Final Gas Rate of Return Guidelines Explanatory Statement

Meeting the requirements of the National Gas Rules

18 December 2018

Economic Regulation Authority

WESTERN AUSTRALIA

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About this guideline and review

The Economic Regulation Authority has undertaken a review of the gas rate of return guidelines.

The guidelines are required under the National Gas Rules, and set out the ERA's methods to estimate the allowed rate of return, value of imputation credits, and return on equity and debt.

The ERA originally published the guidelines on 16 December 2013. The guidelines detailed the method the ERA intended to use to estimate the allowed rate of return for gas transmission and distribution service providers.

The ERA is required to complete its first review of these guidelines, producing a final version of this document, by 16 December 2018.

The ERA published the draft guidelines on 29 June 2018 to allow the public to provide feedback on the ERA's proposed approach. The ERA's draft approach to estimating the rate of return was different to the approach in the 2013 guidelines. The draft drew on the ERA's approach in past gas access arrangement decisions, such as that applied in the Dampier to Bunbury Natural Gas Pipeline access arrangement decision.[1]

The public submissions period closed on 28 September 2018.

The ERA established an Independent Panel to review its draft guidelines. The Independent Panel provided its report to the ERA on 28 October 2018.

This document details the ERA's final guidelines and its development. In developing the final guidelines the ERA has taken into account all available information, including current regulatory practices, public submissions, expert views and the Independent Panel's report.

[1] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 30 June 2016.

1. Introduction

1. The ERA is responsible for approving third party access arrangements in Western Australia for services on gas transmission and distribution pipelines. These pipelines are currently the Dampier to Bunbury Natural Gas Pipeline, the Goldfields Gas Pipeline and the Mid-West and South-West Gas Distribution Systems. The ERA's responsibilities are established under the National Gas Law and National Gas Rules as applied in Western Australia.[2]

2. The National Gas Rules require the ERA to produce rate of return guidelines,[3] and to review these guidelines "at intervals not exceeding five years for the first interval and three years for all subsequent intervals, with the first interval starting from the date the first rate of return guidelines are published under these rules".[4] These reviews provide an opportunity to undertake a comprehensive review of approaches for determining the allowed rate of return on capital.

3. The ERA first published the rate of return guidelines on 16 December 2013 (referred to throughout this document as the 2013 guidelines).

4. The companion to this document – the *Final Rate of Return Guidelines (2018)* – sets out the ERA's current position on determining the allowed rate of return on capital.

5. This document – the *Final Explanatory Statement for the Rate of Return Guidelines (2018)* – provides the ERA's reasoning supporting the position set out in the Final Rate of Return Guidelines (2018).

1.1 The requirement

6. The National Gas Rules require that the rate of return guidelines set out:

- "The methodologies that the [ERA] proposes to use in estimating the *allowed rate of return*, including how those methodologies are intended to result in the determination of a return on equity and a return on debt in a way that is consistent with the *allowed rate of return* objective".[5]

- "The estimation methods, financial models, market data and other evidence that the [ERA] proposes to take into account in estimating the return on equity, the return on debt and the value of imputation credits referred to in rule 87A".[6]

2 The *National Gas Access (WA) Act 2009* implements the National Gas Access (Western Australia) Law and National Gas Rules for Western Australia. All references to National Gas Law (NGL) and National Gas Rules (NGR) referred to throughout this document are references to the NGL and NGR which apply in Western Australia.

3 Australian Energy Market Commission, *National Gas Rules*, Sydney, AMEC, 2017, clause 87(3); or, in short, National Gas Rules 87(13).

4 National Gas Rules 87(16)(a).

5 National Gas Rules 87(14)(a).

6 National Gas Rules 87(14)(b).

7. In its review, the ERA has assumed that:

- A rate of return 'approach' refers to the systems or methods used in the development of the rate of return guidelines, and encompasses the subsidiary methods, estimation methods, financial models, market data and other evidence;
- 'Estimation methods' refers to the procedures used for estimating the rate of return, including through financial models.
- 'Financial models' refers to those mathematical and statistical representations that are used to inform the rate of return – for example, the Sharpe-Lintner Capital Asset Pricing Model.
- 'Market data' refers to any input data that is used to determine the rate of return – for example, financial data or sample data from firms that are comparable to the benchmark efficient entity.
- 'Other evidence' may be broad-ranging, but must be relevant to the estimation of the rate of return to be considered.
- 'Estimation material' may be used to refer to any of the relevant information relating to estimating methods, financial models, market data and other evidence.

8. The guidelines will provide guidance for subsequent gas access decisions of the ERA for Western Australian gas pipelines and networks.

1.2 Application of the guidelines

9. At the date of this publication, the rate of return guidelines are not mandatory in Western Australia.[7] The ERA or service providers may depart from the guidelines when reviewing an access arrangement, provided that an adequate explanation for any proposed change, in terms of the National Gas Law and National Gas Rules, is provided.

10. However, the Council of Australian Governments' Energy Council has developed a framework for binding rate of return guidelines.[8] The *Statutes Amendment (National Energy Laws) (Binding Rate of Return Instrument) Act 2018* has been proclaimed in South Australia, which is the lead parliament for national energy legislation in Australia.

11. This will have implications for the application of these rate of return guidelines to future determinations. If the Western Australian Government chooses to adopt these changes, then these guidelines will become a mandatory instrument.

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[7] National Gas Rules 87(18).

[8] COAG Energy Council, *Binding Rate of Return Guideline*, October 2017, available at: www.coagenergycouncil.gov.au/publications/binding-rate-return-guideline

AER, *Consultation paper: Process for reviewing the rate of return guidelines*, Commonwealth of Australia, July 2017, p. 7.

1.3 Reviewing the guidelines

12. As part of this review, the ERA assessed its approach to setting the rate of return for covered gas pipeline and network access arrangements.

13. The ERA focused on the overall methods, estimation methods, financial models, market data and other evidence for developing the rate of return. This was consistent with the requirements of the National Gas Law and the National Gas Rules.

14. Where relevant, as a means of illustration, the ERA has set out current indicative estimates of the rate of return and associated parameters. However, the specific values arising from the application of the ERA's approach to estimating the rate of return will be determined at each subsequent access arrangement review, by applying the approaches set out in these guidelines.

2. The broad regulatory framework

15. This chapter sets out the relevant requirements of the National Gas Law and National Gas Rules. These requirements establish the regulatory framework for the rate of return decision-making process.

2.1 The National Gas Law

16. The National Gas Law provides for a legislated, uniform national framework governing access to monopoly gas infrastructure, and arrangements for price oversight. The national gas objective sets out the aim of the National Gas Law.[9]

> The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.

17. The National Gas Law and the national gas objective are intended to promote economic efficiency.[10]

> The national gas objective is an economic concept and should be interpreted as such.
>
> The long term interest of consumers of gas requires the economic welfare of consumers, over the long term, to be maximised. If gas markets and access to pipeline services are efficient in an economic sense, the long term economic interests of consumers in respect of price, quality, reliability, safety and security of natural gas services will be maximised. By the promotion of an economic efficiency objective in access to pipeline services, competition will be promoted in upstream and downstream markets.

18. The revenue and pricing principles in the National Gas Law give effect to the national gas objective.[11] The revenue and pricing principles establish that the national gas objective is to be promoted by targeting economically efficient outcomes, through effective incentives.[12]

> A service provider should be provided with effective incentives in order to promote economic efficiency with respect to reference services the service provider provides. The economic efficiency that should be promoted includes—
>
> (a) efficient investment in, or in connection with, a pipeline with which the service provider provides reference services; and
>
> (b) the efficient provision of pipeline services; and
>
> (c) the efficient use of the pipeline.

19. This specification of “effective incentives in order to promote economic efficiency” in the revenue and pricing principles is entirely consistent with an incentive regulation approach.

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9 National Gas Law, s. 23.

10 Holloway, P., *Second Reading Speech: National Gas (South Australia) Bill 2008, Parliamentary Debates (SA),* Legislative Council, 30 April 2008.

11 Holloway, P., *Second Reading Speech: National Gas (South Australia) Bill 2008, Parliamentary Debates (SA),* Legislative Council, 30 April 2008.

12 National Gas Law, s. 24(3).

20. Incentive regulation is the use of rewards and penalties to induce a utility to achieve desired goals where the utility is afforded some discretion in achieving those goals.[13] The regulatory arrangements and associated rate of return framework constitute one form of regulation that has been developed to provide incentives to achieve economic efficiency.

21. The Australian Energy Market Commission has established the allowed rate of return objective in the National Gas Rules.[14]

> The *allowed rate of return objective* is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.

22. In this context, the Australian Energy Market Commission has stated that the allowed rate of return objective is intended to be consistent with the national electricity objective, the national gas objective and the revenue and pricing principles.[15]

> The Commission has taken the opportunity in this final rule determination to explain how the new rules are to be interpreted. Most importantly, the new rules allow the regulator (and the appeal body) to focus on whether the overall rate of return meets the allowed rate of return objective, which is intended to be consistent with the [national electricity objective], the [national gas objective] and the [revenue and pricing principles].

23. The allowed rate of return objective must be interpreted in a manner consistent with the national gas objective. The National Gas Law takes precedence over the National Gas Rules.

2.2 National Gas Rule 87

24. National Gas Rule 87 (NGR 87) includes sub-rules that refer to matters the regulator is to 'have regard to' when determining the allowed rate of return, including: [16]

> **NGR 87(5):** "In determining the *allowed rate of return*, regard must be had to:
>
> (a) relevant estimation methods, financial models, market data and other evidence;
>
> (b) the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and
>
> (c) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt."
>
> **NGR 87(7):** "In estimating the return on equity under subrule (6), regard must be had to the prevailing conditions in the market for equity funds."

[13] Lewis, T., and Garmon, C., *Fundamentals of Incentive Regulation,* PURC/World Bank International Training Program of Utility Regulation and Strategy, June 1997.

[14] National Gas Rules 87(3).

[15] Australian Energy Market Commission, *Rule Determination: Price and Revenue Regulation of Gas Services (GRC0011)*, 29 November 2012.

[16] National Gas Rules 87.

NGR 87(11): "In estimating the return on debt under subrule (8), regard must be had to the following factors:

(a) the desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity referred to in the *allowed rate of return objective*;

(b) the interrelationship between the return on equity and the return on debt;

(c) the incentives that the return on debt may provide in relation to capital expenditure over the *access arrangement period*, including as to the timing of any capital expenditure; and

(d) any impacts (including in relation to the costs of servicing debt across *access arrangement periods*) on a benchmark efficient entity referred to in the *allowed rate of return objective* that could arise as a result of changing the methodology that is used to estimate the return on debt from one *access arrangement period* to the next."

25. In addition, NGR 87 sets out additional requirements for the allowed rate of return, including that:[17]

- It is to be determined such that it achieves the allowed rate of return objective (NGR 87(2)).
- Subject to the rate of return objective (NGR 87(2)), the allowed rate of return for a regulatory year is to be:
  - A weighted average of the return on equity for the access arrangement period in which the regulatory year occurs and the return on debt for that regulatory year (new NGR 87(4)(a)).
  - Determined on a nominal vanilla rate of return that is consistent with the estimate of the value of imputation credits (new NGR 87(4)(b)).[18]
- It results in a return on debt for a regulatory year that contributes to the achievement of the allowed rate of return objective (NGR 87(8)) which is either the same in each year of the access arrangement period or which varies in each year through the application of an automatic formula (NGR 87(9) and NGR 87(12)).
- It incorporates a return on debt that would be required by debt investors over a relevant time period (whether shortly before the access arrangement decision, or on average over an historical period, or some combination of the two approaches) (NGR 87(10)).

17 The points are paraphrased – see the National Gas Rules for exact language.

18 The specification of a vanilla WACC implies that tax liabilities must be estimated separately to the rate of return. On this basis, the requirement is for a 'post-tax' approach.

2.3 Implications for the regulator

26. The anchor for any regulatory decision will be the regulatory approach that best delivers the requirements of the National Gas Law, National Gas Rules, national gas objective, revenue and pricing principles, and allowed rate of return objective. This requirement may be summarised in terms of a primary function and constraints.

    a. The primary function is to achieve an allowed rate of return for a service provider "commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk in respect of the provision of reference services".[19] Related objectives include achieving the allowed rate of return:

        i) for each of the regulatory years[20]

        ii) incorporating effective incentives to promote efficient investment[21]

        iii) in the long term interests of consumers.[22]

    b. One constraint is that uncertainty about the future, information asymmetries and circularity problems complicate the task of determining the rate of return. On this basis, the regulator needs to estimate a cost of debt and cost of equity that give the efficient service provider 'reasonable opportunity' to recover at least the efficient costs it incurs over the regulatory period.[23]

    c. A further constraint is a requirement to minimise transaction costs for the service provider and regulator, all else equal.

27. The current regulatory approach assumes that the efficient firm that meets the above objectives provides the 'benchmark'. The 'benchmark efficient firm' informs the cost building blocks for each regulatory decision.

28. An implication of point a) in paragraph 26 is that the rate of return must remunerate the efficient financing costs of the service provider over the lives of the assets, in terms of net present value.[24]

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[19] National Gas Rules 87(3) – the allowed rate of return objective.

[20] National Gas Rules 87(4).

[21] National Gas Law, s. 24(3) – a revenue and pricing principle – states that the "a service provider should be provided with effective incentives to promote economic efficiency with respect to reference services". Note that the AEMC has stated that "The Commission has taken the opportunity in this final rule determination to explain how the new rules are to be interpreted. Most importantly, the new rules allow the regulator (and the appeal body) to focus on whether the overall rate of return meets the allowed rate of return objective, which is intended to be consistent with the [national electricity objective], the [national gas objective] and the [revenue and pricing principles." (Australian Energy Market Commission 2012, *Rule Determination: National Electricity Amendment Rule 2012*, www.aemc.gov.au, 29 November, p. 23.)

[22] As per the national gas objective.

[23] National Gas Law, s. 24(2) – a revenue and pricing principle – states that the "service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs".

[24] This is consistent with the 'NPV=0', or 'present value' condition. For more detail on the present value principle, refer to *Chapter 4 - Overall rate of return.*

29. The implication of the efficiency element of point a) is that the benchmark firm is assumed to be on, or near, the efficiency frontier, consistent with the performance and cost structure of an efficient service provider. The efficient firm would be part of the portfolio of efficient assets held by an investor.

- The benchmark firm's efficient cost of finance will reflect the prevailing conditions in capital markets for the cost of debt and equity, taking risk into account. The resulting discipline on its cost structure is entirely consistent with that faced by firms in effectively competitive markets, where competitive forces constrain returns to no more than the efficient cost of capital.

- An implication of adopting the benchmark efficient firm is that the actual decisions of the service provider may differ (and often will differ) from the benchmark firm. However, under incentive regulation the regulator does not compensate the regulated service provider for its actual decisions, but compensates it as if it were operating efficiently. If the service provider is not actually operating efficiently relative to the benchmark, then that is a matter for the service provider's management and shareholders.

- The benchmark cannot be purely hypothetical. The benchmark should be based on the actual costs and risks faced by an efficient service provider.

- The benchmark approach provides incentives for the regulated business. If the regulated business is able to exceed the benchmark performance, it is able to retain any increased profits during the regulatory period. If the regulated firm fails to achieve the benchmark, then it bears the losses.

