03	0.97	0.76	0.63	1.09
95% Confidence Interval	[0.91,1.15]	[0.87,1.09]	[0.61,0.91]	[0.51,0.74]	[0.98,1.20]
Bootstrapped Standard Error	0.060	0.060	0.072	0.058	0.057

Source: Economic Regulation Authority analysis

Table 29 Results of bootstrap analysis for rail comparator companies #3

	Toll Holdings Limited	Aurizon Holdings	Genesee & Wyoming Inc.	Kansas City Southern	Asciano Limited
OLS Estimate	0.92	0.65	1.16	1.40	0.75
Mean	0.93	0.65	1.16	1.40	0.75
<i>bias_B</i>	-0.01	0.00	0.00	0.00	0.00
Median	0.92	0.64	1.16	1.40	0.74
95% Confidence Interval	[0.72,1.16]	[0.49,0.81]	[1.04,1.30]	[1.19,1.62]	[0.55,0.95]
Bootstrapped Standard Error	0.11	0.083	0.065	0.112	0.103
LAD Estimate	0.88	0.67	1.14	1.34	0.63
Mean	0.88	0.68	1.15	1.33	0.62
<i>bias_B</i>	0.00	-0.01	-0.01	0.01	0.01
Median	0.87	0.67	1.15	1.34	0.63
95% Confidence Interval	[0.70,1.08]	[0.52,0.89]	[1.01,1.30]	[1.21,1.45]	[0.53,0.70]
Bootstrapped Standard Error	0.091	0.089	0.068	0.061	0.047
MM Estimate	0.87	0.68	1.14	1.40	0.63
Mean	0.87	0.68	1.13	1.39	0.59
<i>bias_B</i>	0.00	0.00	0.01	0.01	0.04
Median	0.87	0.68	1.13	1.40	0.59
95% Confidence Interval	[0.75,1.01]	[0.52,0.86]	[1.00,1.30]	[1.22,1.56]	[0.51,0.67]
Bootstrapped Standard Error	0.067	0.086	0.065	0.085	0.041
TS Estimate	0.90	0.70	1.16	1.38	0.61
Mean	0.91	0.70	1.16	1.38	0.61
<i>bias_B</i>	0.00	0.00	0.00	0.00	0.00
Median	0.91	0.70	1.16	1.37	0.61
95% Confidence Interval	[0.77,1.06]	[0.53,0.87]	[1.03,1.27]	[1.22,1.54]	[0.52,0.71]
Bootstrapped Standard Error	0.074	0.088	0.059	0.080	0.049

Source: Economic Regulation Authority analysis

Table 30 Results of bootstrap analysis for rail comparator companies #4

	Port of Tauranga Limited	Infratil Limited	Auckland International Airport Limited
OLS Estimate	0.60	0.34	0.72
Mean	0.58	0.34	0.69
<i>bias_B</i>	0.02	0.00	0.03
Median	0.59	0.34	0.69
95% Confidence Interval	[0.39,0.75]	[0.26,0.42]	[0.55,0.85]
Bootstrapped Standard Error	0.093	0.041	0.076
LAD Estimate	0.52	0.30	0.70
Mean	0.53	0.30	0.68
<i>bias_B</i>	-0.01	0.00	0.02
Median	0.53	0.29	0.69
95% Confidence Interval	[0.33,0.70]	[0.20,0.39]	[0.50,0.81]
Bootstrapped Standard Error	0.092	0.050	0.082
MM Estimate	0.56	0.32	0.67
Mean	0.58	0.31	0.63
<i>bias_B</i>	-0.02	0.01	0.04
Median	0.58	0.31	0.63
95% Confidence Interval	[0.40,0.76]	[0.23,0.40]	[0.51,0.76]
Bootstrapped Standard Error	0.092	0.042	0.063
TS Estimate	0.53	0.31	0.70
Mean	0.53	0.32	0.69
<i>bias_B</i>	0.00	-0.01	0.01
Median	0.53	0.32	0.68
95% Confidence Interval	[0.37,0.69]	[0.23,0.40]	[0.56,0.82]
Bootstrapped Standard Error	0.082	0.043	0.065

Source: Economic Regulation Authority analysis

Appendix 4 Testing asset beta regression assumptions

1. As discussed in section 12.2.3, the OLS estimator is only appropriate if the Gauss-Markov conditions are satisfied.
2. In order to verify whether or not the assumptions underlying Ordinary Least Squares (**OLS**) regressions are violated in relation to the estimates of equity beta, the Authority has conducted various hypothesis tests designed to test the normality assumption. Regressions for each firm were run over the period 1 March 2009 to 28 February 2014. The residuals were extracted from the OLS beta estimated over the period so that tests could be carried out to determine their distribution. Jarque-Bera tests were carried out to test the null hypothesis of the error series following a normal distribution – an assumption underlying OLS regression.²⁸⁷ The Jarque-Bera test statistic is a goodness-of-fit test analysing the skewness and kurtosis present within residual data. A p-value of less than 0.05 strongly rejects the hypothesis of residuals following a normal distribution, indicating that there is substantial statistical evidence that OLS regression is inappropriate. The Jarque-Bera tests were carried out using the R software package, using the library `tseries` and function `jarque.bera.test()` applied to the residuals of the OLS regression.²⁸⁸ The results are set out below (Table 31).
3. The Authority notes that the Jarque-Bera tests do not reject the Null Hypothesis of normally distributed residuals for Canadian National Railway. As a consequence, there is no statistical evidence to reject the assumption of normally distributed errors for Canadian National Railway. Furthermore, the Authority notes that the bootstrapped standard errors present in Table 28 in Appendix 4 for the OLS estimator of Canadian National Railway is generally lower than that of the robust regression estimators, which provides supporting evidence that the Gauss-Markov assumptions are satisfied for Canadian National Railway.
4. The Authority therefore concludes that the OLS estimator is the most appropriate estimator of the beta for Canadian National Railway as no statistical evidence exists to reject the Gauss-Markov assumptions. As a consequence, the evidence regarding the beta for Canadian National Railway should only be informed by the use of the OLS estimator. However, given the violation of the normality assumption for the remaining companies in the sample, the robust regression results for these companies are still applicable as the normality assumption is rejected.

²⁸⁷ Jarque C.M. and Bera A.K., “A Test for Normality of Observations and Regression Residuals”, *International Statistical Review*, Vol. 55, No.2, August 1987, pp. 163-172.

²⁸⁸ Documentation available at: <http://127.0.0.1:18027/library/tseries/html/jarque.bera.test.html>.

Table 31 Results of Jarque-Bera tests for rail comparator companies

Company	p value	Outcome
Vinci SA	<0.0001	Reject Normality Assumption
Albertis Infraestructuras SA	<0.0001	Reject Normality Assumption
Atlantia SPA	<0.0001	Reject Normality Assumption
Macquarie Atlas Roads Group	<0.0001	Reject Normality Assumption
Transurban Group	<0.0001	Reject Normality Assumption
Union Pacific Corporation	<0.0001	Reject Normality Assumption
Norfolk Southern Corporation	<0.0001	Reject Normality Assumption
Canadian Pacific Railway	0.0002	Reject Normality Assumption
Canadian National Railway	0.1708	Accept Normality Assumption
CSX Corporation	0.0101	Reject Normality Assumption
Toll Holdings Limited	<0.0001	Reject Normality Assumption
Aurizon Holdings	<0.0001	Reject Normality Assumption
Asciano Limited	<0.0001	Reject Normality Assumption
Genesee & Wyoming Inc.	<0.0001	Reject Normality Assumption
Kansas City Southern	<0.0001	Reject Normality Assumption
Port of Tauranga Limited	<0.0001	Reject Normality Assumption
Infratil Limited	0.0431	Reject Normality Assumption
Auckland International Airport Limited	<0.0001	Reject Normality Assumption

Source: Economic Regulation Authority analysis

Appendix 5 The estimation of gamma

1. Prior to 1987, company profits were first taxed at the company level, and taxed again in the form of dividends paid out to shareholders as personal income tax. The imputation tax system avoids corporate profits being taxed twice. Under the Australian imputation tax system, a franking credit is distributed to individuals with dividends to offset personal taxation liability. The franking credit represents the amount of personal taxation already paid at the corporate level, therefore preventing corporate income being taxed twice. Imputation credits in Australia have a face value of one dollar per credit which can be claimed as a rebate to offset personal tax liabilities. Since 1 July 2000, a refund on any excess credits over personal tax liabilities can be claimed. However, international investors cannot utilise imputation tax credits; imputation tax credits only provide benefits to Australian investors.

The Officer framework and the NGR

2. The theoretical framework for examining how franking credits alter the weighted average cost of capital (**WACC**) was proposed by Officer (1994).²⁸⁹ Under the Officer CAPM, a segmented domestic capital market is assumed. By considering the Earnings Before Interest and Tax (**EBIT**) of a company, and how it is distributed between the government (via taxation), debt holders and equity holders the firm's before tax WACC can be derived. A firm's EBIT is distributed as follows:

$$X_O = X_G + X_D + X_E$$

where

X_O is operating income

X_G is the government's share of operating income (taxation),

X_D is the debt holders share of operating income, and

X_E is the equity holder's share of operating income

3. Under an imputation tax system, companies 'pre-collect' personal income tax for governments when they pay company tax. The proportion of the tax collected from the company which will be rebated against personal tax is the parameter gamma. It is convenient to consider gamma as the proportion of personal income tax collected at the company level. As a consequence, the effective company taxation is defined as:

$$\begin{aligned} X_G &= T(X_O - X_D) - \gamma T(X_O - X_D) \\ &= T(X_O - X_D)(1 - \gamma) \end{aligned}$$

4. Therefore, in this representation, gamma is the proportion of tax collected from the company which gives rise to franking credits. Gamma can be considered as the proportion of company tax that is used as prepayment of personal tax liabilities.²⁹⁰

²⁸⁹ R.R. Officer, "The Cost of Capital of a Company Under an Imputation Tax System", *Accounting & Finance*, 1994, pp. 1-17.

²⁹⁰ N.J. Hathaway and R.R. Officer, *The Value of Imputation Tax Credits*, Working paper, Melbourne Business School, (2004).

5. Substituting into EBIT yields:

$$X_0 = T(X_0 - X_D)(1 - \gamma) + X_D + X_E$$

Solving for X_0 :

$$X_0 = \frac{X_E}{(1 - T(1 - \gamma))} + X_D$$

6. The weighted average cost of capital can be derived by substituting the perpetuity definitions of value.

Let

$$E = \frac{X_E}{r_e} \quad D = \frac{X_D}{r_D} \quad \text{and} \quad V = \frac{X_0}{r_0}$$

where

E is the value of equity;
 r_e is the required rate of return to equity holders after-company tax but before-personal tax;
 D is the value of debt;
 V is the sum of debt and equity;
 r_D is the required return to debt holders after tax, i.e. the cost of debt capital; and
 r_0 is the required return before taxes or the before-tax weighted average cost of capital (WACC).

