Draft Determination

2018 Weighted Average Cost of Capital at 30 June 2018

For the Freight and Urban Networks, and the Pilbara Railways

2 May 2019

Economic Regulation Authority
WESTERN AUSTRALIA

Economic Regulation Authority

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About this draft determination

The *Railways (Access) Code 2000* requires the Economic Regulation Authority to determine each year a long-term Weighted Average Cost of Capital (WACC) to be applied in the establishment of capital costs for regulated railways in that year.[1, 2]

Clause 3 of Schedule 4 of the Code further requires the ERA, in every fifth year subsequent to 2003, to invite interested parties to make written submissions and have regard to them prior to determining the WACC values for that year.

On 21 May 2018, the ERA published a consultation paper, inviting comment on the WACC framework, the method for estimating WACC parameters or any other matters associated with the ERA's determination of the WACC for 2018.[3]

Public submissions were received from ATCO Gas Australia and Arc Infrastructure. The ERA also received one confidential submission.

ATCO's submission included its submission on the ERA's draft decision on Western Power's most recent proposed revised access arrangement, which focused on the market risk premium and the value of imputation credits (gamma).

Synergies Economic Consulting made a submission on behalf of Arc Infrastructure. The Synergies report related wholly to the determination of the WACC for railway networks. This report discussed all the WACC parameters.

The release of the ERA's draft determination of the rail WACC was delayed by the finalisation of the 2018 gas rate of return guidelines, released 18 December 2018.

The ERA has undertaken a review of the rail WACC and reviewed available information and public submissions.

This document presents the ERA's draft determination of the 2018 rail WACC.

The ERA is now seeking stakeholder feedback on the draft determination of the 2018 rail WACC.

1 *Railways (Access) Code 2000*, Schedule 4, Clause 3.

2 Regulated railways are those cited in schedule 1 to the Code, currently the Public Transport Authority network, the Arc Infrastructure network, and The Pilbara Infrastructure and Roy Hill Infrastructure railways.

3 https://www.erawa.com.au/cproot/19011/2/WACC%20consultation%20paper%202018.pdf

Making a submission

Interested parties are invited to make submissions on the ERA's draft determination by **4.00 pm (WST) Tuesday, 4 June 2019** via:

Online: www.erawa.com.au/consultation

Email address: publicsubmissions@erawa.com.au

Postal address: PO Box 8469, PERTH BC WA 6849

CONFIDENTIALITY

In general, all submissions from interested parties will be treated as being in the public domain and placed on the ERA's website. Where an interested party wishes to make a submission in confidence, it should clearly indicate the parts of the submission for which confidentiality is claimed and specify in reasonable detail the basis for the claim. Any claim of confidentiality will be considered in accordance with the provisions of the *Economic Regulation Authority Act 2003*.

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

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1 The structure of this draft determination

1. This draft determination discusses the WACC and its individual parameters as they apply to Western Australian railways under the Western Australian regulatory rail framework.

2. For each WACC parameter, this paper details:

   - background, providing a brief description of each parameter
   - public submissions, summarising relevant comments received
   - draft determination, detailing the ERA's considerations and its draft position.

3. The WACC, and the individual parameters as they apply to each of the railways, is provided at the end of this draft determination.

2 The *Railways (Access) Code 2000*

4. The Code describes the WACC as the "interest rate" to be used in an "equivalent annual cost or annuity" calculation of capital costs.[4]

5. The Code does not prescribe a method for determining the WACC.

6. The Code is subsidiary legislation under the *Railways (Access) Act 1998*. The object of the Act is to:

> …establish a rail access regime that encourages the efficient use of, and investment in, railway facilities by facilitating a contestable market for rail operations.[5]

7. The ERA has estimated the rail WACC consistent with the efficient financing costs of efficient entities with a similar degree of risk to the provision of the rail services. This approach is taken on the basis that efficient firms with efficient financing provide a benchmark for each regulatory decision. Basing regulatory decisions on efficient input costs and output prices will facilitate contestability in the provision of railway services.

[4] *Railways (Access) Code 2000*, Schedule 4, Clause 2.

[5] *Railways (Access) Act 1998*, section 2A.

3 The WACC framework

3.1 Background

8. The rate of return, based on a WACC, provides a service provider with a return on the capital it has invested in its business.

9. The WACC is calculated taking into account the relative weights of each component of the capital structure. The Code does not prescribe the components of capital costs to be assessed, or the means of weighting the components.

10. The ERA employs a generally-accepted WACC framework, which provides for:

- The cost of equity.
- The cost of debt.
- The shares of equity and debt in a benchmark financing portfolio as the weightings of these components.

11. For rail, the ERA calculates the WACC on a pre-tax basis.[6]

12. The ERA prefers the pre-tax approach 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 gross replacement valuation basis.

13. In nominal terms, the WACC equation is expressed:

$$WACC_{nom} = R^{e}_{pre} * \frac{E}{V} + R^{d}_{pre} * \frac{D}{V} \qquad \text{(equation 1)}$$

where[7]

$WACC_{nom}$	is the nominal pre-tax weighted average cost of capital
R^{e}_{pre}	is the pre-tax rate of return on equity, or the cost of equity
R^{d}_{pre}	is the pre-tax rate of return on debt, or the cost of debt
E/V	is the proportion of equity in the total financing (comprising equity and debt)
D/V	is the proportion of debt in the total financing.

[6] See 2015 Decision paragraphs 39-45. Unlike gas pipelines, railways are not required to have the WACC calculated on a post-tax basis. In its 2015 decision, the ERA considered that a post-tax approach would require the development of a tax asset base calculated for a standalone entity, which would add considerable complexity to the estimation process. Further, the Code requires the estimation of total costs through an annuity that provides for the return on and of the cost of building a new railway, rather than through a building block approach that is based on a written down asset. For these reasons, the ERA considers it reasonable to retain a pre-tax approach to estimate the rail WACC.

[7] All parameters are expected parameter values.

14. The pre-tax rate of return on equity is not readily available. Therefore a post-tax rate of return on equity is used, which is more easily observed.

15. It is then necessary to adjust the post-tax rate of return on equity for taxation effects, including recognition of the value of imputation credits (commonly known as gamma).

16. The imputation tax system prevents corporate profits from being taxed twice. The gamma parameter accounts for the reduction in the effective corporate taxation that is generated by the distribution of franking credits to investors. As a general rule, investors who are able to use franking credits will accept a lower required rate of return, before personal tax, on an investment that has franking credits, compared with an investment that has similar risk and no franking credits.

17. This provides a framework for calculation of a nominal pre-tax WACC, as follows: [8]

$$WACC_{nom} = R^{e}_{post} * \frac{1}{(1-T*(1-\gamma))} * \frac{E}{V} + R^{d}_{pre} * \frac{D}{V} \quad \text{(equation 2)}$$

where:

$WACC_{nom}$	is the nominal pre-tax weighted average cost of capital
R^{e}_{post}	is the post-tax rate of return on equity, or cost of equity
R^{d}_{pre}	is the pre-tax rate of return on debt, or the cost of debt
T	is the tax rate
γ	is the value of imputation credits (gamma)
E/V	is the proportion of equity in the total financing (comprising equity and debt)
D/V	is the proportion of debt in the total financing.

18. The real WACC is obtained from the nominal WACC by removing expected inflation (π) from the nominal pre-tax WACC, as follows:[9]

$$WACC_{real} = \frac{(1+WACC_{nom})}{1+\pi} - 1 \quad \text{(equation 3)}$$

19. The resulting WACC for a benchmark efficient entity represents efficient financing costs for the provision of assets.

[8] Known as the "Officer/Monkhouse framework".

[9] This has been referred to as the "Market Transformation Method".

3.2 Public submissions

20. No public submissions were received on the general WACC framework.

3.3 Draft determination

21. The ERA will continue to apply the general WACC framework as described in this section.

4 The term of the WACC

4.1 Background

22. The Code describes the WACC as the "target long-term weighted average cost of capital appropriate to the railway infrastructure".[10]

23. A WACC with a term that is consistent with the long economic lives of the assets will best meet the requirements of the Code.[11] This is because the capital cost determinations required by the Code are constructed to apply in perpetuity from a fixed point in time, and not over a defined (shorter) term of an access arrangement.[12]

4.2 Public submissions

24. No public submissions were received on the term of the WACC.

4.3 Draft determination

25. The ERA will continue to apply a long-term approach to the determination of the WACC.

26. For the return on equity and debt a term of 10 years is used as a means to estimate returns. Although terms longer than 10 years are available for the risk free rate, a risk free rate with a 10-year term allows components of models to be estimated consistently.

[10] *Railways (Access) Code 1998*, Schedule 4, Clause 2.

[11] The weighted average economic life of a typical heavy haul rail route may be as high as 50 years.

[12] The capital cost determined is a Gross Replacement Value annuity, calculated as payable over the economic life of the asset.

5 The benchmark efficient entity and risk

5.1 Background

27. Regulators use a benchmark efficient entity to inform the WACC parameters set for a regulated entity. This is consistent with incentive regulation and ensures that a regulator does not compensate a regulated service provider for its actual costs, but compensates it as if it were operating efficiently.

28. When determining a benchmark efficient entity, a regulator needs to account for the risks of providing the regulated services.

29. The ERA uses a benchmark entity for rail service providers that are judged to be similar.

30. The ERA has defined the benchmark efficient entity 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.[13]

31. The ERA considers the components of this definition as follows:

- A 'pure-play' business focuses exclusively on rail services. This thereby solely reflects the risk in the provision of rail services and does not reflect the provision of any other business activities that may have a different risk profile.
- 'Regulated rail facility' is intended to account for the specific types of business activity being dealt with.
- 'Operating within Australia' is intended to account for country-specific factors such as currency, the level of economic growth and laws affecting business. This is consistent with the ERA's intention to base the rate of return on data from domestic financial markets.
- 'Without parental ownership' is intended to recognise that some risks associated with the provision of reference 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.
- The element 'with a similar degree of risk as that which applies to the service provider in respect of the provision of the rail services' is intended to recognise the difference in the risk profile of the rail services.

[13] ERA, *Revised Corrigenda Draft Decision*, 28 November 2014, paragraph 97 https://www.erawa.com.au/cproot/13016/2/141129%20Rail%20WACC%20Method%20REVISED%20Draft%20Decision.pdf

32. The ERA bases its estimates of WACC components on domestic financial markets.[14] This meets the guiding principle that the risk for the asset in question should stem from the economy in which the benchmark efficient entity is situated.[15]

- Market risk and systematic risk are the relevant risk considerations for equity markets. The market risk premium quantifies the risk premium for investing in a given economy as if a diversified portfolio of all listed firms in that economy were held. The risk premium is that part of the return that is in excess of the return on a risk-free asset in that economy. Systematic risk is commonly quantified for a given economy through observing the co-variation between returns on listed equity in firms and the returns on a representative equity market index for the country in which that firm operates.

- To evaluate the cost of equity, Australian regulators have implemented this practice through the application of a domestic Capital Asset Pricing Model (CAPM) framework. The ERA considers that the regulatory costs of basing its analysis on international markets and the adoption of an international CAPM would be significant, and may not improve accuracy.

- In using the domestic CAPM, Australian regulators have recognised the influence of foreign investors, where they invest domestically and thus contribute to market outcomes within Australia.

- The domestic debt market reflects the influence of international lenders supplying debt finance directly to Australian firms. Australian markets for debt are linked to international markets. Covered interest rate parity asserts that, once the differential between spot and forward exchange rates used for hedging is taken into account, no interest rate arbitrage opportunities (to make profit) between two currencies exist. The implication is that borrowing and lending in different currencies cost the same.

33. To supplement small domestic data sets, the ERA also uses international comparators where underlying risk factors are similar.

34. Rail services differ in their operations and network infrastructure. The WACC benchmark should account for these differences, as they give rise to different risk profiles for different operators. Given the differences in the services provided by the four regulated Western Australian rail networks, a single benchmark rail entity will not adequately capture the different risks faced by each network.

35. Urban and freight rail infrastructure have been distinguished on the following bases:[16]

- 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.

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[14] The ERA considers that the regulatory costs associated with basing its analysis on international markets would be significant, with uncertain benefits in terms of improved accuracy.

[15] The country of risk is determined by Bloomberg's methodology. This consists of four factors listed in order of importance: management location, country of primary listing, country of revenue and reporting currency of the issuer. Management location is defined by country of domicile unless location of such key players as CEO, CFO, COO and/or General Counsel is proven to be otherwise.

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

- Freight services do not receive community service obligation payments.
- Freight services are not regulated and are open to competition from road transport.

36. Relevant classification frameworks exist for railway systems on the basis of their operations and infrastructure. In the United States of America, the Surface Transportation Board classifies rail networks by their operating revenues and whether or not they perform switching services and/or terminal operations. This classification system refers to Class I, Class II and Class III railways.[17]

37. On this basis, dedicated iron-ore railways in the Pilbara[18] are different from the general freight networks[19] in the following ways:

- The 'class II/III type railroad' industry is a better approximation to Pilbara railways than large trans-national railroad networks, which share characteristics with the general freight networks.
- The expectation that there would be some increased risk for stand-alone ore-carrying railways given their reliance on a single industry, which has a particular exposure to economic fluctuations, creates an expectation that the asset beta would be higher than that of general freight.

38. As a consequence, separate benchmarks are developed for gearing, credit rating and equity beta specific to each of the regulated rail networks' infrastructure and operations. Utilising the same benchmark for all networks would not adequately capture their different risks, and therefore the efficient financing costs of each of the rail entities.

5.2 Public submissions

39. Synergies' submission discussed the benchmark efficient entity.

[17] Class I carriers are those with operating revenues of $250 million or more (1991 USD); Class II those with revenues in excess of $20 million (1991 USD); and Class III, those with revenues of up to $20 million (1991 USD). 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)).

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)). Switching operations involve activities such as the making and breaking up of trains, while terminal operations involve activities connecting freight from larger rail networks to other modes of transport or rail.

The Class II and III railroads often feed traffic to and receive traffic from Class 1 railroads.

[18] The Pilbara Infrastructure PL and Roy Hill Infrastructure PL.

[19] For example, the Arc Infrastructure network.

40. Synergies' comments on the benchmark efficient entity concerned the equity beta. Synergies considered that comparisons between Arc Infrastructure and the Aurizon networks were no longer appropriate. It considered that Arc Infrastructure's business, and therefore its equity beta, was different to the Aurizon networks due to differences in:

    - the nature of service and customer
    - the nature of regulation
    - market power
    - operating leverage.

41. Synergies' comments are discussed in more detail in the equity beta chapter.

5.3 Draft determination

42. The ERA addresses Synergies' comments separately in its consideration of equity beta.

43. For the draft determination, the ERA continues its approach to the benchmark efficient entity.

44. The ERA defines the benchmark efficient entity 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.

45. The ERA recognises the differing risk profiles of the Western Australian railways and develops separate benchmarks for gearing, credit rating and equity beta specific to each of the regulated rail networks' infrastructure and operations.

6 Gearing

6.1 Background

46. Gearing is the proportion of a business's 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 generally expressed as follows:

$$Gearing = \frac{Debt}{Debt + Equity} \quad \text{(equation 4)}$$

47. This ratio is used to weight the costs of debt and equity when the regulated WACC is determined.

48. 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 is also used:

- To re-lever asset betas for the purposes of analysing the level of systematic risk across businesses in the estimate of equity beta.
- As a factor to determine an appropriate credit rating for deriving the debt risk premium.

49. Gearing differs across industries, and among different companies within the same industry.

50. Different firms have different risk profiles and, as a consequence, have varying debt capacities.[20] The optimal capital structure is determined by the business risk of firms in an industry and the expected loss if default occurs.[21] Given that a service provider's expected monetary risk is likely to differ from that of the comparable sample, the optimal capital structure of the entity is likely to differ as well. It may be appropriate to adjust any estimate of gearing levels to reflect differences in the level of risk between railway networks.

51. Due to a lack of suitable domestic comparators, the ERA's 2015 benchmark sample included international companies from the United States of America, Canada and New Zealand. Given their different risk and operational profiles, the ERA used different benchmark samples for each of the three Western Australian railways.

52. The ERA considered the individual railway gearing as follows:[22]

- That for the Public Transport Authority, network toll road companies were a rough approximation for a passenger rail network and should form the benchmark sample. However, toll roads were likely to have a more elevated risk profile than rail transport.

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

[21] Brealey, R., Myers, S. and Allen, F., *Corporate Finance*, McGraw Hill, 1996, p. 476.

[22] ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks – Final Decision,* September 2015, pp. 39-40, 49.

  - The risks faced by the Public Transport Authority are lower than those faced by the companies in the benchmark sample.
  - Therefore, a benchmark efficient entity representing the Public Transport Authority network will be able to sustain higher levels of gearing.

- That for the Arc Infrastructure network, a combination of Australian and overseas rail and freight businesses should form the benchmark sample.
  - Arc Infrastructure was likely to face less competition relative to overseas rail operators and the benchmark efficient rail entity representing the Arc Infrastructure network would be able to take on higher levels of gearing relative to overseas rail operators.
  - Arc Infrastructure was likely to face higher risk than transport infrastructure and services firms in Australia due to Arc Infrastructure's exposure to particular industries.
  - Therefore a representative gearing range for Arc Infrastructure is formed by using the average of overseas railway operators as a lower bound and the Australian average as an upper bound.
- That for the Pilbara Railways, a combination of Australian and overseas rail businesses should form the benchmark sample.

53. The ERA considered that, due to the lack of close comparators to regulated rail networks, regulatory discretion was needed to estimate the relevant benchmark efficient gearing for each rail network.[23]

54. In its 2015 rail WACC review, the ERA measured gearing for the benchmark sample over a five-year timeframe.

55. Overall, in its 2015 rail WACC review the ERA considered the most appropriate gearing levels were: [24]

- Public Transport Authority - 50 per cent, at the higher end of the observed gearing range.
- Arc Infrastructure - 25 per cent, consistent with the Australian average.
- Pilbara Railways - 20 per cent, given the higher risk stemming from its broad reliance on a single commodity and the limited number of possible customers.

6.2 Public submissions

56. Synergies' submission discussed gearing.

[23] ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks – Final Decision,* September 2015, p. 41.

[24] ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks – Final Decision,* September 2015, p. 48.

57. Synergies recommended that Arc Infrastructure's gearing of 25 per cent not be changed. There had been little change in the gearing of the listed benchmark entities, with the median gearing changing from 20 per cent (in 2015) to 19 per cent.

58. Synergies argued that the ERA had previously acknowledged that higher gearing rates were applied in other regulatory decisions. However, the ERA considered that this evidence was not determinative and opted to place more weight on evidence from its chosen comparator set. Synergies argued that Aurizon was now substantially different from the sample of firms deemed relevant to Arc Infrastructure.

6.3 Draft determination

59. For the draft determination, the ERA recognises the differing risk profiles of Western Australian railways and continues to use separate benchmarks for gearing specific to each type of regulated rail network's infrastructure and operations.

60. For the draft determination, the ERA measured gearing for the benchmark sample over a 10-year timeframe. The ERA considers that the 10-year term for the benchmark gearing is consistent with the ERA's analysis of equity beta and the term of the risk free rate to estimate the return on equity.

61. The ERA has updated gearing estimates for the separate benchmark samples previously adopted by the ERA in its 2015 Decision (Table 1, Table 2 and Table 3).