30. The efficient firm would provide reference services in a way that meets consumers' preferences with regard to price, quality, reliability, safety, and security, thereby meeting the requirement of a)(iii) (long-term interests of consumers).

31. An implication of the subsidiary objective of point a)(i) in paragraph 26 (regulatory years) is that the allowed rate of return objective looks ahead to the actual regulatory years of the access arrangement period.

32. An implication of the subsidiary objective of point a)(ii) (effective incentives) is that best practice regulation will generally set an estimated return *ex ante*, and then allow the firm to capture a portion of any subsequent out-performance or be penalised for under-performance.

33. An implication of point a)(i) (regulatory years) and point b) (uncertainty) is that the regulator sets the rate of return based on the most 'reasonable' predictors of the cost of debt and the cost of equity for the future regulatory years.[25]

34. An implication of point c) (transaction costs) is that regulators are reluctant to revisit the returns to the firm too frequently, particularly where this significantly increases transaction costs for both the regulator and the firm, or where it reduces the power of any incentives associated with an *ex ante* approach. Current practice is to set the regulated return for a five-year period.

[25] National Gas Law, s. 24(2) – a revenue and pricing principle – states that "a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs...".

2.4 Introduction of a binding rate of return

35. At present, the rate of return guidelines are not binding on either the ERA or the pipeline service provider. The Council of Australian Governments' Energy Council has developed a framework for binding rate of return guidelines. The *Statutes Amendment (National Energy Laws) (Binding Rate of Return Instrument) Act 2018* has been proclaimed in South Australia.

36. If the Western Australian Government chooses to adopt these changes, then these guidelines will become a mandatory instrument.

2.4.1 New legislation

37. The new binding rate of return legislation has implications for the application of current gas rules.

38. These include that when the mandatory instrument is given effect in Western Australia, the allowed rate of return objective will fall away.

39. The new binding rate of return legislation will require that a regulator have regard to the following factors to make the rate of return instrument:

    a. the national gas objective

    b. the revenue and pricing principles

    c. the following matters as provided to the ERA:

        i. advice or recommendations given by a consumer reference group

        ii. submissions on the making of the draft rate of return instrument

        iii. advice or recommendations given by experts

        iv. the report given by the independent panel under section 30L

    d. other information the ERA considers appropriate.

40. A binding rate of return instrument would set out how the rate of return would be automatically applied in each regulatory determination, without the exercise of any discretion. However, in developing a binding instrument there is scope for regulatory discretion in establishing the approach and estimates for rate of return parameters.

41. Under the new binding rate of return legislation a new instrument must be published on the fourth anniversary of the day the reviewed instrument was published. The ERA will use the active binding instrument available at that time for any access arrangements as they arise.

2.4.2 Importance of national gas objectives

42. Under the current rules, the ERA sets the allowed rate of return to achieve the national gas objective and the allowed rate of return objective. To set the allowed rate of return, the ERA must also have regard to the revenue and pricing principles.

43. The national gas objective governs the regulatory determinations and has primacy, including over the allowed rate of return objective.

44. The allowed rate of return objective is a rate of return commensurate with efficient financing costs and the risks involved in providing energy network services.

45. The ERA has drafted these guidelines to apply equally to the current framework and the proposed binding rate of return framework, if implemented.

46. The ERA considers this is appropriate as:

- The national gas objective is the overarching objective for the national gas regulatory framework.
- A focus on the national gas objective and the revenue and pricing principles will still use the key concepts required to promote the allowed rate of return objective.
- The draft binding rate of return legislation will change the rules framework for estimating the rate of return (including the removal of the allowed rate of return objective), however, the national gas objective will remain unchanged.
- The ERA would have the discretion to implement relevant concepts that may currently exist under the National Gas Rules and apply them in the implementation of a binding instrument.

2.4.3 New consultation requirements

47. The draft legislation to introduce the binding rate of return instrument introduces new consultation requirements for regulators.

48. The ERA was exempt from the requirement to seek advice from a consumer reference group when preparing its first rate of return instrument and was not required to seek advice from experts.

49. However, the ERA was to commission and have regard to a report given by an Independent Panel when preparing the instrument.

50. The objective of the Independent Panel is to assist the ERA to make the best possible final guideline by providing an independent perspective on the development of the draft guideline.

3. Independent Panel Review

3.1 Requirement for Independent Panel review

51. The draft legislation to introduce the binding rate of return instrument will require the ERA to engage an Independent Panel to review and report on its draft guidelines.

52. On 21 June 2018 the ERA released information about how the Independent Panel would be engaged and its role. The ERA asked interested parties to nominate potential panel members.

53. On 17 August 2018, the ERA established its Independent Panel to review the guidelines. The ERA's three member panel brought a diverse set of skills to the review process. Dr John Fallon (Chair) has substantial experience across all aspects of economic regulation and public policy. Dr Raymond da Silva Rosa leads the discipline of accounting and finance at the University of Western Australia. Ms Julie Barrow is an experienced financial counsellor and consumer advocate.

54. The Independent Panel's objective was to assist the ERA to make the best possible final guideline by providing an independent perspective on its development. Forming the panel should also promote stakeholder confidence that the final guideline is capable of achieving the national gas objective.

55. The ERA asked the Independent Panel to address the following question as part of its terms of reference.

> In your view, is the draft guideline supported by sound reasoning based on the available information such that it is capable of promoting achievement of the National Gas Objective?

56. The terms of reference required that the panel consider the following factors:

- The impact of the guideline as a whole rather than issue-by-issue analysis.
- The revenue and pricing principles in the National Gas Law.
- The rate of return provisions in the National Gas Rules.
- The COAG Energy Council's ongoing reforms to implement a binding rate of return instrument.
- Whether the ERA has had regard to relevant information in reaching its conclusions.
- Whether there is a clear link between the ERA's conclusions and the information on which it relied.
- Whether, in the view of panel members, the methodology set out in the draft guideline will allow stakeholders to replicate the ERA's estimate at a point in time.
- Interactions with other components of the ERA's regulatory determinations and the relevant rules affecting estimation of those components.

57. To answer this question the Independent Panel had to:

- Produce a report on the draft guideline which the ERA would consider when making a final guideline.
- Comment on the draft guideline, but was not asked to propose its own alternative or amended guideline.

58. The draft legislation to introduce the binding rate of return guidelines requires the ERA to consider the panel's report. However, the panel's views are not binding.

3.2 Public submissions

59. ATCO Gas Australia's submission raised procedural questions regarding the Independent Panel. ATCO said that, in order to provide procedural fairness, stakeholders should have an opportunity to comment on the Independent Panel's report prior to the ERA making its final guidelines. [26]

3.3 Independent Panel Report

60. The Independent Panel provided its report to the ERA on 28 October 2018. It was then published on the ERA's website.

61. Under the proposed legislation there was no requirement to consult with stakeholders on the Independent Panel's report prior to the ERA making its final guidelines.

62. In the Independent Panel's opinion, the draft guidelines was supported by sound reasoning based on the available information such that it was capable of promoting the achievement of the national gas objective.[27]

63. The Panel's opinion was qualified by the specific matters summarised in Table 17 of its report. Table 17 details matters where the Panel considered further information and improvement could be made. [28]

64. The Independent Panel report recorded its members' unanimous agreement with the content and all the recommendations of the report. [29]

65. The Independent Panel agreed that the guidelines provide the flexibility to apply equally under the current framework and the proposed binding rate of return framework.[30]

[26] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 36.

[27] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 79.

[28] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 79-84.

[29] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 80.

[30] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 11.

66. The Independent Panel's findings on individual Weighted Average Cost of Capital (WACC) parameters are discussed in the specific parameter chapters. The ERA has considered these findings and comments when developing its final approach and reasoning.

67. The Independent Panel raised general points including:

- self-contained guidelines
- re-opening of guidelines
- the regulatory framework and risk
- profitability.

3.3.1 Self-contained guidelines

68. The Independent Panel considered that the guidelines and explanatory statement needed to be reasonably self-contained so that it was not necessary to reference the 2013 guidelines and supporting documents to understand all key aspects of the guidelines.[31]

3.3.2 Re-opening of guidelines

69. The Independent Panel considered that the guidelines should explain the conditions under which a binding rate of return would be re-opened, reflecting unexpected changes in circumstances.[32]

3.3.3 Regulatory framework and risk

70. The Independent Panel's report gave consideration to how the regulatory framework of energy network businesses may affect their risk and the resulting allowed rate of return.

71. The Independent Panel's considerations regarding the regulatory framework can be summarised as:

- The form and detail of the regulatory arrangements and their implications for an allowed rate of return that promotes economic efficiency are matters that need more consideration.[33]
- The approach may be reasonable but the issue of regulation and its impact on efficient financing needs more consideration. [34]

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[31] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 80.

[32] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 11.

[33] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 8, 18, 30, 46, 63.

[34] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 18.

- Investors may be concerned with potential asymmetry of returns, that is, the potential for skewness or bias on either side of the expected mean return. There may be asymmetry when there is economic regulation. This is an important issue given the capital asset pricing model assumes the only relevant concerns relate to the expected mean return and variance of returns. [35]

- Any observed variance in returns within the regulatory period is limited. That is, within a regulatory period the variance of returns is of far less consequence than variance beyond the regulatory period. [36]

- The form of regulation and the scope for stranded asset risk need to be discussed more in the guidelines. [37]

- The ERA should examine whether the regulatory arrangements affect risk in a way that is not readily reflected in the benchmark parameters and, if so, determine what adjustments are warranted.[38]

3.3.4 Profitability

72. The Independent Panel suggested that consideration should be given to the use of actual financial performance on an ex post basis to help confirm the overall allowed return on equity is reasonable and reasonably balances the interests of all stakeholders.[39]

73. The Independent Panel noted different views expressed by experts on the use of actual profitability data in the Australian Energy Regulator’s expert sessions. The Independent Panel detailed an important opposing view that the review of financial performance on an ex post basis would be fundamentally inconsistent with an incentive-based regulation framework. [40]

74. The Independent Panel considered the regulatory arrangement would need to provide appropriate profit incentives for firms to be efficient but that the actual profitability performance is a relevant consideration in setting a reasonable allowed rate of return.[41]

35 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 19.

36 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 63.

37 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 21.

38 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 23.

39 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 46-47.

40 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 46.

41 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 46.

3.4 ERA consideration

75. The ERA thanks the Independent Panel for its time and review of the draft guidelines.

76. The ERA has considered the Independent Panel's report as part of developing the final rate of return guidelines.

77. The ERA considers the Independent Panel's findings on individual WACC parameters in the specific parameter chapters.

78. The ERA has given consideration to the Independent Panel Report's general points:

- self-contained guidelines
- the regulatory framework and risk
- profitability.

3.4.1 Self-contained guidelines

79. The Independent Panel considers that the guidelines and explanatory statement should be reasonably self-contained.

80. The ERA accepts the Independent Panel's finding that the guidelines and explanatory statement should be reasonably self-contained and has incorporated appropriate additional information into the guidelines and explanatory statement to help this.

3.4.2 Re-opening of guidelines

81. Under the proposed legislation the binding guidelines will remain in place for four years. The use of regulatory discretion is not allowed over this period and as a result the binding guidelines will not be re-opened for any unexpected changes in circumstances.

82. The ERA has included contingency events, where it was deemed appropriate to retain some flexibility to set individual WACC parameters. In such circumstances, a contingency trigger is included to determine if a contingent approach is needed. If the contingency is triggered the ERA will use an alternative detailed approach. In these circumstances, no discretion is used. The contingency approaches are mechanical and are set out in the guidelines.

3.4.3 Regulatory framework and risk

83. The ERA recognises that the consideration of risk and its application to the rate of return is an essential part of developing an allowed rate of return that represents efficient financing costs.

84. Throughout its consideration of the guidelines the ERA has estimated the efficient financing costs of a benchmark efficient entity. Central to this approach is the development/calculation of rate of return parameters based on a benchmark sample including Australian comparable firms having a similar degree of risk to that which applies to the service provider in providing reference services.

85. This requires the ERA's consideration of a gas pipeline business and its regulatory framework, along with the associated risk characteristics.

86. All else being equal, the Australian Energy Regulator (AER) has concluded in past decisions that an entity providing services in a competitive market is likely to have a higher risk and more variable expected returns than a monopoly business such as a service provider in the provision of regulated services. [42]

87. The ERA considers that it is the monopoly status of a business that increases the certainty of the revenue stream, not necessarily regulation. By virtue of the characteristics of a monopoly its revenues will generally be high and risk low.[43] Regulation has the effect of capping the potential monopoly revenue stream.

88. A regulated monopoly is still exposed to some risk, albeit that risk may be low. For example, demand risk may still exist if volumes fall to a level that makes pricing unsustainable and therefore there is no lessening of this risk relative to an unregulated monopoly.

89. However, a regulated monopoly business will be exposed to less risk than a business that services a competitive market.

90. The ERA considers that the following characteristics of the regulatory framework applying to Western Australia's gas pipelines reduce risk relative to the competitive market:

- Periodic resets of allowed revenue, which provides some revenue certainty.
- Consumer Price Index tariff adjustment mechanisms to reflect actual inflation, which mitigate inflation risk.
- Recovery of capital expenditure once the asset base has been approved. Assets are not typically written off, rather firms can often accelerate depreciation.
- Fixed principles where if the regulator approves a fixed principle the regulator must abide by that principle.
- Inclusion of pass-through of costs related to tax or law changes.
- Hybrid trailing average cost of debt, which mitigates interest rate risk.
- Allowance for debt hedging instruments and costs, which helps reduce interest rate risk.
- Treatment of material unexpected adverse events.

[42] AER, *Draft Rate of return guidelines: Explanatory Statement,* July 2018, pp. 104-105.

[43] Monopolies generally have the following characteristics: there is a lack of substitutes for its products; there are significant barriers to entry; there are no close competitors in the market; the business is a price maker; and the business can earn large profits.

91. Compared to a competitive business, the AER considered that regulation of energy network services reduces compensable risks such as:[44]

- *Demand risk*: the revenue or price setting mechanism mitigates demand risk in the short term. Under a price cap, service providers may mitigate the risk of forecast error by restructuring tariffs, as higher fixed charges are set to offset falls in demand. Under a revenue cap, where forecast quantity demanded differs from actual quantity demanded, service providers have the ability to recover variations through price adjustments in subsequent years.[45]

- *Inflation risk*: regulated energy networks face less inflation risk than unregulated businesses, as movements in actual inflation are reflected in the CPI-X price adjustment mechanism.

- *Interest rate risk*: the regulatory framework effectively moves the risk of interest rate movements affecting financing costs onto customers. Different approaches to the return on debt have differing effects on interest rate risk, however, they all actively reduce it.

92. Provisions in the National Gas Rules that mitigate various risks are detailed in Table 1.

[44] AER, *Draft Rate of return guidelines: Explanatory Statement,* July 2018, p. 104.

[45] There is no lessening of risk relative to an unregulated monopoly. Like an unregulated monopoly, demand risk may still exist if volumes fall to a level that makes pricing unsustainable.