7. Substituting these definitions yields the pre-tax cost of capital:

$$r_0 = \frac{r_e}{(1 - T(1 - \gamma))} \cdot \frac{E}{V} + r_D \cdot \frac{D}{V} \quad (1)$$

8. As may be observed in equation 1, under a pre-tax WACC framework, the impact of imputation credits on effective corporate tax rates are incorporated in the WACC itself, such that the gamma (γ) becomes a WACC parameter.9. The proportion of corporate tax reduced by franking credits, gamma (γ), may be factored into two components:

- the fraction of imputation credits created that are assumed to be distributed to shareholders (F);
- the proportion of imputation credits distributed that are redeemed – the utilisation rate (θ).

10. It follows that gamma can be represented by the formula set out in equation (3) below:

$$\gamma = F \cdot \theta \quad (3)$$

11. This is known as the Monkhouse formula.²⁹¹

The Authority's previous position

12. The Authority's prior position regarding the gamma parameter – set out in the gas rate of return guidelines – accounted for stakeholder input and a range of consultants' reports, as well as the Australian Competition Tribunal's (**ACT**) ruling in the application by Energex Limited.²⁹²
13. With regard to the distribution rate F , the ACT concluded that 0.7 was the appropriate value for use in the estimation of gamma. The Authority was not aware of any new information with regard to the distribution rate since the ACT decision. As a consequence, the Authority retained the value of 0.7 for the distribution rate for the Rate of Return Guidelines.²⁹³
14. On the estimate of the utilisation rate θ , the ACT relied solely on the use of dividend drop off studies to reach its decision. Of particular note, the ACT chose to disregard the use of the Beggs and Skeels (2006) study.²⁹⁴ The ACT concluded that SFG's final 2011 study was the best dividend drop off study available, and as a consequence, the Tribunal used the results of the study in its determination of the utilisation rate θ . The ACT ruled that an appropriate value for gamma is 0.25, which reflected a value for the distribution rate F of 0.70 and a value of θ of 0.35.
15. The Authority undertook its own dividend drop off estimation study during the development of the Rate of Return Guidelines, which clearly showed the sensitivity of dividend drop off estimates of θ to data selection. Taking into account the findings the 2011 SFG study (subsequently updated by SFG in 2013), and its own 2013 study, the Authority considered that the appropriate range for the utilisation rate, θ , was 0.35 - 0.55.

²⁹¹ This follows the analysis by Monkhouse in relation to the impact of imputation credits on the effective tax rate of companies. See equation 2.5 in P. Monkhouse, The valuation of projects under the dividend imputation tax system, *Accounting and Finance*, 36, 1996, p. 192.

²⁹² Australian Competition Tribunal, *Application by Energex Limited (No 2) [2010] ACompT7*, October 2010; Australian Competition Tribunal, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT9*, October 2010; Australian Competition Tribunal, *Application by Energex Limited (Gamma) (No 5) [2011] ACompT*, 9 May 2011.

²⁹³ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, www.erawa.com.au, 16 December 2013, p. 208.

²⁹⁴ D.J. Beggs and C.L. Skeels, 'Market Arbitrage of Cash Dividends and Franking Credits', *The Economic Record*, vol. 82, no 258, 2006, pp. 239–252.

Table 32 Estimated value of theta from relevant dividend drop-off studies

Author	Year	Data	θ
SFG ²⁹⁵	2011/ 2013	DatAnalysis, 2000 -2010	0 - 0.35
ERA ²⁹⁶	2013	Bloomberg, 2001 -2012	0.35 – 0.55

Source: Compiled by the Economic Regulation Authority

16. The Authority's resulting estimate for gamma was in the range of 0.25 to 0.385.
17. The Authority notes the ACT's comment in its decision that the estimate of gamma is an 'ongoing intellectual and empirical endeavour'.²⁹⁷ In particular, the ACT noted the following:²⁹⁸

The Tribunal has found some deficiencies in its understanding of the foundations of the task facing it, and the AER, in determining the appropriate value of gamma. These issues have not been explored so far because they have not arisen between the parties, who appear to be in agreement about how the Rules should be interpreted regarding the treatment of corporate income tax. They may be matters that the Tribunal will take up in its further decision in these matters; or they may best be left until the next WACC review. Indeed, they may go to the basis for the Rules themselves.

18. In light of this, and given new evidence regarding the gamma parameter since the publication of the gas rate of return guidelines, the Authority considers that the method for estimating the gamma parameter warrants re-examination. That new evidence relates principally to two reports by Lally in late 2013:

- the first, for the Australian Energy Regulator (**AER**), explores the theoretical underpinnings of gamma, and evaluates the appropriateness of various methodologies for estimating the utilisation rate parameter, θ ;²⁹⁹ and
- the second, for the Queensland Competition Authority (**QCA**), provides new estimates of the distribution rate parameter, F .³⁰⁰

19. The Authority considers that Lally's material advances the regulatory debate regarding the impact of imputation credits. As a consequence, the Authority has re-examined the gamma parameter for the purposes of this draft decision. In the process, the Authority has taken into account Lally's reports, as well as:

- SFG Consulting's responses to Lally's reports;
- the conclusions of the AER in responding to Lally's report, set out in its rate of return guidelines;³⁰¹ and

²⁹⁵ SFG Consulting, *Dividend drop-off estimate of theta: final report*, 21 March 2011.

²⁹⁶ D. Vo, B. Gellard, B. and S. Mero, 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013.

²⁹⁷ Australian Competition Tribunal, *Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9*, 12 May 2011, paragraph 45.

²⁹⁸ Australian Competition Tribunal, *Application by Energex Limited (No 2) [2010] ACompT* October 2010, paragraph 149.

²⁹⁹ M. Lally, *The Estimation of Gamma*, Report for the AER, 21 November 2013.

³⁰⁰ M. Lally, *Estimating Gamma*, Report for the QCA, 25 November 2013.

³⁰¹ Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, December 2013.

- the conclusions of the QCA in its recent cost of capital determination, which also considered the foregoing material.³⁰²

Lally's findings with regard to the estimation of gamma

20. The recent work by Lally provides estimates of the distribution rate F and the utilisation rate θ .

Distribution rate

21. Lally reviewed estimates of the distribution rate in a report to the QCA in November 2013.³⁰³ Lally established new estimates of the distribution rate based on the financial reports for the 10 largest ASX companies over the period 2000 to 2013. The aggregate average was 85 per cent.
22. SFG Consulting subsequently criticised Lally's estimates as being, among other things, subject to potential error, based on a small sample, and inferior to the previous estimate of 70 per cent based on Australian Taxation Office (ATO) data.³⁰⁴
23. However, Lally notes that NERA analysis points to discrepancies with the ATO estimates, as well as potential bias due to reporting issues. Lally argues that the ASX financial report data is audited, and that his technique to extract the data avoids reporting and aggregation problems.³⁰⁵
24. In response to SFG's critique, Lally extended the sample from 10 to 20 firms, giving coverage of 62 per cent of the ASX 200 by capitalisation. That exercise suggested that the approach is robust to the sample size considered, finding that the average distribution rate is about 84 per cent.³⁰⁶

Utilisation rate

25. In his November 2013 advice to the AER, Lally outlines his interpretation of gamma in the Officer CAPM framework.³⁰⁷ Lally surveys the relevant literature regarding how gamma is interpreted, and notes that a definition of the utilisation rate as being '...the weighted-average over the utilisation rates of all investors in the market, with the weights reflecting both value and risk aversion...' concurs with the academic literature, specifically that of Monkhouse and Lally et al.^{308,309} Treating the utilisation rate θ as a value-weighted average over investors implies that the risk aversion of each investor is uncorrelated with the ability to utilise franking credits. **Note that Lally refers to the utilisation rate in terms of the parameter U, which the Authority considers interchangeably with the parameter θ in what follows – that is, the two parameters refer to the utilisation rate, and are equivalent.**

³⁰² Queensland Competition Authority, *Final decision: cost of capital: market parameters*, August 2014.

³⁰³ M. Lally, *Estimating Gamma*, Report for the QCA, 25 November 2013.

³⁰⁴ SFG Consulting, *An appropriate regulatory estimate of gamma*, Report for Aurizon Ltd, 16 January 2014.

³⁰⁵ M. Lally, Review of submissions to the QCA on the MRP, risk-free rate and gamma, 12 March 2014, p. 29.

³⁰⁶ M. Lally, Review of submissions to the QCA on the MRP, risk-free rate and gamma, 12 March 2014, p. 30.

³⁰⁷ M. Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 12.

³⁰⁸ P. Monkhouse, 'The Cost of Equity under the Australian Dividend Imputation System', *Accounting and Finance*, vol.33(2), 1993, pp. 1-18.

³⁰⁹ M.Lally and T.van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, 2003, pp. 187-210.

26. Lally presents criticism of other interpretations of the utilisation rate U , in which the value of the imputation credits is seen as a market value interpretation.³¹⁰ Lally observes that Officer refers to the gamma parameter as the *value* generated by franking credits, and this is often used in support of a market value interpretation.³¹¹ But Lally disagrees with this assessment, noting that in the same paper Officer defines U as the ‘proportion of tax collected from the company which gives rise to the tax credit associated with a franked dividend’.³¹² The Authority notes that the market value interpretation of the required utilisation rate arises from the ambiguity surrounding Officer’s use of the word *value*; submissions in regulatory proceedings³¹³ have largely claimed this as the Officer framework requiring a market value interpretation of the utilisation rate, ignoring the second definition provided within the same paper.
27. Lally explores how franking credits have an impact on the cost of capital by first observing that if imputation is interpreted as the process by which personal tax is substituted for corporate tax, the standard CAPM is valid under an imputation tax system. However, the taxation rate must now apply to the gross dividend, not the cash dividend.³¹⁴ The Officer CAPM extends the CAPM to reflect this interpretation of the imputation taxation system.
28. Lally elaborates, noting in this framework that the equilibrium expected return on equity is as follows:³¹⁵

$$E[\hat{R}] = R_f + \beta_e [E(\hat{R}_m) - R_f] \quad (4)$$

where:

$E[\hat{R}]$ is the expected return of the equity asset;

R_f is the risk free rate;

β_e is the equity beta defined relative to the Australian market portfolio;

$E(\hat{R}_m)$ is the expected rate of return on the Australian market portfolio inclusive of imputation credits to the extent that they can be used.