Table 1: Public Transport Authority gearing estimates for benchmark sample[25]

Benchmark firm	2015 estimate (%)	2018 estimate (%)
Vinci SA	63	43
Albertis Infraestructuras SA	55	55
Atlantia SPA	51	51
European Average	**56**	**50**
Macquarie Altas Roads	46	50
Transurban Group	34	35
Australian Average	**40**	**43**
Average	**50**	**47**

Source: ERA analysis, Bloomberg

62. For the Public Transport Authority benchmark sample, the updated average gearing has reduced slightly from the ERA's 2015 estimate to 47 per cent.

- The European average gearing has reduced, driven by a large reduction in the gearing of Vinci SA.

[25] Gearing is estimated as debt to value (debt and equity). Gearing is measured over a ten-year timeframe. Consistent with the ERA's 2015 estimates, equity is measured as current market capitalisation and debt is measured as a book value of net debt.

- The Australian average gearing has slightly increased.

63. The Public Transport Authority continues to have lower risks than the benchmark sample, and therefore may have higher gearing levels than average.

64. On balance, current information supports the continuation of a benchmark gearing level for the Public Transport Authority of 50 per cent.

Table 2: Arc Infrastructure gearing estimates for benchmark sample[26]

Benchmark firm	2015 estimate (%)	2018 estimate (%)
Genesee & Wyoming Inc.	23	27
Union Pacific Corporation	11	16
Norfolk Southern Corporation	22	24
Kansas City Southern	15	23
CSX Corporation	24	25
United States Average	**19**	**23**
Canadian Pacific Railway	18	24
Canadian National Railway	14	15
Canadian Average	**16**	**20**
Aurizon Holdings	18	19
Toll Holding Limited[27]	23	28
Asciano[28]	36	39
Australian Average	**26**	**29**
Port of Tauranga	11	13
New Zealand Average	**11**	**13**
Average	**20**	**23**

Source: ERA analysis, Bloomberg

65. The sample of benchmark firms for Arc Infrastructure exhibits a slight increase in gearing from the 2015 estimate.

26 Gearing is estimated as debt to value (debt and equity). Gearing is measured over a ten-year timeframe. Consistent with the ERA's 2015 estimates, equity is measured as current market capitalisation and debt is measured as a book value of net debt.

27 The company was delisted on 29 May 2015.

28 The company was delisted on 25 August 2016.

66. To determine a gearing level for Arc Infrastructure:

- Representative gearing is calculated as the average of overseas railways operators as a lower bound and the Australian average as an upper bound.
- Average gearing for overseas railways is calculated as 22 per cent.
- Average gearing for transport infrastructure and services firms in Australia is 29 per cent.
- Representative gearing for Arc Infrastructure is calculated as 25 per cent.

67. On balance, current information supports the continuation of a benchmark gearing level for Arc Infrastructure of 25 per cent.

Table 3: Pilbara Railways gearing estimates for benchmark sample[29]

Benchmark firm	2015 estimate (%)	2018 estimate (%)
Genesee & Wyoming Inc.	23	27
Union Pacific Corporation	11	16
Norfolk Southern Corporation	22	24
Kansas City Southern	15	23
CSX Corporation	24	25
United States Average	**19**	**23**
Canadian Pacific Railway	18	24
Canadian National Railway	14	15
Canadian Average	**16**	**20**
Aurizon Holdings	18	19
Australian Average	**18**	**19**
Average	**18**	**22**

Source: ERA analysis, Bloomberg

68. For the Pilbara Railways benchmark sample, the updated average gearing has increased from the ERA's 2015 estimate to 22 per cent.

69. On balance, current information has not changed significantly enough to change the benchmark gearing level for the Pilbara Networks from 20 per cent.

[29] Gearing is estimated as debt to value (debt and equity). Gearing is measured over a ten-year timeframe. Consistent with the ERA's 2015 estimates, equity is measured as current market capitalisation and debt is measured as a book value of net debt.

70. The ERA continues to consider that benchmark gearing should be determined from observations from an appropriate benchmark comparator set and the use of regulatory discretion.

71. Given the imprecision of benchmark gearing estimates, the ERA will round the gearing estimate to the nearest five per cent.

72. There has not been significant change in the gearing of the benchmark samples to require an adjustment to gearing levels.

73. For the draft determination, the ERA has applied the following gearing ratios:

- 50 per cent for the Public Transport Authority
- 25 per cent for Arc Infrastructure
- 20 per cent for Pilbara Railways.

74. These gearing levels will remain fixed until the next rail WACC method review.

7 Cost of debt

7.1 Approach to cost of debt

7.1.1 Background

75. The ERA's past approach to estimating the rail cost of debt is based on a risk premium over and above the risk free rate, combined with a margin for administrative costs:

$$\text{Return on debt} = \text{risk free rate} + \text{debt risk premium} + \text{debt raising costs} \quad \text{(equation 5)}$$

76. The risk free rate is the rate of return of a hypothetical investment with no risk of financial loss, over a given period of time.

77. The debt risk premium is the margin above the risk free rate of return, required to compensate holders of debt securities for the risk of providing debt finance. The debt risk premium is compensation for investors who tolerate the extra risk, compared to that of a risk free asset.

78. Debt raising costs are direct costs incurred by businesses raising debt financing.

79. The cost of debt estimate is based on prevailing rates on the day just prior to each determination of the annual rail WACC update. The ERA adopts a 40 business day averaging period for estimating the on-the-day risk free rate and the debt risk premium for the rail WACC annual update.[30]

80. Consistent with schedule 4, clause 3(1) of the Code, the annual calculation of the WACC is for the period as at 30 June.

7.1.2 Public submissions

81. Synergies' submission discussed the cost of debt approach.

82. Synergies submitted that a transparent and readily replicable method is preferable to the ERA's method. It preferred a simple averaging of bond yield estimates provided by the Reserve Bank of Australia and Bloomberg.

83. Synergies concluded, nonetheless, that there had not been sufficient divergence between methods to warrant changing the approach at this time.

7.1.3 Draft Determination

84. For the draft determination, the ERA will continue to apply the same approach to the cost of debt which estimates a risk premium over and above the risk free rate, combined with a margin for debt raising costs.

[30] The ERA employs an on-the-day approach in order to reflect the efficient cost of debt at the time of the decision, consistent with the use of an efficient forward-looking cost of debt. See 2015 Decision paragraphs 265-271.

7.2 Risk free rate

7.2.1 Background

85. The risk free rate is the return an investor would expect when investing in an asset with no risk.

86. 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.

87. The ERA's past rail approach to estimate the nominal risk free rate used the observed yield of 10-year Commonwealth Government bonds.

88. The 10-year term is consistent with the long term of the WACC estimate.

89. The risk free rate is re-evaluated for each annual WACC determination for a 40 business day averaging period as at 30 June.

7.2.2 Public submissions

90. Synergies' submission discussed the risk free rate. Synergies agreed with the retention of the current approach to the risk free rate, and the use of 10-year Commonwealth Government bond yields.

7.2.3 Draft determination

91. Recognising the long-term nature of the WACC estimate for rail, the ERA has given further consideration to the longest term of reliable data to inform the risk free rate.

92. Regulatory practice in other frameworks, such as electricity and gas, have applied a risk free rate set on the basis of five-year or 10-year Commonwealth bonds. However, these bond maturities may not best reflect rail's regulatory framework and its long-term WACC requirement.

93. The use of a risk free rate with a term less than the life of a rail asset may create a downward bias, given an upward sloping yield curve.

94. Commonwealth bonds with maturities of greater than 10 years do exist and indicative mid rates are available.[31] [32] The longest Commonwealth bond maturities may approach close to 30 years.

[31] Benchmark Treasury fixed coupon bonds on issue at 28 February 2019: https://aofm.gov.au/fixed-coupon-monthly/february-2019/

[32] Indicative Mid Rates of Australian Government Securities – F16 Table: https://www.rba.gov.au/statistics/tables/xls/f16.xls?v=2019-04-01-12-59-22

95. However, the use of Commonwealth bonds with maturities of greater than 10 years will lead to inconsistency across WACC parameters.

- The debt risk premium is not able to be calculated for 15 years or greater. Very few corporate bonds exist with a term beyond 15 years. Therefore, the return on debt would have to be calculated on the basis of say a 15-year risk free rate plus a 10-year debt risk premium.

- The historic market risk premium is not able to be calculated with a 15-year or greater risk free rate. Commonwealth bond yield data for maturities of 15-years and above does not exist across the full time series used to calculate the historic market risk premium. Therefore, the return on equity would have to be calculated with a 15-year risk free rate and a market risk premium calculated from a 10-year risk free rate.

96. On balance, for the purposes of setting a risk free rate under the rail framework, the ERA will continue to use 10-year Commonwealth Government bonds to estimate the risk free rate.

97. For the draft determination, the risk free rate is 2.76 per cent as at 30 June 2018.

7.3 Debt risk premium

7.3.1 Background

98. The debt risk premium is the return above the risk free rate that lenders require to compensate them for the risk of providing debt funding to a benchmark business. The debt risk premium compensates holders of debt securities for the possibility of default by the issuer.

99. The debt risk premium is closely related to the risk of the business. When issuing debt in the form of bonds, a credit rating can be assigned that reflects the probability of default of the issuer, and therefore the risk present in the bond.

100. The debt risk premium relies on two inputs:

- the term of debt
- the benchmark credit rating.

Term of debt

101. In past rail decisions, the debt risk premium was estimated consistent with a 10-year term.

102. This was the longest feasible term that could be reliably estimated from the observed data. In Australia there is a limited market for corporate bonds of more than ten years, which makes estimating a long-term yield curve difficult.

Benchmark credit rating

103. The ERA's past rail WACC determinations have recognised that the differing operational and risk profiles of the rail businesses require different credit ratings.

- The risks faced by the Public Transport Authority were likely to be substantially lower than that of the companies contained in its benchmark sample, which was based on European toll road operators.
- Aurizon (with a credit rating of BBB+) was likely to be the best comparator for Arc Infrastructure, given that it operates in Australia and transports similar freight. The risk faced by Arc Infrastructure was less than that faced by overseas freight railway operators.
- While Genesee & Wyoming Inc. was the best comparator company for the Pilbara Railways, its low credit rating was inappropriate. Kansas City Southern's credit rating of BBB-, the lowest possible investment grade rating, was appropriate for the Pilbara Railways. This was also at the low end of credit ratings for the Pilbara Railways benchmark sample, consistent with the reasoning that the Pilbara Railways will face a higher level of risk relative to comparators in its benchmark sample.

104. The most recent rail WACC determinations by the ERA are based on benchmark efficient rail entities sustaining credit ratings of:

- A for the Public Transport Authority
- BBB+ for the Arc Infrastructure
- BBB- for the Pilbara Railways.

105. For each rail network, the ERA develops a separate benchmark bond sample, based on the corresponding benchmark efficient credit rating.

Debt risk premium estimation method – revised bond yield approach

106. In past rail determinations, the ERA has used an in-house method developed to estimate the debt risk premium.[33] Through the ERA's revised bond yield approach, the debt risk premium is derived from the observed yields of relevant corporate bonds, taken from Bloomberg, that qualify for inclusion in the benchmark sample.

107. To estimate the debt risk premium, the ERA:

- Uses a benchmark sample of bonds that includes Australian corporate bonds denominated in domestic currency (Australian dollars) and foreign currencies including United States dollars, Euros and British pounds.
- Converts the yields into hedged Australian dollar equivalent yields inclusive of Australian swap rates.
- Averages Australian dollar equivalent bond yields across the averaging period for each bond.
- Estimates yield curves with this data using three techniques.[34]
- Estimates the 10-year cost of debt by averaging these estimates.
- Estimates the regulated debt risk premium using the estimated cost of debt minus prevailing risk free rate.

108. The ERA uses the Bloomberg data service exclusively in order to construct each benchmark bond sample. The following criteria apply in order to select bonds to be included in each of the benchmark samples:

- The credit rating of each bond, as rated by Standard & Poor's, must match that determined for the benchmark efficient entity.
- The remaining time to maturity must be two years or longer.
- The bonds must be issued by Australian (non-financial) entities and denominated in Australian dollars, United States dollars, Euros or British pounds.
- Fixed bonds and floating bonds are eligible for inclusion.

[33] This method has been referred to as the "revised bond yield approach".

[34] See the 2015 Decision for explanations of the Gaussian Kernel (from paragraph 365), Nelson-Siegel (from paragraph 393) and Nelson-Siegel-Svensson (from paragraph 395) techniques.

- Both bullet bonds and bonds with callable/putable redemptions are eligible for inclusion.

- Bonds that are duplicates, inflation linked, called and perpetual instruments are excluded.

- There must be at least 20 yield observations over the required 40 day averaging period.

109. In the 2015 rail WACC review, the ERA acknowledged stakeholder concerns about low bond sample sizes and their ability to produce robust estimates.

- The rail WACC required the use of three bond samples (BBB-, BBB+, A). The number of bonds in each sample has varied over time, with the potential for small sample sizes for BBB- and A bonds.

- This led the ERA to expand the samples for each benchmark credit rating by including additional credit rating steps within the broader band.

- The ERA then used additional debt risk premium estimates from these augmented samples as a reference point for evaluation of the debt risk premium estimates based on the pure benchmark credit ratings.

110. The debt risk premiums based on the augmented samples benefit from a reduced estimation error around the point estimate. However, introducing a sample of bonds with a credit rating that differs from the target benchmark rating will tend to bias the debt risk premium estimate upward, as lower rated bonds are added, or downward, as higher rated bonds are added.

111. To mitigate this bias, the ERA first established the direction of the bias.

- If the bias in an augmented sample-based estimate is likely to be downward, the ERA uses the highest augmented sample-based estimate coming from the three estimation methods. This estimate is then averaged with the highest estimate from the original benchmark rated sample.[35]

- The opposite approach is conducted if the bias is likely to be upward.

112. This sample augmentation/averaging approach balanced bias and estimation error. It mitigates the errors that might arise given the data limitations.

113. The process is illustrated for each of the rail networks for the 2017 determination.[36]

114. The debt risk premium for each benchmark entity rate is re-evaluated for each annual WACC determination.

[35] The highest augmented sample estimate is still likely to be downwardly biased. To offset this bias it is averaged with the highest of the original benchmark sample estimates. This provides for a conservative approach which is intended to limit the bias inherent in expanding the sample away from the target credit rating band. Similar rationale is applied to augmented sample estimates considered upwardly biased - the lower of the augmented sample and original benchmark sample estimates are averaged.

[36] ERA, *Determination on the 2017 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways*, October 2017, pp. 25-26.

7.3.2 Public submissions

115. Synergies' submission discussed the debt risk premium.

116. Synergies' submission is summarised below:

- A transparent and readily replicable method was preferable to the ERA's method.
- The ERA's in-house approach returned similar results to its preferred RBA/Bloomberg approach.
- Synergies preferred a simple averaging of bond yield estimates provided by RBA and Bloomberg. Since the ERA's 2015 WACC Determination, the cost of debt estimates provided by the "bond yield approach" and Synergies preferred method have provided broadly similar results (within 20 basis points) and that neither approach produced results consistently higher than the other.[37]
- The "bond yield approach" was difficult to replicate by stakeholders, without any improvements in accuracy.
- There has not been sufficient divergence between methods to warrant changing the approach at this time.
- The most common credit rating of Arc Infrastructure's comparator set remains at BBB+.

7.3.3 Draft determination

Term of debt

117. For the draft determination, the ERA will continue to estimate the debt risk premium with a 10-year term.

118. The ERA considers this is consistent with the long-term nature of rail assets and its regulatory framework.

119. The ERA uses 10-years as it is the longest term for which reliable data exists for both bonds and the risk free rate.

Benchmark credit rating

120. For the draft determination, the ERA will continue to apply separate credit ratings to each of the rail entities. This reflects the differing operational and risk profiles of the individual rail business.

121. The ERA has reviewed the credit ratings of the benchmark sample of firms. The tables below provide the current credit ratings for each of the benchmark samples.

[37] See figure 5 of Synergies' submission.

Table 4: Credit ratings for the benchmark sample for the Public Transport Authority, 2018

Benchmark firm	Credit rating
Vinci SA	A-
Albertis Infraestructuras SA	BBB
Atlantia SPA	BBB+
Macquarie Altas Roads	N/A
Transurban Group	N/A

122. The above sample produces a range of credit ratings between BBB and A-.

123. The risks faced by the Public Transport Authority are likely to be substantially lower than those of the companies contained in its benchmark sample, which is based on European toll road operators. Therefore, the ERA considers that a benchmark of A remains appropriate.

Table 5: Credit ratings for the benchmark sample for the Arc Infrastructure, 2018

Benchmark firm	Credit rating
Genesee & Wyoming Inc.	BB
Union Pacific Corporation	A-
Norfolk Southern Corporation	BBB+
Kansas City Southern	BBB-
CSX Corporation	BBB+
Canadian Pacific Railway Limited	BBB+
Canadian National Railway Company	A
Aurizon Holdings	BBB+
Toll Holding Limited	Delisted
Asciano	Delisted
Port of Tauranga	BBB+

Source: Bloomberg

124. The above sample produces a range of credit ratings between BB and A.

125. The ERA considers that Arc Infrastructure is comparable to a median credit rating. Therefore, the above credit ratings do not suggest that Arc Infrastructure's BBB+ benchmark credit rating should change.

Table 6: Credit ratings for the benchmark sample for the Pilbara Railways, 2018

Benchmark firm	Credit rating
Genesee & Wyoming Inc.	BB
Union Pacific Corporation	A-
Norfolk Southern Corporation	BBB+
Kansas City Southern	BBB-
CSX Corporation	BBB+
Canadian Pacific Railway Limited	BBB+
Canadian National Railway Company	A
Aurizon Holdings	BBB+

Source: Bloomberg

126. The above sample produces a range of credit ratings between BB and A.

127. While Genesse & Wyoming Inc was considered to be the best comparator company for the Pilbara Railways, the ERA considered that a credit rating of BB was inappropriate.[38] Given that the benchmark efficient entity was assumed to minimise its cost of capital, 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.

128. For the benchmark credit rating of the Pilbara Railways, the ERA continues to use Kansas City Southern's credit rating of BBB-, the lowest possible investment grade rating. The BBB- credit rating is also at the lower end of credit ratings for the Pilbara Railways sample, consistent with the reasoning that the Pilbara Railways will face a higher level of risk relative to the comparators in its benchmark sample.

129. For the draft determination, the ERA continues to consider the following credit ratings are appropriate:

- A for the Public Transport Authority
- BBB+ for Arc Infrastructure
- BBB- for Pilbara Railways.

130. These credit ratings will remain fixed until the next rail WACC method review – the annual updates of the rail WACC will adopt these ratings.

[38] Genesse & Wyoming Inc is considered to be the only operationally comparable firm to the Pilbara Railways on the basis of it being the only class III regional and short-line operator.

Estimation method – revised bond yield approach

131. The ERA notes Synergies' preferred RBA / Bloomberg approach to estimating debt. This approach applies broad credit rating bands to estimate the cost of debt and is not able to accommodate specific credit ratings.

132. The ERA considers that the revised bond yield approach provides a more flexible approach to calculate an efficient cost of debt, as it:

- provides more flexibility to estimate the cost of debt for a particular credit rating
- draws on market data
- reflects market conditions for a nominated averaging period
- recognises the reality that Australian firms source debt funding overseas
- directly addresses the issue of the effective tenor not matching 10 years.