Table 1: Clauses in the National Gas Rules that mitigate risk[46]

NGR	Effect on risk
50	The term of each regulatory control period is at least five years. A fixed duration provides: a period over which the regulated return on its assets is stable; increased cashflow certainty; and fixed terms of access for its services.
92	This control mechanism automatically accounts for indexation and annual increases in efficient costs. It smooths cashflows from year to year to provide a stable level of cash flow, reducing risks to short-term revenue.
97(5)	The prices service providers may charge annually are certain.
76, 77, 78, 87(1), 90	The cashflow that the AER determines incorporates a return on and of the service provider's asset base. The historical asset base rolls forward from one regulatory control period to the next and from year to year within each regulatory control period. This allows the recovery of approved historical asset costs through depreciation, the earning of a return on the asset base, indexation and recovery of future efficient capital expenditure. This substantially lessens risks in capital investment that might otherwise apply to a business operating in a competitive market.
87	The AER sets the rate of return on the asset base by reference to the risks faced by the service provider. The AER updates this each regulatory control period to account for changed market conditions.
87A	The AER makes a provision for tax in determining total revenue regardless of whether the service provider pays tax.
79,91	The AER assesses expenditure requirements for each service provider by reference to the amount necessary to meet a set of standards and objectives. These include the need to meet the expected demand for services and to meet quality, reliability, security, and safety standards. The AER does not assess expenditure by reference to the capacity of consumers to pay. The AER reassesses the requirements of service providers for each regulatory period to account for changes in market conditions and trends.
97(1)(c)	This provision allows service providers to pass through certain costs to consumers in circumstances where this might not be possible in a workably competitive market. For instance, the pass through provisions provide for a pass through of costs that arise through regulatory change.
80-86, and 103-104	These provisions assist in appropriate planning for changes in the commercial environment, including provision for new projects during a regulatory period.
Parts 19-21	These parts provide for a statutory billing and settlements framework with prudential requirements (and other similar provisions) to minimise financial risk of providing and charging for services. There is also provision for dealing with potential risks of retailer insolvency.

Source: NGR, AER Analysis

93. The natural monopoly characteristics typical of regulated businesses mean that a regulated entity has a lower risk of default, and higher credit rating, than a business providing a competitive, unregulated service. This also provides insight into why an equity beta for a benchmark efficient entity would be less than that across all firms in the market. The equity beta for all firms in the market is by definition one.

[46] AER, *Draft Rate of return guidelines: Explanatory Statement,* July 2018, p. 108.

94. The ERA does not mechanistically link particular attributes of the regulatory framework or characteristics of a monopoly business to a corresponding reduction in risk.

95. The ERA considers that regulated monopolies have lower risk than a competitive business. However, a regulated monopoly is exposed to some risk.

96. The regulatory framework does limit a monopoly's ability to maximise profit. However, incentive mechanisms built into the regulatory framework provides regulated businesses with incentives, often over the short term, to increase efficiency.

97. For example, a regulated business is financially rewarded when increasing operating efficiencies so that expenditure levels are below those approved over its access arrangement. In this case, the entity gets to retain some of this reduction in operating expenditure over a fixed period. These reductions in operating expenditure flow to consumers over time through reductions in required revenue and therefore tariffs.

98. This combination of limited downside risk and potential for short term upside benefit explains the risk-reward trade off of a regulated monopoly business. These risk-reward characteristics are incorporated into credit ratings and equity market valuations. Relative to competitive businesses, lower levels of risk for regulated monopolies are reflected in higher credit ratings from ratings agencies and lower betas from market valuations.

3.4.4 Profitability

99. The ERA has considered the Independent Panel's comments on reviewing actual financial performance in determining an allowed rate of return.

100. The AER has considered reviewing actual financial performance in the context of its determination of the rate of return.

101. The ERA has reviewed the AER's consultation for its guidelines and its review of energy network profitability. As part of these processes, some stakeholders have also raised concerns with the high profitability of energy networks being driven by an unreasonably high WACC. Stakeholders have argued that the high profitability of network businesses can bring into question the effectiveness of the regulatory regime in setting allowed revenues.[47]

102. The AER released a draft position paper on energy network profitability in April 2018.[48] The aim of the AER's review was to identify suitable profitability measures and the associated data requirements that would allow it to report and compare the returns of the energy networks it regulates. The AER also considered whether to adjust the rate of return for profitability.

[47] Major Energy Users Inc, *Profitability measures for regulated gas and electricity network business- Discussion paper*, December 2017.

[48] AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018.

103. The AER's consideration of profitability identified factors, in addition to the rate of return, that affect network business profitability.[49] These factors included:

- The incentive schemes that offer service providers incentives to improve the efficiency of their service. This was the main factor identified.
- Regulatory, operational and environmental factors (for example revenue smoothing, the timing of regulatory decisions, WACC parameters, pass through events and one-off type events).

104. Reflecting the difficulty of identifying profitability drivers, the AER considered that adjusting for all these yearly fluctuations to try to make the return on assets more comparable to the pre-tax WACC would add complexity and never fully account for all variations.[50]

105. However, the AER considered that reporting on energy network profitability would help to achieve the National Gas Objective by making those returns and their drivers transparent.[51]

106. Therefore, as detailed in its draft position paper, the AER will implement a method to assess the profitability of energy networks, which includes:

- A suite of five profitability measures.
- Annual publication of a performance report for network businesses.
- A focus on core regulated services, as measures will be used to compare service providers with regulatory benchmarks.
- Improved reporting of regulatory accounts, including the development of specific guidance on how to translate statutory accounts to regulatory accounts and a requirement for independent assurance of submitted information.

107. The AER will consider profitability as part of its regulatory determination processes, however, the information will not be used in a mechanical way to make adjustments to allowed revenues.[52] The information on energy network profitability will help inform future stakeholder submissions.

108. The ERA will continue to monitor developments with the AER's assessment of network business profitability, including improvements in regulatory account reporting.

109. For Western Australia's energy networks, the ERA may further consider the introduction of improvements to the reporting of regulatory accounts and annual profitability of businesses.

110. Stakeholders have also raised concerns that high energy network business values, Regulatory Asset Base (RAB) multiples, have been driven by an unreasonably high WACC.

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49 AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018, p. 13-14.

50 AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018, p. 14.

51 AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018, p. 2.

52 AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018, p. 5.

111. A report by Darryl Biggar reviewed the role of energy networks' RAB multiples and what contributed to a RAB multiple greater than one.[53]

112. Biggar found that there was a range of factors, in addition to expected returns, that influence RAB multiples. A RAB multiple greater than one may be driven by: [54] [55]

- The possibility that buyers overpaid through buyers irrational exuberance or the 'winner's curse'.[56]
- Buyers expecting to achieve greater efficiency gains that result in actual operating and capital expenditure being below the amount currently allowed.
- Buyers expecting to increase revenue by increasing demand for regulated services.
- Buyers expecting to undertake future capital expenditure to increase the RAB.
- Buyers benefiting from more efficient tax structures or financing than the benchmark assumption adopted by the regulator.
- Expectations of higher returns if regulation is relaxed.
- Buyers paying for existing and/or potential unregulated revenue streams that sit outside the RAB.
- Buyers paying an option premium for the ability to undertake future value adding activities.

113. Biggar found that a RAB multiple range of 0.9 to 1.3 was reasonably expected. A RAB multiple outside of this range may give cause for further investigation.[57]

114. Furthermore, McGrathNicol found that RAB multiples were only relevant for a limited period following the transaction, becoming less relevant as time passes.[58]

115. The ERA considers that there is currently no clear understanding of the links between an energy business's RAB multiple and its allowed rate of return. Therefore, at this time, the ERA will not directly link an energy network business's RAB multiple to its allowed rate of return.

116. The ERA will continue to monitor developments with the AER's assessment of network business profitability, including relating to the RAB.

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53 Biggar, D., *Understanding the role of RAB multiples in regulatory processes*, February 2018.

54 Biggar, D., *Understanding the role of RAB multiples in regulatory processes*, February 2018.

55 AER, *Profitability measures for electricity and gas network businesses – Draft position paper,* April 2018, p. 24.

56 The winner's curse is a phenomenon that may occur wherein the winner will tend to over pay due to emotional reasons or incomplete information. Accordingly, the winner will be "cursed" in one of two ways: either the winning bid will exceed the value of the auctioned asset making the winner worse off in absolute terms, or the value of the asset will be less than the bidder anticipated, so the bidder may garner a net gain but will be worse off than anticipated.

57 Biggar, D., *Understanding the role of RAB multiples in regulatory processes*, February 2018, p. 11

58 McGrathNicol, Response to submissions on performance measures, April 2018, p. 16. Available at . https://www.aer.gov.au/system/files/McGrathNicol%20response%20to%20submissions%20on%20profitability%20measures%20-%2023%20April%202018.pdf

117. For the reasons set out above, the final guidelines do not make any adjustments to the rate of return for the profitability of gas pipelines.

4. Overall rate of return

4.1 Background

118. The rate of return, based on a Weighted Average Cost of Capital (WACC), provides a service provider with a return on the capital it has invested in its business.

119. The National Gas Rules require the ERA to adopt a 'nominal vanilla' WACC to develop the rate of return for the benchmark efficient entity.[59]

120. A vanilla WACC does not include any adjustment for tax impacts, such as the effect of imputation credits on the rate of return. The impact of tax on the returns must be accounted for separately, as an explicit deduction from the relevant cash flows. A vanilla WACC is therefore a 'post-tax' framework.

121. The nominal vanilla WACC provides for a simple weighted average of the nominal post-tax return on equity and the nominal return on debt.

122. This chapter sets out the approach the ERA will adopt for future regulatory decisions.

4.2 Draft approach

4.2.1 A nominal post-tax model

123. The ERA will apply an explicit nominal post-tax modelling approach.

124. The Australian Energy Regulator's (AER) post-tax revenue model, or a similar model, will provide a basis for access arrangement determinations. The post-tax revenue model enables the ERA to use a nominal vanilla rate of return.

125. The post-tax revenue model deals with tax explicitly through operating cash flows, consistent with the use of a nominal vanilla rate of return.

4.2.2 Components of the rate of return

126. The ERA will adopt a WACC for a benchmark efficient entity in its simplest 'vanilla' form, expressed as:

$$WACC_{vanilla} = E(r_e)\frac{E}{V} + E(r_d)\frac{D}{V} \qquad \text{equation 1}$$

where:

$E(r_e)$ is the expected return on equity

$E(r_d)$ is the expected return on debt

59 National Gas Rules 87(4).

E/V is the proportion of equity in total financing (comprising equity and debt)

D/V is the proportion of debt in total financing.

4.2.3 The term of the rate of return

127. The term of the estimates for the rate of return will be, as far as possible, consistent with the term of the regulatory period.

128. Accordingly, as the regulatory period for the ERA's gas pipeline and networks decisions is five years, the term of its estimates for the rate of return will generally be five years.

4.2.4 Requirement to meet the allowed rate of return objective

129. The ERA will evaluate its estimate of the allowed rate of return in terms of the requirements of the allowed rate of return objective and the National Gas Rules more broadly. In particular, the ERA will consider whether its allowed rate of return estimate is reasonable for a benchmark efficient entity with a similar degree of risk as the service provider in the provision of reference services.[60]

130. As discussed in Chapter 2, the introduction of a binding rate of return instrument, if implemented, will remove the allowed rate of return objective. The ERA considers that the national gas objective and the revenue and pricing principles will still use the key concepts required to promote the allowed rate of return objective.

4.3 Draft reasoning

131. The National Gas Rules specify the WACC that is to apply in any regulatory year is to be comprised of a weighted average of:[61]

- the return on equity for the access arrangement period in which that regulatory year occurs
- the return on debt for that regulatory year.

132. This specification is, in turn, subject to the requirement that it achieves the allowed rate of return objective.[62] This means that the estimate of the return on equity and the return on debt "is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services".[63]

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60 When the mandatory instrument is given effect in Western Australia the allowed rate of return objective will fall away. The allowed rate of return objective currently must be interpreted in a manner consistent with the national gas objective and the revenue and pricing principles. After the removal of the allowed rate of return objective, the ERA will continue to set the rate of return in a consistent manner with the national gas objective and the revenue and pricing principles.

61 National Gas Rules 87(4)(a).

62 National Gas Rules 87(2).

63 National Gas Rules 87(3).

133. The definition of the ‘benchmark entity’ and the approach to addressing the requirement for a ‘similar degree of risk’ are important considerations. These issues are considered in *Chapter 5 – The benchmark efficient entity*.

4.3.1 Implementing a nominal post-tax model

134. National Gas Rule 87 (NGR 87) requires the ERA to use a post-tax financial model to calculate the rate of return.

135. In the ERA’s 2013 guidelines and its recent regulatory decisions, the ERA used a model similar to the AER’s Post-Tax Revenue Model, which provides a nominal post-tax modelling framework for its decisions. The Post-Tax Revenue Model provides a full nominal building block approach to estimating the revenue requirement for a service provider.

136. The nominal framework means that its building block revenue forecasts include estimates of expected inflation. The revenue allowances are therefore estimated in nominal dollar terms. The regulatory asset base is indexed in each year by expected inflation when calculating the rate of return on capital element in the building block. This is multiplied by a nominal rate of return that includes expected inflation.

137. There is an inflationary gain that arises when a nominal rate is used to compute the return on the nominal capital base. The amount of the inflationary gain is separately calculated and removed from the revenue building block to address double counting of inflation.

138. The Post-Tax Revenue Model deals with tax explicitly through operating cash flows, which is consistent with the use of a nominal vanilla WACC.

139. The ERA will continue to use a model similar to the AER’s Post-Tax Revenue Model for access arrangement determinations, along with a nominal vanilla WACC.

4.3.2 Components of the rate of return

140. The National Gas Rules specify that the rate of return should be a weighted average of the cost of equity and cost of debt (NGR 87(4)(a)). This approach to estimating the overall rate of return is a ‘bottom up’ approach, which combines separate estimates for the cost of equity and the cost of debt.

141. The resulting WACC for a benchmark efficient entity represents the competitive rate of return that an entity must earn on its existing asset base in order to satisfy its creditors, shareholders and other providers of capital. In its simplest vanilla form, the WACC may be expressed as set out in equation 1 above.

4.3.3 The term of the rate of return

142. The National Gas Rules require the ERA to have regard to “the desirability of an approach that leads to the consistent application of any estimates of financial parameters, that are relevant to the estimates of, and are common to, the return on equity and the return on debt”.[64]

[64] National Gas Rules 87(5)(b).

143. The 'present value principle' is a major consideration to establish the appropriate term for the return on equity and the return on debt. The present value principle requires that the present value of a service provider's revenue stream should match the present value of their expenditure stream (plus or minus any efficiency rewards or penalties).[65] This will result in the so-called net present value equals zero condition (NPV=0).

144. The present value principle helps ensure that investors are compensated at a level to encourage efficient investment. This condition means that the present value of the future stream of expected cash flows of a firm is equal to the regulatory asset base. This means that the value of the regulatory asset base is maintained.

145. Therefore, to maintain the regulatory asset base the rate of return does not over-compensate the business (thereby increasing asset values) nor does the rate of return under-compensate the business (thereby reducing asset values).