29. To demonstrate the role franking credits have on the required return on equity, Lally first decomposes the actual return of the market portfolio under an imputation tax system as follows:

$$\hat{R}_m = R_m + \frac{IC_m}{S_m} U$$

(5)

³¹⁰ ENA, Response to the Draft Rate of Return Guideline of the Australian Energy Regulator, 2013.

³¹¹ R.R. Officer, “The Cost of Capital of a Company Under an Imputation Tax System”, *Accounting & Finance*, 1994, pp. 1-17.

³¹² M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 13.

³¹³ For example, ENA, 2013, Response to the Draft Rate of Return Guideline of the Australian Energy Regulator, 2013

³¹⁴ The gross dividend is the sum of cash dividends and franking credits, to the extent franking credits can be utilised.

³¹⁵ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 9.

where:

R_m is the actual rate of return on the market portfolio excluding franking credits;

U is the utilisation rate of the credits (as noted above, equivalent to θ);

S_m is the current value of the market portfolio;

IC_m is the value of imputation credits related to the assets included in the market portfolio.

30. Therefore, when using the Officer CAPM framework, imputation credits first impact the required return on equity via the estimated value of the market risk premium, $MRP = \hat{R}_m - R_f$.
31. Lally further observes that under an imputation tax system, the present value of equity can be determined by discounting the cash flows arising out of the ownership of the equity, including the benefit from imputation credits, using the rate of return determined in (6). This exercise serves to highlight the utilisation rate required under the Officer framework. Lally notes that in one year, the aggregate cash flow is the sum of the expected cash flows to equity holders (Y_1), less the expected company taxation over the year (Tax_1), plus any value derived from the distribution of franking credits. The latter term is defined as $U \times IC_1$, where IC_1 is the distributed imputation credits. This can be intuitively interpreted as the proportion of received franking credits that the representative investor is able to utilise.³¹⁶
32. Given the expected value of the equity in year one, S_1 , the present value of equity can be deduced by discounting S_1 and the aggregate cash flow using the discount rate in (6) as follows:

$$S_0 = \frac{Y_1 - Tax_1 + IC_1 U + S_1}{(1 + E[\hat{R}])} \quad (6)$$

33. The term IC_1 is defined in (6) as ‘the face value of imputation credits received from ownership of equity over a period of one year’. Given franking credits arise out of the proportion of company tax that is used to reduce personal taxation, it follows that IC_1 can be decomposed into the amount of corporate taxation paid, multiplied by the proportion of company taxes that are distributed as imputation credits (where the latter term is the distribution rate, F , in (3)), or $IC_1 = F \cdot Tax_1$. Equation (6) can then be represented as follows:

$$S_0 = \frac{Y_1 - Tax_1(1 - F \times U) + S_1}{(1 + E[\hat{R}])} \quad (7)$$

Where $\gamma = F \times U$ as in (3) (or equivalently, $\gamma = F \times \theta$).

³¹⁶ As noted in paragraph 36, the utilisation rate is a complex weighted average of the individual’s utilisation rates. If this is interpreted as the proportion of franking credits redeemed by the representative investor, it follows that $U \times IC_1$ is the total benefit the representative investors receives from imputation credits.

34. The above framework interprets the value of franking credits in the Officer CAPM framework. It is clear from equations (6) and (7) that the cash flows are determined in part by the benefit arising from imputation credits, $U \times IC_1$.³¹⁷ Moreover, $U \times IC_1$ can be interpreted as the proportion of franking credits received that are then redeemed by the representative investor. Lally considers that this 'value' is not a market value, but instead the numerical value arising out of the utilised imputation credits received by the representative investor.
35. Lally observes that the utilisation rate is a market-level parameter, meaning that the same value applies to all firms.³¹⁸ Lally further considers that individual investors have differing utilisation rates; investors who are able to fully use tax credits are assigned a value of one whilst investors who cannot are assigned a value of zero. These individual utilisation rates are weighted to produce the required market-level utilisation rate U . Lally considers that the correct interpretation of U can be found in Lally and van Zijl, in which it is shown that ' U is a complex weighted average over all investors holding risky assets, where the weights involve each investor's investment in risky assets and their risk aversion'.^{319,320}
36. This interpretation of the utilisation rate contrasts with the market value interpretation.³²¹ Formally, the above required value of U satisfies the following equation:

$$U = \sum_{i=1}^n w_i \times u_i \quad \text{and} \quad \sum_{i=1}^n w_i = 1 \quad (8)$$

where:

w_i is investor i 's weight, representing 'the complex weighted average over all investors holding risky assets, where the weights involve each investor's investment in risky assets and their risk aversion'.³²²

u_i is investor i 's utilisation rate, where investors who are able to fully use tax credits are assigned a value of one whilst investors who cannot are assigned a value of zero.

37. Lally develops five different approaches for estimating the utilisation rate:³²³
- the first excludes foreigners from the domestic capital market, and draws on theoretical considerations to conclude that the appropriate rate is one;
 - the second allows the presence of foreigners, and leads to an estimate of 'around 0.7' (the equity ownership approach);
 - the third uses the proportion of credits that are redeemed with the Australian Tax Office by all investors (the tax statistics approach), giving an estimate of 0.4 to 0.8;

³¹⁷ Given the role of cash flows in providing returns, the argument in this sentence also applies to the present value of equity.

³¹⁸ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 11.

³¹⁹ Ibid.

³²⁰ M. Lally. and T. van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, 2003, pp. 187-210.

³²¹ M. Lally. and , T. van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, 2003, pp. 187-210.

³²² Ibid.

³²³ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 3.

- the fourth is to use market prices, from cum and ex-dividend share prices, simultaneous share and futures prices, simultaneous share index and futures prices, and regressions of returns on imputation credit yields, giving an average across all approaches, excluding implausible results, of 0.39;
- the fifth is to draw on the surveys of market practitioners, yielding a trend to explicit recognition of credits, and a value of 0.75 among those that do.

38. The detail of these approaches are discussed in more detail in the next section, and in the subsequent material that follows.

39. In summarising his advice to the AER, Lally notes that his preference for the utilisation rate is one. Lally notes that in its draft determination, the AER determined a utilisation rate of 0.7,³²⁴ Lally states his opinion that:³²⁵

However, I think that the AER should also have given consideration to defining U to exclude foreign investors, consistent with the Officer CAPM. Accordingly the only holders of Australian equities would be Australian residents. Since U is a value-weighted average over the utilisation rates of individual investors and all Australian residents (including individuals, superannuation funds, and tax-exempt entities) are able to fully utilise these credits, by offset against other tax obligations or by a tax refund, and therefore have utilisation rates of 1, then U would be 1.

40. Lally continues by noting that if the utilisation rate of 1 is rejected, his next preference is for an utilisation rate of 0.7 based on the equity ownership approach. If this possibility is rejected, his next preference is for the utilisation to be determined by the observation of franking credits redeemed, which he concludes falls in a range of 0.4 to 0.8 and suggests a midpoint of 0.6. If this is also rejected, Lally's fourth preference is to use the implied utilisation rate from market price studies, and suggests an average of 0.39. Lally's last preference is to use the evidence of market practitioners, but notes that this ranges from 0 to 0.75 which as a consequence does not produce a reliable point estimate. Lally concludes by noting that, in his view:³²⁶

...the most important requirements in selecting a methodology for estimating U are that the estimate be consistent with the definition of U, as a value-weighted average over the utilisation rates of all investors who are relevant to the Officer CAPM, that the parameter estimate is likely to give rise to an estimated cost of equity from the Officer model that lies within the bounds arising from either complete segmentation or complete integration of equity markets, and that the estimate is reasonably precise.

AER's rate of return guidelines estimate

41. The AER undertook an extensive re-evaluation of the approach to estimating gamma for its rate of return guidelines.

42. The AER considers that the approach to valuing imputation credits should fit within the Officer and Monkhouse framework, and therefore that:³²⁷

³²⁴ The Authority notes the AER, in their final guidelines also determined a utilisation rate of 0.7, see: Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, December 2013, p. 159.

³²⁵ M. Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 48.

³²⁶ Ibid, p. 49.

³²⁷ Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, www.aer.gov.au, December 2013, p. 161.

The value of imputation credits is investors' expected reduction of effective company tax paid because of imputation credits. Specifically, this is the reduction of company tax measured before personal tax.

43. The AER defines the value of imputation credits consistent with the Lally and van Zijl interpretation (refer paragraph 35), with their value being a weighted average across investors in the *defined market*. This further implies that investors are weighted by the value of the shares they own, in addition to their risk aversion. The AER further observes that this interpretation implies that all investors in the defined market collectively set the price, as opposed to a 'marginal investor'.³²⁸
44. The AER outlines its *defined market* as the 'Australian domestic market that recognises the presence of foreign investors to the extent they invest in the Australian domestic market'.³²⁹ The AER states that this definition sits in between the theoretical definitions of a fully segmented and a fully integrated capital market, which it considers to reflect the true Australian capital market. The Authority notes that this interpretation disagrees with Lally's advice, and this is discussed further below.³³⁰
45. The AER considers that the required estimation of gamma must be a market-wide estimate which applies to both of the sub-components, the payout ratio and utilisation rate. The AER noted that this market-wide interpretation for the utilisation rate is consistent with the Officer framework, and reduces estimation difficulties that would arise if a firm-specific or industry-wide utilisation rate was required.³³¹
46. With respect to the payout ratio, the AER relied on Lally's advice who observed that the Officer framework implies a firm level estimate of the payout ratio is appropriate.³³² However as a practical matter, and to prevent regulatory gaming,³³³ a market-wide ratio is appropriate.
47. The AER adopted an estimate of gamma of 0.5.

Estimate of the payout ratio

48. With respect to the distribution ratio, the AER adopted a value of 0.7 based on NERA evidence regarding the cumulative payout ratio, based on taxation statistics. This estimate is consistent with the ACT's decision regarding the payout ratio.

³²⁸ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 161.

³²⁹ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 161.

³³⁰ M.Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 14.

³³¹ Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, www.aer.gov.au, December 2013, p. 164.

³³² In particular, the correct payout ratio at the firm level would reflect the amount of profits paid out as dividends.

³³³ Lally argues that if a firm specific payout ratio is adopted, regulated firms would have an incentive to reduce their payout ratio in order to manipulate its regulated rate of return.