133. The ERA's revised bond yield approach involves the following steps:[39]

- Step 1: Determining the benchmark sample - Identifying a sample of relevant corporate bonds that reflect the credit rating of the benchmark efficient entity.
- Step 2: Collecting data and converting yields to Australian dollar equivalents - Converting the bond yields from the sample into Australian dollar equivalent yields inclusive of Australian swap rates.
- Step 3: Averaging yields over the averaging period – Calculating an average Australian dollar equivalent bond yield for each bond across the averaging period.
- Step 4: Estimating curves - Estimating yield curves on this data by applying the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.
- Step 5: Estimating cost of debt - Calculating the 10-year cost of debt estimate for each of the yield curves in the benchmark sample and augmented benchmark sample. Adjusting the bias of cost of debt estimates from the augmented sample.
- Step 6: Calculating the debt risk premium - Calculating the debt risk premium by subtracting the 10-year risk free rate from the 10-year cost of debt.

134. These steps determine the debt risk premium at a point in time, being the date of calculation.

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[39] Through its 2018 gas rate of return guideline review of the debt risk premium updating process, the ERA has further improved the ease of implementation and robustness of the revised bond yield approach. Technical detail of the ERA's revised bond yield approach can be found at:

ERA, *Final Gas Rate of Return Guidelines Explanatory Statement – Appendix 5 Debt risk premium process for updating in R,* December 2018.

The R toolkit developed by ERA for the most recent gas rate of return guideline flexible enough to accommodate a bond sample at maximum of 300 bonds for maximum of 60 trading days. The tool can be used for estimating 10 years cost of debt for each of the three yield curves for benchmark bond sample and the augmented benchmark bond sample in rail.

It should be noted that rail debt risk premium differs from the gas debt risk premium process in that the rail calculation uses a bias adjustment process and a different risk free rate. Therefore, the final debt risk premium estimate produced in the "output sheet" of the R toolkit should not be used for rail.

135. To mitigate errors that may arise given the data limitations, the ERA augments the bond sample:

- The Public Transport Authority sample is extended from the A benchmark to A+/A/A-.
- The Arc Infrastructure sample is extended from the BBB+ benchmark to BBB+/BBB.
- The Pilbara railways sample is extended from the BBB- benchmark to BBB/BBB-.

136. To mitigate potential bias, the ERA first establishes the direction of the bias:

- If the bias in an augmented sample-based estimate is likely to be downward, the ERA uses the highest augmented sample-based estimate coming from the three estimation methods. This estimate is then averaged with the highest estimate from the original benchmark rated sample.[40]
- The opposite approach is conducted if the bias is likely to be upward.

137. The 2018 bond sample sizes for each of the benchmark credit ratings were:

- 26 bonds for the Public Transport Authority A rated sample
- 46 bonds for the Arc Infrastructure BBB+ rated sample
- 21 bonds for the Pilbara Railways BBB- rated sample.

138. In 2018 the samples were augmented as follows:

- The Public Transport Authority sample was extended from the A benchmark to A+/A/A- increasing the sample from 26 to 83 bonds.
- The Arc Infrastructure sample was extended from the BBB+ benchmark to BBB+/BBB increasing the sample from 46 to 85 bonds.
- The Pilbara railways sample was extended from the BBB- benchmark to BBB/BBB- increasing the sample from 21 to 60 bonds.

Debt risk premium estimates

139. The results of the ERA's debt risk premium estimation method are outlined below.

140. The 10-year risk free rate used for debt risk premium calculation is estimated from 10-year Australian Commonwealth Government securities. The annualised 10-year risk free rate was 2.76 per cent as at 30 June 2018.

[40] The highest augmented sample estimate is still likely to be downwardly biased. To offset this bias it is averaged with the highest of the original benchmark sample estimates. This provides for a conservative approach which is intended to limit the bias inherent in expanding the sample away from the target credit rating band. Similar rationale is applied to augmented sample estimates considered upwardly biased - the lower of the augmented sample and original benchmark sample estimates are averaged.

141. The augmented Public Transport Authority sample was expanded to allow the inclusion of A+ and A- rated bonds; however, no A+ rated bond yield data was available on Bloomberg over the period in question. As a result the Public Transport Authority A rated sample was augmented only with A- bonds. The addition of bonds with a lower credit rating will tend to bias the estimates upward. For this reason the lowest of the augmented sample based estimates (1.388 per cent) is averaged with the lowest A rated sample based estimate (1.357 per cent) to produce an estimate of 1.373 per cent (see table below).

Table 7: 2018 Public Transport Authority – Augmented and original benchmark sample DRP estimates (%)

Approach	High	Mid	Low
A	1.482	1.401	1.357
A+/A/A-	1.401	1.397	1.388
Average of two lowest estimates			**1.373**

Source: ERA Analysis, Bloomberg

142. The augmented Arc Infrastructure BBB+ sample was expanded to allow the inclusion of BBB rated bonds. The addition of bonds with a lower credit rating will tend to bias the estimates upward. For this reason the lowest of the augmented sample based estimates (1.788 per cent) is averaged with the lowest BBB+ rated sample based estimate (1.596 per cent) to produce an estimate of 1.692 per cent (see table below).

Table 8: 2018 Arc Infrastructure – Augmented and original benchmark sample DRP estimates (%)

Approach	High	Mid	Low
BBB+	1.674	1.596	1.596
BBB+/BBB	1.894	1.855	1.788
Average of two lowest estimates			**1.692**

Source: Bloomberg

143. The augmented Pilbara Railways BBB- sample was expanded to allow the inclusion of BBB rated bonds. The addition of bonds with a higher credit rating will tend to bias the estimates downward. For this reason the highest of the augmented sample based debt risk premium estimates (2.124) is averaged with the highest BBB- rated sample based estimate (2.363) to produce an estimate of 2.244 per cent (see table below).

Table 9: 2018 Pilbara Railways – Augmented and original benchmark sample DRP estimates (%)

Approach	High	Mid	Low
BBB-	2.363	2.277	2.249
BBB/BBB-	2.124	2.104	2.095
Average of two lowest estimates	**2.244**		

Source: ERA Analysis, Bloomberg

144. The resulting sample of bonds used for each railway in 2018 is shown at Appendix 1.

145. For the draft determination, the debt risk premium across the three rail businesses have decreased since the 2017 determination from:

- 1.771 per cent to **1.373 per cent** for the Public Transport Authority
- 1.992 per cent to **1.692 per cent** for Arc Infrastructure
- 2.512 cent to **2.244 per cent** for Pilbara Railways.

7.4 Debt-raising costs

7.4.1 Background

146. Debt-raising costs are the administrative costs incurred by businesses when obtaining debt financing.

147. Regulators across Australia have typically included an allowance to account for direct debt-raising costs in their regulatory decisions. Debt-raising costs may include underwriting, legal and company credit rating fees, and any other costs incurred when 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.

148. Australian regulators use benchmark estimates to determine debt-raising costs. To do so, regulators attempt to derive an estimate of debt-raising costs that mimics debt-raising costs that would be incurred by a well-managed efficient benchmark business operating in a competitive market.

149. The ERA and several other Australian regulators have adopted an estimate of debt-raising costs of 0.125 per cent in previous regulatory decisions.

150. The rationale for using a figure of 0.125 per cent dates back to work undertaken by the Australian Competition and Consumer Commission (ACCC) in the early 2000s. Based on advice from the Allen Consulting Group in December 2004, the ACCC affirmed that debt-raising costs were a legitimate expense that should be recovered through the revenues of a regulated utility.[41] This conclusion was consistent with the ACCC's decisions on the issue of debt-raising costs in its regulatory decisions prior to 2004.[42]

151. The ERA investigated the allowances provided by various Australian regulators, and gave particular attention to research underpinning the Queensland Competition Authority's (QCA) 2014 *Cost of debt estimation methodology*.[43] In this report, the QCA reviewed Allen Consulting Group's 2004 findings and the origins of the 0.125 per cent estimate.

[41] The Australian Competition and Consumer Commission, *Final Decision, NSW and ACT Transmission Network Revenue Cap, TransGrid 2004-05 to 2008-09*, April 2005, p. 144.

[42] For instance, the Australian Competition and Consumer Commission, *Final Decision, South Australian Transmission Network Revenue Cap, 2003 to 2007/8*, December 2002, p. 25; and the Australian Competition and Consumer Commission, *Final Decision, GasNet Australia access arrangement revisions for the Principal Transmission System*, November 2002, p. 95.

[43] Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, p. ii.

152. The QCA found that the 0.125 per cent figure was based on figures provided to the ACCC by Westpac in 2002.[44] This figure was discussed in the Allen Consulting Group's report in 2004, which noted that an allowance of 0.125 per cent was likely to have been overstated. Specifically, Allen Consulting Group stated that:

- The ACCC had inappropriately included a dealer swap margin in 2004, resulting in a double-count.[45]
- Without a swap margin, the ACCC's estimate would have been about 0.075 per cent (which was closer to other estimates sourced by the ACCC from banks at the time).[46]

153. The QCA had concerns about the inclusion of the swap margin and the age of the 0.125 per cent estimate. It engaged PwC to prepare updated advice on debt-raising costs. PwC found that debt-raising costs were within the range of 0.09 to 0.108 per cent. PwC's method used the same cost categories identified by Allen Consulting Group in 2004.[47]

154. The ERA is not aware of any new alternatives to the Allen Consulting Group method. Other estimates of debt-raising costs – including Deloitte's 2010 estimate,[48] PwC's' 2011[49] and 2013[50] estimates, and the ERA's own estimate in 2013[51] – have adopted essentially the same approach used by the Allen Consulting Group. The approach set out in the Allen Consulting Group's 2004 study appears to still be relevant and fit-for-purpose. This approach is robust and has been adopted by many Australian regulators over the last 10 years.

155. Therefore, a debt-raising cost allowance of 0.100 per cent per annum is appropriate. This falls within the range provided in the 2013 PwC study, is comparable with estimates now used by the ACCC and QCA and is slightly higher than the most recent estimate adopted by the Australian Energy Regulator (AER). This allowance does not include the swap margin.

156. Therefore, the ERA has updated its allowance for debt-raising costs to 0.100 per cent.

Debt hedging costs

157. Interest rate swaps are derivative contracts, which typically exchange – or swap – fixed-rate interest payments for floating-rate interest payments. They provide a means to hedge and manage risk, but also have a cost.

[44] Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. 18.

[45] Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. 28.

[46] Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. xvii.

[47] PwC, *Debt and Equity Raising Costs: Report for Powerlink Queensland (Appendix K)*, 2011, p. 20.

[48] Deloitte, *Envestra Limited: Debt Financing Costs*, September 2010, p. 4.

[49] PwC, *Debt and Equity Raising Costs: Report for Powerlink Queensland (Appendix K)*, 2011, p. 20.

[50] PwC, *A cost of debt methodology for businesses regulated by the Queensland Competition Authority*, June 2013.

[51] ERA, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 202.

158. The ERA does not consider that an allowance for hedging costs is warranted for the rail WACC.[52]

- As the rail regulatory horizon is long term, rail firms have more certainty about the future and can enter into longer-term funding arrangements, which reduces the need for an efficient entity to hedge. The interest rate risk of the open-ended term of debt is adequately compensated for by the use of a 10-year term for the regulated risk-free rate.[53]

- Unlike some other regulated industries, rail businesses are not subject to periodic (for example, five-year) regulatory resets of the WACC. There is therefore no need to hedge this risk.

7.4.2 Public submissions

159. Synergies' submission discussed debt-raising costs.

160. Synergies agreed with the ERA's proposed 10 basis points costs, and provided references to other studies (PWC, Allen Group) substantiating relevant components of this cost.

7.4.3 Draft determination

161. For this draft determination, the ERA applies an allowance of 0.100 per cent for debt-raising costs.

162. This allowance for debt-raising costs will remain fixed until the next rail WACC method review.

[52] Hedging costs relate to the costs involved in undertaking interest rate swaps to hedge the periodic resets of the regulated 'risk free rate'.

[53] See page 172, 2015 Decision.

8 Cost of equity

8.1 Cost of equity approach

8.1.1 Background

163. The cost of equity is the return that investors require from a firm to compensate them for the risk they take by investing their capital.

164. There are no readily observable proxies for the expected return on equity. While estimates of the cost of debt can be obtained by observing debt instruments, financial markets do not provide a directly observable proxy for the cost of equity, for either individual firms or the market as a whole.

165. Estimating a forward-looking return on equity sufficient to enable regulated firms 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.

166. The model most used by Australian regulators for quantifying the return on equity and associated risk has been the Sharpe Lintner CAPM.

167. This form 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 reflecting the risk premium that investors would require over the risk free rate:

$$R_i = R_f + \beta_i \left(R_m - R_f \right) \qquad \text{(equation 6)}$$

where:

R_i is the required rate of return on equity for the asset, firm or industry in question

R_f is the risk free rate

β_i is the equity beta that describes how a particular portfolio i will follow the market which is defined as $\beta_i = \text{cov}\left(R_i, R_m\right) / \text{var}\left(R_m\right)$

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

168. In its 2015 rail WACC review, the ERA used the Sharpe Lintner CAPM model to estimate the return on equity for the rail WACC, but noted it may also use other models to inform its decision on the return on equity.

169. The 2015 rail method took the following approach to estimating the return on equity:

- The Sharpe Linter CAPM was primarily used to estimate the return on equity.
- The Black CAPM was relevant for the purpose of estimating the return on equity. However, given it is not reliable and practical to estimate a return on equity using this model, the model was not to be used directly, but only to inform the point estimate of the equity beta from within its range for input to the Sharpe Lintner CAPM.
- The dividend growth model was a relevant model for informing the market return on equity and also the forward looking market risk premium.

170. This approach allowed the ERA to consider 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 ERA gave weight to each piece of information according to its merits at the time of each determination.

8.1.2 Public submissions

171. There were no comments in submissions on the cost of equity approach.

8.1.3 Draft determination

172. To date, Australian regulators have used the Sharpe Lintner CAPM to quantify the return on equity and associated risk.

173. Other asset pricing models in the CAPM family build on the standard Sharpe Lintner CAPM,[54] and include:

- the Black and Empirical CAPM
- the Consumption CAPM
- the Inter-temporal CAPM.

174. There is also an extensive range of other models that seek to estimate the return on equity, including the:

- Arbitrage Pricing Theory family of models
- Fama-French Three-Factor Model and its extensions
- Dividend Growth Model family (both single-stage and multi-stage)
- Residual Income Model
- Market Premium approaches
- Build-up Method.

[54] Detailed discussions on models for estimating the return on equity can be found at:
ERA, *Explanatory Statement for the Draft Rate of Return Guidelines,* Appendix 11, 2013, pp. 260 -268.

175. In addition, there are approaches that are not based on modelling, but rather on available data from a range of comparators or analysts' reports. These include:

- estimated market returns on comparable businesses
- broker reports and the Dividend Yield approach.

176. The ERA has reviewed these asset pricing approaches and considers that only the Sharpe Lintner CAPM model is relevant for informing the estimation of the prevailing return on equity for the regulated firms.

177. In past rail determinations, the ERA predominately relied on the Sharpe Linter CAPM for the estimate of the cost of equity. This is also consistent with the ERA's recent regulatory practice for electricity and gas.

178. The Sharpe Lintner CAPM remains the dominant asset pricing model used to estimate the return on equity.[55]

179. In 2016, the Australian Competition Tribunal found that the AER had not erred in applying the Sharpe Lintner CAPM.[56]

180. In making its case for the use of the Sharpe Lintner CAPM, the AER said that it:[57]

- Was reflective of economic and finance principles and market information.
- Was fit for purpose as it was developed for estimating the cost of capital.
- Could be implemented in accordance with good practice.
- Was not unduly sensitive to errors in inputs or arbitrary filtering.
- Used input data that was credible, verifiable, comparable, timely and clearly sourced.
- Was sufficiently flexible to allow for changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

181. The ERA will give full weight to the Sharpe Lintner CAPM when estimating the return on equity.

182. For the draft determination, the ERA will determine a single point estimate for the return on equity using the Sharpe Lintner CAPM.

183. To estimate the return on equity, the ERA will separately estimate:

- the risk free rate
- the equity beta
- the market risk premium.

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55 AER, *TasNetworks final decision 2017-19 | Attachment 3: Rate of return*, April 2017, p. 3-170.

56 Australian Competition Tribunal, 2012, *Application by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, paragraph 735.

57 AER, *TasNetworks final decision 2017-19 | Attachment 3: Rate of return*, April 2017, p. 3-169.

8.2 Market risk premium

8.2.1 Background

184. The ERA uses the Sharpe Lintner CAPM to estimate the return on equity. The market risk premium is a parameter of the Sharpe Lintner CAPM.

185. The market risk premium is the expected rate of return over and above the risk free rate that investors require to invest in a fully-diversified portfolio. *Ex ante*, investors always require a rate of return above the risk free rate to invest and so the expected market risk premium is always positive. *Ex post*, the realised return to the market portfolio may be negative; that is the nature of risk. To establish the cost of capital, it is the *ex ante* market premium that is relevant.

186. The market risk premium compensates an investor for the systematic risk of investing in a fully diversified portfolio. Systematic risk is risk that cannot be diversified away by investors because it affects all firms in the market.[58] Therefore, the market risk premium represents an investor's required return, over and above the risk free rate of return, on a fully diversified portfolio of assets. This is a forward-looking concept.

187. The market risk premium is calculated as follows:

$$MRP = R_M - R_F \qquad \text{(equation 7)}$$

where:

R_M is the expected market return on equity observed in the Australian stock market

R_F is the 10-year risk free rate of return.

188. 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. The market risk premium cannot be directly observed because it depends on investor expectations at the time of investment. In order to set the return on equity, the market risk premium needs to be estimated for a future time period.

189. For rail networks, the ERA's forward-looking market risk premium is estimated for a 10-year period, consistent with the long lives of rail networks and the regulatory framework.

Current *Market Risk Premium estimation method for rail*

190. In order to derive the final point estimate for the forward looking market risk premium, in past determinations the ERA used the Ibbotson, Dividend Growth Model and Wright methods.

[58] The foundation of the Sharpe Lintner CAPM is the proposition that adding an asset to a portfolio reduces risk via the diversification effect but not beyond the risks that the assets in a portfolio share in common, that is, their systematic risk. At the limit, when one has invested in all available assets in the market portfolio, there is only systematic risk left. An important assumption of the CAPM is that assets are priced as though it is only their system risk that is relevant to investors.

191. The Ibbotson method calculates the average of a series of annual market risk premium observations. The market risk premium is calculated for each calendar year over the longest period of time for which data is available. There are currently 134 annual Australian market risk premium observations dating back to 1883. These observations are derived by deducting the risk free rate in each calendar year from the realised market return on equity in that year. The arithmetic average of these observations is typically employed, but the geometric average is also often quoted.

192. The dividend growth model method examines the forecast future dividends of businesses and estimates the return on equity that makes these dividends consistent with the market valuation of those businesses. The dividend growth model uses forecast dividend growth, forecast future growth rates, current share prices and historical returns on equity in order to estimate the market risk premium. This forward-looking discount rate is the implied market return on equity.

193. In past determinations, the ERA has calculated a range for the dividend growth model estimates of the market risk premium from:

- the ERA's two-stage dividend growth model
- recent dividend growth model studies.

194. The Wright approach is an alternative specification of the Sharpe Lintner CAPM. In the Wright approach, the market risk premium is not an independent parameter, but is defined as the difference between the return on equity estimate and the prevailing risk free rate. The relevance of the Wright approach depends on whether there is an inverse relationship between the market risk premium and the risk free rate.