146. In the draft guidelines, the ERA considered that the regulatory return is likely to most closely match the NPV=0 condition when the term of components of the return on equity and the return on debt are based, as far as possible, on the length of the regulatory period. (For a more detailed discussion of the present value principle, refer to 2013 guidelines' *Appendix 2 – The present value principle*.[66])

147. Accordingly, as the term of the regulatory period for the ERA's gas pipeline and networks decisions is five years, the term of its estimates for the rate of return will generally be five years. The exception is the return on debt where the debt risk premium is based on a 10-year term.[67]

4.3.4 Requirement to meet the allowed rate of return objective

148. Under the National Gas Rules, additional considerations must be taken into account when combining the estimates of the expected return on equity and debt through the WACC. Specifically:

- The estimate of the rate of return derived from the ERA's rate of return approach needs to be assessed broadly against the allowed rate of return objective.[68]
- Regard must be given to the 'interrelationship between the return on equity and the return on debt' (NGR 87(11)(b)) and 'any inter-relationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt' (NGR 87(5)(c).

65 Lally, M., *The risk free rate and the present value principle*, 2012, p. 8.

66 ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, pp. 17-30.

67 See *Chapter 7 – Return on debt* for more detail.

68 As noted above, National Gas Rules 87(4) states that the allowed rate of return is 'subject to' National Gas Rules 87 (2), which is that the allowed rate of return is to be determined such that it achieves the allowed rate of return objective. The allowed rate of return objective set out at 87(3) states that the 'rate of return is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in the provision of reference services'.

149. As part of this review, the ERA has evaluated the method it uses to determine the allowed rate of return in terms of the requirements of the allowed rate of return objective and the National Gas Rules more broadly. In particular, the ERA has considered whether its allowed rate of return estimate derived from the application of the method is reasonable for a benchmark efficient entity with a similar degree of risk as the service provider in the provision of the reference services.

150. As previously mentioned the Council of Australian Governments' (COAG) Energy Council has developed a framework for binding rate of return guidelines. The *Statutes Amendment (National Energy Laws) (Binding Rate of Return Instrument) Act 2018* has recently been proclaimed in South Australia. If the Western Australian Government chooses to adopt these changes, then these guidelines will become a mandatory instrument.

151. The introduction of a binding rate of return instrument, if implemented, will remove the allowed rate of return objective.

4.4 Public submissions

152. The ERA did not receive any public submissions on the overall approach to the rate of return.

153. Submissions raised some general matters related to the approval of a final rate of return under the guidelines.

154. ATCO submitted that the ERA did not explain how it has, or proposes to, satisfy itself that the guidelines will, or would most likely, contribute to the achievement of the national gas objective to the greatest degree.[69]

155. Energy Networks Australia's (ENA) submission raised the role of financeability analysis.[70] ENA submitted that financeability assessments could be useful in ensuring that the allowed return is sufficient to support the credit rating that was assumed in deriving that allowed return. ENA supported further exploration of whether and how financeability tests should be applied, including their interaction with the rate of return allowance.

4.5 Independent Panel

156. The Independent Panel considered that the nominal vanilla WACC was simple, transparent, relatively easy to implement and widely used by businesses and regulators.[71]

157. The Independent Panel considered that there was no explanation in the Explanatory Statement of why the nominal vanilla WACC is preferred over other forms that achieve the same result.[72]

69 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 3.

70 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, p. 31.

71 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 14.

72 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 14.

158. The Independent Panel recognised the application of the NPV=0 principle is essential for achieving overall economic efficiency and particularly for ensuring the efficient investment in the long term interests of consumers. The Panel also recognised the logical arguments in support of consistency in the term of estimates with the term of the regulatory period.[73]

159. The Independent Panel considered that on balance the requirement for the term of estimates of the rate of return to match the term of the regulatory period was a sound principle, provided it is feasible for businesses to implement and does not introduce additional risks that are not effectively addressed elsewhere in the guidelines, in particular refinancing risk.[74]

160. The Panel considered that it would be helpful and transparent to understand the intuitive arguments that lead to the conclusion that the term of estimates for the rate of return should match the regulatory cycle.[75]

4.6 Final approach

4.6.1 A nominal post-tax model

161. The ERA will apply an explicit nominal post-tax modelling approach.

162. The AER's Post-Tax Revenue Model, or a similar model, will provide a basis for access arrangement determinations. The Post-Tax Revenue Model enables the ERA to use a nominal vanilla rate of return.

163. The Post-Tax Revenue Model deals with tax explicitly through operating cash flows, consistent with the use of a nominal vanilla rate of return.[76]

4.6.2 Components of the rate of return

164. The ERA will adopt a WACC for a benchmark efficient entity in its simplest 'vanilla' form, expressed as:

$$WACC_{vanilla} = E(r_e)\frac{E}{V} + E(r_d)\frac{D}{V} \qquad \text{equation 2}$$

where

$E(r_e)$ is the expected return on equity

73 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 15.

74 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 15.

75 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 15.

76 Tax cash flows in the revenue model recognise the effects of statutory tax rates, the deductibility of interest expenses and the existence of imputation credits.

$E(r_d)$ is the expected return on debt

E/V is the proportion of equity in total financing (comprising equity and debt)

D/V is the proportion of debt in total financing.

165. The ERA supports the use of the nominal vanilla WACC as it is simple, widely understood, commonly used by regulators and allows the separate calculation of tax effects.

4.6.3 The term of the rate of return

166. The term of the estimates for the rate of return will be, as far as possible, consistent with the term of the regulatory period.

167. Accordingly, as the regulatory period for the ERA's gas pipeline decisions is five years, the term of its estimates for the rate of return will generally be five years.

4.6.4 Requirement to meet the allowed rate of return objective

168. The ERA will evaluate its estimate of the allowed rate of return having regard to the requirements of the allowed rate of return objective and the National Gas Rules more broadly. In particular, the ERA will consider whether its allowed rate of return estimate is reasonable for a benchmark efficient entity with a similar degree of risk as the service provider in the provision of reference services.[77]

169. As discussed in Chapter 2, the introduction of a binding rate of return instrument, if implemented, may remove the allowed rate of return objective. The ERA considers that the national gas objective and the revenue and pricing principles will still engage with key concepts required to promote the allowed rate of return objective.

4.7 Final reasoning

170. In addition to its draft reasoning, the ERA has further considered the overall rate of return approach in light of public submissions and the Independent Panel's report.

171. To develop the rate of return approach laid out in the final guidelines, the ERA has had to satisfy itself of how the overall framework and each of its components best meets the requirements of the national gas objective. These considerations are detailed throughout the final guidelines. The ERA considers that the approaches and methods laid out in the final guidelines best meets the national gas objective.

172. The National Gas Rules require the ERA to adopt a nominal vanilla WACC. The ERA considers that this method is simple, transparent and relatively easy to implement. Furthermore, the approach is widely used by businesses and regulators.

[77] When the mandatory instrument is given effect in Western Australia the allowed rate of return objective will fall away. The allowed rate of return objective currently must be interpreted in a manner consistent with the national gas objective and the revenue and pricing principles. After the removal of the allowed rate of return objective, the ERA will continue to set the rate of return in a consistent manner with the national gas objective and the revenue and pricing principles.

4.7.1 The term of the rate of return

173. The ERA considers that, in a regulated environment in which output prices are set or capped, the present value of the revenue forecast to be earned from an asset (plus or minus any efficiency rewards or penalties) must be equal to the initial investment to ensure that the total costs incurred are recovered. If no more than or no less than the total costs are forecast to be recovered, in discounted terms, then the net present value is zero (NPV=0, or the 'present value principle' hereafter).

- The NPV=0 principle helps ensure that investors are compensated at a level to encourage efficient investment, so that the present value of the future stream of expected cash flows of a firm is equal to the regulated asset base (RAB).
- This means that the value of the RAB is maintained. The rate of return does not over compensate the business (increasing asset values) nor does the rate of return under compensate the business (thereby reducing asset values).

174. The ERA is of the view that setting the terms of the components for the rate of return to match, as far as possible, the regulatory control period – which is generally five years in Australia and New Zealand – will satisfy the present value principle, which is important for providing economically efficient investment signals.[78]

175. This positon is supported by studies by Dr Martin Lally and Kevin Davis, detailed below.

4.7.1.1 Lally's analysis

176. Lally builds on previous work by authors such as Marshal, Yawtiz and Greenberg[79], and Schmalensee[80] who noted the NPV=0 condition as a requirement for a fair return on investment in a regulatory setting. In other words, where output prices are set to cover costs, the rate of return should ensure that the present value of future cash flows equals the initial investment.[81]

177. Lally's 2004 paper extended the present value framework to consider cost and demand shocks and risks arising from depreciation methods. [82]

- Lally concluded that if the rate of return is revised at the end of each regulatory cycle, in accordance with the prevailing rate, then the appropriate term for that rate should be that matching the regulatory period.
- Lally constructed a model of the regulatory cycle. For convenience, Lally assumed a one-year regulation cycle. The results will hold under any regulatory cycle length.

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78 The exception is for any estimate that is annually updated. In that case, the regulatory term becomes one year.

79 Marshal, W., Yawitz, J. and Greenberg, E., 'Optimal Regulation Under Uncertainty', *The Journal of Finance*, vol 36, 1981, pp. 909-922.

80 Schmalensee, R., 'An Expository Note on Depreciation and Profitability Under Rate-of-Return Regulation', *Journal of Regulatory Economics*, Volume 1, No. 3, 1989, pp. 293-298.

81 Lally, M., 'Regulation and the Choice of the Risk Free Rate', *Accounting Research Journal*, Volume 17, No. 1, 2004, p. 19.

82 Lally, M., '*Regulation and the Choice of the Risk Free Rate', Accounting Research Journal*, Volume 17, No. 1, 2004.

- Using this framework, Lally assumed that the allowed rate of return is revised at the end of each regulatory cycle and that the assets are entirely equity financed. Lally utilised the building block approach to set the output price allowed at time t such that the expected revenues realised at time t+1 are equal to the sum of:
  - the expected operating costs at t+1
  - the depreciation allowed for the next period
  - an allowed rate of return applied to the book value of assets.

- Lally argued that the allowed rate of return should be set such that the present value of the future cash flows equals the initial outlay for investment, as outlined by Marshal, Yawtiz and Greenberg, and Schmalensee.

- Lally demonstrated that under an upward sloping risk free term structure, a rate of return with a longer maturity than the regulatory cycle leads to revenues being too large; violating the NPV=0 principle. Conversely, a shorter maturity results in revenues being too small to cover the expected costs, again violating the NPV=0 principle.

- Lally proved that to satisfy this NPV=0 criteria the appropriate rate of return required under a regulatory environment is one where the risk-free rate matches the term of the regulatory period.

178. Lally's 2007 paper extended his 2004 study by allowing for the regulated entity to be partly financed by equity, and partly by debt, with the firm having the option of being able to choose the duration of debt financing.[83]

- Lally's 2007 study considered the implications of the regulated firm being at least partly debt financed, as well as the possibility of the firm choosing a duration for this debt finance that diverges from the length of the regulatory cycle.

- Lally constructed a regulatory framework and outlined four scenarios, detailed in Table 2.

Table 2: Scenarios outlined by Lally 2007

	Firm debt maturity matches regulatory period	Firm debt maturity exceeds regulatory period
Regulator awards return with maturity that matches the length of the regulatory period	Policy 1	Policy 3
Regulator awards return with maturity that exceeds the length of the regulatory period	Policy 2	Policy 4

- Lally began the analysis assuming that the only source of risk is changes in the risk free rate. Using his framework, Lally proved that only under Policy 1 does the present value of cash flows equal that of the initial investment, satisfying the NPV=0 criterion.

83 Lally, M., 'Regulation and the Term of the Risk Free Rate: Implications of Corporate Debt', *Accounting Research Journal*, Volume 20, No. 2, 2007, pp. 73-80.

- Extending the framework, Lally assumed that regulators award a debt risk premium, which allows the existence of recontracting risk. Lally explored each scenario in Table 2 and showed that only under Policy 1 is the NPV=0 principle satisfied. Lally also showed that whilst longer term debt can reduce equity holders' exposure to refinancing risk, it increases their exposure to interest rate risk.

- Lally therefore concluded that if firms are able to fund their assets via a combination of debt and equity, with the existence of re-contracting risk and interest rate risk, the NPV=0 is satisfied under two conditions: (i) the terms of the risk free rate and the debt risk premium match the regulatory period; and (ii) the regulated business uses a debt maturity equal to the regulatory cycle. Lally concluded that departure from either of these conditions will lead to violations of the NPV=0 principle.

- Lally agreed that these findings did not consider any re-financing risk: that is, the risk arising due to the exposure to unusual conditions in the debt markets at the time the debt needs to be refinanced.

- Lally argued that a company may seek to stagger the roll-over of the debt in such a way that the same proportion – which is relatively small – is to be refinanced each year. Lally argued that the company's actual schedule of debt can be converted into a schedule that aligns with the regulatory control period using swap contracts available in the market (interest rate swaps would be used to deal with the risk free rate component and credit default swaps would deal with the debt premium).

179. Lally's 2010 paper extended his NPV=0 analysis to refinancing risk.[84]

- Lally considered the situation where the average debt term used by regulated businesses materially exceeds the five years (that is, the term of the regulatory cycle), and where these firms use neither interest rate swaps nor credit default swaps to equate the longer term (say 10 years) debt with the regulated five-year term of debt. In this scenario, the NPV=0 principle would be violated. This is because the regulator's allowed cost of debt would diverge from those actually incurred by the firms.

- Lally notes the reasoning adopted in previous papers ignored any consideration of refinancing risk (the risk of exposure to unusual conditions in debt markets at the time of refinancing). This refinancing risk results in prudent firms adopting a staggered debt portfolio, with a proportion of total debt being refinanced each year. Interest rate and credit default swaps could be used to hedge the staggered debt portfolio of the firms to the regulated term of debt (assumed to be five years), to ensure they are equal.

- Lally considered options to deal with refinancing risk.

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

- Lally's scenario 2 considered an option that assumes that regulated firms borrow for 10 years, but utilise swap contracts to match the five-year regulatory period. Under this scenario, the regulator would award a cost of debt that would include: (i) a five-year risk free rate; (ii) annualised 10-year debt issuance costs; (iii) five-year debt risk premium; and (iv) the transaction costs involved in swap contracts. Lally found that this approach will satisfy the NPV=0 principle if credit default swaps are available for the regulated entity.

- Lally proposed a scenario 3 to deal with a situation where credit default swaps are not available. In this situation, it was assumed that the regulated firm will borrow for a tenor of 10 years and use interest rate swaps to convert the 10-year risk free rate to a five-year risk free rate. Given the difficulties with using credit default swaps to convert a 10-year debt risk premium to a five-year one, Lally suggested a regulator should use: (i) the five-year risk free rate; (ii) 10-year debt risk premium; (iii) annualised 10-year debt issuance costs; and (iv) the transaction costs involved with swap contracts. Whilst this would violate the NPV=0 principle, Lally suggested that this would be a slight deviation of approximately only 0.04 percentage points of the WACC per year.

- Lally did not advocate any given option in his advice, but outlined the conditions under which each scenario should be chosen. Lally suggested that a higher average term of maturity for debt is indicative of firms being more concerned with refinancing risk.

- In the situation where the average term to maturity is significantly longer than five years, Lally advocated scenario 2 if credit default swaps are readily available and transaction costs are not significant. If transaction costs are significant, or credit default swaps are not readily available then Lally advocated scenario 3.

