Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks

Draft Determination

5 June 2014

Economic Regulation Authority
WESTERN AUSTRALIA

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Invitation to make submissions

Interested parties are invited to make submissions on the Authority's Draft Determination by **4:00 pm (WST) Friday, 27 June 2014** via:

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1 Introduction

1. The Authority is required to publish floor and ceiling 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 floor and ceiling 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 five yearly 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 the five yearly review of the 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 five yearly 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. The gas WACC

[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.

review (hereafter referred to as the **gas rate of return guidelines**) was completed in December 2013 and contained changes to the Authority's approach to estimating the WACC.[2]

9. This draft determination is a further milestone on the path to completion of the five yearly review commenced in 2013.

10. Indicative 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 5.

[2] Economic Regulation Authority, *Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013.

2 The broad regulatory framework

12. 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 floor and ceiling costs range. The WARAR also provides for recourse to arbitration through judicial review if the parties cannot agree.

13. 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:[3]

    - 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.

14. 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
    - to provide a framework and guiding principles to encourage a consistent approach to access regulation in each industry.

15. Clause 6 of the CPA outlines a number of principles for the certification of an access regime. The Productivity Commission notes that:[4]

> 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

[3] 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.

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

- be consistent where more than one state or territory access regime applies to a service
- 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).

16. The WARAR is given power through the Western Australian *Railways (Access) Act 1998* and its subsidiary Code.

17. The object of the *Railways (Access) Act 1998* is to:[5]

> …establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations.

2.1 Considerations of the Authority

18. 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:

> **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.

[5] *Railways (Access) Act 1998*, Part 1, s. 2A.

19. 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

20. 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.

21. 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.[6] The current regulatory approach assumes that efficient firms with efficient financing provide a 'benchmark' for each regulatory decision.

22. 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

23. 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.

24. 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.

25. A number of stakeholders suggested additional criteria. Brockman proposed that it is desirable if the WACC estimates are:[7]

> …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

[6] 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.

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

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

26. The Authority's rationale for criteria were developed as part of the gas rate of return guidelines.[8] 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.

27. The Authority considers that the criteria are consistent with the objectives of the *Railways (Access) Act 1998*.

2.2 Draft determination

28. 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.

29. 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;

[8] 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 rate of return framework

30. 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.[9]

3.1 Current approach

31. 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.[10] 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

[9] *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2 states:

> (1)***…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).
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> (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) (ii) are, if appropriate, modern equivalent assets;
>
> and
>
> WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.

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

- a corresponding estimated real pre-tax WACC for use in the annuity calculation.

32. 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,[11] following comments made in the Australian Competition Tribunal's decision in 2012 on an application by WA Gas Networks; and
- 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.[12]

3.2 Considerations of the Authority

3.2.1 Form of the WACC

33. 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.

34. 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

[11] 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'.

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

progressively moved to adopt the post-tax approach. This removes a source of bias in the estimates.[13]

35. 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.

36. 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 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.

37. 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.

38. 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.[14] 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 ceiling 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.

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[13] 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.

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

39. 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

40. The estimate of the pre-tax return on assets can be expressed as:

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

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;

T_c is the tax rate; and

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

41. 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.

42. 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:

$$WACC_{\text{real pre-tax}} = \frac{(1 + WACC_{\text{nominal pre-tax}})}{1 + \pi_e} - 1 \quad (2)$$

43. 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.

44. 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 details in following chapters.

3.2.3 The term of the WACC

45. The Railways (Access) Code 1998 states that the:[15]

> …WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.

46. The WACC must remunerate the efficient financing costs of the rail service provider over the (long term) economic life of the assets.[16] 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.

47. 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.

48. 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 floor and ceiling costs derived from an annuity over the economic life of the rail assets (see paragraph 18).[17] Therefore, the Authority 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.

49. For the return on equity, a term of 10 years is commonly accepted as a means to estimate the long term return in Australia.[18] 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**).[19]

50. 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.

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[15] *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

[16] See footnote 9 above.

[17] 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 for the risk free rate 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).

[18] The Authority notes that it has adopted a five year term for the gas rate of return. 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 Lally M, *The Appropriate Term for the Risk Free Rate and the Debt Margin,* Report for the Queensland Competition Authority, April 2010.

[19] 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).

51. The term of debt risk premium (**DRP**) component of the cost of debt should also reflect long term debt financing practice. The Authority considers that its Bond Yield Approach provides the best estimate of the DRP for the Australian finance market.

52. 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.

53. The Bond Yield Approach combines the remaining yields to maturity of the observed benchmark samples at each credit rating through a 'joint weighting' approach.[20] The Authority notes that such a 'blended yield' to maturity is typically used in WACC estimates when valuing companies.[21] The blended yield is considered to be the best estimate of the opportunity cost of a firm's debt. The yield to maturity approach accords with the Authority's view that the WACC should be forward looking and based on prevailing conditions (see section 4.2.1).

54. For the foregoing reasons, the Authority has determined that it will adopt a 10 year term for the WACC. The DRP will be estimated utilising the Authority's Bond Yield Approach, which is based on the (joint weighted) average remaining term to maturity of the observed sample of Australian corporate bonds at the relevant target credit rating.

3.2.4 Point estimates or ranges for estimates?

55. 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 point estimates within potential ranges. The option of using ranges, or judgment to

[20] The joint weighting approach gives greater weight to bonds of greater value and longer remaining term to maturity, so the average term may not correspond exactly with the simple average of terms in the sample.

[21] As noted in Rosenbaum J. and Pearl J., *Investment Banking: Valuation, Leveraged Buyouts and Mergers*, 2013, John Wiley and Sons, chapter 3:

> A company's cost of debt reflects its credit profile at the target capital structure, which is based on a multitude of factors including size, sector, outlook, cyclicality, credit ratings, credit statistics, cash flow generation, financial policy, and acquisition strategy, among others. Assuming the company is currently at its target capital structure, cost of debt is generally derived from the blended yield on its outstanding debt instruments, which may include a mix of public and private debt. In the event the company is not currently at its target capital structure, the cost of debt must be derived from peer companies.
>
> For publicly traded bonds, cost of debt is determined on the basis of the current yield on all outstanding issues. For private debt, such as revolving credit facilities and term loans, the banker typically consults with an in-house debt capital markets (DCM) specialist to ascertain the current yield. Market-based approaches such as these are generally preferred as the current yield on a company's outstanding debt serves as the best indicator of its expected cost of debt and reflects the risk of default. Bond quotes and key terms are available through the Bloomberg Bond Description function DES<GO>.
>
> In the absence of current market data (e.g. for companies with debt that is not actively traded), an alternative approach is to calculate the company's weighted average cost of debt on the basis of the at-issuance coupons of its current debt maturities. This approach, however, is not always accurate as it is backward-looking and may not reflect the company's cost of raising debt capital under prevailing market conditions. A preferred, albeit more time consuming, approach in these instances is to approximate a company's cost of debt based on its current (or implied) credit ratings at the target capital structure and the cost of debt for comparable credits, typically with guidance from an in-house DCM professional.
>
> Once determined, the cost of debt is tax-effected at the company's marginal tax rate as interest payments are tax deductible.

determine point estimates within ranges, can occur at different 'levels' of the estimation process.

56. The key ‘levels’ are the estimation of the:

- parameter values;
- return on equity or the return on debt;
- overall rate of return.

57. 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.[22]

3.2.4.1 The parameter level

58. 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.

59. 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.

60. 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.[23]

61. 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.[24]

62. 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.

63. The Authority notes that other Australian regulators adopt similar approaches for determining parameter estimates.

64. 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.

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

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

[24] 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

65. 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.

66. The alternative could be to utilise ranges for parameters, which then inform a range for the return on equity and the return on debt.

67. 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.

68. 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.

69. 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.

70. 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.

71. 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

72. 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. A single point estimate will be facilitated by the single point estimate of the gearing level.

3.3 Draft determination

3.3.1 Components of the WACC

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

74. The nominal pre-tax WACC can be expressed, following Officer, as:[25]

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

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).

75. The Authority will also retain the market transformation method for converting the nominal post-tax WACC to the real pre-tax WACC. The Authority notes that this will tend to overestimate the required return, typically by up to three basis points.

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

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

3.3.2 Term of the WACC

77. The Authority considers that a WACC based on a 10 year term will best meet the requirements of the *Railways (Access) Act 1998* and the Code.

3.3.3 Point estimates or ranges for estimates?

78. 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.

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

79. 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.

80. 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.

81. 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

82. The object of the *Railways (Access) Act 1998* is to:[26]

> …establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations.

83. 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.

84. 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

85. 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

86. The need to consider risk is an implied requirement of the *Railways (Access) Code 1998*, which states that the:[28]

> …WACC is the target long term weighted average cost of capital appropriate to the railway infrastructure.

87. The WACC 'appropriate' to the railway infrastructure will be conditioned by the level of risk associated with the particular railway infrastructure in question.

88. 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.

89. 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.

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[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.

90. 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.

91. 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

92. 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.

93. 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.

94. 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.

95. 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]

[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.

96. 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]

4.2.3 Conceptual definition of the benchmark efficient entity

97. 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:[33]

> 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.

98. 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.

99. 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.

100. Second, the term 'regulated gas network business' is intended to account for the specific type of business activity being dealt with, and that the business activity is regulated.

101. 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]

102. 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.

103. 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

[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, *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.

types of infrastructure or even other types of goods or services in the economy more broadly – could have a similar degree of risk.[35]

104. 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.

105. 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.

106. 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

107. 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]

108. 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.

109. 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

[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.

[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.

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

110. 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.

111. 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.

112. 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

113. 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.

114. 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.

115. 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.

116. CRA differentiated TPI from the general infrastructure business related to the movement of freight in light of the following:

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

- 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.

117. 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.

118. 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]

119. 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

120. 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.

121. These different strands reflect the extent to which foreign investors participate within the Australian domestic capital market.

122. 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

[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).

of return guidelines concluded that efficient finance costs should be based on the Australian domestic capital market.

123. 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.

124. On the other hand, Brockman submitted that it is appropriate to consider a fully integrated (international) version of the CAPM. Nevertheless, Brockman acknowledged that most regulators around the world which apply the CAPM assume segmented (local) capital markets.

125. 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.

126. 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).

127. 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]

128. 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, this may involve considerable cost, and raises issues with regard to the potential for error. The Authority agrees with the Australian Competition Tribunal when it stated:[40]

> …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,

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

> the regulator's task would be of considerably greater dimensions and the scope for disagreement over allocations would likewise be considerably greater.