195. In the 2015 rail review, the ERA derived a point estimate of 7.3 per cent for the market risk premium by:

- Establishing a range for historic market risk premia, based on the Ibbotson approach and Wright approach.
- Establishing a range for the dividend growth model estimates of the market risk premium, based on various dividend studies.
- Establishing a market risk premia range taking into account all approaches.
- Placing greater weight on the Wright estimate, which was considered a strong indicator for future returns.
- Taking all of this information into account and using regulatory discretion to set a market risk premium point estimate.

8.2.2 Public submissions

196. Synergies provided a detailed submission on the market risk premium.

197. Synergies said that the ERA should provide more guidance on the weights it applies to different methods used to determine the market risk premium. The ERA should be more explicit and transparent about the weighting the ERA applies. Synergies recommended an equal weighting be applied to the Ibbotson, Wright and dividend growth model approaches to determine the market risk premium. [59]

198. Synergies' submission can be summarised as follows:

- That the evidence in support of the Wright approach is in no way conditional on whether or not the market risk premium is found to be stationary through unit root and co-integration testing.[60]
- That the return on the market less the risk free rate may well be stationary in the long run. However, in response to macroeconomic shocks (such as low interest rates following the global financial crisis) the market risk free rate may deviate from the long-term average, until these shocks begin to dissipate. Consequently, the potential stationarity of the market risk premium does not preclude the use of the Wright approach.[61]
- That the Wright approach reflected an increasing market risk premium during periods of low interest rates, correcting back when interest rates return to normal levels. Even if the market risk premium does not move one-for-one with the risk free rate, there was some evidence of an inverse relationship, and the Wright approach should be given some weight in the ERA's analysis.[62]
- Synergies provided evidence from other economic regulators and financial practitioners that it said substantiated the principles behind the Wright market risk premium, including a quote from an RBA Governor.[63]
- While it was clear that the risk free rate was below its historical average, there was comprehensive evidence that the return on equity had not followed this pattern to the same extent, and there were insufficient grounds on which to remove the Wright approach from consideration.
- In recent years, the Wright approach should be given more weight than the Ibbotson approach due to a low risk free rate.[64]

[59] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 43.

[60] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 38.

[61] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 38.

[62] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 39.

[63] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 40.

[64] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 41.

- That residual risks associated with dividend growth model assumptions were best mitigated through the use of the dividend growth model in conjunction with Ibbotson and Wright market risk premium estimates.[65]

- The transparency in the weightings that the ERA applied to each of its selected methods should be clearer.[66]

- Synergies recommended an equal weighting be applied to the Ibbotson, Wright and dividend growth model approaches.[67]

199. ATCO provided a submission discussing the market risk premium, which included its submission on the ERA's draft decision for Western Power's most recent proposed revised access arrangement. ATCO considered that the reduction in Western Power's market risk premium was a concern.

200. ATCO's submission can be summarised as follows:

- The historical market risk premium was best derived from the arithmetic mean. ATCO referred to an evaluation by Lally on whether an arithmetic and geometric mean should be applied to historical data. Lally's report found that the arithmetic mean was consistent with the 'present value principle'.[68]

- The dividend growth model should be used to derive the forward-looking market risk premium.

  - The dividend growth model has important advantages, including that it is a forward-looking estimate.

  - Placing less reliance on the dividend growth model will no longer provide a reasonable opportunity to recover at least efficient costs (though ATCO did not explain why it has this view).

  - There is no new evidence to discredit the use of the dividend growth model.

- The market risk premium point estimate was best estimated as the mid-point between the historical market risk premium estimate and the forward-looking market risk premium estimate.

- The historical market risk premium estimate was best estimated by applying equal weight to the Ibbotson and Wright estimates.

[65] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 41.

[66] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 43.

[67] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 41.

[68] Lally, M., *Review of the AER's Methodology for the Risk Free Rate and the Market Risk Premium*, March 2013, p. 44.

8.2.3 Draft determination

201. Given these public submissions and available information, the ERA has given the market risk premium further consideration.

Historic market risk premium

202. The ERA recognises that there are mixed views as to the best averaging technique to apply when estimating the historic market risk premium.

203. Blume's 1974 paper helped establish some accepted findings regarding averaging.[69] Blume showed that:

- Compounding the arithmetic average of one period returns gave an upwardly biased estimate of expected return over N periods.
- Compounding the geometric average of one period returns underestimated the expected return over N periods when the sample period T exceeds N.
- An unbiased estimate of the expected N period returns lay between the compounded value of the arithmetic mean and the geometric mean.

204. Experts have proposed other methods to combine the geometric and arithmetic averages to give an approximately unbiased estimate of expected returns.[70] [71]

205. Indro and Lee extended Blume's analysis.[72] Indro and Lee:

- Confirmed Blume's finding that biases existed in the use of arithmetic and geometric averages.
- Compared the bias and efficiency (magnitude of the standard error) for the arithmetic average, geometric average, Blume's weighted average and the overlapped unbiased estimator.
- Found that biases tended to be exacerbated in the presence of autocorrelation in returns.
- Found that bias arising from the use of the arithmetic average increased as the investment horizon lengthened, and also as the volatility of the returns increased.
- Found that bias arising from the geometric average increased as volatility of returns increased.

[69] Blume, M., 'Unbiased Estimators of Long-Run Expected Rates of Return', *Journal of the American Statistical Association*, vol. 69, 1974, pp. 634-638.

[70] Blume, M., 'Unbiased Estimators of Long-Run Expected Rates of Return', *Journal of the American Statistical Association*, vol. 69, 1974, pp. 634-638.

[71] Jacquier, E., Kane, A. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal,* vol 59, 2003, pp. 46-53.

[72] Indro, D. and Lee, W. 'Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia', *Financial Management*, vol 26, 1997, pp. 81–90.

206. In 2013 Lally produced a report that detailed that the arithmetic mean was consistent with the 'present value principle'.[73] Lally found that an arithmetic mean was applied to a discounting model.

207. However, the ERA's concern is how best to estimate a market risk premium. An often-overlooked presumption is that the forecaster knows the true values of the statistical parameters. In practice these are estimated, and even using the best estimation techniques, the estimators are subject to sampling error. It is this variability of returns, or sampling error, that causes a level of bias in both arithmetic and geometric means. Therefore, in determining a forward estimate of the market risk premium one has to recognise these biases.

208. The report prepared for the AER by McKenzie and Partington argued that the market risk premium was measured with a standard error and that there was a finite sample of returns for the stock market and the stocks.[74] Consistent with a study by Blume, McKenzie and Partington considered that: [75, 76]

- First, when compounding the arithmetic mean over time, it was the sampling error in the measurement of the arithmetic mean return that caused the upward bias in the expected return.

- Second, with a finite sample of returns, there was an upward bias when the arithmetic average was compounded over more than one period.

209. McKenzie and Partington also used findings from various academic studies to support their view that the unbiased estimator of the market risk premium lay between the arithmetic average and the geometric average: for example, they cited Indro and Lee who concluded that arithmetic returns were upwardly biased and geometric returns were downwardly biased;[77] and Jacquier, Kane and Marcus, who reached the same conclusion.[78]

[73] Lally, M., *Review of the AER's Methodology for the Risk Free Rate and the Market Risk Premium*, March 2013, p. 40.

[74] McKenzie, M. and Partington, G., *Supplementary report on the equity market risk premium, a report to the AER on behalf of the Securities Industry Research Centre of Asia-Pacific (SIRCA) Limited*, February 2012, p. 6.

[75] Blume, M., 'Unbiased Estimators of Long-Run Expected Rates of Return', *Journal of the American Statistical Association*, vol. 69, 1974, pp. 634-638.

[76] McKenzie, M. and Partington, G., *Supplementary report on the equity market risk premium, a report to the AER on behalf of the Securities Industry Research Centre of Asia-Pacific (SIRCA) Limited*, February 2012, pp. 5-6.

[77] Indro, D. and Lee, W., 'Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia', *Financial Management*, vol 26, 1997, pp. 81–90.

[78] Jacquier, E., Kane, A. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal,* vol 59, 2003, pp. 46-53.

210. McKenzie and Partington considered that the strength of the estimator of the historic market risk premium should also be taken into consideration, together with its unbiasedness as previously discussed.[79] Strong estimators have lower standard errors and as such they are more precise. McKenzie and Partington noted findings from Jacquier, Kane and Marcus that compounding using the estimated arithmetic average return gave results that were not only upwardly biased, but also highly inefficient.[80]

211. McKenzie and Partington concluded that:[81]

> In our opinion there is no indisputable single best estimator for long run returns. The widespread current practice is to use unadjusted geometric and arithmetic averages. Given the current state of knowledge, we see no strong case to depart from this common practice and recommend that the use of both of these metrics, tempered by an understanding of their inherent biases.

212. In response to public submissions to the AER's 2018 draft guidelines, Partington and Satchell provided further advice on the averaging method.[82] Partington and Satchell considered that it was clear that some weight should be attached to the geometric return.[83]

213. Partington and Satchell's advice on the averaging method can be summarised as follows:

- The objective of the AER is to determine the rate of return that investors expect in equilibrium, and investors do compound returns. Whether or not the AER compounds returns is not the relevant issue. [84]
- Since the unbiased estimate of the expected return for a long-term investment is bounded by the arithmetic and geometric averages, both are relevant to the determination of the market risk premium for a long horizon investment.[85]
- Some weight should be attached to the geometric return and that weight should be greater the more the concern for accuracy relative to unbiasedness.[86]

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79 McKenzie, M. and Partington, G., *Supplementary report on the equity market risk premium, a report to the AER on behalf of the Securities Industry Research Centre of Asia-Pacific (SIRCA) Limited*, February 2012.

80 Jacquier, E., Kane, A. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal*, vol 59, 2003, pp. 46-53.

81 McKenzie, M. and Partington, G., *Supplementary report on the equity market risk premium, a report to the AER on behalf of the Securities Industry Research Centre of Asia-Pacific (SIRCA) Limited*, February 2012, pp. 8-9.

82 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, pp. 29-34.

83 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, p. 34.

84 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, p. 30.

85 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, p. 30.

86 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, p. 34.

- Partington did not propose a weight and considered a regulator inevitably needs to exercise judgement in making this determination.[87]

214. In light of the above information, the ERA has considered approaches to weighting the arithmetic mean and the geometric mean. As the ERA uses multiple sampling periods and considers that investors may have multiple forecast horizons, no one weighting method is preferred.

215. The ERA continues to consider that an unbiased estimate of the historical market risk premium is likely to be somewhere between the geometric average and the arithmetic average.

216. In its draft determination, the ERA has sought to minimise any error with over-reliance on one type of average and continues to support the use of both the arithmetic and geometric averages. This approach recognises:

- That when compounding the arithmetic averages over time, sampling error can cause an upward bias.
- That geometric average can understate returns as it is based on a constant compounding, which does not account for actual variability of returns over time.
- That given the volatility of returns over time, an investor may consider different investment horizons.
- That an unbiased estimate of the historical market risk premium is likely to be somewhere between the geometric average and the arithmetic average.

217. The ERA has therefore sought to minimise any error with over reliance on one of the two types of average by continuing the even weighting of the arithmetic and geometric means.

218. In the draft determination, the historical market risk premium estimate has been updated.

219. The following table details the ERA's revised estimates of the historic market risk premium as at December 2017. Consistent with the long-term approach in rail, the market risk premium is calculated with a 10-year risk free rate.

Table 10 Updated estimates of the historic market risk premium, December 2017 (%)

	Arithmetic			Geometric		
	BHM	NERA	Average	BHM	NERA	Average
1883-2017	6.29	6.65	**6.67**	4.96	5.30	**5.13**
1937-2017	6.01	5.96	**5.99**	4.19	4.14	**4.17**
1958-2017	6.51	6.51	**6.51**	4.21	4.21	**4.21**
1980-2017	6.44	6.44	**6.44**	4.24	4.24	**4.24**
1988-2017	6.01	6.01	**6.04**	4.48	4.48	**4.48**

Source: ERA Analysis

[87] Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, p. 34.

220. These estimates suggest a downward trend in the market risk premium. The AER has also found evidence that suggests a downward trend in the realised market risk premium.[88]

221. The ERA takes the average of the lowest arithmetic mean (5.99 per cent) and the highest geometric mean (5.13 per cent) to develop an estimate of the historic market risk premium of 5.6 per cent.

Wright approach

222. There have been diverging views on the role of the Wright approach.

223. In the 2015 rail WACC decision, the ERA considered that the Wright estimate provided a strong indicator of the likely return on equity for the next 50 years, given the statistical evidence at the time.

224. The statistical evidence that supported the use of the Wright approach was an ERA analysis of the long-run average market return on equity, the yield on bonds and the market risk premium.[89] The ERA analysis used the Dickey-Fuller statistical test[90] to test for a random walk[91] and draw conclusions on the stationarity of the long-term data. The results:

- Found the market return on equity was stationary (not a random walk).
- Found that yields on bills and bonds were non-stationary (a random walk).
- Found mixed evidence on a stationary market risk premium, with it probably being non-stationary (a random walk).
- Provided empirical support for the Wright approach to establish an upper bound of a market risk premium range.

225. This analysis informed the ERA's position on the Wright approach for subsequent decisions made by the ERA.

226. The ERA is now aware of new information from a Partington and Satchell review of the ERA's statistical analysis.[92] The Partington and Satchell analysis raised the following concerns with the ERA's analysis:

- Following a random walk is not the only notion of non-stationarity. For example, a process of market evolution will not be a random walk but will be non-stationary.
- The non-stationary result for yields on bills and bonds may have been the result of very high inflation from 1973 to 1986. Had the analysis used real yields, the results may have been stationary.

88 AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 240.

89 ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines, Appendix 16*, December 2013.

90 The Dickey-Fuller statistical test is used to establish whether a time series is non-stationary.

91 A random walk is where changes in a variable follow no discernible pattern or trend, that is, the path of a variable consists of a succession of random steps.

92 Partington, G. and Satchell, S., *Report to the AER: Discussion of estimates of the return on equity*, April 2017.

- The analysis may have been better done on levels of prices rather than on returns. Partington and Satchell noted that, except in very unusual circumstances, returns were stationary. Prices typically behave like random walks. Therefore, it is better to test the linear combinations of random walk variables and whether they are co-integrated (that is, with the resulting error term being stationary).

- The ERA analysis was not supportive of the Wright approach.

227. Partington and Satchell advised that they were unconvinced by the Wright approach for estimating the market risk premium and recommended that it be given little weight. The Wright CAPM has no "well accepted theoretical support", "does not seem to be much used, if at all, in practice" and "runs contrary to the well accepted view that asset prices are inversely related to interest rates". [93]

228. Most recently, Partington and Satchell have expressed concern regarding the use of the Wright model to estimate the market risk premium.

> We feel that the Wright approach has no support based on any clear evidence in the Australian context.[94]

229. Furthermore, the AER stated that it did "not agree with the underlying premise of the Wright CAPM that there is a clear inverse relationship between movements in the risk free rate and market risk premium. Consequently, we place limited reliance on the Wright approach."[95]

230. Synergies argued that the Wright approach should continue to be used and recommended that equal weight be placed on it compared to the Ibbotson and dividend growth model approaches.[96]

- Synergies argued that support of the Wright approach was not conditional on the stationary test. However, Synergies did not provide any statistical evidence of the direct relationship been the market risk premium and the risk free rate, or that the return on equity had remained unchanged.

- Synergies provided some examples of practitioners' comments that it said supported the use of the Wright approach. One of these examples was a 2015 speech from the Governor of the RBA, where the Governor stated that, post-crisis, earnings yields on listed companies seemed to have remained unchanged. However, this analysis inappropriately used the earnings-to-price ratio in place of the required total return on equity. Other quotes detailed that there was no direct correlation between the risk free rate and the return on equity. However, this did not imply a relationship between interest rates and the market risk premium, and therefore did not necessarily support the Wright approach.

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[93] Partington, G. and Satchell, S., *Report to the AER: Cost of equity issues–2016 electricity and gas determinations*, April 2016, p. 31.

[94] Partington, G. and Satchell, S., *Report to the AER: Discussion of estimates of the return on equity*, April 2017, p. 28.

[95] AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, pp. 3-98, 3-211.

[96] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, pp. 40-44.

231. The ERA has considered existing and new evidence to assess the reasonableness of using the Wright approach to estimate the market risk premium. This included expert views, public submissions and considerations that address the Wright approach in the AER's Draft Rate of Return Guidelines.[97]

232. On the basis of all available information, the following information raised concern with the continued use of the Wright approach:

- The Partington and Satchell review of the ERA's past statistical analysis on the stationarity of the return on equity, the market risk premium and the risk free rate found that the analysis did not support the Wright approach.[98]
- Partington and Satchell expressed concern regarding the use of the Wright model in the estimation of the market risk premium.[99]
- There was concern with the "underlying premise of the Wright CAPM that there is a clear inverse relationship between movements in the risk free rate and market risk premium." [100]
- There was lack of support for the use of the Wright approach from the AER's concurrent evidence session.[101]
- ATCO's later submission on Western Power's access arrangement chose not to challenge the ERA's reasoning for disregarding the Wright estimate.[102]
- There was no estimable inverse relationship between the market risk premium and the risk free rate.[103]
- The AER considered that the model had no theoretical basis in Australia and was not an appropriate tool for regulatory use, nor was it used by market practitioners.[104]

233. Based on this information, the ERA considers that theoretical and empirical concerns exist with the Wright approach.

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97 AER, *Draft Rate of Return Guidelines – Explanatory Statement,* July 2018.

98 Partington, G. and Satchell, S., *Report to the AER: Discussion of estimates of the return on equity*, April 2017.

99 Partington, G. and Satchell, S., *Report to the AER: Discussion of estimates of the return on equity*, April 2017, p. 28.

100 AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, pp. 3-98, 3-211.

101 AER, *Second Concurrent Evidence Session*, April 2018, p. 69.

102 ATCO, *Re: New Rate of Return Information – Western Power Network Access Arrangement – 2017/18 to 2021/22*, August 2018, p. 4.

103 AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 204.

104 AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 234.

Partington, G. and Satchell, S., *Cost of Equity issues 2016 Electricity and Gas Determinations,* April 2016, pp. 30-31.

Partington, G. and Satchell, S., *Report to the AER*, May 2018, pp. 34-35.

AER, *Draft decision - Multinet Gas access arrangement 2018-22, Attachment 3 - Rate of return*, p. 220.

AER analysis of independent valuation reports for the 2018 rate of return guideline review also indicated no reports appeared to use the Wright CAPM.

234. The ERA will not consider the Wright approach when estimating the market risk premium in this draft determination.

Dividend growth model approach

235. In past determinations, the ERA has calculated a range for the dividend growth model estimates of the market risk premium from:

- the ERA's two-stage dividend growth model
- recent dividend growth model studies.

236. As fewer dividend growth model studies are available, the ERA proposes to simplify the calculation of the dividend growth model estimate through relying on its own estimate.

237. The ERA's preferred construction of the dividend growth model is the two-stage dividend growth model set out in the Dampier to Bunbury Natural Gas Pipeline (DBNGP) decision.[105] The two-stage model assumes that dividends grow at the long-term growth rate following the dividend forecast period. The ERA will deduct the on-the-day estimate of the 10-year risk free rate from the return on equity produced by the dividend growth model.

238. The ERA's two-stage dividend growth model uses a point estimate of 4.6 per cent for the long-term growth rate of nominal dividends per share. This rate is informed by the analysis of Lally.[106]

239. The ERA considers that the two-stage dividend growth model provides for a simple and reasonable approach.

- The three-stage model is an added complication that does not add much value. In addition, as detailed by Partington, there is significant uncertainty about the optimal construction of the three-stage model and its transition pattern for dividends.[107]
- With a growth rate of 4.6 per cent, the two-stage dividend growth model produces slightly higher results than the three-stage model.[108]
- The extent to which any weight should be applied to the dividend growth model further decreases the small difference between the two-stage and three-stage models.