180. In 2014 Lally undertook further work on the cost of debt for the Queensland Competition Authority. Lally found that the hybrid approach was preferred over the on-the-day approach and the full trailing average, which supports the use of an on-the-day risk free rate and a trailing debt risk premium.[85]

4.7.1.2 Davis' analysis

181. In his advice to the Australian Competition and Consumer Commission (ACCC), Davis advocated the use of a risk-free rate of return that matches the length of the regulatory period.[86]

182. Davis outlined why it is wrong to consider the longer term life of the asset when considering the return on debt:[87]

> The argument that debt and real asset maturities should be matched is incorrect in that it confuses maturity with interest rate exposure considerations. The real assets involved in access pricing generate a future cash flow stream which is reset every five years (at regulatory determinations) in line with movements in market interest rates. Thus the duration of the real assets is five years or less.

85 Lally, M., The Trailing Average Cost of Debt, Report for the Queensland Competition Authority, March 2014.

86 Davis, K., *Risk Free Interest Rate and Equity and Debt Determination in the WACC, prepared for the ACCC*, August 2003, pp. 11-12.

87 Davis, K., *Determining Debt Costs in Access Pricing,* Appendix A of IPART February 2011, Developing the approach to estimating the debt margin: Other industries: Draft Decision, December 2010, p. 2.

183. Davis noted that regulated entities often assert that an efficient financing strategy involves an entity raising debt with a maturity close to the expected life of the asset or minimising transaction costs and risk when refinancing a debt portfolio. Davis suggested that this argument is invalid due to the ability of regulated entities to change the characteristics of debt instruments via the use of either floating rate debt or interest rate swaps.

4.7.1.3 Implications

184. The ERA considers that setting the terms of the components for the rate of return to match, as far as possible, the regulatory control period – which is generally five years – will satisfy the present value principle, which is important for providing economically efficient investment signals.

185. The implications for the term of return on equity and the return on debt are discussed briefly below. More detail on the estimation of specific parameters is provided in their specific chapters.

Return on equity

186. The ERA will adopt the Sharpe Lintner CAPM to estimate the return on equity (see *Chapter 11 – Return on equity*). The return on equity under the Sharpe Lintner CAPM is derived from the sum of the estimate of the risk free rate and an estimate of the risk premium for the benchmark efficient entity (derived as the product of the estimated beta and the estimated market risk premium).

187. The estimates are forward looking.

188. The ERA considers that as the return on equity is reset every five years, using a five year term for the risk free rate is consistent with ensuring that investors in a regulated firm have reasonable opportunity to recover a return on their investments. Basing the risk free rate on a 10-year term could allow investors to earn extraordinary returns, which would not be in the long-term interests of consumers.

189. Overall, the ERA considers that a risk free rate based on the on-the-day five year risk free rate prevailing at the start of the regulatory period is the best approach for estimating the return on equity (see *Chapter 8 – Risk free rate of return*).

190. Davis considered that it is important that the term of the risk free rate used for the market risk premium and the left hand side of the CAPM equation are the same.[88]

191. Furthermore, the ERA considers that as the value of the RAB is assured at the end of the regulatory period, then investments in regulated assets may be considered to be a sequence of investments with a horizon of five years, in line with the view of Davis. As a corollary, the ERA considers that the use of the market risk premium in the CAPM suggests that the return on equity will err on the generous side, as it is based on a weighted average of assets which have significantly greater uncertainty attached to their future value than has the RAB.

192. When setting a regulated rate of return, the ERA considers that a market risk premium is estimated over a five year period (see *Chapter 12 – Risk free rate of return*).

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88 Davis, K., *Risk Free Interest Rate and Equity and Debt Determination in the WACC, prepared for the ACCC*, August 2003, p. 10.

193. The ERA considers that this return on equity approach would be consistent with the Lally/Davis NPV=0 principle.

Return on debt

194. The ERA will adopt an estimate of the return on debt based on a risk premium over and above the risk free rate, combined with an additional margin for administrative and hedging costs (see *Chapter 7 – Return on debt*):

Return on debt = risk free rate + debt risk premium + debt raising costs + hedging costs

equation 3

195. Overall, the ERA considers the best approach to estimate the return on debt includes:

- a hybrid trailing average approach, which:
  - adopts the five-year bank bill swap rate, set on-the-day (see *Chapter 8 – Risk free rate of return*)
  - uses a 10-year trailing average for the debt risk premium, which is updated annually so that each year a new year's debt risk premium is estimated and the oldest estimate in the 10-year series is removed (see *Chapter 10 – Debt risk premium*)
- debt issuance costs (see Chapter 14 – Debt and equity raising costs)
- debt hedging costs (see Chapter 14 – Debt and equity raising costs).

196. The ERA considers that this return on debt approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.

4.7.2 Financeability analysis

197. The ENA submitted that financeability assessments could be useful in ensuring that the allowed return is sufficient to support the credit rating that was assumed in deriving that allowed return. The ENA supported further exploration of whether and how financeability tests should be applied, including their interaction with the rate of return allowance.

198. The ENA referred to an Independent Pricing and Regulatory Tribunal (IPART) New South Wales review of financeability tests, which is still ongoing.

199. The ERA has considered IPART's final report for its review of the financeability test.[89]

200. The application of financeability analysis under a binding rate of return framework may be limited, as such analysis would likely involve the use of discretion.

89 IPART, *Review of our financeability test - Final Report,* November 2018.

5. The benchmark efficient entity

5.1 Background

201. Regulators use a benchmark efficient entity to inform the Weighted Average Cost of Capital (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.

202. In determining a benchmark efficient entity a regulator needs to account for the risks of providing the regulated services.

203. The allowed rate of return objective, as set out in National Gas Rule 87(3), introduces the concept of a 'benchmark efficient entity'.

> The *allowed rate of return objective* is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services (*the allowed rate of return objective*).

204. The wording of the allowed rate of return objective requires the rate of return to be based on:

- the efficient financing costs of
- a benchmark efficient entity, with
- a similar degree of risk as the service provider in the provision of reference services.

205. This chapter outlines how the ERA will approach each of these elements.

5.2 Draft approach

5.2.1 Efficient financing costs

206. Financial markets provide observations that can be used to estimate the efficient financing costs of the benchmark efficient entity.

207. The ERA preferred observations based on market outcomes to other types of information on the premise that markets provide useful information that sufficiently reflects efficient outcomes.

208. The ERA considered the guiding principle should be that the risk for the assets observed should stem from the economy in which the benchmark efficient entity is situated.

5.2.2 The benchmark efficient entity

209. In the draft guidelines, the ERA defined the benchmark efficient entity as:

> An efficient 'pure-play' gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.[90] [91]

5.2.3 Similar risk in the provision of reference services

210. The ERA will base its estimates of efficient financing costs on the results from a sample of comparator firms with efficient financing costs that are judged to be similar to a single benchmark efficient entity for the provision of gas pipeline and network services in Australia. This means that comparator firms need not operate in the transmission and/or distribution of gas, but must have operations that are comparable. At the outset of the guidelines, the sample is established and used to inform the value of *firm* specific WACC parameters which remain fixed until the next rate of return guideline review.[92]

5.3 Draft reasoning

211. In what follows, the ERA considers:

- the efficient financing costs of
- a benchmark efficient entity, with
- a similar degree of risk as the service provider in the provision of reference services.

5.3.1 Efficient financing costs

212. National Gas Rule 87 makes reference to efficient financing costs as outlined in the *allowed rate of return objective* set out above. Efficient financing costs are expressed as a WACC for the benchmark firm. This is a weighted mix of the return on equity and debt financing for a regulatory year within the access arrangement period or term of the guidelines.

213. The following sections set out theories of efficient financing, including:

- economic theory on the efficiency of market outcomes
- financial theory on market efficiency

[90] A 'pure-play' business focuses exclusively on a particular product or service.

[91] This definition has changed from the previous Rate of Return Guidelines which used the term 'An efficient 'pure-play' regulated gas network'. This definition still allows the ERA to use either regulated or non-regulated businesses for our benchmark sample, which was specifically endorsed by the Federal Court. See Federal Court of Australia, *Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 and Australian Energy Regulator v Australian Competition Tribunal (No 3) [2017] FCAFC 80*, 24 May 2017, [536] for more details.

[92] The term 'firm' here refers to the benchmark efficient firm. Firm specific parameters are those that are specific to the *benchmark efficient firm*. These include gearing, equity beta, credit rating, debt risk premium and hedging costs. In contrast, market wide parameters are those that are observed across the economy's markets more broadly. These include the nominal risk free rate of return, inflation, interest rate swap rate, gamma and the market risk premium.

- financial theory on portfolio efficiency
- the use of domestic versus international markets.

5.3.1.1 The role of markets in efficient financing

214. Efficiency of financial markets is typically thought of across a number of dimensions. This includes efficiency from an economic welfare maximising perspective, the speed and extent to which information is incorporated in market determined prices and compensation for market risk.

5.3.1.2 Economic theory on the efficiency of market outcomes

215. From the perspective of economic theory, competitive markets and market equilibriums contribute to various aspects of economic efficiency including efficient investment (dynamic efficiency), efficient operation (productive efficiency) and efficient use of resources (allocative efficiency).

216. Markets provide a platform where competitive pressure changes prices. Quantities supplied and consumed increase up until the point no more improvements can be made. The market clearing price and quantity at this point is the competitive equilibrium which corresponds to an efficient allocation of resources that maximises the benefit accruing to consumers and producers engaging in market transactions.

217. This provides an economic basis for accepting that outcomes observed in markets should give an indication of efficient financing costs, albeit based on the assumption that market participants are rational and informed.

5.3.1.3 Financial theory on market efficiency

218. The efficient market hypothesis postulates that a capital market is efficient if prices always fully reflect all available information.

219. Tests of this hypothesis examine the speed and degree to which financial market prices incorporate new information. Eugene Fama reviewed tests based on three subsets of information, where each subsequent set incorporates the last, to establish the point at which the hypothesis looks doubtful:

- *weak-form tests* - based on historical prices
- *semi-strong form tests* - based on publically available information such as company and economic announcements
- *strong-form tests* - based on privately available information.[93]

220. The empirical evidence he reviewed could not disprove the hypothesis that security prices reflected the first two information sets. Limited evidence, however, was found against the hypothesis tested on the strong-form information set. Semi-strong form tests, in particular, are concerned with the speed at which prices adjust to publically available information. Tests based on company and macroeconomic announcements indicated prices reacted at the time of the announcement and that some evidence suggested prices moved in anticipation of the announcement in an unbiased way.

93 Fama, E., 'Efficient capital markets: A review of theory and empirical work', *The Journal of Finance*, vol.25, no. 2, 1981, pp. 383-417.

221. An inefficient market can create opportunities that can be exploited to make abnormal returns. Fama's later review recognised that the cost of getting prices to reflect information is not always zero and so consequently prices are hypothesised to reflect information up to the point where marginal profits from using that information reflect marginal costs. Additionally, an empirical rejection of the efficient market hypothesis could be a result of a bad pricing model used to test the hypothesis and/or market inefficiency. Fama replaced the weak, semi-strong and strong-form tests above with the following three classifications of research identified in the literature:

- tests for return predictability
- event studies
- tests for private information.

222. Fama's tests for return predictability found some part of returns were predictable. However, Fama noted that this predictability was only a small proportion of the variance and therefore Fama could not conclude substantial market inefficiency. Event studies substantially overcame the joint hypothesis problem.[94] These studies typically found that stock prices appear to adjust within a day of event announcements.[95]

223. Fama's reviews provide an empirical basis for accepting that outcomes observed in financial markets should give an indication of efficient financing costs that quickly price in all publically available information. Robert Shiller is a key proponent of the notion that markets are inefficient. He showed that stock prices are far too volatile to be justified by rationally expected changes in dividends.[96] Shiller suggests that psychological factors explain large deviations from efficient prices.[97] While this is an important theoretical debate, there is little alternative as a regulator than to accept that financial markets do obtain and incorporate information on investment prospects.

224. Dimson and Mussavian summarise the usefulness of the assumption that markets are efficient:

> The last two decades have witnessed an onslaught against the efficient markets hypothesis. Yet as Roll (1994) observes, it is remarkably hard to profit from even the most extreme violations of market efficiency. Stock market anomalies are only too often chance events that do not persist into the future. The importance of the efficient markets hypothesis is demonstrated by the fact that apparently profitable investment opportunities are still referred to as 'anomalies'. The efficient markets model continues to provide a framework that is widely used by financial economists.[98]

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[94] The joint hypothesis problem is the problem that testing for market efficiency is difficult, or even impossible. Any attempts to test the market (in)efficiency must involve asset pricing models so that there are expected returns to compare to real returns. It is not possible to measure abnormal returns without expected returns predicted by pricing models. Therefore, anomalous market returns may reflect market inefficiency, an inaccurate asset pricing model or both.

[95] Fama, E., 'Efficient capital markets: II', *The Journal of Finance*, vol. 46, no.5, 1991, pp. 1575-1617.

[96] Shiller, R., 'Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?', *The American Economic Review*, vol.71, 1981, p. 421-436.

[97] Shiller, R., 'From efficient markets theory to behavioral finance', *Journal of Economic Perspectives,* vol.17, no.1, pp. 83-104.

[98] Dimson, E. and Mussavian, M., 'A brief history of market efficiency', *European Financial Management*, vol.4, no.1, 1998, pp. 91-103.

5.3.1.4 Financial theory on portfolio efficiency

225. A profitable investment will yield revenue that recovers its costs (including debt) and in addition provides a return on equity. The revenue to be derived, and consequently, the rate of return from such investments, is not certain and is therefore risky. The expected rate of return for an investment may be compared with expectations for alternative investments, once it has been adjusted for risk. Riskier investments have higher costs of debt funding and a higher expected return on equity meaning higher equity funding costs.

226. Risk in portfolio theory is defined in terms of the expected variability of returns and this variability is the risk that investors are concerned with. A sole focus on variability means that either the probability distribution of expected returns is symmetric or investors do not care if the distribution of returns is asymmetric, that is exhibiting skewness or bias on either side of the expected mean return. However, investors may also be concerned about potential asymmetry of returns that are not reflected in the variance of returns. [99]

227. Modern portfolio theory provides a foundation for defining risk. It assumes, among other things, that investors are rational and markets are efficient. In modern portfolio theory, an asset's return is modelled as a random variable with a finite mean and variance. The variance of an asset's return measures the likely divergence from the expected return, and is taken as the measure of *total risk* arising from holding the asset.

228. Systematic risk is the part of total risk that is driven by broader market factors. It cannot be eliminated through holding assets that have less than perfectly correlated returns with each other (diversification) because it tends to be a common driver of risk between assets. Systematic risk is typically measured as the standardised covariation of an asset's (or a portfolio of assets') returns with the returns of the market portfolio. This covariance is commonly known as asset beta. Assets with higher systematic risk have returns that co-vary more than one for one with market returns. Assets with lower systematic risk have returns that co-vary less than one for one with market returns.

229. Assets or portfolios of assets which minimise systematic risk for any given return or maximise return for any given level of systematic risk are efficient. These portfolios are characterised in the Capital Asset Pricing Model (CAPM) as various combinations of risk free and risky assets.[100] The returns on these portfolios are conventionally used to establish the *minimum* return required by an investor for investing in an asset with a given level of exposure to systematic risk.

[99] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 19.

[100] Brealey, R.A. & Myers, S.C. *Principles of Corporate Finance*, McGraw-Hill, pp. 173-180.