129. 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.

130. 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.

131. 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.

132. 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.

133. 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. 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

134. 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.

135. 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.

136. 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 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.[41]

137. 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.

138. 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.

139. 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.[42] The benchmark samples for the Authority's 2009 TPI determination were developed by CRA.[43]

140. 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.

141. 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.

142. 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.[44] The Authority considers that these five broad

[41] 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.

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

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

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

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 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

143. 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.[45] In addition, the Authority's predecessor, the Rail Access Regulator, previously accepted the use of British passenger operations in its WACC determination.[46] 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.

144. 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.

145. 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.

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

[46] 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.

146. 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 function[47]. Selected companies will:

- belong to the OECD;[48]
- 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.

147. 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[49]
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.

148. 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.

149. In addition, two British companies were excluded: Stagecoach Group and FirstGroup, based on their high historical growth rates.

150. The remaining companies in the sample are considered the most relevant comparator companies to the PTA rail network as they involve some form of

47 Bloomberg function EQS.

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

49 Bloomberg field: CIE_DES.

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.

151. 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 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

152. 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.[50,51]

153. 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.[52,53] 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.

154. 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.

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

[51] 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.

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

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

155. The Authority has used the Bloomberg terminal in order to identify comparable companies for Brookfield (Table 2). The following filters were applied in the Bloomberg terminal using the Equity Screening function, that the firm:[54:]

- operates in an OECD country that has similar political, economic and geographical similarities to Australia;[55]
- belongs to the ICB Subsector: Railroads; and
- provides sufficient pricing data to allow calculation of its equity beta and gearing.

156. In addition, the Authority has included comparator companies that were included in its previous WACC determinations for the Brookfield Rail network.[56] 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.[57] 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.

157. 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:

158. 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.

159. 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.

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[54] Bloomberg function EQS.

[55] 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.

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

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

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

Company Name	Country	Ticker	Company Description[58]
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 Authority previously considered the construction of a benchmark sample for TPI in its 2009 WACC determination.[59] 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.

161. The Authority considers that only overseas railway operators are able to adequately capture the risks faced by the TPI rail network (Table 3).

162. 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.[60] This is primarily due to Genesee & Wyoming Inc. operating class III short-railway lines.

4.3 Draft determination

163. 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.

164. 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.

165. 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.

166. 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.

[58] Bloomberg field: CIE_DES.

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

[60] Ibid, p. 39.

Table 3 Comparator companies for TPI Network

Company Name	Country	Ticker	Company Description[61]
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.

Source: Bloomberg Terminal, Economic Regulation Authority analysis.

[61] Bloomberg field: CIE_DES.

5 Gearing

167. 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.

168. Different firms have inherently different risk profiles and as a consequence have varying debt capacities.[62] The optimal capital structure is determined by the business risk inherent to firms in an industry and the expected loss if default occurs.[63] 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.

169. 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

170. In its 2008 decision, the Authority determined that the appropriate gearing level for the Public Transport Authority was 35 per cent.

171. The estimate of the required gearing for PTA was based on the report prepared for the Authority by the Allen Consulting Group (**ACG**).[64] 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.

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

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

[64] 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

172. 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.[65]

173. 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.

174. 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.

[65] 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

175. For TPI, the Authority adopted a gearing of 30 per cent in its 2013 rail WACC determination.[66] 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.

176. 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.[67] 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.

177. 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.

178. The Queensland Competition Authority adopted a gearing of 55 per cent in its 2010 Draft Access Undertaking for the Queensland Rail Network.[68] This adopted gearing was unchanged from its 2006 undertaking.

5.2 Considerations of the Authority

5.2.1 Theoretical Considerations

179. 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.[69]

180. 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

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

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

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

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

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.

181. 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:[70]

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

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'.

182. 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).

183. 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

184. 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.

185. 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.

186. Various estimation methods are available for determining benchmark gearing. These estimation methods were previously examined by the Australian Energy Regulator in

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

its 2009 WACC review of regulated gas and electricity networks.[71] The Authority has also examined the alternative methods in its recent rate of return guidelines for gas transmission and distribution networks.[72] Each of these methods is discussed in turn below.

187. 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,[73] instead of using gross debt.

188. On this basis, gearing is determined as:

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

where

MV represents the market values; and

BV represents book values.

189. 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.

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

190. 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.

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

191. 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.

192. 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

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

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

[73] 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.

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.

193. 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.[74] Flinders submitted that the appropriate time periods should be at the review time frame (five years).[75] 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.[76]

194. 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

195. The results for the estimated gearing level of each of the comparator companies to PTA are set out below (Table 6).

196. Table 6 shows that, for the European toll roads, gearing has increased by 14 per cent from the previous European average shown in Table 4Table 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.

197. 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.

[74] 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.

[75] 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.

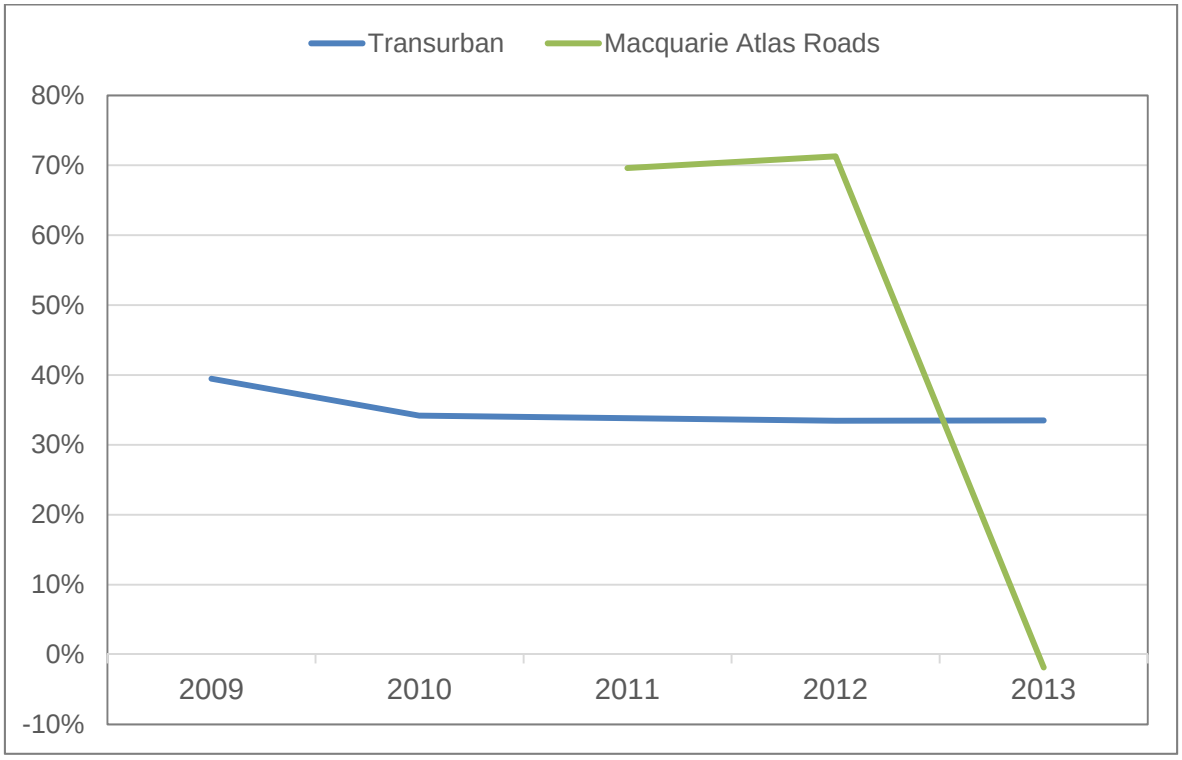
[76] The term of the WACC is 10 years, consistent with the need to estimate a long term rail WACC (see section 3.2.30). However, data availability and relevance may imply shorter spans of time for the estimates of the benchmarks. In this case, internal consistency needs to be accounted for between related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

198. 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.

199. 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.[77] 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

200. 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

201. The Authority considers that TPI's reliance on a small number of 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.

202. 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.

[77] 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 determination

5.3.1 PTA

203. 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. 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.

204. 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.[78]

[78] 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

205. 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.

206. 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.

207. 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).

208. Given that the Brookfield Rail network is likely to face less competition relative to overseas rail operators,[79] 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. 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.

209. 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.[80]

5.3.3 TPI

210. 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.

211. 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.

212. The Authority considers that Genesee & Wyoming Inc. is likely to be the best comparator to TPI, given that it is a short-line dedicated railway.

213. Overall, the Authority considers that a benchmark gearing of 20 per cent is appropriate for the purposes of this determination.

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

[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.

214. 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.[81]

[81] 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

215. 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

216. 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:

Cost of Debt = Risk Free Rate + Debt Risk Premium + Debt raising costs

217. 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.

218. 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.

219. 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

220. Issues in estimating the cost of debt include:

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

6.2.1 Approach to estimating the cost of debt

221. 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.[82] 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.

222. 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.

[82] 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.

223. 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.

224. 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.

225. 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.[83]

226. 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.

227. 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 account that engagement. This requires efficient pricing of rail services, consistent with outcomes that would be observed in effectively competitive markets.[84]

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[83] 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.

[84] 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.

228. 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.[85]
  - 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.

229. 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.[86]

[85] 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.

[86] Productivity Commission, *National Access Regime Draft Report*, 2013, p. 81.

230. 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.[87]

6.2.2 Components of the cost of debt estimate

231. 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.

232. 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.

233. 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 consistent with the average term to maturity observed in the Authority's Bond Yield Approach. The approach for estimating the risk free rate is considered further in Chapter 7.

234. The debt risk premium will continue to be derived from that for an observed sample of comparator firms with similar credit ratings as the benchmark efficient entity, through the Authority's 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.

235. 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.

6.3 Draft determination

236. 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:

Cost of Debt = Risk Free Rate + Debt Risk Premium + Debt raising costs

237. 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.

[87] 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.

7 Risk free rate of return

238. 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.

239. 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

240. 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

241. 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.

242. 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.[88]

7.2.1.1 The choice of proxy for "risk free" assets

243. 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.

[88] 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.[89]

244. 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.[90]

245. The Authority notes that in addition to CGS, there have also been proposals to use either:[91]

- 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.

246. 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.[92] 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.

247. 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.

248. 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,[93] 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.

249. Stakeholders responding to the Issues Paper were generally supportive of using estimates of the risk free rate that are based on the CGS.

250. 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

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89 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.

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

91 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.

92 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.