240. On this basis, to the extent that any weight should be applied to the dividend growth model, the ERA will use the two-stage dividend growth model, which produces an estimate of 7.2 per cent as at October 2018.

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[105] ERA, *Final decision on the proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020 – Appendix 4 Rate of Return,* 30 June 2016, p. 115.

[106] Lally, M., *Review of the AER's proposed dividend growth model*, December 2013, p. 14.

[107] Partington, G., *Report to the AER: Return on equity (Updated)*, April 2015, pp. 26, 52.

[108] AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, p. 3-222.

241. The ERA has considered all available information to assess the reasonableness of using the dividend growth model approach to estimate the market risk premium. This has included consideration of expert views, public submissions and consideration of the dividend growth model approach in the AER's Rate of Return Guidelines.[109]

242. On the basis of all available information, there are concerns with the dividend growth model approach:

- The dividend growth model method has the benefit of being forward-looking, and takes the current economic outlook into account through dividend growth expectations, but is unreliable on its own.[110]

- McKenzie and Partington noted the sensitivity of the model to assumptions and input values:[111]

> Clearly valuation model estimates are sensitive to the assumed growth rate and a major challenge with valuation models is determining the long run expected growth rate. There is no consensus on this rate and all sorts of assumptions are used: the growth rate in GDP; the inflation rate; the interest rate; and so on. A potential error in forming long run growth estimates is to forget that this growth in part comes about because of injections of new equity capital by shareholders. Without allowing for this injection of capital, growth rates will be overstated and in the dividend growth model this leads to an overestimate of the market risk premium.

- Partington and Satchell's review of the role of the dividend growth model to estimate the market risk premium raised a number of concerns.[112] Partington and Satchell considered it very unlikely that the dividend growth model would produce a forward-looking market risk premium commensurate with the prevailing conditions in the market for funds.[113]

- The AER analysed the historical results from its construction of the dividend growth model and found that there was a large negative correlation between the market risk premium estimates from the dividend growth model and the risk free rate. This means that the dividend growth model implicitly assumes a stable return on equity, which is inconsistent with the view that there is a lack of support for an inverse relationship between the risk free rate and the market risk premium.[114]

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[109] AER, *Draft Rate of Return Guidelines – Explanatory Statement,* July 2018.

[110] McKenzie, M. and Partington, G., *Report to the AER – Supplementary report on the equity market risk premium*, February 2012, p. 14.

[111] McKenzie, M. and Partington, G., *Equity market risk premium*, December 2011, p. 25.

[112] Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017.

[113] Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017, p. 25.

Partington, G. and Satchell, S., *Report to the AER: Allowed rate of return 2018 Guideline review*, May 2018, p. 33;

[114] AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 221.

- The AER stated that the dividend growth model had some merit as a theoretical model but that concerns about inputs, biases and sensitivities have limited its use.[115]

- Given the concerns with the dividend growth model, Partington and Satchell considered that it was not appropriate to apply equal weights to the historic market risk premium and the dividend growth model.[116]

- Furthermore, the AER did not propose to use the dividend growth model to directly inform the market risk premium estimate.[117]

243. Based on available information, the ERA considers that the dividend growth model has the following weaknesses:

- There is no clear agreement among experts as to the best form for the dividend growth model, or its inputs.

- The dividend growth model is sensitive to its assumptions.

- Forecasts of future earnings and dividends are fairly inaccurate over more than two years.

- The dividend growth model is subject to upward bias from the smoothed or sticky nature of dividends.

- Biases in analyst forecasts can lead to biased dividend growth model forecasts of the market risk premium.

- The dividend growth model is likely to be upwardly biased when interest rates are low.

- The dividend growth model estimates provide a single discount rate, which equates the present value of the future infinite dividend stream with the observed share price.

244. ATCO's submission on the ERA's draft decision on Western Power's most recent proposed revised access arrangement referred to an ERA rail decision from October 2017 that included a market risk premium determined by effectively giving 100 per cent weight to the dividend growth model. The ERA notes that this rail decision was the application of a past rail method, and not a review of the market risk premium method.

245. The ERA recognises that it has had past concerns with the use of the dividend growth model, and notes ATCO argues that some of the ERA's concerns are not new and therefore it should not adjust its view. However, new information, submissions and further advice over the course of the ERA's rate of return reviews[118] gave the ERA cause to give greater weight to these weaknesses of the dividend growth model.

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[115] AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 235.

[116] Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017, p. 27.

[117] AER, *Draft rate of return guidelines – explanatory statement,* July 2018, p. 236.

[118] Including the Western Power Access Arrangement 20 Sept 2018 and the Gas Rate of Return Guidelines 16 December 2018.

246. At any point in time, the ERA's estimation of the market risk premium will need to be informed by a range of relevant material. The relative contributions of different estimation methods for the market risk premium should be conditioned by their quality, including the potential to introduce bias. The averaging over different estimation methods for the market risk premium should be informed by the quality of the estimates used and the extent to which the estimates are unbiased.

247. Based on this information, the ERA has diminished confidence in the dividend growth model and considers that it is reasonable to place less reliance on the dividend growth model, relative to the historic market premium.

Conditioning variables

248. In its determinations for electricity and gas, the ERA adopted forward looking indicators of market conditions for the next five years in order to select a point estimate within the range of the market risk premium. These indicators included:

- dividend yields on the All Ordinaries Index
- interest rate swap spreads
- default spreads
- the Australian Stock Exchange (ASX) 200 volatility index.

249. While these conditioning forward-looking indicators are relevant for gas and electricity, these indicators are of limited relevance for setting the rail WACC. This is because the rate of return for railways regulated under the Code is long term, approaching 50 years. The indicators used for electricity and gas decisions are all shorter term (five years). The ERA therefore considers that the indicators have limited relevance for the rail WACC estimates, and has not taken the indicators into account.

Determining point estimate

250. For the purposes of the draft determination, the ERA will use the following approach to estimate the market risk premium:

- Place more reliance on the historic market premium, relative to the dividend growth model. The historic market premium is a simple and well-accepted method for calculating the market risk premium using historical data. Historical averages of the market premium are widely used by financial practitioners and regulators in Australia. The ERA considers historical averages provide the best source of evidence available to estimate the market risk premium.
- Place less reliance on the dividend growth model, relative to the historic market premium. While the dividend growth model has the benefit of taking the current economic outlook into account, it is unreliable on its own. The dividend growth model suffers from weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias.
- Determine a final point estimate of the market risk premium by using its regulatory judgement considering the relative merits of all relevant material.

251. The final point estimate of the market risk premium will be rounded to one decimal point.

252. The market risk premium estimated for the rail rate of return will be different to that estimated by the ERA for gas or electricity. While the method for calculating the market risk premium for rail is similar to that used by the ERA for gas and electricity, the use of the 10-year risk free rate in rail will mean that market risk premiums are not directly comparable.

253. To determine the final point estimate of the market risk premium adopted in this rail WACC draft determination:

- Updated analysis indicates that the best estimate of the market risk premium using historical data on market risk premium is 5.6 per cent as at December 2017.
- Updated analysis indicates that the best estimate of the market risk premium using its two-stage dividend growth model is 7.2 per cent as at October 2018.
- Regulatory discretion is used to select the final point estimate of the market risk premium from the historical data method and the dividend growth model method with the view that estimates of the market risk premium from historical data is given a greater weight than estimates from the dividend growth model.

254. In summary, on the basis of all available information, together with its regulatory discretion, the ERA considers that an estimate of the market risk premium of 5.9 per cent is consistent with the easing of risk conditions in Australia, and with the diminished confidence in the robustness of dividend growth model estimates.

255. For the draft determination, the ERA has adopted a market risk premium of 5.9 per cent.

256. This market risk premium will remain fixed until the next rail WACC method review.

8.3 Equity beta

8.3.1 Background

257. Equity beta is the 'slope' parameter β_i in the Sharpe Lintner CAPM. The slope parameter β_i 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.

$$R_e = R_f + \beta_e \left(R_m - R_f \right) \qquad \text{(equation 8)}$$

where:

R_e is the required rate of return on equity for the asset, firm or industry in question

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

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

258. The risk of an asset is typically thought of as the variance in asset returns. This variance is a measure of the total risk of an asset. Total risk consists of systematic and non-systematic risk. Systematic risk is that part of total risk in a firm's returns that stems from the economy and markets more broadly. Systematic risk cannot be easily eliminated through diversification. Non-systematic risk is the risk stemming from unique attributes of the firm, which may be eliminated by an investor through diversification. For this reason, only systematic risk is compensated in the return on equity.

259. The equity beta is a parameter that measures the systematic risk of a security or a portfolio in comparison to the market as a whole.

260. Two risk factors are generally considered to affect the value of equity beta for a particular firm:

- The type of business, and associated capital assets, that the firm operates measured by asset or 'un-levered' beta.
- The amount of financial leverage (gearing) employed by the firm, which levers or 'amplifies' the asset beta to arrive at equity beta.

Current approach

261. In its 2015 rail determination, the ERA took the following approach to estimating equity beta.

262. The ERA considered 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. 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 entity.

263. Estimates of asset beta based on benchmark samples should, if possible, be relevant to the regulated rail businesses in Western Australia, in two respects:

- Estimates of asset beta from the benchmark samples should be relevant to the economy in which the efficient benchmark entity is operating (in this case, the Australian economy).
- Estimates should also be relevant to the industry/sector in which the efficient benchmark entity is operating (in this case, the rail industry).

264. There were not enough rail business comparators operating in Australia to adequately inform such an approach. A benchmark sample including Australian, European and North American countries was therefore used.

265. Consistent with the construction of the benchmark efficient entity, the ERA had three benchmark samples to represent the three regulated rail networks.

266. Weekly data was used over the five-year data period from 1 July 2010 to 30 June 2015.

267. The approach to estimating the benchmark asset beta and associated equity beta is detailed below.

- To estimate equity beta the methods set out in Henry's advice to the ACCC are used.[119] Henry's study was updated in 2014, but remained essentially unchanged.[120]
- To address the influence of outliers, the following methods to calculate beta are used:[121] [122]
  - the Least Absolute Deviations (LAD)
  - the Ordinary Least Squares (OLS)
  - the Maximum Likelihood Robust (MM)
  - the Theil-Sen (T-S).

[119] Henry, O., *Estimation Beta: Advice Submitted to the Australian Competition and Consumer Commission*, April 2009.

[120] Henry, O., *Estimating Beta: An update*, April 2014.

[121] ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks: Final Decision - Appendix 1*, September 2015.

[122] Vo et al. (2014) re-examined the estimates of beta in the Australian regulatory context. In their study, a data set was updated in comparison with Henry's study in 2009. In addition, another contribution from Vo et al. (2014) study was that two new approaches were added in their study: (i) the Maximum Likelihood robust theory (MM) and (ii) the Theil Sen methodology. For each of these new approaches, the authors argued that among the robust regression estimators currently available, the MM regression had the highest breakdown point (50 percent) and high statistical efficiency (95 percent) while the Theil Sen estimator was proposed by Fabozzi (2013) in response to the OLS estimator being acutely sensitive to outliers.

- The Brealey-Myers formula are used to de-lever and re-lever betas. All equity betas are de-levered using the sample firm's average gearing ratio. These asset betas are then re-levered by the benchmark gearing.

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

(equation 9)

where:

β_a is the asset beta

β_e is the equity beta

E is the value of debt

D is the value of equity.

- Regulatory discretion is used when assessing beta estimates and determining final equity beta estimates.

268. In its 2015 rail WACC review, the ERA determined the following betas:

- Public Transport Authority – an asset beta of 0.3, combined with estimated gearing of 50 per cent, which gives an equity beta of 0.6.
- Arc Infrastructure – an asset beta of 0.7, combined with estimated gearing of 25 per cent, which gives an equity beta of 0.9.
- Pilbara Railways – an asset beta of 1.05, combined with estimated gearing of 20 per cent, which gives an equity beta of 1.3.

8.3.2 Public submissions

269. Synergies provided a detailed submission on equity beta.[123]

270. Synergies argued that an asset beta of at least 0.75 was consistent with Arc Infrastructure's prevailing risk profile. In arguing for an asset beta of 0.75 Synergies undertook:

- an updated analysis of Arc Infrastructure's comparator sample
- a 'first principles analysis' of Arc Infrastructure and Aurizon.

[123] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, pp. 15-35.

Arc Infrastructure comparator sample

271. Synergies updated the ERA's comparator sample for Arc Infrastructure's beta. This analysis of 11 comparators indicated that the average asset beta for the sample decreased from 0.91 to 0.86 since the 2015 review.[124]

272. Synergies' analysis showed that Aurizon's asset beta declined from 0.69 in 2015 to 0.55 in 2018, which was markedly lower than North American rail comparator betas.

273. Synergies submitted that the ERA employed significant regulatory discretion to estimate the asset beta for Arc Infrastructure. This discretion included that Arc Infrastructure's beta will sit below that of most overseas railway comparators and is likely to be best estimated by reference to Aurizon's asset beta. While the ERA gave weight to other Australian transport companies, these other comparators were no longer available to the ERA due to de-listing. Synergies argued that the ERA's approach could be simplified in practice to a direct adoption of the Aurizon beta. Synergies was concerned that the focus on Aurizon was leading to instability and relying on a comparator of limited relevance.[125]

Synergies' first principle analysis

274. Synergies submitted that the ERA's previous comparisons between Arc Infrastructure and Aurizon are no longer appropriate.

275. Synergies conducted a first principle analysis to consider the risk profiles of Arc Infrastructure and Aurizon.[126] [127] Using this analysis, Synergies argued the risk profiles of the two businesses are different due to:[128]

- The nature of service and customers:
  - Synergies agreed that general freight (including intermodal) had significant exposure to changes in domestic demand, but did not agree with the ERA's apparent characterisation of the remaining tasks – transporting export commodities or inputs to export commodities - as having low systematic risk. Production volumes of iron ore, alumina and nickel all have significant potential to fluctuate. Synergies provided some examples affecting Arc Infrastructure, including mine closures, reductions and increased future development uncertainty.
  - Arc Infrastructure does not enjoy the highly regulated revenues and enhanced confidence of Aurizon. Aurizon recently announced that it will cease its intermodal freight operations, which will result in Aurizon deriving 100 per cent of its revenue from coal, on long-term (10 to 15 year) contracts.

[124] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 15.

[125] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, p. 21.

[126] A first principles analysis is a qualitative assessment, which develops a profile of the firm's systematic risks and assesses their likely impact on beta.

[127] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 21.

[128] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 22.

- Duration of contracts - Aurizon's long-term contracts and revenue certainty contrasted with Arc Infrastructure. Arc Infrastructure had seen major long-term contracts renegotiated, rolled-off or terminated, which increased its exposure to the economic cycle.

- The nature of regulation - Aurizon operates under a revenue cap regime, which enabled stable regulatory returns and allowed the application of various risk allocation, mitigation and compensation mechanisms. Arc Infrastructure does not benefit from this level of stability.

- Market power - Many of Arc Infrastructure's customers had the option of road transport, which was not an option for Aurizon (coal) customers. Arc Infrastructure did not enjoy the benefits of the high route traffic densities of Aurizon's major corridors.

- Growth options - Growth opportunities are incorporated into a company's value and increased growth opportunities, and their associated variability, can increase a company's equity beta. Arc Infrastructure's rail network asset covered an economically diverse region and provided it with the potential to serve varying new commodity projects.[129]

- Operating leverage - Arc Infrastructure was exclusively a below-rail business and thus had a high operating leverage, and higher than Aurizon's. Arc Infrastructure was similar to American class 1 railroads in that respect. A high proportion of Arc Infrastructure's costs are fixed and it has no scope to redeploy assets in response to reduction in demand for its services. Synergies submitted that the ERA previously acknowledged that "higher operating leverage may contribute to a high sensitivity of profits to changes in levels of demand and a higher beta value for the freight network business".

276. On balance, Synergies argued that these observations indicated that a direct comparison between Arc Infrastructure and Aurizon may not be appropriate and that such a link may lead to a significant underestimation of Arc Infrastructure's beta.[130]

277. Arc Infrastructure faced a level of risk which was almost identical to that of an unregulated business.[131] Synergies' analysis indicated that Arc Infrastructure's exposure to systematic risk had almost certainly not decreased since the previous review. In addition, recent events highlighted the higher systematic risk to which Arc Infrastructure had always been exposed.[132]

278. Synergies recommended increasing the Arc Infrastructure asset beta from 0.7 to at least 0.75, which is equivalent to an equity beta of 1.00.[133]

[129] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 31.

[130] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, p. 25.

[131] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 34.

[132] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 34.

[133] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks,* June 2018, p. 35.

8.3.3 Draft determination

Beta estimation method

279. Consistent with the ERA's current practice of determining an appropriate beta for regulated businesses in electricity, gas, water and rail, the ERA considers that empirical evidence must be used to inform its judgment for equity beta.

280. For the purposes of calculating rail equity betas, the ERA will continue to:

- Use the methods set out in Henry's advice to the ACCC in 2009 to define the equity beta estimation approach.
- Employ the following methods to calculate beta:
  - the Least Absolute Deviations (LAD) method
  - the Ordinary Least Squares (OLS) method
  - the Maximum Likelihood Robust (MM) method
  - the Theil-Sen (T-S) method.
- Use the Brealey-Myers formula to de-lever and re-lever betas.
- Apply its regulatory discretion when assessing beta estimates and determining final equity beta estimates.

281. The ERA notes that for rail there is a lack of comparable Australian companies. As a consequence, and consistent with its 2015 rail WACC approach, the ERA relies on overseas railway network operators in order to form the benchmark samples to estimate equity beta for the Public Transport Authority, Arc Infrastructure and Pilbara Railways.

282. For the 2018 rail WACC review, the ERA uses weekly data for the 10-year data period from 1 January 2009 to 31 December 2018. This is consistent with the long lives of rail assets and the Western Australian regulatory rail framework.

283. The asset betas for the three benchmark samples are presented below.

Public Transport Authority empirical estimates

284. The ERA continues the Public Transport Authority's benchmark sample for the purposes of estimating equity beta.

285. The ERA notes that Macquarie Atlas Roads becomes Atlas Arteria after splitting from Macquarie. In this analysis, the new name together with its new Bloomberg's ticker are used.

286. For the 10-year period from 1 January 2009 to 31 December 2018, estimated asset betas for benchmark sample firms for the Public Transport Authority are presented in Table 11.

Table 11 Estimated asset betas for Public Transport Authority benchmark sample, January 2009 – December 2018

Name	Country	Industry	Estimates of asset beta				
			OLS	LAD	MM	Theil Sen	Average
Vinci SA	France	Toll Roads	0.56	0.60	0.58	0.57	0.58
Abertis Infraestructuras S.A	Spain	Toll Roads	0.32	0.30	0.31	0.29	0.31
Atlantia SPA	Italy	Toll Roads	0.34	0.34	0.34	0.33	0.34
European Average							**0.41**
Atlas Arteria	Australia	Toll Roads	0.45	0.40	0.41	0.40	0.42
Transurban Group	Australia	Toll Roads	0.29	0.27	0.26	0.27	0.28
Australian Average							**0.35**
Average of the Benchmark Sample							**0.38**

Source: ERA analysis with data from Bloomberg

287. The Public Transport Authority's benchmark sample produces the following estimates of the asset beta:

- a mean of 0.38
- a range of 0.26 to 0.60.