230. In summary, markets can maximise welfare by facilitating transactions which contribute to the optimal or efficient allocation of resources. Despite documented anomalies, financial markets tend to efficiently (immediately and unbiasedly) incorporate new information. This suggests that observations taken from markets are likely to lead to pricing of debt and equity that adequately compensates investors for returns expected under prevailing market conditions. The measurement of systematic risk using market returns as a benchmark assists in establishing the minimum return on equity required by an investor as efficient compensation for risk that cannot be easily diversified away. Pricing of debt and equity that takes prevailing market conditions and systematic risk into account facilitates the efficient allocation of financial resources in the economy. For these reasons, the cost of capital observed in the debt and equity markets provides an important reference point for a regulator seeking to establish the efficient financing costs of a regulated benchmark efficient entity.

5.3.1.5 Domestic or international financial markets

231. When making observations of the efficient financing costs of regulated firms operating in Australia, the degree to which international capital market observations are taken into account must be considered.

232. In the draft guidelines, the ERA considered the guiding principle should be that the risk for the asset in question should stem from the economy in which the benchmark efficient entity is situated. This is because the country of risk affects the operational aspects of the benchmark efficient entity, some of which are provided below.

- *Lifecycle risk* – this is the risk stemming from a country's stage of development. Emerging markets are much more susceptible to global market and economic shocks than mature markets in developed economies.

- *Political risk* – countries exposed to corruption, civil unrest or nationalisation/expropriation by governments represent riskier investments than those with less exposure.

- *Legal system* – the protection of property rights and quick resolution of legal disputes creates a lower risk environment for investors.

- *Economic structure* – countries whose economic prosperity is dependent on specific commodities, products or services are exposed to changes in price or demand for the product/service. The effects of this exposure spread beyond the producing industry into other sectors of the economy.[101]

[101] Baker, K. and Filbeck, G., *Investment Risk Management*, Oxford Scholarship Online, 2015, p. 156.

Markets for equity

233. Market risk and systematic risk are the relevant risk considerations for equity markets.

234. 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 covariation between returns on listed equity in firms and the returns on a representative equity market index for the country in which that firm operates.

235. In evaluating the cost of equity, Australian regulators have implemented this practice through application of a domestic CAPM framework. Further detail is provided in *Chapter 11 – Return on equity*.

236. In this process, regulators have recognised the influence of foreign investors, where they invest domestically and thus contribute to market outcomes within Australia. For example, imputation credits are often distributed with Australian shares. These allow investors paying tax in Australia to claim back money on their tax return. This effectively constitutes part of the return on equity and so should be taken into consideration. However, these credits may only be of use to investors lodging an Australian tax return, unless foreign taxation agreements exist. For this reason estimates of the assumed use of tax imputation credits distributed on Australian shares have taken account of the estimated participation of foreign investors (who potentially do not lodge an Australian tax return) in Australian equity markets.

237. Therefore, the implementation of CAPM is not strictly based on a domestic market perspective because, in practice, it assumes foreign investors affect relevant parameters and domestic investors can invest internationally as well.

Markets for debt

238. Credit risk, or the likelihood that a debt issuer will meet its contractual obligation to pay interest and repay principal, is the main relevant risk consideration for debt.

239. Regulated Australian firms raise debt both domestically and overseas. Table 3 shows that 49 per cent of Australian utility debt listed on Bloomberg outstanding at December 2017 was issued on foreign markets.

Table 3 Market of issue for utility bonds with country of risk classified as Australia

Market of issue	Number	Percentage of total bonds
DOMESTIC MTN (Australia)	14	29.8%
EURO MTN (Europe)	19	40.4%
PRIVATE PLACEMENT (US)	2	4.3%
AUSTRALIAN	10	21.3%
EURO NON-DOLLAR (Europe)	2	4.3%
Total	**47**	**100.0%**

Source: Bloomberg, ERA Analysis

240. The Brattle Group has suggested in the context of estimating the cost of debt that:[102]

> ...lack of data can be a serious problem in environments such as Australia, where there are limited numbers of rate regulated entities and few, if any, entities with the same risk characteristics as the target. Therefore, looking to other sources overseas, recent debt issuances or investment banks' forecasts of financing costs becomes important.

241. Australian markets for debt are linked to international markets, reflecting a policy of relatively unrestricted capital mobility. With arbitrage, the cost of debt in Australia should be similar to that in other developed countries, once all risk factors, including country specific factors affecting operations and exchange rate risk, are taken into account.

242. In the draft guidelines, the ERA considered that debt instruments trading in foreign markets and denominated in foreign currencies are relevant if the country of risk is classified as Australia. 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.[103]

243. However, the base rates in debt denominated in foreign currency are based on foreign interest rates. 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 costs the same. The Australian Competition and Consumer Commission's Regulatory Economic Unit has considered the relationship of interest parity.

> To assess what treatment of foreign currency bonds is more appropriate for the AER, we need to first consider whether or not a version of 'swap' covered interest parity holds for the AUD, USD and Euro-denominated bonds issued by Australian companies. This would imply that the difference between the AUD bond credit spreads and the hedged foreign currency credit spreads on comparable bonds is small (i.e., can be essentially attributed to transaction costs). If that is the case, then it would be appropriate to treat the hedged credit spreads on the USD and Euro-denominated bonds similarly to the credit spreads on the AUD-denominated bonds. This treatment would be appropriate regardless of whether the AER's benchmark debt instruments only include AUD-denominated bonds or also comparable USD and Euro-denominated bonds.[104]

244. In its reviews of the debt risk premium, the ERA has found that there is no significant difference between the Australian denominated bond yields and hedged foreign currency bond yields. Further details are given in *Chapter 10 – Debt risk premium*.

245. Inclusion of bonds denominated in foreign currency and swapped into Australian dollar equivalents allows observations to be made on a broader sample of instruments thereby overcoming issues arising from a lack of data that the Brattle Group refers to above.

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102 DBNGP (WA) Transmission Pty. Ltd., *Response to Consultation Paper*, Att. 4 (Brattle Group 2013, *Estimating the Cost of Debt*), 2013, p. 2.

103 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.

104 Australian Competition and Consumer Commission, *Return on debt estimation: a review of alternative third party data series*, Regulatory Economic Unit Report for the AER, August 2014, p. 25.

Practical Issues

246. Limiting the risk exposure to the economy in which the benchmark efficient entity is situated raises practical issues for obtaining observations in equity markets. The measurement of systematic risk and market risk premium necessitates selecting a particular stock exchange to represent the market. Corporate actions such as mergers and acquisitions have reduced the number of listed firms with operations in energy network service provision. The current firms are shown in Table 4.

Table 4 Firms listed on the Australian Stock Exchange with operations in energy network service provision

2013	2017	Corporate actions
Envestra	-	Acquired by Cheung Kong Group. Delisted on 17/10/2014
APA Group	APA Group	-
DUET Group	DUET Group	Acquired by Cheung Kong Infrastructure. Data up to 28/04/2017
Hastings Diversified Utilities Funds	-	Acquired by APA Group. Ceased trading on 21/11/2012
SP Ausnet	Ausnet	Renamed
Spark Infrastructure Group	Spark Infrastructure Group	-

Source: Bloomberg

247. The benchmark sample has reduced from six to four firms. Although DUET Group is no longer listed it still has sufficient data for meaningful analysis.

248. The reduced sample of listed firms means that the results of the analysis based on this sample are more subject to idiosyncratic events affecting a given firm. Larger sample sizes tend to reduce such idiosyncrasies.

249. Expanding the scope of the analysis to include comparable international firms is a potential solution. The ERA notes in its rail WACC methodology that:

> There is a range of costs and benefits to be evaluated when considering whether to adopt a domestic or international form of any particular model of the rate of return or its components. On balance, the Authority considers that the regulatory costs of moving to a full international approach would be significant, with uncertain benefits in terms of potentially more accurate estimates.[105]

250. The use of international benchmarks implies higher uncertainty in the resulting estimate of the benchmark parameters. As Frontier Economics noted in its 2013 report to the AER on risk in regulated energy networks:

- The structure of foreign water utilities may differ from those in Australia.

[105] ERA, *Review of the method for estimating the Weighted Average Cost of Capital for the Regulated Railway Networks: Final Decision,* 18 September 2015, p. 16.

- Foreign regulatory arrangements governing water utilities overseas may differ from those in Australia.
- Water utilities overseas may also be exposed to different macroeconomic factors/risk drivers to those in Australia.[106]

251. These statements were made for water utilities, however, they are also applicable considerations in using foreign energy networks as comparators, particularly given that the systematic risk and market risk exposures on foreign firms will be based on foreign stock exchanges.

252. The ERA considered analysis limited to the sample of four companies which have exposure to the Australian market preferable to using foreign comparators, which can fundamentally differ on factors outlined by Frontier above.

253. Debt markets overcome these issues by not being constrained to trading on a particular exchange. Debt instruments are typically traded over-the-counter between two parties instead of being listed and traded on an exchange. This means the instruments' risk exposure can be limited to the relevant economy, but still trade in foreign markets. Overcoming this constraint allows for a larger sample of observations which improves the robustness of cost estimates.

254. These issues are considered in more detail in subsequent chapters, within the context of the evaluation of the cost of equity and the cost of debt.

5.3.1.6 Role of non-financial market information and data

255. The ERA may consider non-financial market information and data such as the reports of analysts, experts and companies, agency statements, appraisals and quotes in developing values for parameters that remain fixed for the duration of the guidelines.[107]

5.3.1.7 Role of efficient markets

256. While there is ongoing academic debate on the efficiency of financial markets, the ERA considered the efficient markets model provides a framework that justifies the use of financial market observations to estimate the cost of capital. Financial market observations will be used to evaluate the efficient financing costs of the benchmark efficient entity.

257. The ERA considered that the extent to which foreign markets are considered should be guided by the principle that the risk of the asset being observed should stem from the economy in which the benchmark efficient entity is situated. Observations on equity will be limited to domestic markets on account of the need to quantify systematic risk, while observations on debt will be limited to those instruments where the country of risk is classified as Australia.

[106] Frontier Economics, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia: A report prepared for the AER*, July 2013, p. 93.

[107] The parameters that remain fixed for the duration of the guidelines are gearing, hedging and debt raising costs, credit rating, equity beta and the value of imputation credits (gamma).

5.3.2 Benchmark efficient entity

258. Identification of the benchmark efficient entity is central to the determination of the allowed rate of return objective of rule 87 of the National Gas Rules. The allowed rate of return objective is to be commensurate with the efficient financing costs of the benchmark efficient entity. It is therefore a requirement that the benchmark efficient entity have efficient financing costs. It is expected that the benchmark efficient entity would achieve this by structuring its finances so as to minimise its cost of capital, given the degree of risk of providing reference services. This requirement reflects the National Gas Rules and the allowed rate of return objective, and seeks to ensure that customers do not bear the costs of inefficient financing decisions by service providers.

259. Australian regulators have, to date, used the concept of the benchmark efficient entity when estimating the gearing ratio, the credit rating and the equity beta.

260. There is no definition of a benchmark efficient entity in the National Gas Rules. Therefore, in practice, there is a need to define the characteristics of the benchmark efficient entity. This involves establishing a conceptual definition for the benchmark efficient entity and then gathering evidence from actual ‘comparator’ entities which resemble the conceptual entity, as a means to inform the benchmark parameters for the cost of equity and the cost of debt.

5.3.2.1 Definition of the benchmark efficient entity

261. In the draft guidelines, the ERA defined the benchmark efficient entity as:

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

262. The financing practices of the benchmark efficient entity should be based on actual practices of firms operating in the market to ensure that the benchmark is attainable. The ERA will base its estimates of efficient financing costs on the observations from a sample of comparator firms that are judged to be similar to the single benchmark efficient entity for the provision of gas pipeline and network services in Australia.

263. This is the ‘pure-play’ method where the comparator is ideally in the same industry and single line of business.[108] In practice, this is not always possible and is addressed below.

5.3.2.2 Conceptual issues

264. The efficient benchmark need not reflect the actual financial characteristics of the service provider. Instead, the benchmark efficient entity should reflect attainable and efficient means of financing to deliver the reference services. This provides an incentive for the firm to move towards efficient benchmark financing through reducing costs and/or risk or profit from outperforming the benchmark by realising new cost efficiencies. If regulated allowances tracked the actual costs of the firm this may not be efficient if the firm is financed inefficiently. Even if the firm is efficiently financed,

108 Chartered Financial Analyst Institute, *Corporate Finance and Portfolio Management: Level 1 Volume 4*, Charlottesville, Virginia, Wiley, 2014, p. 53.

awarding actual costs would leave the firm with no profit incentive to further reduce costs.

265. A commonly applied approach involves averaging performance measures across similar firms to infer an attainable benchmark.[109] The ERA uses this as the basis for establishing benchmark efficient financing costs. The firms are similar in that they deliver services similar to reference services. The benchmark takes account of the degree of risk associated with that delivery. The National Gas Law and the National Gas Rules recognise that risk is a key consideration.

5.3.2.3 Implementation issues

266. In the past, the ERA has based its estimates of efficient financing costs on benchmark results from the average of a sample of comparator firms, for:

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

267. The benchmark must, as far as possible, reflect achievable financing practices, which reflect the practices of efficient firms exposed to a similar degree of risk as the regulated firm. By reflecting achievable financing practices, these benchmark efficient parameters will allow the service provider reasonable opportunity to attain costs close to those based on them.[110]

Interpretation of the word 'similar'

268. The requirement in the allowed rate of return objective is for the benchmark efficient entity to have a 'similar degree' of risk as that of the service provider providing the reference services. The term similar recognises the practicalities of approximating risk profiles. Provided that there is not a material difference between that of the benchmark efficient entity and that associated with providing the reference services, then this aspect of the allowed rate of return objective will be met.[111]

269. Here the consideration is the meaning of the term similar. Specifically, how wide is the range of allowed differences in the risks, while still being considered similar? Increasing the range would account for the inherent uncertainties in estimating risks, allow sample sizes to be increased and improve the quality of the estimates. However, allowing greater risk differences implies some increased probability that the risk profile of the service provider may have a material difference to the risk profile of the relevant benchmark entity. There is a trade-off between quality of estimates and relevance.

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[109] This is a form of 'Yardstick' regulation. See Shleifer, A., 'A theory of yardstick regulation', *Rand Journal of Economics*, vol. 16, no.3, 1985, pp. 319-327.

[110] The requirement that the firm have 'reasonable opportunity to recover at least the efficient costs the service provider incurs in providing reference services' is a requirement of the revenue and pricing principles in the National Gas Law: Part 3, Division 2, section 24(2) WA National Gas Access Law.

[111] Discussions with Moody's suggested that credit rating agencies evaluate such materiality quantitatively, without reference to a quantified threshold.

270. Uncertainty in estimation approaches, particularly when it comes to risk assessments, mean that the regulator should not fall into the trap of misplaced precision. The Australian Energy Market Commission, for example, suggested:

> ...the Commission recognises that if a regulator concluded that the risk characteristics of a benchmark efficient service provider are different between, for instance, electricity and gas service providers, there may be challenges in all cases in identifying sufficiently precise measurements of the quantum of the difference for determining the rate of return.[112]

271. The ERA therefore agreed with the AER, which has noted that larger samples are desirable, unless this would lead to a material bias in the efficient financing costs.