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

essentially the same outcome.[94] The RBA data is publicly available. Therefore, the Authority sees no compelling rationale for change.

251. 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.[95] 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

252. 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.

253. 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.

254. 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

255. The general practice of Australian regulators is to adopt an averaging period in the range of 20 to 40 trading days for smoothing the day to day fluctuations of the observed risk free rate.[96] The Authority has to date utilised a 20 trading days period.

256. The Authority reconsidered the averaging period as part of the development of the gas rate of return guidelines.[97]

257. With regard to the averaging period, the Authority considers that there is a trade-off between prediction efficiency and short term volatility considerations. The Authority views prediction performance as being an important consideration for the setting of the averaging period.[98] However, the risk free rate may be very volatile in the short term, which may not be conducive to establishing the best estimate of the prevailing forward looking risk free rate. The Authority's analysis indicates that an averaging

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94 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.

95 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.

96 There are three different types of moving averages: (i) Simple Moving Average; (ii) Exponential Moving Average; and (iii) Weighted Moving Average, and they are all calculated slightly differently. However, all have a similar smoothing effect on the data, so that any sharp changes in rates are removed, and, as a result, the overall direction is shown more clearly. For simplicity, the Authority adopts the simple moving average in its calculations.

97 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. 84.

98 Prediction efficiency is relevant to the achievement of economic efficiency (refer to section 6.2.1). 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. 61.

period of anything less than 60 trading days – immediately prior to the release of the regulatory decision – may be used to overcome the volatility issue, as the prediction performance would not be statistically different as compared to the current spot value of the risk free rate.[99]

258. 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.

259. In the gas rate of return guidelines, the Authority concluded that an averaging period of 40 days would still provide a good estimate of the prevailing rate, while reducing volatility. A 40 day period that falls close to the final determination of the rail WACC, would meet both the requirement for efficiency and acceptable volatility.

260. 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.[100] Nevertheless, the Authority considers that the 40 day averaging period has satisfactory prediction properties.

261. 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.

7.3 Draft determination

262. The Authority will base its estimation of the nominal risk free rate on the observed yield of 10 year Commonwealth Government Securities (**CGS**) bonds.

263. 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.

99 Consistent with the random walk hypothesis and the behaviour of non-stationary series, the current value of the risk free rate will be the best predictor of the rate prevailing over the subsequent regulatory period. The Authority's analysis indicates that a value derived over an averaging period of less than 60 days performs as well as the current value, but that a value based on an averaging period of longer duration than 60 days, such as one year or five years, is statistically inferior in prediction performance (see Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2012, pp. 659-666).

100 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.

8 Benchmark credit rating

264. 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.

265. 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.

266. 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

267. 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.[101] This conclusion was based on the advice from the Allen Consulting Group, which observed available credit ratings for comparable overseas and domestic comparators.[102]

268. 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**).[103] The Authority has consistently rejected the argument that the systematic risk of an infrastructure owner necessarily reflects that of its customer base.[104]

269. 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

[101] 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.

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

[103] 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.

[104] 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.

270. 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.[105,106,107]

8.2 Considerations of the Authority

8.2.1 Methodology used to estimate credit rating

271. 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,[108] or the actual awarded credit rating from a credit rating agency.

272. Brockman submitted that estimates of the cost of debt for access providers should not be linked to their actual credit ratings.[109] 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).

273. Flinders submitted that the two existing freight railways under the regime clearly have different credit ratings for the parent entity and the railway.[110] 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+.

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

[106] Queensland Competition Authority, Final Decision, Queensland Rail Network's 2010 DAU, 2010.

[107] 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.

[108] 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.

[109] 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.

[110] 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.

274. 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.[111] 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+.

275. 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.[112] 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.

276. The Authority has previously addressed these methodologies in the rate of return guidelines for gas distribution and transmission networks.[113] 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.

277. 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

	Financial Risk Profile					
Business 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

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

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

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

278. 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 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.[114] 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.[115] 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

[114] Obtained via Bloomberg on 9 May 2014, 2013.

[115] *Railways (Access) Code 1998*, Schedule 4, Division 1, Clause 2.

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

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 determination

8.3.1 PTA

279. 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.

280. Furthermore, the Authority notes that the observed gearing of these toll road operators is on average 50 per cent,[116] 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.

281. 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.

282. 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.[117]

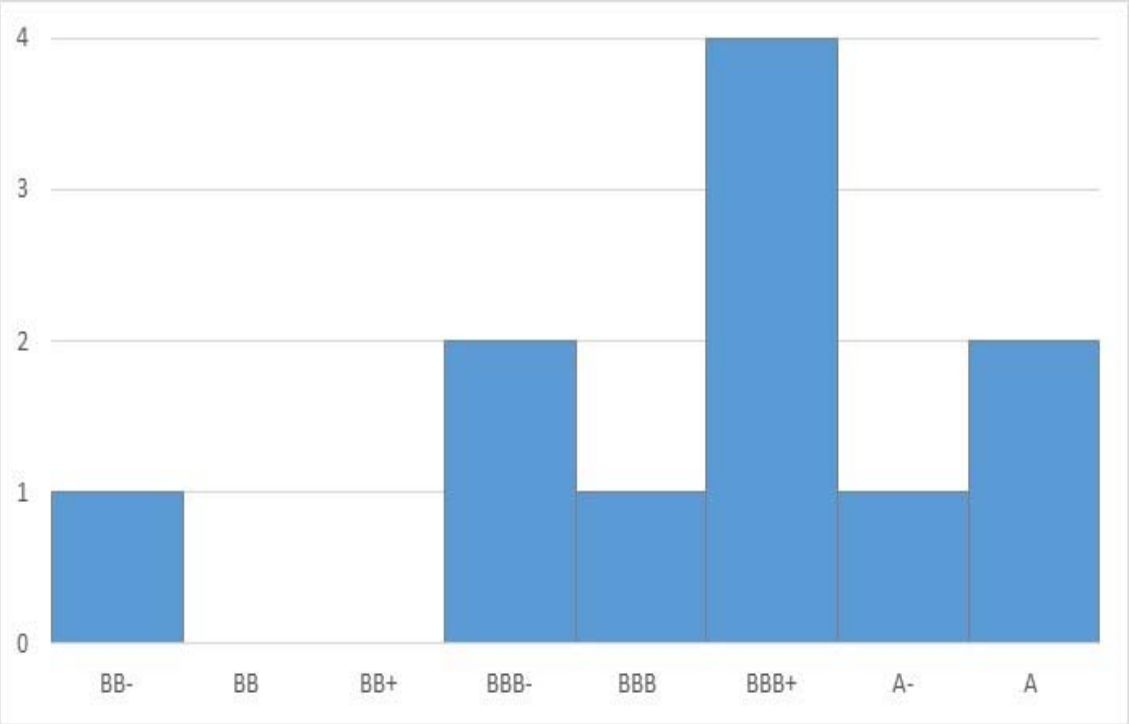
8.3.2 Brookfield Rail

283. 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.

[116] Refer to Table 6 in Chapter 5 - Gearing.

[117] 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 2 Brookfield Rail benchmark sample observed credit ratings frequency



Source: Bloomberg, Economic Regulation Authority analysis

284. 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.

285. 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.

286. 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.

287. 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.

288. 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.

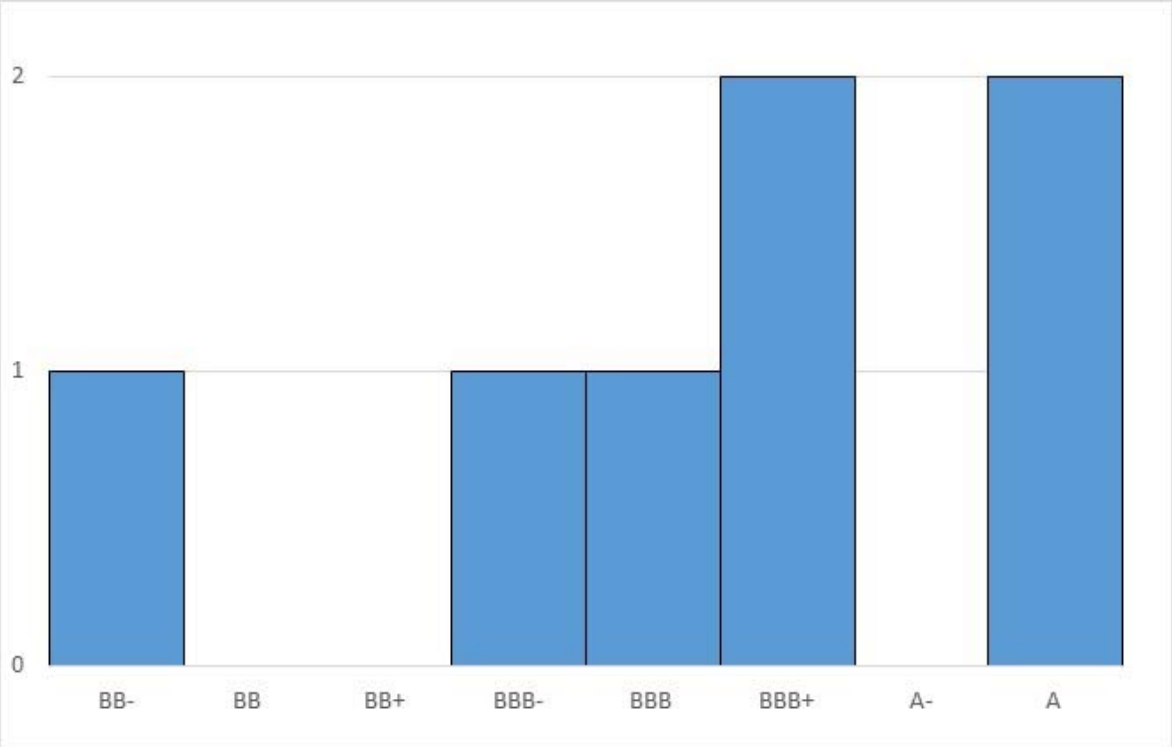
289. The Authority also notes that the Brookfield Rail network is rated as BBB by Standard and Poor's.[118] The Authority further notes that, whilst a BBB+ determination would diverge slightly from the credit rating assigned by S&P, this divergence would be consistent with Brookfield Rail having a higher 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").[119]

290. 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.[120]

8.3.3 TPI

291. 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.

Figure 3 TPI benchmark sample observed credit ratings frequency



Source: Bloomberg, Economic Regulation Authority analysis

[118] Standard & Poor's, *Ratings Direct – Aurizon Network Pty Ltd*, 15 May 2013.