288. The ERA notes that the systematic risk present in the benchmark sample above is expected to be higher than that of the Public Transport Authority rail network. The Public Transport Authority rail network primarily transports passengers via rail across the Perth Metropolitan area and its systematic risk is likely to be far lower than that of a toll road company.

289. In addition, the ERA notes that the comparator company Vinci SA is a diversified business providing other services, and owning and operating other types of assets. The ERA considered that Vinci SA's systematic risk is likely to be higher than that of the Public Transport Authority network.

290. Consistent with its 2015 rail WACC review, the ERA uses its discretion to select a relevant asset beta at the lower end of the empirically derived estimated range.

291. Therefore the ERA considers that it is appropriate to maintain the Public Transport Authority's asset beta at 0.3.

Arc Infrastructure empirical estimates

292. The ERA continues the Arc Infrastructure benchmark sample for the purposes of estimating equity beta.

293. For the 10-year period from 1 January 2009 to 31 December 2018, estimated asset betas for benchmark sample firms for Arc Infrastructure are presented in Table 12.

Table 12 Estimated asset betas for Arc Infrastructure benchmark sample, January 2009 – December 2018

Name	Country	Industry	Estimates of asset beta				
			OLS	LAD	MM	Theil Sen	Average
Genesee & Wyoming Inc.	US	Rail Freight	1.09	1.02	1.04	1.06	1.05
Union Pacific Corporation	US	Rail Freight	1.00	0.98	0.97	0.99	0.99
Norfolk Southern Corporation	US	Rail Freight	0.97	0.93	0.94	0.96	0.95
Kansas City Southern	US	Rail Freight	1.12	1.11	1.11	1.11	1.11
CSX Corporation	US	Freight	1.05	1.03	1.02	1.03	1.03
United States Average							**1.03**
Canadian Pacific Railway	Canada	Rail Freight	0.88	0.79	0.84	0.83	0.84
Canadian National Railway	Canada	Rail Freight	0.73	0.72	0.73	0.71	0.72
Canadian Average							**0.78**
Aurizon Holdings	Australia	Freight	0.60	0.64	0.64	0.64	0.63
Toll Holdings Limited	Australia	Freight	0.66	0.36	0.48	0.46	0.49
Asciano Limited	Australia	Rail Freight	0.64	0.44	0.43	0.42	0.48
Australian Average							**0.53**
Port of Tauranga	New Zealand	Ports and Cargo	0.33	0.48	0.50	0.46	0.44
New Zealand Average							**0.44**
Average of the Benchmark Sample							**0.70**

Source: ERA analysis with data from Bloomberg

294. Arc Infrastructure's benchmark sample produces the following asset beta results:

- a mean of 0.70
- a range of 0.33 to 1.12.

295. In its 2015 rail WACC review, to assess Arc Infrastructure's asset beta of 0.7:

- The ERA considered that Aurizon was potentially the best comparable company to the Arc Infrastructure network, given that it operates in Australia and transports a somewhat similar mix of bulk commodities and general freight. However, the ERA also noted the differences between the networks, particularly the reliance of Arc Infrastructure on the local grain supply each year.
- The ERA noted that other Australian firms in the Arc Infrastructure benchmark sample are the non-rail comparators, Toll and Asciano. The ERA considered that non-rail operators were a less valid proxy company compared to the rail operators. That said, these comparators either incorporate rail operations (Asciano) or operate in similar markets for transport services (Toll).
- For overseas rail operators, the ERA argued they would possess a higher level of systematic risk, relative to an Australian railway operator, given that American and Canadian railway operators were expected to face higher degrees of competition from alternative forms of transportation such as roads.
- For the New Zealand port comparator, the ERA expected that it would have a lower level of systematic risk, given the diverse nature of port operations covering road, rail and shipping.

296. Synergies' qualitative risk analysis was to decouple the link between Arc Infrastructure and Aurizon. Synergies argued that there were considerable differences between the two firms and recommended an asset beta for Arc Infrastructure of 0.75, if not higher.

297. The ERA considers that Arc Infrastructure and Aurizon do have different risk profiles and it may not be reasonable to assume the two firms' asset betas are the same.

298. However, Synergies qualitative analysis does not provide additional evidence of the best approach in which the equity beta for Arc Infrastructure can be estimated. The ERA continues to consider that a beta estimate for Arc Infrastructure is best determined through the use of a benchmark sample.

299. The benchmark sample includes Aurizon, which is the only listed Australian railway. However, the benchmark sample does not solely rely on Aurizon. Therefore, to estimate Arc Infrastructure's beta the ERA considers all available information from the benchmark sample.

300. In summary, in considering Arc Infrastructure's asset beta for the 2018 rail WACC review the ERA considers that:

- The Aurizon network is not a directly comparable company to Arc Infrastructure. There are differences in the operations of the businesses which mean that it is likely that the Aurizon network would have a lower risk than that of the Arc Infrastructure network. Therefore, while Aurizon may have some value as a comparator, it is likely that Arc Infrastructure's asset beta would be higher.

- There is some value in the comparators Toll (which operates in similar markets) and Asciano (which incorporates rail operations).

- Overseas rail operators will possess a higher level of systematic risk, relative to an Australian railway operator.

- The New Zealand port comparator will have a lower level of systematic risk.

301. The ERA notes that the 2018 average estimate across regions for Arc Infrastructure's benchmark sample is 0.70.

302. On balance, the ERA uses its discretion to select a relevant asset beta close to the benchmark sample average across regions but higher than that of Aurizon.

303. Therefore, consistent with its 2015 rail WACC review, the ERA considers that it is appropriate to maintain Arc Infrastructure's asset beta at 0.7.

Pilbara Railways empirical estimates

304. The ERA continues the Pilbara Railways' benchmark sample for the purposes of estimating equity beta.

305. For the 10-year period from 1 January 2009 to 31 December 2018, estimated asset betas for benchmark sample firms for the Pilbara Railways are presented in Table 13.

Table 13 Estimated asset betas for Pilbara Railways' benchmark sample, January 2009 – December 2018

Name	Country	Industry	Estimates of asset beta				
			OLS	LAD	MM	Theil Sen	Average
Genesee & Wyoming Inc.	US	Rail Freight	1.09	1.02	1.04	1.06	1.05
Union Pacific Corporation	US	Rail Freight	1.00	0.98	0.97	0.99	0.99
Norfolk Southern Corporation	US	Rail Freight	0.97	0.93	0.94	0.96	0.95
Kansas City Southern	US	Rail Freight	1.12	1.11	1.11	1.11	1.11
CSX Corporation	US	Freight	1.05	1.03	1.02	1.03	1.03
United States Average							**1.03**
Canadian Pacific Railway	Canada	Rail Freight	0.88	0.79	0.84	0.83	0.83
Canadian National Railway	Canada	Rail Freight	0.73	0.72	0.73	0.71	0.72
Canadian Average							**0.78**
Average of the Benchmark Sample							**0.90**

Source: ERA analysis with data from Bloomberg.

306. The Pilbara Railways' benchmark sample produces the following asset beta results:

- a mean of 0.90
- a range of 0.71 to 1.12.

307. In its 2015 rail WACC review, to assess the Pilbara Railways' asset beta of 1.05:

- The ERA considered that an appropriate asset beta for the Pilbara Railways would be higher than that of the average overseas comparator rail networks, given the importance of general freight for the overseas networks.
- The ERA considered that the Pilbara Railways were likely to have a higher level of risk than an intermodal or general freight railway, the Pilbara Railways were single commodity railways in a remote location that exclusively served mining-related export demand.

- The ERA considered that Genesee & Wyoming was the best, (albeit an imperfect) comparator for the Pilbara Railways. Genesee & Wyoming was likely to be the best comparator for a short-line railway[134] and had characteristics that were sensitive to overseas markets.

- The ERA considered that Aurizon provided a comparator for the Pilbara Railways, given that it operated in Australia and was reliant on transporting export commodities to coastal ports. However, the ERA considered that the Pilbara Railways were likely to face a higher risk of operation and investment in comparison with Aurizon. Aurizon's revenue cap distinguished it from railroads in the US and Canada.

308. To consider the Pilbara Railways' asset beta for the 2018 rail WACC review:

- The ERA maintains its position that Genesee & Wyoming is likely to be the best comparator in the benchmark sample for the Pilbara Railways.

- The ERA continues to consider that Aurizon is not a direct comparator for the Pilbara Railways.

- Genesee & Wyoming and the average benchmark sample beta has reduced slightly.

309. On balance, the ERA uses its discretion to select a relevant asset beta for the Pilbara Railways that places the most weight on the Genesee & Wyoming estimate.

310. Therefore the ERA considers that it is appropriate to set the Pilbara Railways' asset beta at 1.00.

The ERA's beta determination

311. For the 2018 rail WACC review, the ERA determines the following betas for the draft determination:

- The Public Transport Authority – an asset beta of 0.3, combined with estimated gearing of 50 per cent, which gives an equity beta of 0.6.

- Arc Infrastructure – an asset beta of 0.70, combined with estimated gearing of 25 per cent, which gives an equity beta of 0.9.

- Pilbara Railways – an asset beta of 1.00, combined with estimated gearing of 20 per cent, which gives an equity beta of 1.3.

312. Equity betas will remain fixed until the next rail WACC method review.

[134] The short-line railways are the railway companies operating over a relatively short distance in comparison with national railway networks.

9 Value of imputation credits (gamma)

9.1 Background

313. The imputation tax system prevents corporate profits from being taxed twice. Prior to the introduction of imputation on 1 July 1987, company profits were taxed once at the corporate level and again at the dividend recipient level (for example, as personal income tax). Under the Australian imputation tax system, franking credits are distributed to investors at the time dividends are paid and provide an offset to those investors' taxation liabilities.

314. The gamma parameter accounts for the reduction in the effective corporate taxation that arises from the distribution of franking credits to investors. As a general rule, investors who are able to use franking credits will accept a lower required rate of return, before personal tax, on an investment that has franking credits, compared with an investment that has similar risk and no franking credits.

315. The ERA utilises the Officer framework to adjust the WACC to incorporate the value of imputation credits.[135] This provides a framework for calculation of a nominal pre-tax WACC, as follows:

$$WACC_{nom} = R^{e}_{post} * \frac{1}{(1-T*(1-\gamma))} * \frac{E}{V} + R^{d}_{pre} * \frac{D}{V} \qquad \text{(equation 10)}$$

where:

$WACC_{nom}$	is the nominal pre-tax weighted average cost of capital
R^{e}_{post}	is the post-tax rate of return on equity, or cost of equity
R^{d}_{pre}	is the pre-tax rate of return on debt, or the cost of debt
T	is the tax rate
γ	is the value of imputation credits (gamma)
E/V	is the proportion of equity in the total financing (comprising equity and debt)
D/V	is the proportion of debt in the total financing.

316. Gamma is commonly estimated through the Monkhouse formula as the product of the distribution rate and the utilisation rate, as follows: [136]

gamma = distribution rate x utilisations rate (equation 11)

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

[136] Monkhouse, P., *The Valuation of Projects under a Dividend Imputation Tax System*, *Accounting and Finance 36*, 1996, pp. 185-212.

317. The distribution rate represents the proportion of imputation credits created that is expected to be distributed to investors.

318. The distribution of franking credits differs amongst companies, 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 value of gamma required for use in the rail WACC is difficult to identify.

319. For the 2015 rail WACC review, the distribution rate was calculated, with Australian Taxation Office (ATO) data, as 0.8 for listed equity and 0.7 for all equity.

320. The utilisation rate is the weighted average of the utilisation rates of individual investors, with investors able to fully use the credits having a rate of 1 and those unable to use them having a rate of zero.

321. The 2015 rail approach to gamma considered that three different approaches to estimating the utilisation rate were appropriate: [137]

- *The equity share approach* – The equity share or equity ownership approach uses Australian Bureau of Statistics (ABS) data on the equity ownership of foreign investors. Assuming that all local investors can fully use the credits (utilisation rate of one) and foreign investors cannot use the credits (utilisation rate of zero), it follows that the utilisation rate is the proportion of equity held by local investors. This method produced a range for the utilisation rate of 0.48 to 0.59.

- *The taxation statistics approach* – This method uses ATO data to observe the proportion of distributed imputation credits that have been used by investors to reduce their personal taxation liabilities. This method produced a utilisation rate of 0.43.

- *The dividend drop off approach* – Dividend drop off studies examine how share prices change on ex-dividend days after distribution of both cash dividends and attached franking credits. The amount by which the share prices change (on average) is assumed to reflect the value investors place on the cash dividend and imputation credit as separate from the value of the shares. This method produced a range for the utilisation rate of 0.35 to 0.69.

322. The ERA based its estimate of gamma on the following:

- The equity share ownership approach produced an estimate of gamma of 0.4.

- The taxation statistics approach produced an estimate of gamma of 0.3.

- The dividend drop off method produced a range for the estimate of gamma of 0.3 to 0.5.

323. The resulting range for the ERA's estimate of gamma was 0.3 to 0.5. The ERA placed most reliance on the equity share ownership approach. Taking all relevant information into account, a point estimate for gamma of 0.4 was adopted.

[137] Please see 2015 Decision paragraphs 841-1008 for a comprehensive canvasing of available techniques identified to estimate gamma.

9.2 Public submissions

324. Synergies provided a submission on gamma.[138]

325. Synergies' proposal for gamma utilised four approaches to calculate gamma. The proposal continued the three past approaches: equity ownership, tax statistics and dividend drop off approaches. These approaches were augmented with an additional new approach: the finance theory and financial practitioners approach. Gamma was then estimated as the average gamma produced from these four approaches. On the basis of this method Synergies argued that gamma should be 0.25. [139]

326. Synergies' submission can be summarised as follows:

- Gamma should be determined through the use of market measures.
- The equity ownership approach was a non-market approach, which did not include all reasons why imputation credits cannot be redeemed.
- Tax statistics provided a direct estimate of the actual amount of credits redeemed by taxpayers. Gamma could be calculated by credits redeemed over credits created. The taxation statistics approach was the most robust of the available non-market approaches.
- The value from the dividend drop off approach should be updated to 0.25. The market prices for gamma were observable and that the dividend drop off approach was a robust method.
- Finance theory and market evidence indicated that gamma should be zero. This additional approach represented a market measure of gamma.
  - Academic studies found that foreign investors were the marginal price-setting investors and this meant that gamma was equal to zero.
  - A review of expert valuation reports and independent experts found few reports incorporated gamma into the CAPM for their cost of equity calculations.

327. ATCO provided a submission which discussed gamma. ATCO's submission attached its submission for the ERA's draft decision on Western Power's most recent proposed revised access arrangement. ATCO commissioned Frontier Economics to produce a report on gamma, which was included in its submission.[140]

[138] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, pp. 50-59.

[139] Synergies Economic Consulting, *2018 WACC methodology review for WA railway networks*, June 2018, p. 59.

[140] Frontier Economics, *The 'utilisation' estimate of gamma – report prepared for ATCO Gas Australia,* May 2018.

328. Frontier had three principal propositions:[141]

- That ATO data can provide a suitable estimate of gamma through the use of credits redeemed divided by credits created. This approach would not separately need to calculate the distribution rate and the utilisation rate.
- That deficiencies in the ABS data warrant its rejection for estimating the utilisation rate. Frontier noted some concerns expressed by the ABS and noted that this data has been significantly revised by the ABS, suggesting that this warrants its rejection. Frontier expressed a view on the need to compare the quality of competing estimators.
- That errors in Lally's analysis using financial statement data to estimate the distribution rate mean that this method should not be used. Frontier argued that:
  - The 20 companies examined by Lally are unsuitable because these companies have substantial foreign income, and Frontier assumed that foreign income drives up the distribution rate.
  - Lally presumes that all credits distributed by firms are immediately available for shareholders to redeem, but that this might not occur. Therefore some credits might be delayed or lost.
  - There are a number of errors in Lally's analysis to estimate the aggregate distribution rate of the largest 20 firms. Frontier did not present a revised estimate of the aggregate distribution rate.

9.3 Draft determination

329. The ERA has further considered gamma and its approach taken in the 2015 rail WACC review given:

- The finalisation of limited merits and court reviews of gamma.
- New developments in gamma identified during the ERA's recent considerations for the gas rate of return guidelines and Western Power final decision.[142] [143]
- Clarification from the ATO on the use of its data for the purpose of estimating gamma. [144] [145] [146]

[141] Frontier Economics, *The 'utilisation' estimate of gamma – report prepared for ATCO Gas Australia,* May 2018.

[142] ERA, *Explanatory Statement for the Rate of Return Guidelines,* 18 December 2018.

[143] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base,* 20 September 2018.

[144] ATO note to the AER regarding imputation. Available at: https://www.aer.gov.au/system/files/ATO%20Note%20to%20AER%20regarding%20imputation%20-%209%20May%202018.pdf

[145] AER minute on meeting with ATO. Available at: https://www.aer.gov.au/system/files/AER%20-%20Minute%20of%2021%20June%202018%20meeting%20with%20ATO%20and%20comments%20on%20ENA%20summary%20-%205%20July%202018_1.DOCX

[146] AER minute on meeting with ATO. Available at:

- Public submissions received by the ERA on gamma associated with its electricity, gas and rail determinations.

- New advice from Lally on gamma.[147] [148] [149]

9.3.1 Gamma reviews

330. The estimate of gamma has been the subject of some contention in recent Australian regulatory decisions, with network businesses consistently proposing a gamma value of 0.25, and the ERA and AER setting a value of 0.40.

331. There has been contention about the definition of the value of franking credits.

332. Synergies also takes a differing position on the definition of value and argues that gamma is the product of:

- The proportion of tax paid that has been distributed to shareholders as franking credits (the distribution rate).

- The value the marginal investor places on $1 of franking credits, which Synergies refers to as the market value of franking credits.

333. The estimate of gamma under the National Electricity Rules and National Gas Rules has been the subject of several limited merits reviews by the Australian Competition Tribunal, with the following outcomes:

- In February 2016, the Tribunal found in favour of the New South Wales networks Ausgrid, Endeavour Energy and Essential Energy that gamma should be 0.25. In March 2016, the AER applied to the Federal Court for judicial review of the Tribunal decisions to set aside the New South Wales and Australian Capital Territory electricity and gas distribution network revenue determinations. In May 2017, the full Federal Court upheld the AER's appeal in respect of the Tribunal's construction of the rules regarding gamma.[150]

- In June 2016, the Tribunal found in favour of ATCO that gamma should be 0.25. At that time there was no final determination of the full Federal Court appeal of the AER decision.

- In October 2016, the Tribunal found in favour of the AER, against SA Power Networks, that gamma should be 0.4. SA Power Networks appealed the Tribunal decision to the Federal Court. In January 2018, the full Federal Court also affirmed the AER's decision on gamma for a value of 0.4.[151]

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https://www.aer.gov.au/system/files/ATO%20Note%20-%20Clarification%20of%20points%20in%20previous%20ATO%20note%20dated%209%20May%202018%20titled%20'ATO%20note%20to%20the%20AER%20regarding%20imputation%27%20-%2014%20September%202018.pdf

147 Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* July 2018.

148 Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018.

149 Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018.

150 Federal Court of Australia, Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79, May 2017

151 Federal Court of Australia, SA Power Networks v Australian Competition Tribunal (No 2) [2018] FCAFC 3, Jan 2018.

- The ERA's gamma decision for the DBNGP access arrangement decision was appealed by DBNGP. In July 2018, the Tribunal dismissed the application for merits review.