Estimate of theta

49. The AER determines that the most appropriate utilisation rate is 0.7, based on a range of methodologies outlined by Lally:³³⁴
- the equity ownership approach – gives an estimated range of 0.7 to 0.8 for U, and is given primary weight, as the AER considers it consistent with the conceptual framework of Officer and Monkhouse;
 - tax statistics studies – which suggest a value for U of 0.4 to 0.8, and which is given some regard, despite acknowledged problems with data quality and consistency;
 - implied market value studies – for a range of 0 to 0.5, is given less regard, as the AER considers it is not consistent with the conceptual framework of Officer and Monkhouse, and is complex and difficult to estimate; and
 - the conceptual goal posts approach – for a range for U of 0.8 to 1.0, which provide boundaries for the estimation of U, although the AER does not consider this an empirical approach; and
 - other supporting evidence, including observations about market practice, government tax policy, and imputation equity funds.

The QCA's estimate

50. The QCA in its recent cost of capital determination adopted a value for gamma of 0.47, being the product of an estimated distribution rate of 0.84, and an estimated utilisation rate of 0.56.³³⁵
51. For the distribution rate of 0.84, the QCA relied on Lally's analysis of financial report data from the top 20 firms in the ASX 200 (see above). The QCA prefers Lally's estimates, as it considers it is robust and of high quality. QCA notes the estimation issues apparent in the ATO data, and also observes that the ATO estimates include listed and unlisted companies, whereas other CAPM estimates are estimated relative to listed companies only.³³⁶
52. For the utilisation rate, the QCA adopted an estimate of 0.56 based on updated estimates of the equity ownership shares of Australian listed companies. The QCA considered various strands of work, including in relation to:³³⁷
- dividend drop off studies – noting that there are well documented methodological and econometric problems with these studies, and widespread concern as to their reliability and interpretation, therefore giving low weight to these estimates;
 - tax statistics estimates – citing relevant studies by Hathaway and Handley and Maheswaran for the post 2000 period, which give an average value of around 0.53;
 - equity ownership approach – using an estimate of 44 per cent as the foreign ownership share of listed equities and assuming a utilisation rate of one for domestic resident investors, implying an average utilisation rate of 0.56;

³³⁴ Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, www.aer.gov.au, December 2013, p. 159.

³³⁵ Queensland Competition Authority, *Final Decision: cost of capital: market parameters*, August 2014, p. 28.

³³⁶ Queensland Competition Authority, *Final Decision: cost of capital: market parameters*, August 2014, p. 26.

³³⁷ Queensland Competition Authority, *Final Decision: cost of capital: market parameters*, August 2014, p. 27.

- conceptual goal posts approach – noting that Lally’s estimate using a fully segmented domestic CAPM and a fully integrated CAPM (the latter using the Solnik model) is of some relevance, but also that there is some uncertainty as to the bounds;
- other supporting evidence – citing a KPMG study from 2013 which identified most practitioners explicitly adjust for imputation credits when valuing infrastructure, at a rate that averaged 75 per cent.

Estimating gamma – Authority analysis

53. The estimation of gamma needs to account for both the theoretical underpinnings and the best means to empirically estimate the required parameters.
54. The Authority remains of the view that gamma may be estimated as the product of the distribution rate and utilisation rate, as set out in equation 3. This approach is consistent with the accepted methodology set out by Officer and Monkhouse, as discussed above.

Distribution rate

55. In its recent decisions, the Authority has adopted a distribution rate of 0.7, from within the range of 0.7 to 1. This was the rate accepted by the ACT in its 2011 decision on the gamma. This estimate was retained for the Rate of Return Guidelines, as the Authority considered that there was no new evidence to depart from this finding.³³⁸
56. The 0.7 rate was based on ATO data showing around 70 per cent of total imputation credits created had been distributed. This ATO data covers both listed and unlisted companies.
57. More recent ATO data evaluated by NERA continues to provide support this estimate:³³⁹
- the cumulative distribution ratio from 1996 up to 2010-11, drawn from tax statistics is 0.69, similar to earlier estimates based on this method;
 - the average distribution rate over the last five years, constructed from net tax and the change in the franking account balance is 0.70; and
 - the average distribution rate over the last five years, constructed from net tax and franked dividends distributed is 0.53.
58. NERA considers that the cumulative distribution ratio is the most reliable number, but is likely to be an upwardly biased estimate due to under-reporting by companies of franking account balances and the treatment of firms who go bankrupt.³⁴⁰ NERA also observes that there is no ready explanation for the substantial gap between the other two measures. This raises concerns as to the utility of the ATO estimates.

³³⁸ Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, www.erawa.com.au, 16 December 2013, p. 212.

³³⁹ NERA, *The payout ratio*, Report for the Energy Networks Association, June 2013.

³⁴⁰ NERA, *The payout ratio*, Report for the Energy Networks Association, June 2013, p. 11.

59. These estimates are market averages. It is accepted regulatory practice to adopt a market average, as this avoids regulatory gaming at the firm level, and sample issues at the industry level.
60. The Authority notes Lally's estimate of 0.84, which has been adopted by the QCA. This estimate is based on financial reports of the top 20 ASX 200 listed entities, covering 62 per cent of the ASX 200 market capitalisation. The Authority agrees with the QCA that this estimate well founded, and that the estimate is potentially superior to the other studies, particularly those that are based on data prior to changes to the imputation system in 2000.

Utilisation rate

61. The Authority considers the evidence for the utilisation rate in what follows.

Equity Ownership Approach

62. The equity ownership approach for estimating the utilisation rate relies on the estimated proportion of Australian shares owned by Australian residents who are eligible to utilise imputation credits. Eligible Australian investors use franking credits to offset their personal taxation by the amount of company taxation prepaid, and their utilisation rate is one. Given international investors cannot utilise franking credits, their utilisation rate is zero. It follows that an estimate of the utilisation rate can be calculated by analysing the proportion of Australian equity held by Australian investors.
63. However, the Authority notes that this approach does not reflect the risk aversion present within the complex weighted average in the Lally et al definition.³⁴¹
64. Formally, the equity ownership approach produces an estimate of the required utilisation rate in equation (3) by observing the total proportion of Australian equity held by Australian residents. This estimate can be represented as follows:

$$\hat{U} = \sum_{i=1}^n v_i \times u_i \quad \text{and} \quad \sum_{i=1}^n v_i = 1 \quad (9)$$

where:

\hat{U} is the estimated utilisation rate;

v_i is the proportion, weighted by value, of Australian equity owned by the i^{th} investor;

u_i is the utilisation rate of the i^{th} investor; with $u_i = 1$ for domestic investors and $u_i = 0$ for international investors.

65. Using this approach, the AER estimates the utilisation rate to be between 0.7 and 0.8.³⁴² The AER estimate is based on 2007 evidence provided by the Australian Bureau of Statistics (**ABS**), which showed that 71 per cent of Australian equity is

³⁴¹ M. Lally, and T. van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, 2003, pp. 187-210.

³⁴² *Ibid.*

held by domestic investors.³⁴³ Additional evidence was sourced from Hathaway in September 2013, which provides evidence that over the past 24 years, Australian equity is held by domestic investors at a proportion between 75 and 81 per cent.³⁴⁴ The AER notes some discrepancies between the two studies, even though Hathaway's more recent data is based on the ABS data. Accordingly, the AER adopted the range encompassing both estimates (that is, 70 to 80 per cent).

66. The AER notes that under the Officer framework, the weightings for the representative investor should reflect both:

- the value weighting of each investor; and
- the risk aversion of each investor, defined as the expected return of each investor's portfolio divided by their expectations of variance in that portfolio.³⁴⁵

67. The AER notes that a drawback of the equity ownership approach is that it does not take into account the risk aversion of each investor. Comparing equation (9) to equation (8), this implies that the weights are not equivalent, that is $v_i \neq w_i$. The AER notes that it is impossible to estimate this factor accurately, and therefore the correct weights w_i are unobservable.³⁴⁶ On balance, the AER considers the equity ownership approach is appropriate as it aligns with the interpretation of the gamma parameter, being an estimate over the entire trading year that does not suffer any methodological issues.

68. The Authority concurs with the AER that this approach suffers from the drawback that it does not correctly estimate the appropriate weighting, in that it does not reflect the risk aversion of each investor. However, as noted above, the direction of this imprecision is unquantifiable, therefore the Authority has no reason to believe this approach would lead to a biased estimate of the utilisation rate. That is, whilst the weights using this approach do not coincide with the required definition, there is currently no evidence to suggest that $v_i < w_i$ or $v_i > w_i$ systematically. The Authority therefore recognises that the equity ownership approach is applicable, given the empirical reality of the presence of foreign investors in the Australian domestic financial market.

69. In contrast to the AER, the QCA further update the ABS estimates and report that the estimates support a foreign ownership share (listed and unlisted) of around 30 per cent, depending on the period chosen.³⁴⁷ This supports the value of equity ownership share of 0.7. The QCA then identifies that the foreign share of *listed* equities is 44 per cent, implying equity ownership of 56 per cent.³⁴⁸

³⁴³ Australian Bureau of Statistics, *Feature article: Foreign ownership of equity*, Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/featurearticlesbytitle/EDEB646A92BF2BFBCA2579B8000DF20B?OpenDocument>

³⁴⁴ N. Hathaway, Imputation Credit Redemption ATO data 1988-2011, Where have all the credits gone? September 2013, pp. 16-21.

³⁴⁵ P. Monkhouse, 'The cost of equity under the Australian dividend imputation system', *Accounting and finance*, November 1993, vol. 33(2), p. 10.

³⁴⁶ Australian Energy Regulator, *Better Regulation Explanatory Statement for the Rate of Return Guidelines*, www.aer.gov.au, December 2013, p. 173.

³⁴⁷ Queensland Competition Authority, *Final Decision: cost of capital: market parameters*, August 2014, p. 98.

³⁴⁸ Ibid.

70. Overall, the Authority considers that the foregoing evidence points to the equity share ownership approach supporting an estimate of U around 0.7 if all equity is considered, and 0.56 if only listed equity is considered.