[119] 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.

292. 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 rational for Genesee & Wyoming Inc., Standard and Poor's noted that:[121]

> 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.

293. 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.

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

295. 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.

296. The Authority notes that a credit rating of BBB- for the TPI rail network is unchanged from its 2009 determination.[122]

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

[122] 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

297. 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.

298. 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

299. 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.[123] This was based on the advice of the Allen Consulting Group.[124] In the 2009 WACC determination for the TPI network, the Authority used debt risk premiums derived from the use of Bloomberg fair value curves.[125]

300. 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.[126] 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.[127]

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[123] 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.

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

[125] 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.

[126] 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.

[127] Economic Regulation Authority*, Explanatory Statement for the Rate of Return Guidelines,* p. 109.

9.2 Considerations of the Authority

301. 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,[128] and is quoted by financial services such as Bloomberg. Subtracting the risk free rate results in the DRP, and represents the risk premium bond holder's demand for incurring the risk of default.

302. 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.[129] 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.[130]

303. Brockman submitted that it broadly supports the Authority's existing process.[131] 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:[132]

- 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.

304. 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. Given this, the Authority considers that the

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

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

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

131 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.

132 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.

Bond Yield Approach, regularly applied in previous utility determinations,[133][134][135] is appropriate to estimate the required DRP for each of the benchmark efficient entities representing the rail networks.

9.2.1 Authority's Bond Yield Approach

305. The key component of the Bond Yield Approach is to develop a benchmark sample of corporate bonds which hold a similar level of risk as that of the benchmark efficient entity. The Authority uses the Bloomberg data service exclusively in order to construct the benchmark sample. The following characteristics are required to select bonds to be included in the benchmark sample:[136]

- the credit rating of each bond must match that of the benchmark efficient entity, as rated by Standard & Poor's;
- the time to maturity must be 2 years or longer;
- bonds must be issued in Australia by Australian entities and denominated in Australian dollars;
- both fixed bonds[137] and floating bonds are included,[138]
- both bullet and callable/ putable redemptions are included;[139] and
- at least 10 yield observations are required over the specified averaging period.

306. The Authority developed the above criteria for deriving the benchmark sample based on considerations of market relevance and sample size. As outlined in its Discussion Paper in 2010, the Authority considers that these criteria are necessary given the small size of the Australian corporate bond market.[140] In addition, the Authority considers that the above criteria, which are used to construct a benchmark sample, allows for an estimate of the DRP that is commensurate with the risks faced by the benchmark efficient entity.

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

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

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

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

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

138 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 (BBSW) (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.*

139 A callable (putable) 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 (putable) 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).

140 Economic Regulation Authority, *Discussion Paper – Measuring the Debt Risk Premium: A Bond-Yield Approach*, December 2010 p. 10.

307. The Authority is aware of the potential weaknesses of observed yields for some bonds reported by Bloomberg. However, as discussed at length in its Discussion Paper released in December 2010[141] and its final decision on the adoption of the Bond Yield Approach in estimating the DRP in WAGN's proposed Access Arrangement,[142] the Authority is of the view that there is a trade-off between the relevance of the market data and the number of observations in the benchmark sample. The Authority notes that using Bloomberg's high valuation scores on observed yields will reduce the size of the benchmark sample to only a few bonds. As a consequence, the Authority is of the view that its current approach is appropriate for estimating the required DRP.

9.2.1.1 The joint-weighted averaging approach

308. The DRP is derived based on the observed yields obtained from the bonds in the benchmark sample. The DRP for each bond is calculated by subtracting the relevant risk free rate that has the same maturity and from the observed yield of the bond.[143] A weighted average DRP is then calculated by weighting each DRP in the benchmark sample by its *"joint-weight".*

309. The joint-weighted mechanism takes into account two key characteristics of bonds in the benchmark sample: (i) the term to maturity (a bond with a longer term to maturity is given a higher weight in the sample); and (ii) the amount at issuance (a bond with a larger amount at issuance is given a higher weight in the sample).

141 Ibid.

142 Economic Regulation Authority, *Final Decision on Proposed Revisions to the Western Australian Gas Network*, December 2010.

143 As in Chapter 7 – Risk free rate, the risk free rate is calculated via linear interpolation of the two CGS with maturity closest to that of the desired maturity.

310. The joint-weighted average calculates a joint weighted average debt risk premium (**JW**) as follows:

$$JW = \sum_{i=1}^{n} w_i \overline{DRP_i} \quad (9)$$

where;

n is the number of bonds in the sample;

w_i is the weight assigned to bond i in the sample and defined as:

$$w_i = \frac{(Maturity_i).(IssueAmount_i)}{\sum_{j=1}^{n}(Maturity_j).(IssueAmount_j)};$$

$Maturity_i$ is the term to maturity of bond i;

$IssueAmount_i$ is the size of the bond, in dollar terms at its issuance date; and

$\overline{DRP_i}$ is the average debt risk premium observed over the averaging period for bond i.

311. Given that the Bond Yield Approach is based on a benchmark sample of bonds, with a similar level of risk to that of the benchmark efficient entity, it follows that the derived DRP will be a function of bonds in that sample. As a consequence, no econometric cross check is necessary as the joint-weighted approach is constrained to have a sensible outcome reflecting the prevailing market conditions for funds.

312. The Authority considers that the joint-weighting mechanism is 'fit for purpose' for estimating the DRP for the WACC of each of the benchmark efficient rail entities.

9.2.1.2 Averaging period for the debt risk premium

313. 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.[144] 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.

314. 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.[145] Requiring bonds to

[144] 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).

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

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 requires each bond to have at least 10 days of pricing data in this 40 day averaging period in order to be included in the benchmark sample. The Authority is of the view that this is necessary given the lack of financial data available in Australia, with this approach maximising the number of relevant bonds available in the benchmark sample.

9.3 Draft Determination

315. The Authority is of the view that it is appropriate to use the Bond Yield Approach together with the joint-weighting mechanism to estimate the debt risk premium. The debt risk premium derived from the Bond Yield Approach will be based on the observed yields of relevant Australian corporate bonds, taken from Bloomberg, that qualify for inclusion in the benchmark sample. For each of the rail networks, a separate bond sample will be developed based on the corresponding benchmark efficient credit rating.

316. 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 in Australia by Australian entities and denominated in Australian dollars;
- fixed bonds and floating bonds are eligible for inclusion;
- both Bullet bonds and bonds with Callable/ Putable redemptions are eligible for inclusion; and
- there are at least 10 yield observations over the required 40 day averaging period.

317. The debt risk premium is derived based on the observed yields obtained from the bonds in each benchmark sample. The debt risk premium for each bond is calculated by subtracting the relevant risk free rate that has the same maturity as that of the bond.

318. A weighted average debt risk premium is then calculated by weighting each estimated debt risk premium for each bond in the benchmark sample by its 'joint-weight"'. The joint-weight for each bond is calculated by multiplying the bond's term to maturity by its amount at issuance, then dividing by the sum of all bonds in the sample's terms to maturity times their amount at issuance. The debt risk premium for the benchmark efficient entity is then calculated as the weighted average debt risk premium of each bond in the benchmark sample by using its joint weight.

10 Return on equity

319. 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.

320. 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.[146]

10.1 Current approach

321. 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.

322. 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

323. 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

324. 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.

325. 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

[146] 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.[147]

326. 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.

327. 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.

328. 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.[148]

329. 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.

330. 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.[149] 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.

331. 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.

332. Third, there is a need to consider prevailing conditions for the return on equity.[150] McKenzie and Partington succinctly capture the rationale for the need to consider prevailing conditions:[151]

> 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

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

[148] 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.

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

[150] NGR 87(7).

[151] 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.

333. 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'.[152,153] The implication is that the expected return on equity is not constant through time.

334. 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. The Authority considers that the forward looking, prevailing return on equity will fluctuate over time. 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

335. 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**).

336. 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.

337. 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;
- 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.

338. 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.

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

153 Elsewhere in the gas rate of return guidelines, the Authority considered whether historic time series data of observed fluctuations in the return on equity exhibits 'stationarity', and hence whether its historic observations can be relied on to provide a guide to expected future returns.

339. 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.

340. The Authority also determined in the gas rate of return guidelines to give weight to relevant outputs from the DGM when estimating the market risk premium (**MRP**) for input to the Sharpe Lintner CAPM. Estimates from the DGM will be used to inform the range of the MRP, which will be then used as input to the Sharpe Lintner CAPM.

341. 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.

342. 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.

343. 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.

344. 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. The Authority will also utilise the DGM as an input for estimating the MRP.