334. The ERA considers that contemporary Tribunal and Federal Court judicial reviews have all upheld the reasoning in the regulator's decision and found no error with the value of 0.4 and how it was derived. This included clarification of the definition of value and gamma and the reasonableness of the use of the utilisation approach.

335. The ERA considers the recent regulatory decisions and legal reviews are relevant to its considerations on the method of how to estimate gamma for rail. These reviews confirm that the ERA's utilisation approach as appropriate.

9.3.2 Taxation statistics

336. As part of the AER's 2018 review of its rate of return guidelines, it sought clarification from the ATO on the use of tax statistics to estimate gamma.

337. In May 2018, the ATO advised the AER that taxation statistics data should not be used for detailed time series analysis of the imputation system. The ATO recommended that taxation statistics data not be used as the basis of a detailed macro analysis of Australia's imputation system.[152]

338. On 21 June 2018, the AER, ATO, experts and network stakeholders had a meeting to clarify the ATO's note. The minutes for this meeting are available on the AER's website.[153] At this meeting the ATO confirmed its concern with the use of tax statistics in time series analysis for gamma, including that:

- Tax statistics should not be used to reconcile the imputation system.
- Using aggregate data related to the imputation system from taxation statistics (including franking account balance [FAB], net tax amounts, dividends) in a time series analysis does not allow for entries and exits of businesses and therefore this analysis will be flawed.

339. On 14 September 2018, the ATO provided a further note that taxation statistics data should not be applied to all aspects of the imputation system.[154]

340. Lally, who also attended the June 2018 meeting, considered that the ATO's September 2018 note stated unequivocally that no ATO data should be used for examining the imputation system.[155]

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[152] ATO note to the AER regarding imputation. Available at: https://www.aer.gov.au/system/files/ATO%20Note%20to%20AER%20regarding%20imputation%20-%209%20May%202018.pdf

[153] AER minute available at: https://www.aer.gov.au/system/files/AER%20-%20Minute%20of%2021%20June%202018%20meeting%20with%20ATO%20and%20comments%20on%20ENA%20summary%20-%205%20July%202018_1.DOCX

[154] Available at: https://www.aer.gov.au/system/files/ATO%20Note%20-%20Clarification%20of%20points%20in%20previous%20ATO%20note%20dated%209%20May%202018%20titled%20'ATO%20note%20to%20the%20AER%20regarding%20imputation%27%20-%2014%20September%202018.pdf

[155] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 6.

341. Given the credibility of the ATO data and the opinion expressed by the ATO, the ERA considers that ATO data should not be used to determine gamma.

9.3.3 Lally review

342. To assist with its consideration of gamma, the ERA commissioned Dr Lally to:

- Review public submissions on the ERA's approach to gamma in its draft decision on Western Power's AA4. ATCO had submitted detailed reports from Frontier on gamma.
- Review the ERA's approach to gamma in its draft gas rate of return guidelines.
- Account for the AER's recent consultation process.
- Express a view on the ERA's approach to gamma in the draft gas rate of return guidelines.

343. The findings from Lally's July 2018 review of gamma are summarised below.[156]

- Lally largely concurred with the ERA's views. The only major exception was the ERA's view that, despite using a domestic version of the CAPM, internal consistency required that the estimate of gamma take account of the presence of foreign investors. Lally took the view that the model was for the domestic CAPM, with no foreign investors. Therefore, the distribution rate should theoretically be one.[157]
- The empirical reality was that the market was partially integrated.[158]
- There was no suitable model that recognised the empirical reality that national equity markets were partially integrated. Lally favoured estimating the cost of equity using a model that assumed complete segregation of national equity markets, and also from one that assumed complete integration of these markets, followed by exercising judgement in choosing between these two boundary values.[159]
- Lally favoured the use of ABS data to estimate the proportion of Australian equities held by local investors.[160]
- Lally disagreed with the three principal propositions from Frontier.[161]
  - The principal drawback with using ATO data to estimate gamma is that it implicitly estimates the distribution rate for the average firm rather than the benchmark efficient entity. In addition, an estimate of the utilisation rate is still required.

[156] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018.
[157] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.
[158] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.
[159] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.
[160] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 17.
[161] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.

- There are deficiencies in the ABS data but not as large as those in the ATO data. The revision to the ABS data is not a concern and it improves the data set.

- The review addresses Lally's analysis of financial statements:

  - While the 20 companies examined have substantial foreign income and this is not a feature of the benchmark efficient entity, Frontier offers no empirical evidence that this increases the distribution rate. Lally showed that as the proportion of foreign income increases the distribution rate decreases, which is the opposite direction that is claimed by Frontier. Lally showed that the distribution rate will increase with the removal of firms with high foreign income.

  - Lally demonstrated that delay in the transmission of credits from the source companies to ultimate users has an immaterial effect. Lally went on to demonstrate credits trapped in intermediaries do not materially reduce the distribution rate.

  - Frontier referred to errors in a previous report by Lally. Frontier ignored later reports from Lally that corrected these errors. In any case, the correction of errors in the distribution rate using financial statement data does not change the estimate of 83 per cent using 2000 to 2013 data and extension of the data to 2017 raises the estimate to 88 per cent.

344. The ERA commissioned further advice from Lally to response to further public submissions on gamma. Lally's further September 2018 advice can be summarised as follows.[162]

- Frontier's detailed concerns with Lally's distribution rate calculation are:

  - The problems with the use of the ATO Franking Account Balance (FAB) data applied equally to the franking balance data drawn from the financial statements of the top 20 firms. Therefore, Frontier argued that it was inappropriate to use Lally's approach, which used franking data from financial statements. In response, Lally argued that the problem of firms dropping out of the ATO FAB data did not affect financial statement data from a stable list of companies.

  - The use of financial statement data was subject to the problem that some credits were extinguished within corporate structures without being distributed to shareholders. Lally noted that the examples provided by Frontier for BHP and Rio Tinto were issues involving the utilisation rate for credits rather than the distribution rate. To correct this, BHP and Rio Tinto could be removed from the set of companies, which would have the effect of increasing the distribution rate from 88 per cent to 95 per cent.

  - Some firms have received large tax refunds that decreased their franking balancing, leading to an overestimate of the distribution rate. Lally noted the tax refunds could also lead to underestimation and most refund situations would not lead to errors in the estimate.

[162] Lally, M., *Review of Frontier's Gamma Submissions*, September 2018.

- The review reaffirmed that there was no need to use the same set of companies for estimating the utilisation and distribution rates. Lally considered that there was good reason to not do so. For example, one might want to use specific firms to estimate the distribution rate, while at the same time using all firms to estimate the utilisation rate.[163]

345. In separate advice to the AER, Lally extended his distribution rate analysis from the largest 20 ASX companies to the largest 50 ASX companies.[164] Lally's further analysis can be summarised as follows:

- Estimates of the distribution rate was expanded to the 50 largest ASX firms, using data from their financial statement for the period 2000 to 2017.

- The 50 ASX company sample increased the distribution rate estimate to 89 per cent, compared to 83 per cent from the top 20 ASX companies.[165]

- The estimate of 89 per cent was a lower bound for the distribution rate. The 50 ASX firms includes companies with foreign operations and such operations are not relevant for estimating the distribution rate of an Australian energy network business. The effect of foreign operations appears to be to reduce the distribution rate.[166]

346. Lally also reviewed evidence relating to the estimation of gamma from the AER's Independent Panel, submissions in response to the AER's draft rate of return guidelines, a new note from the ATO, and Frontier's submission to the ERA. Lally's report to the AER can be summarised as follows: [167]

- The ATO's September 2018 note states unequivocally that no ATO data should be used for examining the imputation system.[168]

- Reaffirmed his earlier rebuttals of Frontier's report.

- Considered that foreign operation may have mixed effects on a company's distribution rate. Theoretically, it may reduce tax payments to the ATO and therefore might be expected to increase the distribution rate. However, it may also reduce the firm's dividends, and would exert a downward effect on the distribution rate. Therefore this issue should be empirically tested.

- Found that removing foreign ownership increased the distribution rate.

[163] Lally, M., *Review of Frontier's Gamma Submissions*, September 2018, p. 6.

[164] Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018.

[165] Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018, p. 4.

[166] Lally, M., *Estimating the Distribution Rate for Imputation Credits for the Top 50 ASX Companies*, October 2018, pp. 3-4.

[167] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018.

[168] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 6.

- Considered whether an estimate of gamma based on the ATO data for all equity was appropriate. ATO data is highly unsuitable for estimating gamma directly because it covers all firms, which are unsuitable for estimating the distribution rate of the benchmark efficient entity, and also because the ATO data for estimating the utilisation rate (which is additionally required) is highly problematic. Alternative data sources are free of both problems. Therefore the ATO data should not be used.[169]

- Considered whether the distribution rate and the utilisation rate should be estimated from the same group of investors and reaffirmed that there is no necessity to do so, and good reason for not doing so.[170]

- Considered that the distribution rate should be estimated from financial statement data. This distribution rate should be estimated with a large set of firms (to avoid manipulation of price or revenue cap) and firms should be selected on the basis of market cap (subject to deleting firms with substantial foreign operations).[171]

- Considered that the best estimate for the distribution rate for an Australian firm with minimal foreign operations was 0.95 rounded to the nearest 0.05. [172]

- Considered that the utilisation rate should be defined as the weighted average over the utilisation rates of all investors in the Australian market. If account is taken of foreign investors, the best estimates come from the ABS data on the proportion of Australian equities owned by local investors.[173]

- Considered that the best estimate for the utilisation rate was 0.65 rounded to the nearest 0.05. [174]

Dividend drop off approach

347. Synergies did not endorse non-market approaches for estimating gamma and preferred the use of a market based approach. Therefore, Synergies argued for the continued use of the dividend drop off approach. Synergies later recommended that gamma be estimated by applying equal weights to the dividend drop off approach and its three other proposed approaches (which include non-market approaches).

348. Dividend drop off studies examine how share prices change on ex-dividend days after distribution of both cash dividends and attached franking credits. It infers the value of distributed imputation credits from market prices. The amount by which the share prices change (on average) is assumed to reflect the value investors place on the cash dividend and imputation credit as separate from the value of the shares.

[169] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 3.
[170] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 8.
[171] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, pp. 3-4.
[172] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 5.
[173] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 5.
[174] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 5.

349. Dividend drop off studies assume perfect capital markets. This assumption implies that there are no transaction costs, no differential taxation between dividends and capital gains and share prices are not subject to any influence other than the distribution of dividends and franking credits. The theory of arbitrage predicts that in this situation, the expected reduction of the share price from cum-dividend day to the ex-dividend day (the price drop off) should equal the gross dividend which includes the value of the cash dividend and the value of the franking credit. However, the assumption of perfect capital markets is unlikely to hold in reality. In addition, given that investors will not fully value the combined package of the gross dividend, the expected price drop-off should be less than that of the face value.[390]

350. The primary advantage of dividend drop off studies is that they can be used to infer a market value of dividends and imputation credits. However, dividend drop off studies have substantial measurement and estimation issues.

351. A paper by McKenzie and Partington has highlighted the imprecision inherent in the dividend drop off method.[175] The authors showed that the drop off ratio can vary considerably, depending on the particular specification or regression technique applied. As such, they are of the view that it was not appropriate to consider the estimates of utilisation rate from various dividend drop off studies.

352. The estimation issues associated with dividend drop off studies manifest themselves by the lack of consensus in the literature about the estimation of the utilisation rate.

353. There are several reasons why dividend drop off studies may not provide a good estimate of the utilisation rate.

- The utilisation rate is a complex weighted average over all investors, reflecting their relative wealth and risk aversion, and this may not correspond to the market value of the credits (whether estimated by a dividend drop-off study or any other market-based method). If the utilisation rate is not defined as the market value of credits, then market studies such as dividend drop-off analysis will be of limited relevance.

- Dividend drop off studies only estimate the utilisation rate of just two days – the cum-dividend and the ex-dividend dates. Consequently, they provide an estimate of the utilisation rate with weights that reflect the composition of investors around the cum- and ex-dividend dates – not the weighted average across all points in time. Furthermore, such investors may be quite untypical of investors in general. The market value in these studies is influenced by the marginal investor over those dates, rather than the value attributed across all investors.

- Dividend drop off studies may not accurately separate out the effect of taxation benefits associated with imputation credits on the share price change from the effect of the cash dividend. Multiple statistical models can be used and the results can be quite sensitive to a small number of outlying observations.[176]

[175] McKenzie, M, & Partington, G., (2010), *Selectivity and Sample Bias in Dividend Drop-Off Studies,* Finance and Corporate Governance Conference 2011 Paper, available at SSRN: http://ssrn.com/abstract=1716576 or http://dx.doi.org/10.2139/ssrn.1716576.

[176] Lally, M., *The Estimation of Gamma,* Report for the AER, November 2013, section 3.5.

- There is considerable evidence of anomalous share price behaviour around ex days, which raises the possibility that any estimate of the utilisation rate from a dividend drop-off analysis will simply reflect that anomalous behaviour.[177]

- Estimates of the market value of credits from methods other than dividend drop off studies produced markedly different results, undermining the credibility of such market-based estimates.[178]

354. Lally summarises the difficulties with using market-based estimates well.

> …market based estimates are unreliable estimates of the average utilisation rate because they are affected by the actions of tax arbitrageurs, there are very wide range of such results, they are very sensitive to a number of methodological choices, and data around ex-dividend dates are known to be afflicted by anomalous behavior.[179]

355. For these reasons, the ERA places no weight on the dividend drop off estimates and considers that there is no observable market price for gamma.

9.3.4 Finance theory and market evidence

356. Synergies argued that finance theory and market evidence indicated that gamma should be zero.

- Academic studies argued that foreign investors were the marginal price-setting investors, and this meant that gamma was equal to zero.

- A review of expert valuation reports and independent experts which found few reports incorporated gamma into the CAPM for their cost of equity calculations.

357. The ERA considers that the utilisation rate is a complex weighted average over all investors and this may not correspond to the market value of the credits or the marginal investor. The marginal investor may be quite atypical of investors in general.

358. Further, Ainsworth, Partington and Warren's analysis do not align with Synergies' position on the marginal investor and a gamma of zero.[180]

> Indeed, whether prices are set by a marginal investor, or by aggregation across investors, is an open question… It is our contention, therefore, that a policy decision should not be based on the assertion that the marginal investor setting prices in the Australian market is an overseas investor. To do so would base policy on an insecure foundation, and risks serious error.

359. The argument that gamma has zero effect on the cost of capital is in contrast to the significant past evidence put forth by both network businesses (proposing a gamma value of 0.25), and the ERA and AER (setting a value of 0.40).

360. Further, the ERA considers that independent reports are prepared for varying needs, which may not align with the need to set a regulated rate of return.

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[177] Lally, M., *The Estimation of Gamma,* Report for the AER, November 2013, section 3.5.

[178] Lally, M., *The Estimation of Gamma,* Report for the AER, November 2013, Table 2.

[179] Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 18.

[180] Ainsworth, A., Partington, G. and Warren, G., *Do franking credits matter? Exploring the financial implications of dividend imputation*, May 2015.

361. For the draft determination, the ERA will not apply any weight to Synergies arguments that the finance theory and market evidence suggest gamma is zero.

9.3.5 Estimation of the distribution rate

362. The ERA determines gamma through the Monkhouse formula as the product of the distribution rate and utilisation rate. The distribution rate and utilisation rate are separately estimated.

363. The ERA has given the distribution rate further consideration in light of new information.

364. The distribution rate represents the proportion of imputation credits generated by a benchmark efficient entity that is expected to be distributed to investors. The ERA considers that the distribution rate is a firm-specific rather than a market-wide parameter.

365. The ERA has not used ATO data to determine the distribution rate. This is confirmed by Lally, who, in view of problems with the dividend and franking balance data of the ATO, considered the best estimate of the distribution rate of the benchmark efficient entity was obtained from financial statement data.[181] The ATO data also has the problem of being market wide, which means that it is not reflective of the benchmark efficient entity.

366. Given the credibility of the ATO data and the opinion expressed by the ATO, the ERA considers it inappropriate to use ATO data to determine the distribution rate.

367. The ERA disagrees with concerns over the use of Lally's distribution rate calculation.

368. The ERA considers that it is not necessary to use the same set of companies for estimating the utilisation and distribution rates.

369. The definition of the benchmark efficient entity is an entity that operates in Australia and has a similar degree of risk as that which applies to the particular regulated entity. To estimate the distribution rate for the benchmark efficient entity, the ERA considers an appropriate approach is to use data from a broader range of companies that are comparable to the benchmark efficient entity in a relevant way.

370. Lally suggested one option is to pick a collection of companies within the same industry as the benchmark efficient entity.[182] For the three rail benchmark efficient entities, it is difficult to construct a data set for such companies, particularly where some benchmark sample firms are overseas entities to which the Australian tax imputation system does not apply.

371. With lack of data the choice of whether or not to include certain marginal cases is likely to have a material impact on the resulting estimate.[183]

[181] Lally, M., *Review of Frontier's Gamma Submissions*, September 2018, p. 8.

[182] Lally, M., *Review of the AER's views on gearing and gamma*, 7 May 2018, p. 18.

[183] Lally, M., *Review of the AER's views on gearing and gamma*, 7 May 2018, p. 19.

372. The ERA therefore considers that the 50 largest ASX-listed firm is reasonable. The ERA considers that the data from financial statements is of high quality given it is audited and subject to scrutiny in financial markets. The distribution rate of the top 50 ASX-listed companies captures more information on the smaller listed companies and reduces the impact of finance sector concentration in the ASX 20.

373. The ERA recognises that foreign operations do have an effect on the distribution rate from the top 50 ASX firms. Lally's further analysis finds that the distribution rate increases with the removal of foreign operations.[184] However, the removal of firms with significant foreign operations does not have a material impact on the distribution rate. The ERA considers that this indicates that the distribution rate is at least 0.9.

374. Based on the new information discussed above, the ERA considers it is appropriate to use the distribution rate from the top 50 ASX firms with minimal foreign operations. This provides a distribution rate of 0.9, rounded to one decimal point.

375. For the draft determination, the ERA considers a distribution rate of 0.9 appropriate.

9.3.6 Estimation of the utilisation rate

376. The ERA has given the utilisation rate further consideration in light of new information.

377. The utilisation rate is the weighted average over the utilisation rates of individual investors, with investors able to fully use the credits having a rate of one and those unable to use them having a rate of zero. The ERA considers that the utilisation rate is a market-wide rather than a firm wide parameter.

378. To estimate the utilisation rate, the ERA relies on the equity ownership approach to determine the percentage of domestic investors in the Australian equity market.

379. ABS information on equity ownership obtained from the Australian National Accounts can be used to estimate the utilisation rate.[185]

380. When using this ABS data, the ERA has refined the equity ownership approach by filtering the national accounts data to focus on the types of equity that is most relevant to the estimation of a market-wide utilisation rate. This data refinement is consistent with the method set out by the AER.[186] The method:

- Excludes from the calculation entities that are wholly owned by the public sector – including equity issued by the 'central bank', 'central borrowing authorities', 'national public non-financial corporations' and 'state and local public non-financial corporations'.

- Sums the equity held by those classes of domestic investor that are eligible to utilise imputation credits – 'households', 'pension funds' and 'life insurance corporations'.

[184] Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 5.

[185] Australian Bureau of Statistics, Australian National Accounts: Finance and Wealth, Catalogue 5232.0, Tables 47 and 48.

[186] AER, *TasNetwork Access Arrangement 2017-19, Attachment 4 – Value of Imputation credits*, p. 161.