Tax statistic estimates

71. The Authority determined in its gas access Rate of Return Guidelines that tax statistics could not be used to estimate the required utilisation rate, given the ACT determination.³⁴⁹ However, in light of the new advice and interpretation from Lally, the Authority has considered the previous position to be in error and has re-examined the appropriateness of using tax statistics to estimate the required utilisation rate.
72. In particular, the Authority concurs with the AER that the interpretation regarding the required gamma parameter was not correct at the time of the ACT determination. Therefore, the previous argument employed by the Authority in disregarding taxation statistics does not hold.³⁵⁰ In particular, the argument used by the Authority – that investors incur costs to obtain franking credits – is irrelevant for the calculation of the utilisation rate, as this is not required under the Lally interpretation of the gamma parameter. That is, the required gamma parameter under the Officer framework refers only to the proportion of personal taxation reduced by corporate taxation paid, and need not reflect any costs incurred to obtain the imputation credits.
73. Tax statistics estimate the utilisation of imputation credits, which is a measure of the imputation credits redeemed by shareholders. This methodology uses Australian Taxation Office (**ATO**) statistics to observe the proportion of distributed imputation credits that have been used by investors to reduce their personal taxation liabilities. This approach implicitly assumes that the value of a redeemed franking credit is equal to its face value, whilst an unredeemed franking credit has no value. It follows that the average value of a franking credit is equal to the proportion of franking credits redeemed.³⁵¹
74. Formally, the tax statistics approach produces an estimate of the required utilisation rate in equation (8) by observing the total amount of franking credits redeemed by Australian residents. An investor who redeems a franking credit by definition has a utilisation rate of 1, whilst an unredeemed credit has a utilisation rate of 0. The estimate can then be stated as follows:

$$\hat{U} = \sum_{i=1}^n r_i \times u_i \quad \text{and} \quad \sum_{i=1}^n r_i = 1 \quad (10)$$

where:

\hat{U} is the estimated utilisation rate;

r_i is the proportion of franking credits redeemed by the i^{th} investor as a percentage of the total number of franking credits;

u_i is the utilisation rate of the i^{th} investor; with $u_i = 1$ for domestic investors and $u_i = 0$ for international investors.

³⁴⁹ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, www.erawa.com.au, December 2013, p. 212.

³⁵⁰ Ibid.

³⁵¹ NERA Economic Consulting, *The Value of Imputation Credits*, A report for the ENA, Grid Australia and APIA, 11 September 2008, p. 23.

75. The Authority noted in the Rate of Return Guidelines that two studies – performed by Hathaway and Officer (2004) and Handley and Maheswaran (2008) – have been considered by regulators in the past to estimate the required utilisation rate.³⁵²
76. Hathaway and Officer (2004) examined national tax statistics in order to estimate the average value of redeemed imputation credits from 1988 to 2002.³⁵³ They calculated that 71 per cent of company tax payments had been distributed as imputation credits on average and estimated that 40 to 50 per cent of the distributed credits were redeemed by taxable investors. Taking these two factors into account indicated to the authors that the statutory company tax rate is reduced by a proportion of 28 to 36 per cent. This suggested that the effective rate of company taxation is around 19 to 21 per cent. They estimated a value of gamma within a range of 0.38 to 0.44. However, they noted that some of their data is not reliable.³⁵⁴
77. Handley and Maheswaran (2008)³⁵⁵ examined the reduction in individual tax liabilities due to imputation credits from 1988 to 2004. Their study found that 67 per cent of distributed imputation credits were used to reduce personal taxes between 1990 and 2000, and this increased to 81 per cent over 2001-2004.
78. In his advice to the AER, Lally observed that SFG Consulting has previously argued that taxation statistics can only provide an upper bound on U , as opposed to a point estimate of U .^{356,357} This argument was also previously accepted by the Authority as a consequence of the ACT decision.³⁵⁸ Lally notes that as people who receive franking credits utilise them fully, this is incorrect and redemption rates can be used to provide a point estimate of U . Lally demonstrates this by defining u_i as the utilisation rate of investor i , and t_i denote their marginal taxation rate. Lally notes that the personal tax obligation of that investor due to dividends paid, after the taxes already paid by the company is as follows:

$$Tax_i = (DIV + u_i IC)t_i - u_i IC \quad (11)$$

79. Lally notes that Australian investors can be assigned to two groups, those who can and cannot utilise franking credits. Given that the taxation for those who can utilise franking credits is as follows:

$$Tax_i = (DIV + IC)t_i - IC \quad (12)$$

It follows that $u_i = 1$ for these investors.

³⁵² Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, p. 212.

³⁵³ N.J. Hathaway & R.R. Officer, *The Value of Imputation Tax Credits*, working paper, Melbourne Business School, 2004, p. 14.

³⁵⁴ N.J. Hathaway & R.R. Officer, *The Value of Imputation Tax Credits*, working paper, Melbourne Business School, 2004, p. 14.

³⁵⁵ J. Handley and K. Maheswaran, "A Measure of the Efficacy of the Australian Imputation Tax System", *The Economic Record*, Vol. 84, No. 264, 2008, pp. 82-94.

³⁵⁶ SFG Consulting, *Estimating Gamma*, Report prepared for QR National, 2012, p. 7.

³⁵⁷ M. Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 18.

³⁵⁸ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013, p. 212.

80. Lally notes that therefore, as the utilisation rate is not less than 1 for these investors, taxation statistics can provide an accurate point estimate of U . Implicit in this analysis is the assumption that franking credits cannot be transferred between investors. Lally continues by observing the evidence presented by McKenzie and Partington, which indicates that even though legislation exists to prevent this, it can be overcome in some cases.³⁵⁹ Lally further notes that if this practice is extensive, it may result in tax statistics overestimating the utilisation rate. The Authority considers that as the legislation to transfer the credits exists to prevent this, it is likely to considerably constrain this activity and as a consequence this is not considered a significant issue.
81. The Authority notes that Hathaway has observed that large discrepancies exist in relation to franking credits when comparing ATO taxation data to that of ATO company financial data.³⁶⁰ Hathaway urges caution in using ATO statistics for any estimates of parameters concerned with franking credits, until a reconciliation related to the actions of state owned enterprises is conducted, which may provide an explanation.
82. Both the AER, and Lally observe that using taxation statistics may be inconsistent with the interpretation of gamma under the Officer framework, where the utilisation rate is required to satisfy the complex weighted average outlined in equation (8).³⁶¹ Taxation statistics produce an estimate of the utilisation rate that are weighted by the amount of imputation credits received, not by equity ownership or risk aversion. On balance, the AER noted that it considers taxation statistics have merit in informing the required utilisation rate, but given these criticisms, it does not propose relying solely on this in informing its judgement. The AER notes that the range of evidence reported above points to a utilisation rate in the range of 0.4 to 0.8. The Authority agrees with these conclusions.
83. As a consequence of the reinterpretation of the gamma parameter, the Authority now considers taxation statistics can be used to *empirically* estimate the utilisation rate. However, given the concerns of Hathaway, Lally and the AER, the Authority does not consider that this methodology can be given much weight in determining the required utilisation rate, U . In particular, the Authority considers the equity ownership approach outlined above provides a superior empirical estimate of the required utilisation rate U relative to the taxation statistics method. This is a consequence of the equity ownership approach reflecting equity ownership, whilst taxation statistics only reflect credits redeemed.

Implied Market Value

Dividend Drop-Off Studies

84. Dividend drop-off studies examine how share prices change on ex-dividend days after distribution of both cash dividends and attached franking credits. The amount by which the share prices change (on average) is assumed to reflect the value investors place on the cash dividend and imputation credit as separate from the

³⁵⁹ M. McKenzie, and G. Partington, *Evidence and Submissions on Gamma*, report prepared for the AER, 2010.

³⁶⁰ N.Hathaway, Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?, September 2013, p. 5.

³⁶¹ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 175.

value of the shares. Econometrics can then be used to distinguish the component of the price drop off due solely to the value of the franking credits. By performing this analysis over a long period of time and across a large number of dividend events, an average market valuation of franking credits can be obtained.

85. The Authority previously relied solely on the evidence from dividend drop off studies to estimate the required utilisation rate as a consequence of the ACT determination.³⁶² As discussed above, this was the basis for adopting a utilisation rate of 0.35 to 0.55 in the Rate of Return Guidelines.³⁶³ The Authority noted, however, that dividend drop off studies suffer from a variety of econometric estimation issues that result in the estimated value of theta being vulnerable to the dividend sample, parametric form of the regression equation and regression technique used.³⁶⁴ The Authority was of the view that the best way to mitigate these effects was to rely on more than one dividend drop off study in order to inform the correct utilisation rate.³⁶⁵ At the time, the Authority noted that only two dividend drop off-studies were relevant – the SFG estimate³⁶⁶ and that arising from its own analysis.³⁶⁷ This was the only evidence considered relevant to inform the required utilisation rate at the time of formulating the Rate of Return Guidelines.³⁶⁸
86. The Authority has changed its view in light of the interpretation of the gamma parameter provided by Lally and additional material highlighted by the AER and the QCA.³⁶⁹ In particular, the Authority notes that both Lally and the AER consider that dividend drop off studies do not correctly estimate the utilisation rate required under the Officer framework.³⁷⁰ The AER provides the following criticisms of dividend drop off studies not previously considered by the Authority:
87. The required utilisation rate under the Officer framework is a complex weighted average determined by the value of equity that investor's hold and their relative risk aversion. Dividend drop off studies, however, only reflect the value weighted utilisation rate around just two days, the cum-dividend and ex-dividend dates. As a consequence, they measure the 'utilisation rate'³⁷¹ with a value weighting that reflects the composition of investors around the cum and ex-dividend dates, not the correct weighted average across the entire market over an entire year, as required.
88. A key assumption of the Officer CAPM framework employed by Australian regulators is that it assumes a segmented domestic capital market in addition to tax invariance

³⁶² Australian Competition Tribunal, Application by Energex Limited (No 2) [2010] ACompT7, October 2010.

³⁶³ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, December 2013, p. 208.

³⁶⁴ D. Vo, B. Gellard, S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013.

³⁶⁵ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, December 2013, p. 208.

³⁶⁶ SFG Consulting 2011, *Dividend drop-off estimate of theta*, Final Report, 21 March.

³⁶⁷ D. Vo, B. Gellard, S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013.

³⁶⁸ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, December 2013, p. 208.

³⁶⁹ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, December 2013, p. 173.

³⁷⁰ M. Lally, 'The Estimation of Gamma, Report for the AER', School of Economics and Finance, Victoria University of Wellington, Nov 2013, p. 20.

³⁷¹ Lally notes that the utilisation rate derived from dividend drop off studies has been consistently misinterpreted, this is discussed below.

between capital gains and dividends. Dstudies, however, reflect the empirical reality of foreign investors and differential taxation rates between capital gains and dividends. Therefore, any estimate of the utilisation rate using the dividend drop off method is incompatible with the Officer CAPM framework and by extension the NGR.

89. The required estimate of the utilisation rate is defined relative to a representative investor's ability to use each franking credit to reduce personal tax. However, as trading around the ex-dividend date represents a variety of different incentives³⁷², it does not accurately reflect the taxation incentive.
90. The AER and Lally also highlight the econometric problems that exist with dividend drop off studies. This issue has been well explored by the Authority,³⁷³ which has previously noted that this is the reason for the large divergence in empirical estimates of the utilisation rate using dividend drop off studies.³⁷⁴ The Authority noted that any estimate of theta is essentially a function of the most influential observations, due to the extreme multicollinearity present in the data. This conclusion is supported by the AER, who notes:³⁷⁵

Further, even if implied market value estimates were conceptually appropriate, there are significant limitations with the accuracy and robustness of such studies.