> A preference for large samples over close matches to the benchmark—this principle would suggest that all data should be included in the sample unless there was a very clear reason to expect that it would bias the end estimate. Using larger samples can minimise the shortcomings of individual data sources or data points. However, this needs to be weighed against the risk of using a large sample of data that is not reflective of the benchmark efficient firm. [113]

Public or private ownership

272. The benchmark efficient firm need not take ownership into account, be it public or private. Efficiency requires that risk adjusted cost of capital be the same for all firms in the economy. This means that efficient firms with the same or similar degree of risk must incur the same or similar risk adjusted capital costs. Put differently, the risk adjustment should be the same or of a similar magnitude.

273. In addition, to ensure competitive neutrality and reflect risk more appropriately state governments charge state-owned utilities a debt neutrality or loan guarantee fee over and above the rate that the state can borrow at.

274. Such adjustments recognise that, without the passing of risk to the government parent, the state-owned regulated firm would face the same cost of debt as a private sector regulated firm. Introducing a distinction between public and private ownership would violate the term ‘without parental ownership’ in the ERA’s definition of a benchmark efficient entity.

A single benchmark or multiple benchmarks

275. The allowed rate of return requires the regulator to account for risks associated with the provision of the reference services.

276. The ERA’s preference was to retain a single average benchmark efficient entity for gas pipeline and network service provision in the Australian domestic market. The use of multiple benchmarks degrades incentives to reduce costs by creating an incentive to attain the application of a different benchmark. Regulated network service providers in Australia are considered to have sufficiently similar risk in the provision of reference services to avoid the need for multiple benchmarks.

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112 Australian Energy Market Commission, *Rule Determination National Electricity Amendment (Economic Regulation of Service Providers) Rule 2012,* 2012, p. 67.

113 AER, *Rate of Return Guidelines Issues Paper*, 2012, p. 22.

277. For consistency between the ERA's estimate of equity beta and the benchmark credit rating, the ERA considered that the starting point is to form a benchmark sample from which the benchmark gearing level can be determined.

278. The ERA was of the view that companies included in the benchmark sample must have three characteristics in order to be useful as comparators for the benchmark efficient entity.

- The company must be a network service provider in the gas and/or electricity industry in Australia.
- The company must be listed so that the market value of its equity can be estimated using available data sources, such as Bloomberg.
- Data on the values of debt and equity must be available.

279. The ERA considered the length of time over which data should be analysed. Data for the analysis needs to be relatively recent so that it informs a view of current market conditions. For this purpose, a five-year period has been used.

280. The following four companies have satisfied the above three criteria.

- APA Group (APA AU Equity)
- Spark Infrastructure (SKI AU Equity)
- Duet Group (DUE AU Equity)
- SP AusNet Group (AST AU Equity).

5.3.3 Degree of risk associated with provision of reference services

281. The perceived degree of risk associated with the service provider in providing reference services is a key element in the cost of capital. The risks that matter for the investor, and hence for the rate of return, are the systematic risks. Systematic risk is discussed below.

282. The first step is to identify the range of risks and the second step is to classify whether those risks are systematic or non-systematic.

283. The next step is to assess whether the identified risks are material, and hence whether the risk needs to be accounted for in the rate of return. The perspective of the investor is important, as the rate of return is the compensation required to induce the investor to supply capital to the firm. This process can only be applied to the determination of parameters which have values fixed at the outset of the guidelines.

5.3.3.1 Defining risk

284. Under modern portfolio theory, the risk factors influencing the expected returns of a benchmark efficient entity can be separated into systematic risks and non-systematic risks. This is an important risk categorisation that helps to inform which risks should be compensated in the rate of return and those which are not.

285. Systematic risk stems from the market in which a firm operates and is often associated with prevailing economic conditions that will have an impact on all firms, to a greater or lesser degree.[114] Regulators need to be concerned with systematic risk in setting the rate of return, as this risk exposure is not diversifiable and will influence the risk-adjusted returns required by investors seeking to invest in the regulated firm. Systematic risks are key to the determination of the cost of equity.

286. Non-systematic risk, or diversifiable risk, on the other hand, is risk that is specific to the firm itself, or to the firm as part of a broader industry segment. Non-systematic risk can be either wholly or partially offset by an investor through an appropriately diversified portfolio.[115]

287. Debt investors may be concerned with systematic as well as non-systematic risk because both of these affect the probability of default on contracted payments of principal and interest.

- Conceptually the CAPM could also apply to debt markets and if it did then only systematic risks would be relevant.
- While conceptually the CAPM could apply in pricing debt, it is not practical to do so and is not necessary because the required rate of return on debt can be observed directly in the debt market.

5.3.3.2 Identifying and classifying risk

288. Major risks may be grouped as:

- revenue risk under the price cap regime applying to gas pipelines and networks
- input price risks
- financial risks
- political/regulatory risk.

Revenue risk

289. Various risks may contribute to variability in revenue, due to variability in pipeline or network throughput. These risks include:

- Upstream supply risk – reflecting the potential for the pipeline or network to become stranded.
- Operating risk – reflecting the potential for operational or technical problems to reduce throughput for a period of time.

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114 Under portfolio theory, the measure of systematic risk for a particular asset is its standardised co-variance with the overall market portfolio. This reflects the portion of variance in the asset's returns that are explained by the variance of the overall market.

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

- Competitive risk – reflecting the potential for competitive bypass or competing technologies or energy services to reduce demand for the pipeline or network services.

- Downstream demand risk – reflecting the composition of demand and its diversification.

290. Upstream supply risk will be unique to the particular pipeline or network. Some elements of supply risk will be within the control of the entity itself, for example related to decisions on the size of the pipeline or network. In this case, shareholders should bear the risk. Additionally, an investor may diversify across pipelines to reduce the risk of adverse supply shocks. As a consequence, upstream supply risk in general should not be compensated through the rate of return.

291. Operating risks also are within the control of the entity. Operational risk may be reduced or eliminated through appropriate expenditure on capital equipment and maintenance. Operating risks in general should not be compensated through the rate of return.

292. Competitive risks will be unique to the entity, but the risk should be able to be diversified by the investor through holding a portfolio of assets. For example, to the extent that the demand for gas from a transmission pipeline is reduced by new technology, such as solar power, the investor may invest in that industry. Similarly, to the extent that competitive bypass is possible, then the investor could invest in the bypass itself, or in the industries that would benefit from the bypass. On this basis, competitive risk in general should not be compensated through the rate of return.

293. Downstream demand risk can be outside the control of the firm, and therefore exogenous and systematic. Indeed, there will be a part of the volatility in revenue which does reflect systematic demand risk faced by all firms in the economy. Such demand risk will be reflected in the variability of returns on equity, which is captured through models such as the CAPM.

294. However, some proportion of demand risk may be diversifiable. An example might be a gas transmission pipeline, which is heavily exposed to a small set of commodity prices. The risk faced by this pipeline is for a significant demand decline if commodity prices fall and downstream customers fail. However, this risk may be diversifiable to an extent by the investor. To continue the example, a non-systematic downturn in commodity prices, say reflecting a large increase in supply capacity, may be offset by higher returns in other sectors of the economy, as businesses that use the commodity as an input experience lower cost structures.

295. In general, to the extent that revenue risk is diversifiable, it should not be compensated in the rate of return. Systematic revenue risk will relate to the demand conditions in the economy, which are captured by models of the return on equity.

Input price risk

296. The main input price risks may be grouped as:

- Input cost increases – whether due to industry, regional, or international cost increases, including those arising from exchange rate risks. These are specific to a input factor and may affect operating costs and investment costs. For example, this could include an industry and geographic specific labour cost escalator.

- Inflation costs increases – result from a broader basket of costs. The eight city weighted average Consumer Price Index (CPI) is generally used for inflation.

297. Industry or regional input cost risks should be diversifiable by investing in other industries or other regions. To the extent that input costs to an industry or region are rising, then investors can diversify into other industries or regions.

298. Given its broad nature, inflation cost risk is more systematic and not diversifiable.

299. Under the regulatory framework cost increases are treated as follows:

- Specific input costs for operating and capital expenditure for the regulated firm are part of the revenue building blocks to ensure the best available nominal forecasts.

- General inflation forecasts are used to escalate other parts of the building blocks. This inflation adjustment helps ensure that the regulatory asset base maintains its value in nominal terms.

- During the regulatory period, tariffs are varied to update for actual inflation, that is, through the regulatory period the expected inflation is displaced with the actual inflation outcome in each year.

- Tariffs are not adjusted for actual variations in specific input costs. For example, a regulated entity would gain or lose from any variation from its initial forecast operating expenditure input cost escalators.

300. To the extent actual changes to operating and capital expenditure input escalators differ from general inflation there remains some exposure. However, this input price exposure should be diversifiable.

301. Given the update for actual inflation, exposure to general inflation is minimal.

302. These risks in general should not be compensated through the rate of return.

Financial risks

303. The main financial risks may be grouped as:

- refinancing risks

- interest rate mismatch risks

- liquidity risks

- default risks.

304. Refinancing risk is the possibility that the firm will not be able to roll over its debt when its existing facilities end. Firms tend to manage this risk by reducing the amount of debt that needs to be refinanced at any point in time by diversifying the sources of debt, and staggering the timing of debt issuances. This gives a portfolio of debt comprising different instruments with different terms to maturity, which allows the firm to reduce refinancing risks. The investor may further reduce this risk by diversifying across firms. Nevertheless, some level of refinancing risk will remain, related to general economic conditions, and this will need to be compensated. Typically, this risk is captured in the debt risk premium applied to the regulated firm.

305. Interest rate mismatch risks, or alternatively interest rate re-pricing risks, refer to the possibility that the firm when it refinances will face interest rates that diverge from those underpinning its pricing, and hence revenue. All firms face this risk, to a greater or less degree. Firms may manage these mismatch risks by hedging, which will reduce the degree of mismatch.

306. Liquidity risks are the ability or otherwise to trade an asset at any particular point in time. The less liquid an asset, the more risky, and the higher rate of return that is likely to be required to hold that asset. This liquidity premium required by the investor in the regulated firm will be influenced by the liquidity in markets more generally. As a result, there is a systematic component in liquidity risk, which will be captured in the debt risk premium.

307. Default risk will be influenced by:

- the capacity to generate cash flows from operations
- the volatility in those cash flows
- debt coverage – given by the ratio of cash flows to interest and principal payments.

308. Default risks arise from the possibility that the firm may run into cash flow difficulties, such that it is unable to meet its financial obligations and becomes insolvent. All firms face this risk to some degree. Default risks are reduced where cash flows are stable and provide good coverage of expenses. Credit ratings agencies assess the potential for a firm's default based on a range of indicators, including the appropriateness of the firm's level of gearing. Other considerations can relate to the operating environment, including sovereign and regulatory risk, as well as the scale and complexity of operations.[116] These credit ratings are a main component informing the debt risk premium required by lenders.

309. All firms face these financial risks to a greater or lesser degree. However, some financial risks can be managed through the use of a portfolio, reducing the requirement for compensation through the rate of return. Other financial risks, that cannot be managed or prudently reduced by the firm or investor, will need to be compensated. The resulting financing costs will be efficient.

Political and regulatory risk

310. The main political and regulatory risks may be grouped as:

- policy changes that may affect input costs
- regulatory framework changes, which, for example, may affect prices and revenue.

[116] The size of the entity may influence the scale and complexity of operations, as well as liquidity or the ability to engage effectively with financial markets. However, as observed by Frontier Economics in its Discussion Paper for the AER, 'even if the cost of capital is related negatively to business size, there is no compelling extant theory that explains such a relationship. This makes it difficult to judge to what extent the relationship is applicable to specific sectors, such as regulated utilities' (Frontier Economics 2013, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia: A discussion paper prepared for the AER*, provided as part of workshop materials, p. 30). Where a smaller operation involves increased costs of engaging with financial markets, then these can be addressed in operating costs, rather than through the rate of return.

311. All firms in the economy face the risk of policy change. For example, a change in corporate taxation rates would be reflected in input costs, as markets adjust prices to fully or partially account for changes in tax expenses. A change in taxation rates would also affect after-tax profitability. As such, this is systematic risk. Such systematic risk needs to be compensated. However, it is possible that such risk could be transmitted through interest rate risk and the other financial risk elements, as it is faced by all firms in the economy.

312. The utility regulatory framework can have an effect on the risks perceived by the investor - for example, the effectiveness of governance arrangements and the associated quality of utility regulation.

313. However, such risks will be one of a range of regulatory requirements placed on the firm. The utility will also face other regulation and policy constraints, for example regulation of labour practices or environmental practices, which will be common with those constraints for other firms operating elsewhere in the economy.

314. Other elements of the utility regulatory framework may manifest elsewhere in the risk matrix. For example, the type of regulatory control – whether revenue cap or price cap – may influence the extent of demand risk for the regulated firm.

315. Overall, the possibility of future changes in the regulatory framework poses a risk for the investor. Such risks may be mitigated by good regulatory governance, for example, by ensuring that adequate notice is provided of change. In addition, provision for transitional arrangements where appropriate may also help to increase certainty and reduce the compensation required for these risks.

316. A significant proportion of regulatory risk will be diversifiable by the investor. This is because any change which increases (or decreases) the relative profit of the regulated firm will tend to reflect decreases (or increases) in the prices of the reference services, decreasing (or increasing) costs to other firms, and hence offsetting changes in returns. As a result, regulatory risk is likely to be a reasonably small consideration in the investor's requirement for the rate of return, provided that the regulatory regime is reasonably stable. Such risk is likely to be picked up as part of broader sovereign risk, as it will reflect investor's perceptions of the general standards of policy and government.

5.3.3.3 Role of risk

317. The starting point for the ERA's considerations of risk will be the benchmark efficient entity.

318. The ERA will use its judgment to determine whether it needs to adjust the parameters, the return on equity, the return on debt or the overall rate of return, relating to the benchmark efficient entity, in order to account for any material differences in risk.

5.4 Public submissions

319. ATCO's submission considered the benchmark efficient entity. ATCO accepted that the draft guidelines need to establish a conceptual definition for the benchmark efficient entity because the conceptual definition recognises the regulatory and commercial risk, consistent with the revenue and pricing principles.[117]

320. No public submissions objected to the ERA's draft approach to the benchmark efficient entity.

321. Submissions raised that regulated gas pipelines were materially distinct from regulated electricity network businesses, and that the method for estimating the rate of return for gas pipelines should reflect this.[118] [119]

5.5 Independent Panel

322. The Independent Panel considered that some brief explanation of the components of the definition of the benchmark efficient entity would be helpful when the definition is first presented.

323. The Independent Panel noted that another issue with the choice of a benchmark based on existing firms is that it assumes that the existing technology is an appropriate benchmark. However, the Independent Panel did not consider this a problem because the regulatory arrangements may still provide a sufficient incentive to innovate and reduce costs provided the benefits from doing so can be retained for a sufficiently long period. The Independent Panel noted that this also may not be an issue for the regulated gas pipelines.

324. The Independent Panel considered that markets need not be perfectly efficient. Rather the concept of effectively competitive or workably competitive has been used in economic regulation and competition matters as a benchmark for providing useful information and that provided markets are workably competitive the market information they provide can be used in making various policy and regulatory decisions and may be the best source of information.[120]

5.6 Final approach

5.6.1 Efficient financing costs

325. Financial markets provide observations that can be used to estimate the efficient financing costs of the benchmark efficient entity.