- Sums the equity held by the classes of investors that are not eligible to use imputation credits - 'the rest of the world'.

- Determines the share of equity held by domestic private investors eligible to use imputation credits as a proportion of the equity held by the eligible and non-eligible private investors in the market.

- Excludes government-held equity from the calculation of the domestic ownership share.

381. Based on the most recent updated ABS data, all (listed and unlisted) equity suggests a range for the utilisation rate of between 0.6 to 0.7.[187]

382. The most recent March 2018 quarter's ABS equity ownership data shows a utilisation rate for all equity of 0.65. The average of domestic equity ownership rate over 120 quarterly observations since the introduction of imputation tax system in June 1988 is 0.63.

383. Given estimation accuracy, the ERA has rounded to one decimal place. Therefore, the ERA has applied a utilisation rate of 0.6.

384. For the draft determination, the ERA determines a utilisation rate of 0.6.

9.3.7 Estimation of gamma

385. The ERA will continue to determine gamma through the Monkhouse formula as the product of the distribution rate and utilisation rate.[188]

386. For the draft determination, the ERA has applied a gamma of 0.5.

[187] ABS, Technical Notes on significant quality assurance work undertaken for the historical revision through review of complication methods and through source data, September 2017 http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/5232.0Technical+Note1Sep%202017

[188] The Monkhouse formula is expressed as: gamma = distribution rate x utilisation rate

Monkhouse, P., *The Valuation of Projects under a Dividend Imputation Tax System*, *Accounting and Finance 36*, 1996, pp. 185-212.

10 Inflation

10.1 Background

387. Inflation is the rate of change in the general level of prices of goods and services.

388. Forecast inflation can be used to translate the nominal WACC to a real WACC.

389. A nominal rate of return incorporates the real rate of return, compounded with a rate that reflects expectations of inflation. The ERA will use a nominal vanilla rate of return for its decisions.

390. To calculate forecast inflation for rail the ERA has used the Fisher equation and the observed yields of:[189]

- 10-year Commonwealth Government Securities, which reflect a market-based estimate of the nominal risk free rate.
- 10-year indexed Treasury bonds, which reflect a market-based estimate of a real risk free rate.[190]

391. This approach is known as the Treasury bond implied inflation approach and is based on the premise that the yield on Commonwealth Government Securities and the yield on Treasury bonds differ by an inflation component. This can be expressed in the equation below:

$$\pi = \frac{(1+R_f)}{(1+R_{Rf})} - 1 \qquad \text{(equation 12)}$$

where

π is the expected inflation rate

R_f is the 10-year nominal risk free rate of return estimated on Treasury Bonds

R_{Rf} is the 10-year real risk free rate of return estimated on Treasury indexed bonds.

392. The ERA uses the longest term for reliable data to inform the rail WACC. For Australian bonds, given the availability of data, this is a 10-year term.

393. The ERA will estimate the expected inflation rate consistent with the estimate of the risk free rate by adopting an averaging period of 40 business days as at 30 June.

10.2 Public submissions

394. Synergies' submission discussed inflation.

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189 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.

190 ERA, *Final decision on the proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020 – Appendix 4 Rate of Return*, 30 June 2016, p. 33.

395. Synergies agreed that the calculation of inflation through the Treasury bond implied inflation approach was a reasonable approach.

10.3 Draft determinations

396. For the draft determination, the ERA considers the Treasury bond implied inflation approach is appropriate.

397. For the draft determination, the ERA estimates a forecast inflation rate of 1.95 per cent as at 30 June 2018.

11 Draft determination on rail rate of return

398. Taking into account the information provided through public submissions and other available information, the ERA has reviewed the rail WACC approach. The considerations of the ERA are set out above.

399. Based upon the above assessment of each of the rate of return parameters, the point estimates for each of the parameters that the ERA considers may reasonably be applied to Western Australian railways are as shown in the table below:

- A nominal rate of return of 5.27 per cent for the Public Transport Authority.
- A nominal rate of return of 7.32 per cent for Arc Infrastructure.
- A nominal rate of return of 9.13 per cent for the Pilbara Railways.

Table 14 The ERA's draft determination for 2018 rail WACC for period to 30 June 2018

Parameter	Public Transport Authority	Arc Infrastructure	Pilbara Railways
Cost of equity parameters			
Nominal risk free rate (%)	2.76	2.76	2.76
Equity beta	0.60	0.9	1.3
Market risk premium (%)	5.90	5.90	5.90
Nominal after tax return on equity (%)	**6.30**	**8.0.7**	**10.43**
Cost of debt parameters			
Nominal risk free rate (%)	2.76	2.76	2.76
Benchmark credit rating	A	BBB+	BBB-
Term of debt for debt risk premium	10 years	10 years	10 years
Debt risk premium (%)	1.373	1.692	2.244
Debt issuing costs (%)	0.100	0.100	0.100
Nominal cost of debt (return on debt) (%)	**4.23**	**4.55**	**5.10**
Other parameters			
Debt proportion (gearing)	50	25	20
Forecast inflation rate (%)	1.95	1.95	1.95
Franking credits (gamma) (%)	0.5	0.5	0.5
Corporate tax rate (%)	30	30	30
Weighted Average Cost of Capital			
Nominal after-tax WACC (%)	**5.27**	**7.19**	**9.36**
Real after tax-WACC (%)	**3.25**	**5.14**	**7.27**

Source: ERA analysis

Appendix 1 International bond sample

Table: Public Transport Authority bond sample

Ticker	Issuer
EK974172 Corp	Rio Tinto Finance USA Ltd
EJ855408 Corp	BHP Billiton Finance USA Ltd
AN129025 Corp	Telstra Corp Ltd
AP811577 Corp	Telstra Corp Ltd
UV827072 Corp	Telstra Corp Ltd
EJ329466 Corp	Rio Tinto Finance USA PLC
EJ038714 Corp	BHP Billiton Finance USA Ltd
AO147640 Corp	SGSP Australia Assets Pty Ltd
EK835349 Corp	Telstra Corp Ltd
EJ855396 Corp	BHP Billiton Finance USA Ltd
EI400709 Corp	Optus Finance Pty Ltd
JK730176 Corp	Telstra Corp Ltd
AR226811 Corp	AusNet Services Holdings Pty Ltd
EH437851 Corp	Rio Tinto Finance USA Ltd
EI873161 Corp	Telstra Corp Ltd
AM402825 Corp	AusNet Services Holdings Pty Ltd
EK315745 Corp	SGSP Australia Assets Pty Ltd
EI881021 Corp	BHP Billiton Finance USA Ltd
DD105676 Corp	BHP Billiton Finance USA Ltd
EI291758 Corp	Telstra Corp Ltd
AO674434 Corp	Victoria Power Networks Finance Pty Ltd
AP198220 Corp	SGSP Australia Assets Pty Ltd
EJ038718 Corp	BHP Billiton Finance USA Ltd
AN149130 Corp	Telstra Corp Ltd
AO500496 Corp	ETSA Utilities Finance Pty Ltd
EI452667 Corp	Rio Tinto Finance USA Ltd
AO757948 Corp	Optus Finance Pty Ltd
EJ095285 Corp	Telstra Corp Ltd
EJ583194 Corp	Telstra Corp Ltd
AQ884088 Corp	United Energy Distribution Pty Ltd
LW938501 Corp	SGSP Australia Assets Pty Ltd
AP489931 Corp	United Energy Distribution Pty Ltd
EI638393 Corp	Telstra Corp Ltd
EI443204 Corp	Telstra Corp Ltd
EJ297361 Corp	Wesfarmers Ltd
EK875768 Corp	BHP Billiton Finance Ltd
EJ251235 Corp	AusNet Services Holdings Pty Ltd

Ticker	Issuer
LW474837 Corp	SGSP Australia Assets Pty Ltd
EK755216 Corp	AusNet Services Holdings Pty Ltd
AN129024 Corp	Telstra Corp Ltd
EJ384977 Corp	SGSP Australia Assets Pty Ltd
EJ101048 Corp	Rio Tinto Finance USA PLC
EJ372241 Corp	BHP Billiton Finance Ltd
EJ651064 Corp	BHP Billiton Finance Ltd
AR408024 Corp	AusNet Services Holdings Pty Ltd
EI601137 Corp	Victoria Power Networks Finance Pty Ltd
EK348922 Corp	AusNet Services Holdings Pty Ltd
AR868580 Corp	Victoria Power Networks Finance Pty Ltd
EJ372136 Corp	BHP Billiton Finance Ltd
EK966481 Corp	Optus Finance Pty Ltd
AR256351 Corp	Nissan Financial Services Australia Pty Ltd
EJ372146 Corp	BHP Billiton Finance Ltd
EK875756 Corp	BHP Billiton Finance Ltd
QZ447553 Corp	United Energy Distribution Pty Ltd
EK523339 Corp	Wesfarmers Ltd
EJ372256 Corp	BHP Billiton Finance Ltd
EJ845780 Corp	Australia Pacific Airports Melbourne Pty Ltd
EJ752521 Corp	AusNet Services Holdings Pty Ltd
AO811495 Corp	ETSA Utilities Finance Pty Ltd
EJ212046 Corp	BHP Billiton Finance Ltd
AS664625 Corp	AusNet Services Holdings Pty Ltd
EI561531 Corp	SGSP Australia Assets Pty Ltd
EK536984 Corp	Australia Pacific Airports Melbourne Pty Ltd
EJ202356 Corp	New Zealand Milk Australasia Pty Ltd
EK104871 Corp	SGSP Australia Assets Pty Ltd
QZ932852 Corp	Australia Pacific Airports Melbourne Pty Ltd
EK898928 Corp	Wesfarmers Ltd
EI601069 Corp	Victoria Power Networks Finance Pty Ltd
EK055444 Corp	AusNet Services Holdings Pty Ltd
UV800801 Corp	Australia Pacific Airports Melbourne Pty Ltd
EI626314 Corp	AusNet Services Holdings Pty Ltd
AS664612 Corp	AusNet Services Holdings Pty Ltd
AS177694 Corp	Victoria Power Networks Finance Pty Ltd
QJ539736 Corp	Australia Pacific Airports Melbourne Pty Ltd
ED104267 Corp	WMC Finance USA Ltd
AQ307077 Corp	ETSA Utilities Finance Pty Ltd
EI902224 Corp	Telstra Corp Ltd

Ticker	Issuer
AR408188 Corp	AusNet Services Holdings Pty Ltd
DD109142 Corp	WMC Finance USA Ltd
EK902477 Corp	Wesfarmers Ltd
EK969853 Corp	Optus Finance Pty Ltd
EI902396 Corp	Telstra Corp Ltd
EJ251460 Corp	AusNet Services Holdings Pty Ltd

Table: Arc Infrastructure bond sample

Ticker	Issuer
AS344445 Corp	Ausgrid Finance Pty Ltd
AS179649 Corp	Caltex Australia Ltd
AS197471 Corp	Transurban Queensland Finance Pty Ltd
EK156115 Corp	Sydney Airport Finance Co Pty Ltd
AS533603 Corp	DBNGP Finance Co Pty Ltd
QJ190690 Corp	BHP Billiton Finance Ltd
AN261101 Corp	Coca-Cola Amatil Ltd
AS241348 Corp	Sydney Airport Finance Co Pty Ltd
QJ189681 Corp	BHP Billiton Finance USA Ltd
AO953984 Corp	Transurban Finance Co Pty Ltd
QJ190880 Corp	BHP Billiton Finance Ltd
JV523711 Corp	AusNet Services Holdings Pty Ltd
AS072056 Corp	Ausgrid Finance Pty Ltd
QJ191077 Corp	BHP Billiton Finance Ltd
EJ879888 Corp	Brisbane Airport Corp Pty Ltd
AN751205 Corp	Aurizon Network Pty Ltd
EK415237 Corp	Coca-Cola Amatil Ltd
AS482636 Corp	Amcor Finance USA Inc
AM676513 Corp	Coca-Cola Amatil Ltd
AO547987 Corp	Incitec Pivot Finance LLC
QJ192853 Corp	BHP Billiton Finance USA Ltd
EK468529 Corp	Aurizon Network Pty Ltd
QZ766772 Corp	Transurban Queensland Finance Pty Ltd
AS239645 Corp	Brisbane Airport Corp Pty Ltd
JK876383 Corp	Sydney Airport Finance Co Pty Ltd
AS806819 Corp	Coca-Cola Amatil Ltd
LW832384 Corp	Coca-Cola Amatil Ltd
QZ418350 Corp	Transurban Finance Co Pty Ltd
QJ221786 Corp	Brambles USA Inc
AP725596 Corp	Boral Finance Pty Ltd
EJ889313 Corp	Aurizon Network Pty Ltd
EK911822 Corp	Transurban Finance Co Pty Ltd
AM796866 Corp	APT Pipelines Ltd
LW077755 Corp	Aurizon Network Pty Ltd
EJ390616 Corp	APT Pipelines Ltd
AS071836 Corp	Ausgrid Finance Pty Ltd
EK805514 Corp	APT Pipelines Ltd
EK130688 Corp	Perth Airport Pty Ltd
AP094552 Corp	Newcastle Coal Infrastructure Group Pty Ltd

Ticker	Issuer
AP725619 Corp	Boral Finance Pty Ltd
EJ431710 Corp	CIMIC Finance USA Pty Ltd
AP044525 Corp	Woodside Finance Ltd
EK262202 Corp	Coca-Cola Amatil Ltd
EK805538 Corp	APT Pipelines Ltd
EJ922576 Corp	Coca-Cola Amatil Ltd
AP138040 Corp	Brambles Finance PLC
AQ252535 Corp	Energy Partnership Gas Pty Ltd
EK807821 Corp	APT Pipelines Ltd
EK805526 Corp	APT Pipelines Ltd
EI404435 Corp	Woolworths Group Ltd
LW239378 Corp	QPH Finance Co Pty Ltd
EK315685 Corp	Brambles Finance Ltd
JK849874 Corp	Amcor Finance USA Inc
EJ450801 Corp	APT Pipelines Ltd
EJ596276 Corp	Amcor Ltd/Australia
EK878745 Corp	Sydney Airport Finance Co Pty Ltd
EJ963774 Corp	AquaSure Finance Pty Ltd
QZ870137 Corp	APT Pipelines Ltd
EK465508 Corp	Transurban Finance Co Pty Ltd
EJ406857 Corp	Sydney Airport Finance Co Pty Ltd
EJ861639 Corp	Transurban Finance Co Pty Ltd
EK775847 Corp	Woodside Finance Ltd
EI634847 Corp	Woolworths Group Ltd
QJ413201 Corp	Transurban Finance Co Pty Ltd
QZ372379 Corp	Woodside Finance Ltd
EI421490 Corp	Sydney Airport Finance Co Pty Ltd
EK627931 Corp	Transurban Queensland Finance Pty Ltd
EK642479 Corp	Transurban Queensland Finance Pty Ltd
EI664116 Corp	Woodside Finance Ltd
EK807839 Corp	APT Pipelines Ltd
EI702147 Corp	CIMIC Finance USA Pty Ltd
EI325336 Corp	APT Pipelines Ltd
EK355413 Corp	QPH Finance Co Pty Ltd
EG021985 Corp	Sydney Airport Finance Co Pty Ltd
EJ764636 Corp	QPH Finance Co Pty Ltd
EJ758820 Corp	Perth Airport Pty Ltd
EG064076 Corp	Sydney Airport Finance Co Pty Ltd
UV302700 Corp	DBNGP Finance Co Pty Ltd
EK510724 Corp	DBNGP Finance Co Pty Ltd

Ticker	Issuer
JK936002 Corp	Coca-Cola Amatil Ltd
EI748620 Corp	Coca-Cola Amatil NZ Ltd
EJ271436 Corp	Coca-Cola Amatil Ltd
EI814473 Corp	Coca-Cola Amatil Ltd
UV855167 Corp	Coca-Cola Amatil Ltd
JV320429 Corp	Coca-Cola Amatil Ltd

Table: The Pilbara railways bond sample

Ticker	Issuer
AS344445 Corp	Ausgrid Finance Pty Ltd
AS197471 Corp	Transurban Queensland Finance Pty Ltd
AO951980 Corp	Santos Finance Ltd
AS533603 Corp	DBNGP Finance Co Pty Ltd
AS511777 Corp	BlueScope Finance Americas LLC
AN191913 Corp	Pacific National Finance Pty Ltd
QZ512178 Corp	Qantas Airways Ltd
QZ727992 Corp	Qantas Airways Ltd
JV523711 Corp	AusNet Services Holdings Pty Ltd
AS072056 Corp	Ausgrid Finance Pty Ltd
AR620052 Corp	Pacific National Finance Pty Ltd
EJ879888 Corp	Brisbane Airport Corp Pty Ltd
EK907291 Corp	Pacific National Finance Pty Ltd
AS482636 Corp	Amcor Finance USA Inc
AO547987 Corp	Incitec Pivot Finance LLC
QZ766772 Corp	Transurban Queensland Finance Pty Ltd
AS239645 Corp	Brisbane Airport Corp Pty Ltd
AQ107007 Corp	Adani Abbot Point Terminal Pty Ltd
AN441270 Corp	Pacific National Finance Pty Ltd
AP725596 Corp	Boral Finance Pty Ltd
EJ637162 Corp	Origin Energy Finance Ltd
AM796866 Corp	APT Pipelines Ltd
EJ378433 Corp	Newcrest Finance Pty Ltd
EJ390616 Corp	APT Pipelines Ltd
AS071836 Corp	Ausgrid Finance Pty Ltd
EJ859807 Corp	Origin Energy Finance Ltd
EK805514 Corp	APT Pipelines Ltd
EK130688 Corp	Perth Airport Pty Ltd
EJ832440 Corp	Pacific National Finance Pty Ltd
EK311797 Corp	Qantas Airways Ltd
AP094552 Corp	Newcastle Coal Infrastructure Group Pty Ltd
AP725619 Corp	Boral Finance Pty Ltd
EJ431710 Corp	CIMIC Finance USA Pty Ltd
EI870493 Corp	Newcrest Finance Pty Ltd
EK269091 Corp	Qantas Airways Ltd
EK805538 Corp	APT Pipelines Ltd
EK807821 Corp	APT Pipelines Ltd
EK805526 Corp	APT Pipelines Ltd
EI404435 Corp	Woolworths Group Ltd

Ticker	Issuer
LW239378 Corp	QPH Finance Co Pty Ltd
JK849874 Corp	Amcor Finance USA Inc
EJ450801 Corp	APT Pipelines Ltd
EJ596276 Corp	Amcor Ltd/Australia
QZ870137 Corp	APT Pipelines Ltd
EI634847 Corp	Woolworths Group Ltd
EI870349 Corp	Newcrest Finance Pty Ltd
EK627931 Corp	Transurban Queensland Finance Pty Ltd
EI630791 Corp	Pacific National Finance Pty Ltd
EK642479 Corp	Transurban Queensland Finance Pty Ltd
EK807839 Corp	APT Pipelines Ltd
EI409804 Corp	Pacific National Finance Pty Ltd
EI702147 Corp	CIMIC Finance USA Pty Ltd
EI325336 Corp	APT Pipelines Ltd
EJ610528 Corp	Origin Energy Finance Ltd
EI836446 Corp	Origin Energy Finance Ltd
EK355413 Corp	QPH Finance Co Pty Ltd
EJ764636 Corp	QPH Finance Co Pty Ltd
EJ758820 Corp	Perth Airport Pty Ltd
UV302700 Corp	DBNGP Finance Co Pty Ltd
EK510724 Corp	DBNGP Finance Co Pty Ltd