91. Lally further notes:³⁷⁶

The AER does not consider that these estimates are useful for a number of reasons. In respect of dividend drop off studies, these include evidence that trading activity around dividend ex-days is abnormal, that correction is required for market movements, and the sensitivity of results to data, outliers and model choices. More generally these problems include the difficulties in separating the values of franking credits and dividends in these studies, the wide range of empirical results from such studies, the possibility of bias from 'bid-ask bound', and the exposure of such estimates to the tax circumstance and transaction costs of tax arbitrageurs. Many of these problems are manifest in high standard errors in the estimates of the coefficients. I concur with all of these concerns, and I have additional concerns about these studies or their interpretation.

92. Lally also provides evidence that Australian regulators (including the Authority) and the ACT have consistently misinterpreted the results of dividend drop off studies for estimating the required utilisation rate. Lally observes that the coefficient of the regression equation in dividend drop off studies is generally assumed to be the utilisation rate, which Lally suggests is incorrect. Lally demonstrates this by first outlining the dividend drop of equation as follows:

$$P_{i,t-1} - P_{i,t}^* = \delta D_i + \theta FC_i + u_i \quad (13)$$

where:

³⁷² Such as transaction costs, tax situation and trading strategy.

³⁷³ D. Vo, B. Gellard, S. Mero. 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013.

³⁷⁴ The Authority explored in the explanatory statement of the Rate of Return Guidelines the econometric issues encountered in dividend drop off studies, for a detailed discussion see: Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, Dec 2013, p.216 and Economic Regulation Authority, *Appendices to the Explanatory Statement for the Rate of Return Guidelines* Dec 2013, Appendix 28.

³⁷⁵ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, Dec 2013, p. 177.

³⁷⁶ M. Lally, 'The Estimation of Gamma, Report for the AER', November 2013, p. 20.

$P_{i,t-1}$ is the cum-dividend price;
 $P_{i,t}^*$ is the ex-dividend price corrected for the market movement;
 D_i is the cash dividend;
 FC_i is the franking credit;
 u_i is the regression residual.

93. Lally begins by noting that no distinction should be made regarding the cash dividend and franking credit if the franking credit can be fully utilised, e.g. a cash dividend of \$10 and a franking credit of \$2 is equivalent to a cash dividend of \$12. That is, an investor should be indifferent between the decomposition of any gross dividend³⁷⁷ received to the extent the franking credit can be utilised. Lally further observes that if all investors can utilise imputation credits, the required regression equation would be as follows:

$$P_{i,t-1} - P_{i,t}^* = \delta[D_i + FC_i] + u_i \quad (14)$$

94. In this circumstance, δ , recognises that the expected price change can differ from the paid out gross dividend,³⁷⁸ as in reality, the tax rate applicable on the gross dividend can diverge from that of capital gains.³⁷⁹ In order to incorporate the empirical reality of not all investors being able to utilise franking credits, Lally notes that the franking credit covariate should be multiplied by the coefficient U , to represent the average utilisation rate. The required equation is then as follows:

$$\begin{aligned}
 P_{i,t-1} - P_{i,t}^* &= \delta[D_i + U.FC_i] + u_i \\
 &= \delta D_i + U.\delta.FC_i + u_i
 \end{aligned} \quad (15)$$

95. Based on this analysis, it is apparent that $\theta = U.\delta$. Therefore, in order to derive the required utilisation rate, U , from dividend drop off studies, the estimated coefficient of the franking credit, θ , must be divided by the estimated coefficient of the cash dividend, δ , as follows, $U = \frac{\theta}{\delta}$.

³⁷⁷ Gross dividend refers to the sum of the cash dividend and the franking credit, $G_i = D_i + FC_i$.

³⁷⁸ The coefficient in equation (16), δ , is the gross drop-off ratio, see: Beggs D., and Skeels, C., 2006, 'Market Arbitrage of Cash Dividends and Franking Credits', *Australian Economic Papers*, vol 82, pp. 239-252. The estimated coefficient, $\hat{\delta}$, therefore measures the average change in stock price that occurs due to payment of \$1 of gross dividend.

³⁷⁹ The Authority notes that the theoretical model underlying dividend drop off studies is based on Elton, E.J and Gruber, M.J (1970), 'Marginal Stock Holder Tax Rates and the Clientele Effect', *Review of Economics and Statistics*, 52, 68-74. Under the assumptions of no stochastic uncertainty, no time value of money and no transaction costs, it can be shown that $\delta = \frac{(1-T_d)}{(1-T_g)}$ where T_d is the tax rate applicable to the gross

dividend, whilst T_g is the tax rate applicable on capital gains. It follows that $\hat{\delta}$ measures the divergence in tax rates applicable to the gross dividend and capital gains of the representative investor.

96. The Authority has accepted the criticism that it has misinterpreted the required utilisation rate in previous regulatory decisions, in addition to the Rate of Return Guidelines. Re-interpreting the required utilisation rate from the previously considered relevant dividend drop off studies results in a utilisation rate of 0.4 from the SFG analysis,³⁸⁰ and a range of 0.40 – 0.63 from the Secretariat’s analysis.³⁸¹
97. Lally in his advice also explores the following issues with dividend drop off studies and the impact this has on the required estimate of the utilisation rate:
- Only studies that contain estimates using data from July 2000 are relevant, due to changes in the taxation system at this time;
 - The wide variety of estimates of the utilisation rate using this methodology from different authors damage the credibility of this method; Lally further notes that this is due to the large standard errors arising from the econometric issues arising in dividend drop off studies;
 - Lally further explores the interpretation of the utilisation parameter U with respect to dividend drop off studies and notes that any estimate using this method will reflect the motives of investors who trade at this time, and not the required value-weighted average of all investors in the market;
 - Lally acknowledges the academic literature regarding the abnormal returns regarding stocks trading around cum and ex-dividend days. In particular, Lally cites Walker and Partington, who state that due to microstructure and the presence of tax arbitrage, there is ‘the issue of whether use of the traditional drop-off ratio may lead researchers to make erroneous inferences’.³⁸²
 - Lally also cites the Cannavan, Finn and Gray simultaneous price study, noting that the authors have similar concerns, when they state that for ‘...these reasons, it is unlikely that the traditional ex-dividend day drop-off methodology will be able to separately identify the value of cash dividends and imputation credits’.³⁸³ Lally observes that this contradicts the SFG Consulting’s dividend drop off result as an estimate of the utilisation rate.³⁸⁴
98. Lally also presents a criticism of SFG’s report on estimating gamma which warrants consideration,³⁸⁵ given that it examines issues regarding the correct interpretation of U in the Officer CAPM. SFG notes that the Officer CAPM assumes that unfranked cash dividends and capital gains are equally valued (that is, they are tax invariant), which is in conflict with the empirical reality of differential taxation between the two. To eliminate this inconsistency, SFG advocates restricting any estimate of the ratio of unfranked cash dividends and capital gains to equal 1. This would have the practical implication of restricting the cash dividend coefficient, δ , in equation (13)

³⁸⁰ SFG Consulting 2011, Dividend drop-off estimate of theta, Final Report, 21 March.

³⁸¹ D. Vo, B. Gellard, S. Mero. ‘Estimating the Market Value of Franking Credits, Empirical Evidence from Australia’ Conference Paper, Australian Conference of Economists 2013.

³⁸² S. Walker and G. Partington., ‘The Value of Dividends: Evidence from Cum-Dividend Trading in the Ex-Dividend Period’, *Accounting and Finance*, vol.39, 1999, pp. 275-296.

³⁸³ D. Cannavan, F. Finn, and S. Gray, ‘The Value of Imputation Tax Credits in Australia’, *Journal of Financial Economics*, vol 73, 2004, pp. 167-197.

³⁸⁴ SFG Consulting 2014, *Estimating Gamma*, Report for ATCO Gas Australia, 13 March 2014.

³⁸⁵ SFG 2012, *Estimating Gamma*, report prepared for QR National (www.qca.org.au).

- to be 1, and this would force the franking credit coefficient, and consequently the utilisation rate to equal 0.³⁸⁶
99. Lally disagrees with this, noting that this conflicts with the evidence presented by SFG of a utilisation rate of 0.4, and that it is internally inconsistent with its estimated value of the cash dividend of between 0.85 and 0.9. Finally, Lally considers that this approach conflicts with logical inference, in that a model should be chosen because it reflects the empirical evidence and that the assumption of equal taxation between cash dividends and capital gains is wrong. Lally also observes that not all dividend drop off studies estimate a drop off ratio of 1, noting the results of Beggs and Skeels³⁸⁷ and Brown and Clarke³⁸⁸, which estimate the drop off ratio with a range from 0.93 to 1.17. Lally further notes that examination of non-imputation regimes (such as Australia pre-imputation and overseas markets) indicate that the cash dividend coefficient is also less than one, indicating that SFG's assumption of fully valued cash dividends is flawed.
100. Lally presents the view that using dividend drop off studies to estimate the required U is irrelevant, as due to the many methodological problems, they should not be given much weight. Lally notes that the empirical reality of differential taxation should result in the rejection of the Officer CAPM in regulatory practice, and suggests other CAPM's such as Lally (1992),³⁸⁹ Cliffe and Marsden (1992),³⁹⁰ or Lally and van Zijl (2003).³⁹¹ Lally then notes that '...however, until this point is reached, it would not be sensible to choose an estimate of U merely to paper over the empirical challenges to the Officer CAPM'.³⁹²
101. The Authority considers that market value statistics have little value in informing the required utilisation rate. This is primarily a consequence of the above criticism of Lally and the AER, in addition to the previous econometric criticisms outlined in the Rate of Return Guidelines.³⁹³
102. In addition, the Authority has previously recognised that as dividend drop off studies are a market based measure, they incorporate the costs investors incur to obtain franking credits.³⁹⁴ This contradicts the required interpretation of the utilisation rate under the Officer CAPM framework, which requires a complex weighted average of

³⁸⁶ This implication also follows from the observation that dividend drop off studies estimate a gross drop-off of approximately 1, see: SFG Consulting 2011, Dividend drop-off estimate of theta, Final Report, 21 March and Vo, D., Gellard, B., Mero, S. (2013) 'Estimating the Market Value of Franking Credits, Empirical Evidence from Australia' Conference Paper, Australian Conference of Economists 2013.

³⁸⁷ Beggs D., and Skeels, C., 2006, 'Market Arbitrage of Cash Dividends and Franking Credits', *Australian Economic Papers*, vol 82, pp. 239-252.