345. 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

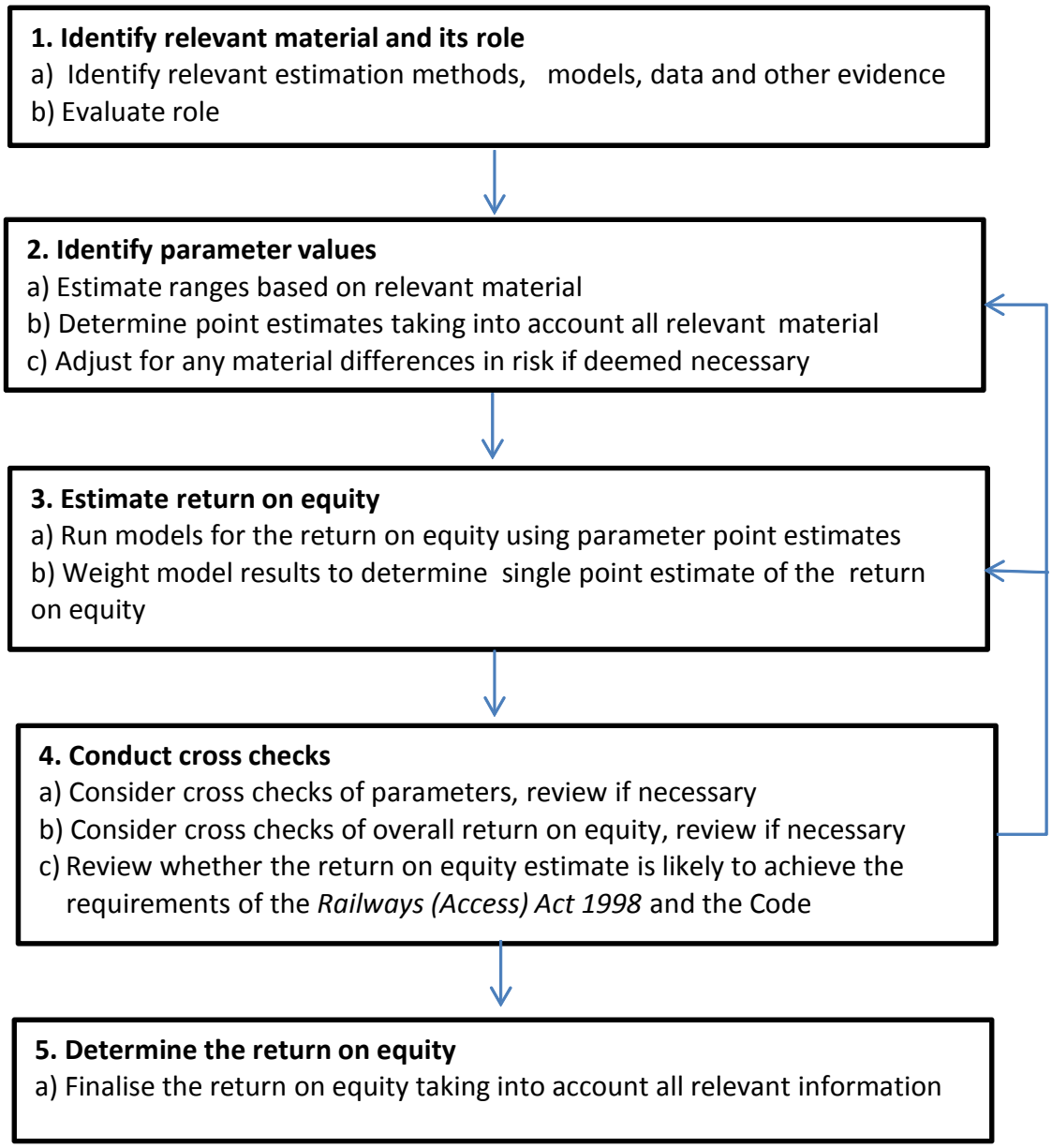
346. The Authority will adopt a five step approach for estimating the return on equity.[154] The five steps are summarised in Table 13 below. This approach will allow the Authority to have regard to a wide range of material, taking account of relevant models for the return on equity, as well as a range of other relevant information. The Authority will 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*.

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

[154] 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.

Table 13 Proposed approach to estimating the return on equity



10.2.3.1 Step 1: identify relevant material and its role

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

349. 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.

350. 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

351. 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.

352. All other models of the return on equity were judged to be not relevant at the current time.

353. Therefore, the Authority proposes to give full weight to the Sharpe Lintner CAPM when estimating the return on equity.

Other relevant material

354. 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.[155]

10.2.3.2 Step 2: estimate parameter point estimates

355. 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.

356. 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.

357. 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

358. 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.

359. The parameters in the Sharpe Lintner CAPM model are the risk free rate, the equity beta and the market risk premium (**MRP**). The risk free rate is observed as single point estimate from the Commonwealth Government Security (**CGS**) proxy, consistent with the 10 year term (see section 3.2.3). The equity beta and the MRP are subject to estimation uncertainty and multiple estimation approaches and are 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.

[155] 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.

- The Authority has considered relevant material for the MRP in chapter 11 – Market risk premium. The MRP is estimated initially as a range.

Parameter point estimates

360. 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

361. 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

362. 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.

363. 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

364. A point estimate of the MRP will be selected from within the identified range.

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

366. In order to determine the point estimate of the market risk premium within a range, the Authority is of the view that relevant information relating to investors' perceptions of risk in the financial market should be used, in combination with the Authority's judgement with regard to prevailing conditions.

367. The Authority's starting point is around the mid-point of the identified range.

10.2.3.3 Step 3: Estimate the return on equity

368. 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.

369. 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

370. Checks informed by other relevant material would be conducted to determine 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.

371. Checks would include:

- comparison of the risk free rate with the historic return on debt;
- comparison of the implied return on equity with the historic return on equity.

10.2.3.5 Step 5: Determine return on equity

372. 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 determination

10.3.1 Models of the return on equity

373. 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**).

374. 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.

375. The Authority also decided to give weight to relevant outputs from the DGM when estimating the market risk premium (**MRP**) for input to the Sharpe Lintner CAPM. In particular, estimates from the DGM will be used to inform the range of the MRP, which will be then used as input to the Sharpe Lintner CAPM. That conclusion is adopted for the rail WACC.

376. 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

377. The Authority will determine a single point estimate for the return on equity.

378. 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.

379. 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.

380. 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.

381. The Authority will adopt a five step approach for estimating the return on equity. The five steps are summarised in Table 13. 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.

11 Market risk premium

382. 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).

383. 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.

384. In chapter 10, the Authority sets 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.

385. 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.

386. This chapter considers issues related to the estimate of the market risk premium. In particular, it establishes the range for the forward looking estimate of the MRP.

11.1 Current approach

387. 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.

388. 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.

389. 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.

390. 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

391. The Authority conducted an extensive analysis of the MRP for the gas rate of return guidelines.[156] 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.

392. 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'.[157]

393. 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'.

394. 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.[158]

395. The Authority also performed alternative econometric tests (Dickey Fuller Generalised Least Squares tests) which provide contrary empirical evidence to the above. This analysis produces evidence that the MRP in Australia is stationary (when a risk-free rate is proxied by observed returns on bills[159]) or that the MRP is marginally stationary (when a risk-free rate is proxied by observed returns on bonds).

396. In conclusion, the Authority's empirical analysis does not support a clear relationship between the risk-free rate and the market risk premium within the Australian context. The contradictory evidence identified in the gas rate of return guidelines is consistent with the conclusions of an extensive literature review conducted by Professors McKenzie and Partington on both theoretical and empirical studies regarding this relationship.[160] McKenzie and Partington found no conclusive evidence of any

[156] 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.

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

[158] 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.

[159] Bills are a short term debt instrument of maturity up to 3 months.

[160] McKenzie and Partington, *Report to the AER: Supplementary Report on the Equity Market Risk Premium*, 22 February 2012, p. 9.

systematic relationship, concluding that this relationship could be negative; positive; or independent.

397. The Authority is therefore of the view that there is inconclusive statistical evidence to suggest any relationship existing between the risk-free rate of return and the MRP. Given the conflicting evidence regarding the relationship between the risk free rate and MRP, it is necessary to use different methodologies, in addition to regulatory judgement in determining the appropriate value of the MRP. However, the implication of the analysis is that the MRP may fluctuate, depending on economic conditions. On this basis, the Authority considers that the forward looking MRP does vary. The Authority is of the view that the direction of that fluctuation – relative to the risk free rate and the return on equity – is not quantifiable. As a consequence, auxiliary information must be used to determine the appropriate point estimate within an estimated range of MRP values.

11.2.1 Estimating the market risk premium

398. The market risk premium cannot be directly observed, unlike other market based parameters such as the risk free rate and debt risk premium. As a consequence, estimation procedures for estimating the MRP are imprecise. In addition, the MRP is a forward-looking concept subject to high levels of uncertainty in the short term. The Authority considers that any estimated MRP must be a forward looking MRP, commensurate with the prevailing conditions expected over the future term of the WACC. Australian regulatory practice over the past decade has typically applied a MRP of 6 per cent, based on the historic average.

399. Given the inconclusive empirical and academic evidence regarding the nature of the relationship between the MRP and risk free rate, outlined above, the Authority is of the view that a reasonable range of estimates – using different methodologies – is necessary in order to best estimate the most relevant forward looking MRP. This approach allows for a permissible range of MRP values to be estimated, taking into account the possible theoretical relationships that exists between the MRP and risk free rate. The Authority will then exercise its regulatory judgement, based on other information, to inform the rate of return that best reflects the prevailing market conditions for funds.

400. Submissions on the Issue Paper largely supported this approach:

- Brockman submitted that there are a variety of ways to estimate the MRP, including backward-looking and forward-looking approaches. The most common approach is to consider long run historical averages of excess returns on the market. Survey data could also be useful in informing estimates. In addition, consideration of information regarding existing and future expectations could provide forward-looking evidence.
- ARTC submitted that the MRP is volatile and as such a long-term average needs to be calculated to estimate a meaningful premium. ARTC considered that the period of averaging needs to be at least 30 years and while longer periods change the calculated answer marginally, the advantage of a stable estimate outweigh any disadvantages of the longer time horizon. ARTC considers that studies over various time periods have consistently produced estimates in the range of 6 to 8%. In ARTC's view, and putting the effects of the global financial crisis aside, a range of between 6% and 7% is a more reasonable estimate of the long-term market risk premium. With the instability caused by the global financial crisis still in the economy and financial markets,

a market risk premium from at least the mid-point of this range would be considered conservative.

- Flinders submitted that – like all key elements of the WACC framework – careful judgment must be exercised to estimate the MRP as the premium is not directly observable. Flinders noted that regulators should take a consistent approach to MRP and use both historical indices and consideration of information sources regarding current and future expectations. This approach provides a more informed forward look than the use of purely historical data.

11.2.2 Historical risk premium approach

401. The historical risk premium approach estimates the MRP by observing historical realised excess returns[161] of the market portfolio, and using this to inform the future expected MRP. This is based on the assumption that investors will determine their expected equity risk premium, in the future, informed by realised equity returns from the past. This approach implicitly assumes that no relationship exists between the MRP and risk free rate. It is also assumed expectations will be developed on long term observations and thus are relatively stable over time. Investors are not expected to change their long-term expectation of the MRP as frequently as daily changes in the financial markets.

402. As part of the development of the gas rate of return guidelines, the historical data on equity risk premiums was considered as a means to estimate a forward looking MRP.[162] The following studies informed an appropriate range for the MRP (Table 14).

[161] Realised excess returns are the difference between the realised return of the market portfolio and the relevant risk free rate of return.

[162] 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 11.2.5.

Table 14 Estimates of a forward looking MRP using the historical risk premium approach

Study/Author	Period	Assumed value of imputation credits	Term of a risk-free rate	Estimates of the MRP (Per cent)
Handley/ AER (2011)[163]	1883 – 2011 1988 - 2011	0.35	10 years	5.0 – 6.0
Brailsford, Handley and Maheswaran[164]	1883 – 2010 1988 - 2010	0.50	10 years	6.0 – 6.5
ERA	1972 – 2011 1988 - 2011	0.65	5 years	5.0 – 6.0
Value Adviser Associates[165]	1883 - 2010	1.00	10 years	6.0 – 7.0
Value Adviser Associates[166]	1883 – 2008 1958 -2008	0.5	10 years	6.1 – 7.2

Source: Compiled by the Economic Regulation Authority

403. Based on the results in Table 14 the Authority is of the view that a relevant MRP based on historical averages of risk premium approach indicates the MRP is likely to fall within the range of 5.0 per cent and 7.0 per cent. The Authority notes that the historical risk premium approach is appropriate if no relationship between the MRP and risk free rate exists.