³⁸⁸ Brown, P., and Clarke, A. 1993, 'The Ex-Dividend Day Behaviour of Australian Share Prices Before and After Dividend Imputation', *Australian Journal of Management*, vol.18, pp.1-40.

³⁸⁹ Lally, M., 1992, 'The CAPM under Dividend Imputation', *Pacific Accounting Review*, vol.4, pp. 31-44.

³⁹⁰ Cliffe, C. and Marsden, A. 1992, 'The Effect of Dividend Imputation on Company Financing Decisions and the Cost of Capital in New Zealand', *Pacific Accounting Review*, vol.4, pp. 1-30.

³⁹¹ Lally, M. and van Zijl, T., 2003, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance*, vol.43, pp. 187-210.

³⁹² M. Lally, *The Estimation of Gamma*, Report for the AER', November 2013, p. 32.

³⁹³ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, 16 December 2013.

³⁹⁴ These costs include transaction costs, risk, the lack of international diversification opportunities for domestic investors and international investors inability to utilise franking credits.

individual's utilisation rates³⁹⁵, as in equation (6). As a consequence of this interpretation regarding the required utilisation rate U , the Authority considers these costs are not necessary, and any estimate that incorporates them will necessarily underestimate the required utilisation rate U in the Officer CAPM.

103. The Authority now considers that dividend drop off studies are only useful to the extent that they confirm that investors place value on franking credits, however, due to the econometric issues associated with them, their exact market value cannot precisely be determined. Given that this market value is irrelevant to the required utilisation rate, the Authority has disregarded them for informing the required utilisation rate. The Authority notes this is a significant departure from the view held in the Rate of Return Guidelines, with dividend drop off studies being the sole evidence to inform the required utilisation rate.³⁹⁶

Simultaneous Price Studies

104. The simultaneous price methodology infers a value for franking credits (and a corresponding value for cash dividends) by observing prices of shares in a company (which entitle the holder to dividends and the associated franking credits) and derivatives contracts on the same stock (which involve no such entitlement). The difference in the prices of the stock and the implied price of the stock from the derivatives contract provides an estimate of the value of the dividend and the associated franking credit.

105. The AER surveyed a range of alternative market value studies:³⁹⁷

- futures studies provide estimates in the range from 0.12 to 0.53 based on more recent studies;
- equity returns studies provide confounding results, with some suggesting negative rates, which is implausible;
- simultaneous share trades provide estimates in the range 0.68 to 1, but all the results are based circumstances prior to 2000.

Views of market participants

106. The AER also considers auxiliary evidence regarding the view of market participants, in particular:³⁹⁸

- Surveys of ASX listed companies;³⁹⁹
- Surveys of institutions (such as investment banks);⁴⁰⁰

³⁹⁵ As before, investors who can utilise franking credits have an utilisation rate of 1, whilst investors who cannot have an utilisation rate of 0.

³⁹⁶ Economic Regulation Authority, Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules, www.erawa.com.au, December 2013, p. 216.

³⁹⁷ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 173.

³⁹⁸ Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 182.

³⁹⁹ Troung, Partington and Peat, 'Cost-of-capital estimation and capital-budgeting practice in Australia', *Australian Journal of Management*, June 2008, vol.33 (1), pp. 95-121.

⁴⁰⁰ KPMG, Corporate finance: Valuation practices survey, April 2013.

- Independent expert reports lodged with the ASX;⁴⁰¹
- Other evidence such as the existence of equity imputation managed funds⁴⁰² and the government legislation designed to prevent dividend washing.⁴⁰³

107. The AER concludes from examining the evidence that imputation credits have significant value to investors, but notes that this evidence cannot be used to estimate the correct utilisation rate.⁴⁰⁴ The Authority agrees that the above evidence is not directly relevant to the estimation of the required utilisation rate under the NGR. However, it does confirm that franking credits have value to investors.

Conceptual Goal Posts Approach

108. Lally considers that the assumed presence of foreign investors in the regulatory definition of the market portfolio is incompatible with the assumptions of the Officer CAPM, because the latter assumes a fully segmented domestic capital market.⁴⁰⁵ Lally is of the view that while the ideal model will reflect all possible empirical contingencies, in practice this is often impossible. However, any model based on unrealistic assumptions will by definition contain an error.

109. Importantly, Lally observes that this conceptual conflict can manifest itself through a perverse impact on the estimated cost of equity. He demonstrates this by noting that as equity markets have continued to globalise and become more integrated, foreign ownership of Australian equity will tend to increase, which will by definition decrease any *empirical* estimate of the required utilisation rate U .

110. Lally demonstrates that where the empirically estimated value of U is used in the Officer CAPM, it will tend to result in an *increase* in the cost of equity estimate, while in reality the cost of equity should fall as a consequence of a more integrated equity market.⁴⁰⁶ Lally considers that this failure of the model arises directly as a consequence of the incompatibility between the assumptions of perfect segmentation in conjunction with an empirical estimate of the utilisation rate U based on the presence of foreign investors in the domestic capital market. Lally notes that:⁴⁰⁷

In this event the partial recognition of foreign investors would effectively constitute cherry-picking that maximises the revenue or price cap, i.e. ignoring foreign investors when it is favourable to regulated firms (choosing the CAPM) and also estimating U by a methodology that reflects the presence of these investors when it is also favourable to regulated firms.

111. Lally's analysis may be summarised as follows.⁴⁰⁸ First, Lally utilises the Officer CAPM to estimate the return on equity under the assumption of a fully segmented

⁴⁰¹ The AER source the following submission to their guidelines: SFG, Evidence on the required return on equity from independent expert reports: Report for the Energy Networks Association, 24 June 2013.

⁴⁰² Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, www.aer.gov.au, December 2013, p. 182.

⁴⁰³ Ibid.

⁴⁰⁴ Ibid.

⁴⁰⁵ M. Lally, *The Estimation of Gamma*, Report for the AER, 23 November 2013, p. 14.

⁴⁰⁶ This occurs due to investors being able to diversify risk more effectively, resulting in a reduction in any risk premium.

⁴⁰⁷ M. Lally, 'The Estimation of Gamma, Report for the AER', School of Economics and Finance, Victoria University of Wellington, Nov 2013, p. 38.

⁴⁰⁸ Ibid.

domestic capital market, with various outcomes depending on an assumed range for the utilisation rate.

112. Lally then turns to the case of completely integrated capital markets, and proceeds to estimate a return on equity using the Solnik CAPM.⁴⁰⁹ Lally notes that this international CAPM has close parallels to the Officer CAPM. As the definition of the market portfolio differs between the two models – the Officer model being a segmented and the Solnik model being integrated – both the market risk premiums and equity beta necessarily are different in the two models.
113. Lally proceeds with a detailed numerical analysis of the cost of equity capital under each model. Lally shows that using the fully segmented Officer CAPM, with a utilisation rate of one, consistently produces an estimate of the return on equity that exceeds that of complete integration (as estimated with the Solnik model).
114. Importantly, Lally demonstrates that adopting a utilisation rate of less than one in the Officer CAPM, while not adjusting other parameters in the model to account for the presence of foreign investment, can result in an estimate of the return on equity that exceeds the full segmented Officer CAPM.
115. The corollary is that the model parameters need to change to reflect the presence of foreign investors.⁴¹⁰

...as one moves from a world of complete segmentation to complete integration, the model used should also change and this is not done. Instead regulators are using a model that presumes complete segmentation and populating it with an estimate for U that reflects partial segmentation. The result is regulatory estimates of the cost of equity that lie outside the bounds of complete segmentation and complete integration. Given the use of the Officer model by regulators, and an MRP estimate that can reasonably be presumed to lie between the two extreme cases, the only values for U that produce sensible estimates for the cost of equity are those from 0.80 to 1.

116. In this context, the Authority notes that the lower bound of Lally's estimated range for U depends on the assumptions for the Solnik model. The estimate of what is 'sensible' also depends on the assumptions used for the regulator's estimate of the partially segmented domestic MRP.
117. It is possible that varying these assumptions would broaden the permissible range of what is potentially 'sensible'. Lally conducts sensitivity analyses, demonstrating that some combinations of the parameters provide sensible estimates for a value for U as low as 0.625.⁴¹¹
118. Accordingly, the Authority considers that it is reasonable to infer a range for θ of 0.6 to 1, as conceptual goal posts. The Authority recognises that there is uncertainty as to the exact lower bound, and that values approaching 0.6 require combinations of less likely parameter values. The AER reaches similar conclusions.⁴¹²

⁴⁰⁹ Solnik, B. 1974, 'An Equilibrium Model of the International Capital Market', *Journal of Economic Theory*, vol.8, pp. 500-24.

⁴¹⁰ M. Lally, *The Estimation of Gamma*, Report for the AER, November 2013, p. 44.

⁴¹¹ M. Lally, *The Estimation of Gamma*, Report for the AER, November 2013, Table 3, p. 45.

⁴¹² Australian Energy Regulator, Better Regulation Explanatory Statement for the Rate of Return Guidelines, December 2013, p. 181.

Appendix 6 The bond yield approach extended sample

- The following tables set out the bonds utilised in the enhanced bond yield approach benchmark sample.