11.2.3 The dividend growth model

404. The dividend growth model estimates the required rate of return for an asset by equating the present value of expected cash flows with the observed price of the asset. The dividend growth model can be used to estimate the expected market return by equating the present value of *forecast* future dividends of a market index, and equating this with the observed price of the index. By subtracting the relevant risk free rate, an estimate of the expected market risk premium can be derived.

405. The dividend growth model assumes that the market cost of equity never changes over time which implies that any change in the risk free rate is perfectly offset by an opposite change in the MRP.[167] As a consequence, the dividend growth model would be more relevant if the MRP and risk free rate were perfectly negatively correlated. Assuming that this particular relationship holds, the Authority is of the view that the dividend growth model is a relevant model for informing the range of the forward looking MRP. This conclusion is based on consideration of the conflicting empirical

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

[164] Brailsford , Handley and 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.

[165] Value Adviser Associates, *The provision of analysis supporting a value for Market Risk Premium,* a Report prepared for DBNGP (WA), 2011, p. 4.

[166] Value Adviser Associates, *The Market Risk Premium,* a Report prepared for WestNet Energy, 2009, p. 11.

[167] Lally M, *The Dividend Growth Model,* 4 March 2013, p. 3.

evidence regarding the relationship between the risk free rate and the MRP, noted above.

406. The Authority examined estimates of the MRP – including its own estimate – as part of the development of the gas rate of return guidelines.[168] The Authority then assembled a sample of estimates of the MRP derived through the DGM (Table 15).

Table 15 Estimates of the MRP adopted to determine a appropriate range

Study/Author	Approach	Estimates of the MRP (Per cent)
CEG	DGM	8.5 – 9.0
Capital Research	DGM	7.0 – 7.5
NERA	DGM	6.0 – 7.5
Lally (AER)	DGM	6.0 – 8.5
ERA	DGM	4.0 – 6.5
SFG	DGM	4.0 – 8.0

Source: Australian Economic Regulator, *Multinet Final Decision*, 2013, Table 5.3, p. 124; SFG Consulting, *Dividend discount model estimates of the cost of equity*, 19 June 2013; and Economic Regulation Authority analysis. Multiple estimates by the same organisation are combined in ranges.

407. The Authority considered that CEG's estimates of a forward looking MRP of 8.5 per cent and 9.0 per cent are significantly higher than all other estimates using the same approach. The Authority noted that – based in its own application of the dividend growth model – a change of 50 to 100 basis points in the estimated MRP can occur when the potential biases present in forecast dividends are removed. Accordingly, the Authority considers that less weight should be given to estimates at the upper end of the range of the implied MRP from the DGM, such as those from the CEG studies.

408. Based on the above estimates, with limited weight given to CEG's studies, the Authority is of the view that a forward looking MRP using the DGM falls within the range of 6.0 per cent and 7.5 per cent.

11.2.4 An appropriate range for the MRP

409. The Authority considers that it is appropriate to determine a range for the forward looking value of the MRP, informed by the outcomes from two separate approaches: (i) the historical average approach in which historical data on equity risk premium are used; and (ii) the dividend growth model.

410. The estimates of the MRP from these two approaches can be summarised as follows:

- using the historical average approach, the Authority considers that the average is likely to fall within the range of 5.0 per cent to 7.0 per cent; and
- for the six estimates using the dividend growth model, the Authority considers that the range of 6.0 – 7.5 per cent is appropriate.

[168] 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.

411. Combining the two ranges, the Authority considers that a range of 5.0 per cent to 7.5 per cent is appropriate for the forward looking estimate MRP.

412. The Authority will exercise regulatory judgement to estimate the appropriate point estimate within this range at any given time.

11.3 Draft determination

413. The Authority considers that it is appropriate to determine a range for the forward looking value of the MRP, informed by the ranges from two separate approaches: (i) the historical average approach in which historical data on equity risk premium are used; and (ii) the dividend growth model. Combining the two ranges, the Authority considers that a range of 5.0 per cent to 7.5 per cent is appropriate for the forward looking estimate MRP.

414. The Authority will exercise regulatory judgement to estimate the appropriate point estimate within this range when making its annual rail WACC determination.

12 Equity beta

415. 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.

416. 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.

417. 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.

418. 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:

$$R_e = R_f + \beta_e \left(R_m - R_f \right) \tag{5}$$

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;

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

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

419. 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

420. 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.[169] 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.

421. 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.[170] 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.

422. 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 16. 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.

423. 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.

[169] 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.

[170] 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 16 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

424. 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.[171] 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 16 below.

[171] 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 17 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

425. 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.

426. 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.[172] Based on this, its view was that there was limited justification to adopt a beta value outside of the range derived from comparator businesses.

427. 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 18. 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.

428. 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.[173] The Authority considered that Genesee & Wyoming Inc. was likely to be the best comparator for a short line railway operator such as TPI.

[172] 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.

[173] 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 18 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

429. 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 19). 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 19 Equity Beta determinations by other Australian regulators

Regulator	Year	Rail network	Equity Beta
QCA[174]	2010	QR Network	0.8
ACCC[175]	2010	ARTC/HVCN	0.94
IPART[176]	2009	ARTC/HVCM	0.85

Source: ERA analysis

[174] Queensland Competition Authority, *Final Decision, Queensland Rail Network's 2010 DAU*, 2010.

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

[176] 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

430. 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.[177] 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.

431. 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.[178,179] 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.[180]

432. 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.

[177] Australian Energy Regulator, *Final decision: WACC review*, May 2009.

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

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

[180] Ibid.

433. 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:

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

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.

434. 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.

435. 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.[181] 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

436. 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.[182] 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.

[181] 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.

[182] 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.

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

438. 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.[183] 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.

439. 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.[184] 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.

440. 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.

441. 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 outlined discussed in chapter 4.

12.2.3 Estimation of the required asset beta

442. The Authority's method for estimating the benchmark asset beta and associated equity beta is outlined in Appendix 1.

443. 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 20).

[183] Ibid.

[184] 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 20 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.

444. 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.

445. The results for each of the benchmark samples are as follows.[185]

12.2.3.1 PTA Regression Results

Table 21 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 22 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 23 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

446. 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.

12.3 Draft determination

447. 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.

448. 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 conduced bootstrap analysis, in order to inform the overall observed range of permissible asset betas.[186] 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

449. 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

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

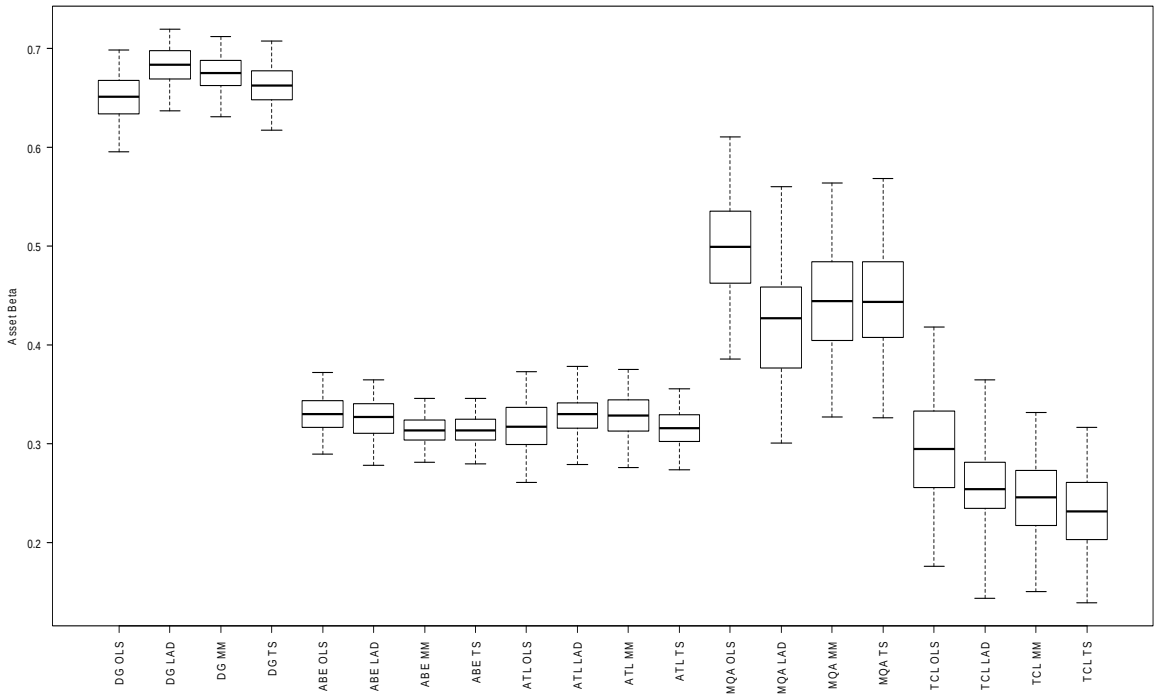
Authority considers that comparing the service provided by the PTA and the comparator companies of the benchmark sample is likely to be inaccurate as toll road companies are only an approximation to the service provided by passenger rail. In particular, the Authority considers the systematic risk of 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.

450. 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.

451. Based on the above regression results contained in Table 21, 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.

452. Figure 4 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 4 95 per cent confidence intervals for PTA comparator companies' asset betas



Source: Economic Regulation Authority analysis

453. 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.

454. 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.[187] 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

455. 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.

456. 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.