'A' credit rating

No.	Bond	Country of Domicile	Country of Risk	S&P Credit Rating	Years to maturity	Currency	Spread to Swap with Cross Currency Conversion (40 Day Average in bp)	Amount (A\$)	Redemption
1	Telstra Corp Ltd	AU	AU	A	2.1	AUD	52.63	275,000,000	AT MATURITY
2	Telstra Corp Ltd	AU	AU	A	2.4	EUR	65.52	1,000,000,000	AT MATURITY
3	Telstra Corp Ltd	AU	AU	A	3.0	AUD	31.61	750,000,000	AT MATURITY
4	Telstra Corp Ltd	AU	AU	A	4.0	AUD	41.11	500,000,000	AT MATURITY
5	Optus Finance Pty Ltd	AU	AU	A	4.1	AUD	56.38	75,000,000	AT MATURITY
6	Optus Finance Pty Ltd	AU	AU	A	4.1	AUD	51.55	300,000,000	AT MATURITY
7	Optus Finance Pty Ltd	AU	AU	A	4.9	USD	111.85	500,000,000	AT MATURITY
8	Telstra Corp Ltd	AU	AU	A	5.4	EUR	94.65	1,000,000,000	AT MATURITY
9	Telstra Corp Ltd	AU	AU	A	5.7	AUD	54.59	500,000,000	AT MATURITY
10	Optus Finance Pty Ltd	AU	AU	A	5.9	EUR	113.02	700,000,000	AT MATURITY
11	Telstra Corp Ltd	AU	AU	A	6.4	EUR	104.42	500,000,000	AT MATURITY
12	Telstra Corp Ltd	AU	AU	A	6.9	USD	98.60	1,000,000,000	AT MATURITY
13	Telstra Corp Ltd	AU	AU	A	6.9	USD	99.03	1,000,000,000	AT MATURITY
14	Telstra Corp Ltd	AU	AU	A	7.5	EUR	105.77	750,000,000	AT MATURITY
15	New Zealand Milk Australasia Pty Ltd	AU	AU	A	7.5	AUD	73.72	150,000,000	AT MATURITY
16	Telstra Corp Ltd	AU	AU	A	7.9	EUR	106.36	1,000,000,000	AT MATURITY
17	Telstra Corp Ltd	AU	AU	A	8.9	EUR	104.59	1,000,000,000	AT MATURITY
18	Telstra Corp Ltd	AU	AU	A	9.1	AUD	70.79	50,000,000	AT MATURITY
19	Telstra Corp Ltd	AU	AU	A	9.1	EUR	136.70	75,000,000	AT MATURITY
20	Telstra Corp Ltd	AU	AU	A	2.1	AUD	52.63	275,000,000	AT MATURITY

'BBB-' credit rating

No.	Bond	Country of Domicile	Country of Risk	S&P Credit Rating	Years to maturity	Currency	Spread to Swap with Cross Currency Conversion (40 Day Average in bp)	Amount (A\$)	Redemption
1	DBNGP Finance Co Pty Ltd	AU	AU	BBB-	2.5	AUD	189.06	275,000,000	CALLABLE
2	Leighton Finance USA Pty Ltd	AU	AU	BBB-	2.7	USD	249.51	145,000,000	AT MATURITY
3	Premier Finance Trust Australia	AU	AU	BBB-	2.8	AUD	140.07	190,000,000	AT MATURITY
4	DBNGP Finance Co Pty Ltd	AU	AU	BBB-	3.5	AUD	212.18	325,000,000	CALLABLE
5	Leighton Finance Ltd	AU	AU	BBB-	3.9	USD	289.56	79,000,000	AT MATURITY
6	Adani Abbot Point Terminal Pty Ltd	AU	AU	BBB-	4.0	AUD	247.98	500,000,000	AT MATURITY
7	Premier Finance Trust Australia	AU	AU	BBB-	4.8	AUD	139.73	190,000,000	AT MATURITY
8	DBNGP Finance Co Pty Ltd	AU	AU	BBB-	4.9	AUD	152.25	300,000,000	CALLABLE
9	Adani Abbot Point Terminal Pty Ltd	AU	AU	BBB-	5.6	AUD	266.73	100,000,000	AT MATURITY
10	Leighton Finance USA Pty Ltd	AU	AU	BBB-	5.7	USD	311.56	115,000,000	AT MATURITY
11	DBNGP Finance Co Pty Ltd	AU	AU	BBB-	5.9	AUD	164.60	100,000,000	CALLABLE
12	Newcrest Finance Pty Ltd	AU	AU	BBB-	7.0	USD	356.35	750,000,000	AT MATURITY
13	Newcrest Finance Pty Ltd	AU	AU	BBB-	7.0	USD	356.89	750,000,000	AT MATURITY
14	Newcrest Finance Pty Ltd	AU	AU	BBB-	7.9	USD	384.89	750,000,000	AT MATURITY
15	Newcrest Finance Pty Ltd	AU	AU	BBB-	7.9	USD	384.44	750,000,000	AT MATURITY
16	Leighton Finance USA Pty Ltd	AU	AU	BBB-	8.0	USD	320.89	500,000,000	AT MATURITY
17	Leighton Finance USA Pty Ltd	AU	AU	BBB-	8.0	USD	322.66	500,000,000	AT MATURITY
18	Caltex Australia Ltd	AU	AU	BBB-	22.9	AUD	291.33	550,000,000	CALLABLE
19	Newcrest Finance Pty Ltd	AU	AU	BBB-	27.0	USD	438.48	500,000,000	AT MATURITY
20	Newcrest Finance Pty Ltd	AU	AU	BBB-	27.0	USD	441.31	500,000,000	AT MATURITY

'BBB+' credit rating

No.	Bond	Country of Domicile	Country of Risk	S&P Credit Rating	Years to maturity	Currency	Spread to Swap with Cross Currency Conversion (40 Day Average in bp)	Amount (A\$)	Redemption
1	AusNet Electricity Services Pty Ltd	AU	AU	BBB+ /#+	2.1	USD	161.16	100,000,000	AT MATURITY
2	Coca-Cola Amatil Ltd	AU	AU	BBB+	2.2	AUD	56.37	250,000,000	AT MATURITY
3	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	2.3	AUD	98.49	400,000,000	AT MATURITY
4	Powercor Australia LLC	AU	AU	BBB+	2.5	AUD	114.43	200,000,000	AT MATURITY
5	CitiPower I Pty Ltd	AU	AU	BBB+	2.7	AUD	70.15	300,000,000	CALLABLE
6	CitiPower I Pty Ltd	AU	AU	BBB+	2.7	AUD	101.33	275,000,000	CALLABLE
7	Coca-Cola Amatil Ltd	AU	AU	BBB+	3.3	AUD	25.58	100,000,000	AT MATURITY
8	Jemena Ltd	AU	AU	BBB+	3.4	USD	158.36	150,000,000	AT MATURITY
9	Jemena Ltd	AU	AU	BBB+	3.4	USD	151.05	150,000,000	AT MATURITY
10	Brambles Finance PLC	GB	AU	BBB+	3.5	EUR	100.58	500,000,000	AT MATURITY
11	Coca-Cola Amatil Ltd	AU	AU	BBB+	3.8	AUD	46.09	200,000,000	AT MATURITY
12	Caltex Australia Ltd	AU	AU	BBB+	4.0	AUD	105.28	150,000,000	AT MATURITY
13	Woodside Finance Ltd	AU	AU	BBB+	4.3	USD	123.95	600,000,000	AT MATURITY
14	Woodside Finance Ltd	AU	AU	BBB+	4.3	USD	125.02	600,000,000	AT MATURITY
15	CitiPower I Pty Ltd	AU	AU	BBB+	4.4	AUD	141.92	150,000,000	CALLABLE
16	Coca-Cola Amatil Ltd	AU	AU	BBB+	5.0	AUD	56.56	150,000,000	AT MATURITY
17	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	5.4	AUD	128.72	150,000,000	AT MATURITY
18	Brambles USA Inc	US	AU	BBB+	5.4	USD	145.92	500,000,000	AT MATURITY
19	Brambles USA Inc	US	AU	BBB+	5.4	USD	127.91	500,000,000	AT MATURITY
20	Coca-Cola Amatil Ltd	AU	AU	BBB+	5.6	AUD	59.64	205,000,000	AT MATURITY
21	Aurizon Network Pty Ltd	AU	AU	BBB+	6.0	AUD	116.69	525,000,000	AT MATURITY
22	Coca-Cola Amatil Ltd	AU	AU	BBB+	6.1	AUD	68.66	100,000,000	AT MATURITY
23	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	6.3	GBP	160.75	250,000,000	AT MATURITY
24	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	6.4	AUD	117.49	350,000,000	AT MATURITY
25	Woodside Finance Ltd	AU	AU	BBB+	6.5	USD	136.19	700,000,000	CALLABLE
26	Woodside Finance Ltd	AU	AU	BBB+	6.5	USD	137.11	700,000,000	CALLABLE
27	Coca-Cola Amatil Ltd	AU	AU	BBB+	6.5	AUD	79.02	100,000,000	AT MATURITY
28	Coca-Cola Amatil NZ Ltd	AU	AU	BBB+	6.7	AUD	79.93	45,000,000	AT MATURITY
29	Coca-Cola Amatil Ltd	AU	AU	BBB+	6.8	AUD	81.63	100,000,000	AT MATURITY
30	Powercor Australia LLC	AU	AU	BBB+	6.8	AUD	118.77	300,000,000	AT MATURITY
31	Coca-Cola Amatil Ltd	AU	AU	BBB+	6.9	AUD	81.17	30,000,000	AT MATURITY
32	Powercor Australia LLC	AU	AU	BBB+	7.2	AUD	119.23	630,000,000	AT MATURITY
33	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	7.7	EUR	145.92	500,000,000	AT MATURITY
34	Coca-Cola Amatil Ltd	AU	AU	BBB+	7.7	AUD	80.40	30,000,000	AT MATURITY
35	SGSP Australia Assets Pty Ltd	AU	AU	BBB+	8.4	USD	190.68	500,000,000	AT MATURITY
36	Brambles Finance Ltd	AU	AU	BBB+	9.6	EUR	150.02	500,000,000	CALLABLE
37	Aurizon Network Pty Ltd	AU	AU	BBB+	9.9	EUR	175.83	500,000,000	AT MATURITY

Appendix 7 Indicative rail WACCs

1. This appendix provides indicative estimates of the rail WACCs under the method set out in this revised draft decision.
2. All parameters accord with this revised draft decision, and are based on 18 trading days ending 6 November 2014.
3. The following summarises the indicative WACC outcomes for each rail network (Table 33).

Table 33 Indicative rail WACCs

Determination	Public Transport Authority	Brookfield Rail	The Pilbara Infrastructure
Nominal Risk Free Rate (10 year term)	3.33%	3.33%	3.33%
Real Risk Free Rate	0.81%	0.81%	0.81%
Inflation Rate	2.50%	2.50%	2.50%
Gearing	50%	25%	20%
Debt Risk Premium	1.417%	1.740%	3.652%
Debt Issuing Cost	0.125%	0.125%	0.125%
Australian Market Risk Premium	7.87%	7.87%	7.87%
Equity Beta	0.60	0.93	1.56
Asset Beta	0.30	0.70	1.25
Corporate Tax Rate	30%	30%	30%
Franking Credit	50%	50%	50%
Nominal Cost of Debt	4.877%	5.200%	7.112%
Real Cost of Debt	2.319%	2.634%	4.499%
Real After Tax Cost of Equity	5.42%	7.98%	12.81%
Nominal Pre Tax Cost of Equity	9.48%	12.56%	18.39%
Real Pre Tax Cost of Equity	6.81%	9.82%	15.50%
Nominal Pre Tax WACC	7.18%	10.72%	16.13%
Real Pre Tax WACC	4.56%	8.02%	13.30%
Nominal After Tax WACC	6.47%	9.31%	13.93%
Real After Tax WACC	3.87%	6.64%	11.15%

Source: Economic Regulation Authority analysis