457. Figure 5 and Figure 6 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.

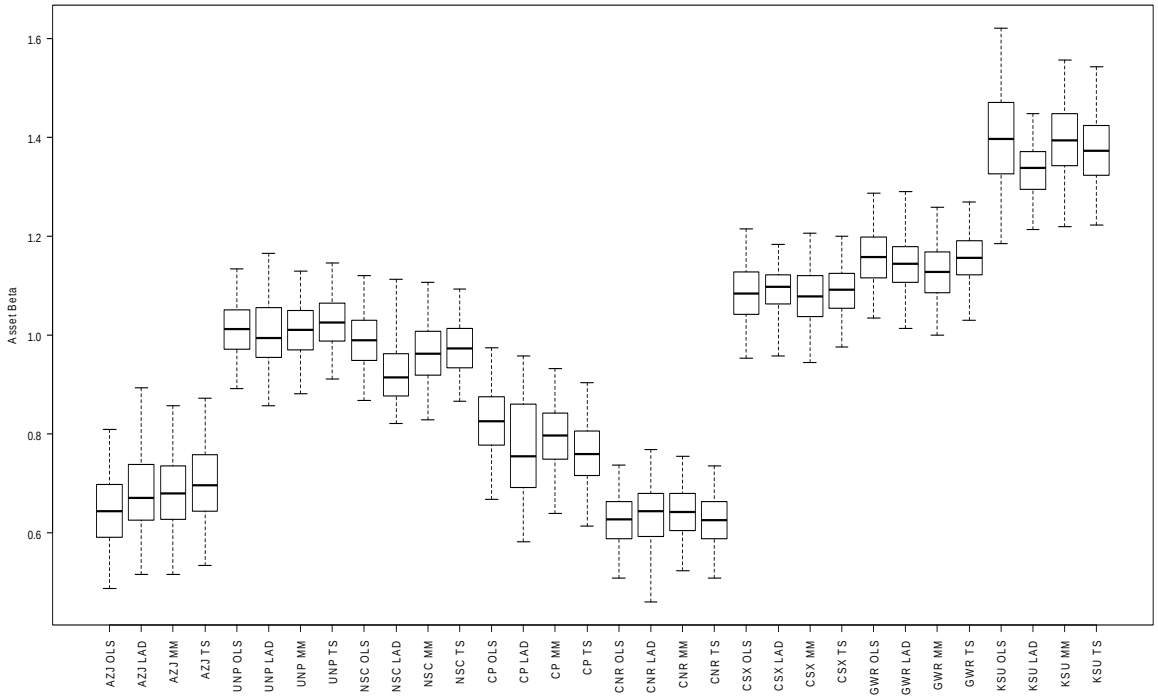
458. As noted previously, the Authority considers that the Brookfield Rail network will have a lower level of systematic risk relative to overseas rail operators, with Aurizon being the most comparable company in Brookfield's sample. The Authority considers that an asset beta of 0.7 for the Brookfield 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,

[187] 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.

459. 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.[188] 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.

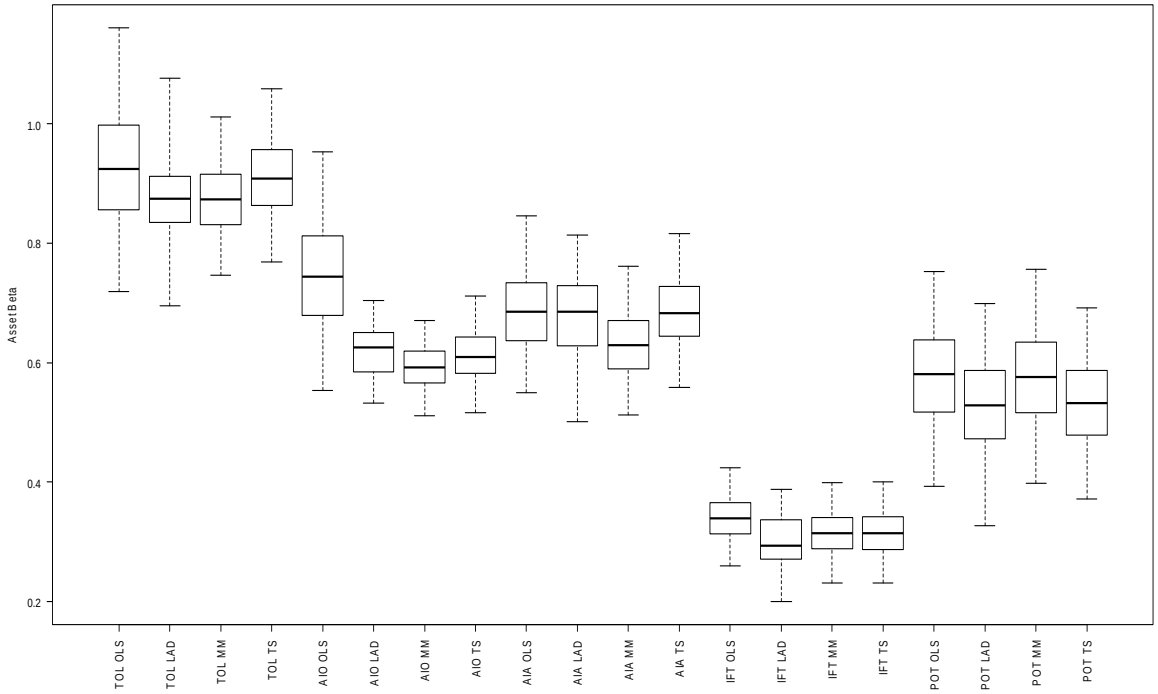
Figure 5 95 per cent confidence intervals for Brookfield Rail comparator companies – rail comparators' asset betas



Source: Economic Regulation Authority analysis

[188] 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 6 95 per cent confidence intervals for Brookfield Rail comparator companies - non-rail comparators' asset betas



Source: Economic Regulation Authority analysis

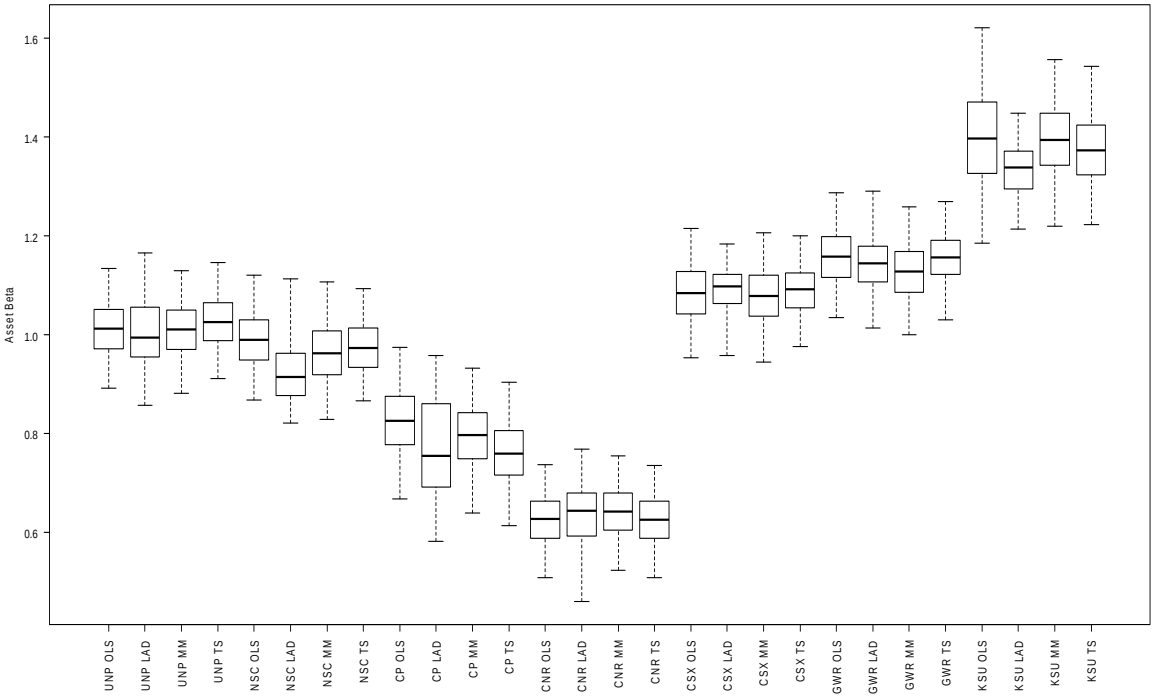
12.3.3 The Pilbara Infrastructure

460. The Authority has previously noted that TPI's 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.[189] The Authority has previously noted that Genesee & Wyoming Inc. was likely to be the best comparator for a short railway line such as TPI.

461. 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 TPIs 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.

[189] 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 7 95 per cent confidence intervals for TPI comparator companies' asset betas



Source: Economic Regulation Authority analysis

462. 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.[190]

463. 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.

190 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

464. Debt raising costs are the administrative costs and other charges incurred by businesses in the process of raising or refinancing debt.[191]

13.1 Current approach

465. 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.

466. 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**).[192]

13.2 Considerations of the Authority

467. 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.

468. The Authority considered debt raising costs in detail as part of the development of the gas rate of return guidelines.[193] That analysis observed that the formative work on debt raising had been undertaken by ACG in 2004.

469. 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.[194]

470. 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;

[191] 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.

[192] 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.

[193] 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.

[194] 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.

471. 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.[195]

472. 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.

473. The Authority is not aware of any new alternatives to the ACG method. Recent estimates of debt raising costs – including Deloitte's 2010 estimate[196]; PricewaterhouseCoopers' 2011 estimate[197]; the AER's 2013 estimate[198]; and the Authority's estimate in 2013[199] – have all adopted the same approach as in ACG's 2004 estimate.

474. 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.

475. The Authority considers that its most recent 2013 estimate of debt raising costs – of 12.5 basis points per annum (bppa) (Table 24) – remains relevant.[200] The estimate continues the allowance for debt raising costs provided for in the Authority's previous rail WACC decisions.

476. 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.

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

196 Deloitte, *Envestra Limited: Debt Financing Costs*, September 2010.

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

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

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

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

Table 24 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 determination

477. 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.

478. 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

479. 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

480. 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.

481. 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.

482. 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 0.70[201] and a theta of 0.35,[202] which produces a gamma value of 0.25[203], to be consistent with the ACT's decision.

483. 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.[204]

484. In the Authority's 2013 rail WACC Determination a gamma value of 0.25 was adopted.[205]

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

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

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

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

205 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

485. 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:

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

486. The Authority considered its approach to estimating gamma in developing its gas rate of return guidelines.[206] The Authority's approach for the rail WACC will follow the approach set out in detail in the gas rate of return guidelines.

487. First, the Authority considers that an estimate of the payout ratio of 70 per cent is appropriate, based on the empirical evidence currently available. This estimate is consistent with the ACT's decision with regard to the value of the payout ratio, referred to in paragraph 482.

488. Second, the Authority notes that three methodologies exist for estimating theta; (i) tax statistics, (ii) dividend drop off (**DDO**) studies; and (iii) the simultaneous price methodology. The Authority has previously considered that tax statistics can only provide an upper bound for the value of theta; whilst simultaneous price studies suffer from a lack of relevant data. However, the Authority recognises that these approaches are the subject of current debate, and is undertaking further research.

489. Accordingly, the Authority considers that dividend drop-off studies offer a key advantage in that they calculate an observed market value for franking credits. The Authority therefore considers that the dividend drop-off methodology is the most appropriate methodology for estimating theta.

490. However, dividend drop-off studies are known to suffer from a variety of 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. As a consequence, the Authority is of the view that it is more appropriate to use a range of dividend drop-off studies to inform the estimate of theta. Given significant changes to the taxation system in the year 2000-01, the Authority considers it appropriate to use post-2000 studies only.

Table 25 Estimated value of theta from relevant dividend drop-off studies

Author	Year	Data	Theta
SFG[207]	2011/ 2013	DatAnalysis, 2000 -2010	0 - 0.35
ERA[208]	2013	Bloomberg, 2001 -2012	0.35 – 0.55

Source: Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 208.

206 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.

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

208 Vo, D., Gellard, B., Mero, S., *Estimating the Market Value of Franking Credits, Empirical Evidence from Australia,* Conference Paper, Australian Conference of Economists, 2013.

491. Table 25 outlines that the estimated range for theta from dividend drop off studies that the Authority considers relevant. Taking account of the ACT's decision, the Authority considers that the appropriate range for theta is 0.35-0.55.

492. Given the payout ratio of 0.70, the Authority determines the resulting estimated range for gamma to be 0.25 to 0.385. The Authority considers that the corresponding point estimate for gamma should be 0.3.

493. In response to the Issues Paper, ARTC and Flinders submitted a view that a value for gamma of zero is feasible and supportable. However, the ARTC noted that the result of the ACT decision for a gamma of 0.25 is at least within the range ARTC would consider feasible. As such, ARTC would support that value, but urges that the Authority continue investigation into the hypothesis that gamma may be zero.

494. TPI and Brockman also submitted that the value for gamma should be set to 0.25.

495. In response, and as noted above, the Authority recognises that further research is needed to inform the value for gamma. The Authority will update its value for gamma if its further investigation provides a rationale.

14.3 Draft determination

496. The Authority will adopt a point estimate for gamma of 0.3.

497. The Authority recognises that further research is needed to inform the value for gamma. The Authority will update its value for gamma if its further investigation provides a rationale.

15 Inflation

498. 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.

499. 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

500. 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.

501. 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.

502. However, the Treasury bond method assumes efficient pricing of the Treasury indexed bonds, in particular that observed yields must reflect the value that the market places on these instruments at that instant in time. The period around the global financial crisis 2008-2009 saw a decrease in liquidity for Treasury indexed bonds. Lack of frequent trading meant that observed yields were not likely to reflect efficient pricing. As a consequence, the Authority discontinued the use of this methodology following its 2008 review of the rail WACC method.

503. In its 2008 determination, the Authority took the view that:

- there is sound evidence for bias in estimates of real risk free rates derived from implied returns on inflation-indexed government bonds; but
- there has not been a sustainable case put to Australian regulators for the existence of bias in estimates of nominal risk free rates derived from implied yields on nominal government bonds.

504. On this basis, the Authority determined a real risk free rate by:

- determining a nominal risk free rate as the average of implied returns on nominal Commonwealth Government Securities 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.

505. For the 2008 rail WACC determination, the Authority took the view that the best estimate of the forecast rate of inflation was 2.75 per cent, based on projections made by the Reserve Bank of Australia and the Western Australian Treasury.

506. The inflation estimate was subsequently updated in each following rail WACC determination.[209]

15.2 Considerations of the Authority

507. The Authority notes that Australian regulators have adopted three methods for estimating expected inflation (i) the Treasury bond approach (ii) the inflation swap approach (iii) the RBA Inflation forecast approach.

508. The Authority reviewed each of the three approaches in developing the gas rate of return guidelines.[210] The Authority concluded that estimating the expected inflation rate using the observed yields of CGS and of Treasury indexed bonds, then using the Fisher equation to estimate the implied inflation rate – the Treasury bond implied inflation approach – is the most robust measure of inflation expectations.

509. However, given the issues that have occurred with this approach historically, the Authority may adopt the RBA's inflation forecast approach, if required.

15.3 Draft determination

510. The expected inflation rate will be estimated using the Treasury bond implied inflation approach. Given the term for the WACC, the Authority's approach will use the Fisher equation and the observed yields of 10-year Commonwealth Government Securities (**CGS**) (which reflect a market based estimate of the nominal risk-free rate) and 10-year indexed Treasury bonds (which incorporate a market based estimate of a real risk-free rate).[211]

511. The Authority will estimate the expected inflation rate consistent with the estimate of the risk-free rate by adopting an averaging period of 40 trading days prior to the update of the rail WACC.

512. Linear interpolation will be used to derive the daily point estimates of both the nominal 10-year risk-free rate and the real 10-year risk-free rate, for use in the Fisher equation.[212]

513. An indicative estimate of inflation, using this method, is 2.70%, as at 14 May 2014. The Authority will update this estimate for each annual update of the rail WACC.

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209 In recent years, however, the liquidity of the Treasury index bonds has improved, and the Authority has again adopted the Treasury bond approach in deriving the estimate for expected inflation over a future regulatory control period.

210 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. 222.

211 The formal Fisher equation is: $1+i=(1+r)(1+\pi^e)$

where: i is the nominal interest rate, r is the real interest rate and π^e is the expected inflation rate.

212 It is not common to observe a CGS bond with an expiry date that exactly matches that of the regulatory period end. As such, two bonds are selected that fall on either side of the end day of the regulatory period. The dates on these bonds are referred to as the 'straddle' dates. Linear interpolation estimates the yields on the regulatory period end date by assuming a linear increase in yields between the straddle dates on the two bonds observed.

Appendices

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:[213]

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \varepsilon_{i,t} \quad (12)$$

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 AER[214] 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.

[213] Henry, O, "Estimation Beta", *Advice Submitted to the Australian Competition and Consumer Commission*, www.accc.gov.au, 2009, p. 2.

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

4. As a consequence, the Authority has used continuously compounded returns as described in equation (3) for estimating equity beta.

$$r_{i,t}^{c} = \ln\left[(p_{i,t-1} + d_{i,t}) / p_{i,t-1} \right] \quad (13)$$

$$r_{i,t}^{d} = \frac{p_{i,t} - p_{i,t-1} + d_{i,t}}{p_{i,t-1}} \quad (14)$$

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.[215] 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.

[215] Ibid.

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.

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:[216]

$$E[\varepsilon_i] = 0.$$
$$Var[\varepsilon_i] = \sigma^2$$
$$Cov[\varepsilon_i, \varepsilon_j] = 0 \text{ if } i \neq j$$
$$\varepsilon_i \sim N(0, \sigma^2)$$

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.[217] 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, $Var[\varepsilon_i] = \sigma^2$. 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.[218]

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

[216] Hill R.C., Griffiths W.E, Lim G.C, *Principles of Econometrics*, 2008, p. 32.

[217] Gross J., Linear *Regression,* Springer Publishing, 2003, p. 53.

[218] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines,* December 2013, p. 165.

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 a variety of robust regression procedures in addition to OLS when undertaking regression analysis.[219]

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.[220] 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.[221] A detailed discussion of the MM estimator can be found in Appendix 17 of the rate of return guidelines for gas.[222]

13. Fabozzi (2013) suggests the use of the Theil-Sen estimator for estimating the appropriate value for beta.[223] 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.[224] A detailed discussion of the Theil-Sen estimator can be found in Appendix 17 of the rate of return guidelines for gas.[225]

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[219] Andersen, R., *Modern Methods for Robust Regression.* Thousand Oakes: SAGE Publications, 2008, pp. 91-92.

[220] 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.

[221] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, December 2013.

[222] Economic Regulation Authority, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, December 2013. p. 145.

[223] Fabozzi, F.J, *Encyclopaedia of Financial Models*, Wiley Publications, 2013, p. 442.

[224] Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, December 2013.

[225] 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

7. Bootstrapping is the statistical procedure by which the sampling distribution of a relevant statistic is estimated by re-sampling the available data.[226] 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.

8. 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.[227]

9. 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 26, Table 27, Table 28 and Table 29).

[226] Fox J., An R and S-PLUS Companion to Applied Regression, Appendix p 1, Sage Publishing, 2002.

[227] 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 26 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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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 27 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
$\widehat{bias}_B$	-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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	-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 28 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
$\widehat{bias}_B$	-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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	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 29 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
$\widehat{bias}_B$	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
$\widehat{bias}_B$	-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
$\widehat{bias}_B$	-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
$\widehat{bias}_B$	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.[228] 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.[229] The results are set out below (Table 30).

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 27 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 exits 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.

[228] 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.

[229] Documentation available at: http://127.0.0.1:18027/library/tseries/html/jarque.bera.test.html.

Table 30 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 Indicative rail WACCs

5. This appendix provides indicative estimates of the rail WACCs under the revised method set out in this draft review.

6. The indicative estimates are based on that produced in the gas rate of return guidelines. The following estimate is taken from the gas rate of return guidelines (and thus not updated for the purpose of this indicative rail):[230]

   - a market risk premium of 6.0 per cent.

7. All other parameters accord with this draft determination, taken at 30 April 2014.

8. The following summarises the indicative WACC outcomes for each rail network (Table 31).

[230] 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 30.

Table 31 Indicative rail WACCs

Determination	Public Transport Authority	Brookfield Rail	The Pilbara Infrastructure
Nominal Risk Free Rate (10 year term)	4.10%	4.10%	4.10%
Real Risk Free Rate	1.37%	1.37%	1.37%
Inflation Rate	2.70%	2.70%	2.70%
Gearing	50%	25%	20%
Debt Risk Premium	1.015%	1.691%	2.107%
Debt Issuing Cost	0.125%	0.125%	0.125%
Australian Market Risk Premium	6.00%	6.00%	6.00%
Equity Beta	0.60	0.93	1.56
Asset Beta	0.30	0.70	1.25
Corporate Tax Rate	30%	30%	30%
Franking Credit	30%	30%	30%
Nominal Cost of Debt	5.243%	5.919%	6.336%
Real Cost of Debt	2.477%	3.135%	3.541%
Real After Tax Cost of Equity	4.87%	6.82%	10.50%
Nominal Pre Tax Cost of Equity	9.75%	12.28%	17.06%
Real Pre Tax Cost of Equity	6.87%	9.33%	13.98%
Nominal Pre Tax WACC	7.50%	10.69%	14.92%
Real Pre Tax WACC	**4.67%**	**7.78%**	**11.90%**
Nominal After Tax WACC	6.47%	8.76%	12.05%
Real After Tax WACC	3.68%	5.90%	9.11%

Source: Economic Regulation Authority analysis