326. The ERA prefers observations based on market outcomes to other types of information on the premise that markets provide useful information that sufficiently reflects efficient outcomes.

[117] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 5.

[118] APAG, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, p. 1.

[119] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 5.

[120] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 19.

327. The ERA considers that the risk for the assets observed should stem from the economy in which the benchmark efficient entity is situated.

5.6.2 The benchmark efficient entity

328. The ERA defines the benchmark efficient entity as:

> An efficient 'pure-play' gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services. [121]

5.6.3 Similar risk in the provision of reference services

329. The ERA will base its estimates of efficient financing costs on the results from a sample of comparator firms with efficient financing costs that are judged to be 'similar' to a single benchmark efficient entity for the provision of gas pipeline and network services in Australia. This means that comparator firms need not operate in the transmission and/or distribution of gas, but must have operations that are comparable. The sample is established and used to inform the value of firm-specific WACC parameters which remain fixed until the next rate of return guideline review.[122]

5.7 Final reasoning

330. In addition to considerations in its draft reasoning, the ERA has also given further consideration to the benchmark efficient entity in response to public submissions and Independent Panel comment.

5.7.1 Efficient financing costs

331. Financial markets provide observations that can be used to estimate the efficient financing costs of the benchmark efficient entity.

332. The ERA notes the Independent Panel's commentary on the concept of effectively competitive or workably competitive markets.

333. The ERA supports the view that markets do not have to be perfectly efficient to provide useful information to provide value in decision making. Rather, effectively competitive or workably competitive markets may be the best source of information, which can be used as a benchmark that provides useful information that can be used in making policy and regulatory decisions.

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[121] This definition has changed from the previous Rate of Return Guidelines which used the term 'An efficient 'pure-play' regulated gas network'. This definition still allows the ERA to use either regulated or non-regulated businesses for our benchmark sample, which was specifically endorsed by the Federal Court. See Federal Court of Australia, *Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 and Australian Energy Regulator v Australian Competition Tribunal (No 3) [2017] FCAFC 80*, 24 May 2017, [536] for more details.

[122] The term 'firm' here refers to the benchmark efficient firm. Firm specific parameters are those that are specific to the benchmark efficient firm. These include gearing, equity beta, credit rating, debt risk premium and hedging costs. In contrast, market wide parameters are those that are observed across the economy's markets more broadly. These include the nominal risk free rate of return, inflation, interest rate swap rate, gamma and the market risk premium.

334. The ERA continues to prefer observations based on market outcomes to other types of information on the premise that markets provide useful information that sufficiently reflects efficient outcomes.

335. The ERA considers the guiding principle should be that the risk for the assets observed should stem from the economy in which the benchmark efficient entity is situated.

5.7.2 Definition of benchmark efficient entity

336. The ERA defines the benchmark efficient entity as:

> An efficient 'pure-play' gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services. [123]

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

- Efficient may be interpreted to mean efficiency in its broad economic sense, consistent with the national gas objective, the revenue and pricing principles, and the allowed rate of return objective.
- A 'pure-play' business focuses exclusively on gas pipeline services. This thereby solely reflects the risk in the provision of gas pipeline services and does not reflect the provision of any other business activities that may have a different risk profile.
- 'Gas network business' 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. The ERA considers that this is consistent with its 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 risk, 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 reference services' is intended to recognise the difference in the risk profile of the reference services.

[123] This definition has changed from the previous Rate of Return Guidelines which used the term 'An efficient 'pure-play' regulated gas network'. This definition still allows the ERA to use either regulated or non-regulated businesses for our benchmark sample, which was specifically endorsed by the Federal Court. See Federal Court of Australia, *Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79 and Australian Energy Regulator v Australian Competition Tribunal (No 3) [2017] FCAFC 80*, 24 May 2017, [536] for more details.

5.7.3 Single benchmark entity

338. AGPA raised that regulated gas pipelines are materially distinct from regulated electricity network businesses, and that the method for estimating the rate of return for gas pipelines should reflect this.[124]

339. ATCO noted that over time, the degree of risk faced by a pure play gas distribution business may increase relative to a pure play electricity network due to the increasing contestability of gas connection points and appliances.[125]

340. The allowed rate of return requires the regulator to account for risks of providing the reference services.

341. The ERA continues to define the benchmark efficient entity as:

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

342. The ERA continues to support a single 'average' benchmark efficient entity for gas pipeline and network service provision in the Australian domestic market.

343. The ERA considers that gas pipelines are similar to other Australian energy networks. Regulated Western Australian gas pipelines operate under a similar regulatory framework to other Australian energy networks. Both gas and electricity service providers face limited competition risk by virtue of being regulated monopolies.

344. In the AER's expert session there was no agreement on whether different benchmarks were warranted. Partington noted difficulty in reliably measuring the risk differences, Johnstone noted the possibility of upside risks and Gray noted there may be discussions needed on whether risks are partially non-systematic.[126]

345. Consistent with its approach to developing a benchmark sample, the ERA uses the best available comparable firms of Australian energy networks. The ERA's benchmark sample includes those available from Western Australian gas pipelines.

346. The use of multiple benchmarks diminishes incentives to reduce costs by creating an incentive to attain the application of a different benchmark tailored to a specific business. For example a distinction between transmission or distribution services, or by geographic characteristics.

347. For the final guidelines, the ERA considers regulated network service providers in Australia have sufficiently similar risk in the provision of the reference services to avoid the need for multiple benchmarks.

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[124] AGPA, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, p. 1.

[125] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 5.

[126] Cambridge Economic Policy Associates*, Rate of Return Guideline Review – Facilitation of Concurrent Expert Evidence Expert Joint Report,* April 2018, p. 49.

5.7.4 Implementation issues

348. The efficient benchmark need not reflect the exact financial characteristics of the service provider. Instead, the benchmark efficient entity should reflect the most efficient financial means to deliver the reference services. This provides incentive for the firm to move towards efficient financing, or to improve on those outcomes, in the risk/cost of capital trade-off.

349. The efficient finance practices of the benchmark efficient entity should reflect the actual practices of comparator firms operating in the market with efficient financing costs.[127]

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

351. The process of developing benchmark estimates involves observing the efficient financing practices of a set of businesses which are similar comparators for the benchmark.

352. The ERA will base its estimates of efficient financing costs on the results from a sample of comparator firms with efficient financing costs that are judged to be ‘similar’ to a single benchmark efficient entity for the provision of gas pipeline and network services in Australia. This means that comparator firms need not operate in the transmission and/or distribution of gas, but must have operations that are comparable.

353. The ERA considers that companies included in the benchmark sample must have three characteristics in order to be useful as comparators for the benchmark efficient entity.

- The company must be a network service provider in the gas and/or electricity industry in Australia.
- The company must be listed so that the market value of its equity can be estimated using available data sources, such as Bloomberg.
- Data on the values of debt and equity must be available.

354. The ERA acknowledges that the firms in its comparator set have varying characteristics. The ERA takes this into account when exercising its regulatory judgement in determining benchmark parameters. The ERA considers the comparator set is the best available.

355. For consistency between the ERA’s estimate of equity beta and the benchmark credit rating, the ERA considers that the starting point is to form a benchmark sample from which the benchmark gearing level can be determined.

356. The ERA then uses this benchmark sample to inform its estimates of specific WACC parameters.

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

6. Gearing

6.1 Background

357. 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 so is generally expressed as follows:

$$Gearing = \frac{Debt}{Debt + Equity}$$ equation 4

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

359. Under the National Gas Rules, the allowed rate of return for a regulatory year should be a weighted average of the return on equity for the access arrangement period in which that year occurs and the return on debt for that year.[128]

360. 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 in determining an appropriate credit rating for deriving the debt risk premium.
- To determine interest and tax expenses in a post-tax revenue model.

6.2 Draft approach

361. The target gearing is the relevant gearing level in the cost of capital. In the draft guidelines, the ERA considered that target gearing should be determined from observations of the gearing level of firms in the benchmark sample of Australian utility businesses.

362. The average gearing of the benchmark sample determines the benchmark efficient level of gearing.

363. The ERA observed trends in average gearing across various definitions of debt and equity and examined the drivers of the results. The ERA's recent analysis, using the updated data to 2017, indicates that a benchmark gearing level of 55 per cent debt is appropriate. This value is fixed until the next review of the guidelines.

[128] National Gas Rules 87(4).

6.3 Draft reasoning

364. Theoretically, market gearing should be used for equity beta derivation and WACC calculation. However, in practice, the market value of debt is not observable, as it is not as frequently traded as market equity. Given the book value of debt is an acceptable proxy for market debt,[129] this led to the ERA's preference of a hybrid approach in estimating market gearing by using the book value of debt and market values of equity averaged over five years.

365. The ERA placed more reliance on the use of market value gearing estimates, compared to book value estimates. Market value gearing estimates, where available, are preferred as they reflect the market's current information on the efficient financing of the benchmark entity. This gearing can then be used to inform the setting of efficient financing costs for the upcoming regulatory period. Book values, however, are a historical measure and not necessarily representative of forward looking values.

366. This is consistent with Henry's market approach to estimating equity beta, which uses gearing to de-lever and re-lever beta estimates, and the five-year observation period over which equity beta is measured.

367. This measure indicates a pronounced decline in gearing since late 2009. This is mainly driven by firms in the benchmark sample experiencing strong share price growth from around 2009.

368. Alternative book value based measures of gearing exhibit a slight decline. These measures suggest that gearing has declined slightly since 2008.

369. Other regulators' decisions are based on analysis that uses a longer 10-year period or analysis that pre-dates December 2013. The ERA considers these are out of date or not as relevant to gearing decisions over the coming years.

370. Since the decline in the market value gearing measure is so pronounced, the ERA's preference is to reduce gearing from the long held value of 60 per cent.

371. In the past, the ERA and the AER have periodically reviewed gearing.[130] Although the outcome has been to apply a value of 60 per cent, it does not automatically follow that the gearing must be held constant at this value, particularly if evidence suggests otherwise. Appropriately incorporating new information on gearing as it becomes available helps to avoid a number of well documented analytical biases such as anchoring and adjustment, conservatism, availability, confirmation and status quo.[131] It also helps to avoid larger changes or 'shocks' if declining trends continue. For example, making small adjustments at each review can avoid shocks resulting from large delayed adjustments that fail to incorporate new information as it becomes available.

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129 Lally, M., Review of the AER's views on gearing and gamma, p. 3.

130 AER, *Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, pp. 111-125.

AER, *Explanatory statement: Rate of return guideline appendices*, December 2013, pp. 126-130.

ERA, *Explanatory statement for the rate of return guidelines*, December 2013, pp. 44-52.

131 Epley, N. and Gilovich, T., 'Putting adjustment back in the anchoring and adjustment heuristic: Differential processing of self-generated and experimenter-provided anchors, *Psychological Science*', vol. 12, no. 5, 2001, pp. 391-396.

6.3.1 Theoretical considerations on optimal capital structure

372. A firm's capital structure affects the cost of debt and equity within the WACC independently. The optimal capital structure should minimise the cost of capital thereby maximising the value of the firm. Optimal capital structure choices differ across industries, as well as for different companies within the same industry.

373. Three preeminent theories that attempt to explain optimal capital structure are: the static trade-off theory, the pecking order theory and equity market timing hypothesis.[132]

374. *Static trade-off theory* stems from the propositions of Modigliani and Miller (MM) which are cast in both a *no tax* and *with tax* setting.[133]

375. The starting point is based on an unrealistic *no tax* assumption. MM Proposition I asserts that capital structure is irrelevant.[134] When the tax benefit to the firm from interest deductibility is assumed away, capital structure becomes irrelevant. Investors can apply financial leverage themselves through borrowing funds to purchase equity and so leverage at the firm level is of no value to investors. The total value of a firm is simply equal to the market value of the free cash flows generated by its assets, which is not affected by how they are funded.[135] MM Proposition II under the no taxes assumption asserts that the cost of equity increases linearly with increased debt. Debt is typically lower cost than equity because its senior claim over firm assets reduces risk. The benefit from the increased use of relatively cheap debt financing is perfectly offset by the linear increase in the cost of equity. The cost of equity increases as a result of leverage increasing the risk to shareholders.

376. Introducing taxes changes MM Proposition I – capital structure becomes relevant and firm value is maximised using 100 per cent debt financing. The tax benefit (or shield) to the firm from interest deductibility adds value to investors. With taxes, MM Proposition II asserts that the cost of capital is minimised at 100 per cent debt as a result of the greater tax shield lowering the WACC.

377. The MM propositions ignore the costs of financial distress. These costs include those directly associated with going into bankruptcy/administration and indirect costs such as investment opportunity costs and impairment of goodwill. The static trade-off theory recognises the trade-off between maximising firm value using the benefit of the tax shield on debt and increased costs of financial distress that come with increased leverage. The optimal capital structure balances these considerations to maximise firm value. This is shown diagrammatically in Figure 1.

Hilbert, M., 'Toward a Synthesis of Cognitive Biases: How Noisy Information Processing Can Bias Human Decision Making', *Psychological Bulletin*, vol. 138, no.2, pp. 211-237.

Samuelson, W. and Zeckhauser, R., 'Status quo bias in decision making', *Journal of Risk and Uncertainty*, vol. 1, no. 1, 1988, pp. 7-59.

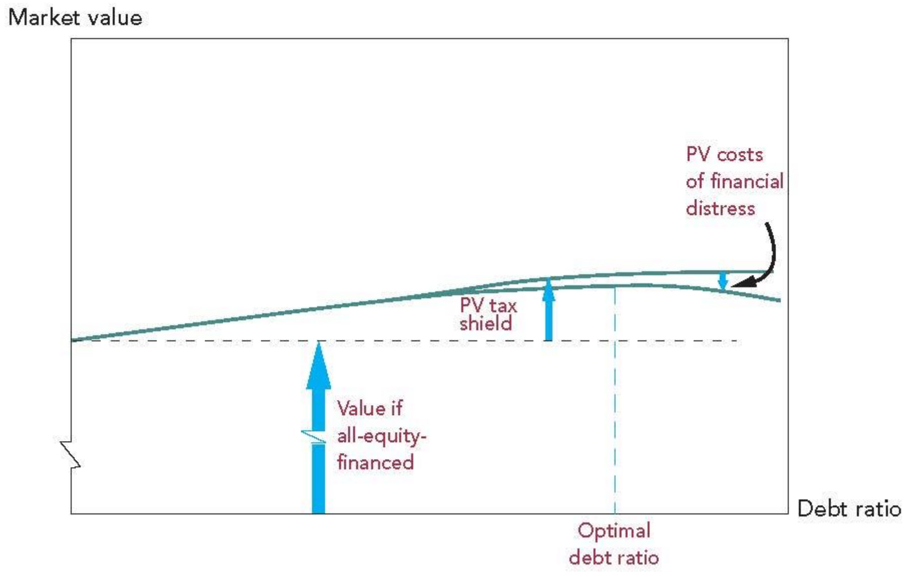
[132] Zhou, Q., Tan, K., Faff, R. and Zhu, Y., 'Deviation from target capital structure, cost of equity and speed of adjustment', *Journal of Corporate Finance*, vol.39, pp. 99-120.

[133] Additional assumption include no transaction or bankruptcy costs, homogeneous investor expectations, riskless borrowing and lending, no agency cost and that operating income is not affected by financing decisions.

[134] Berk, J., DeMarzo, P. and Harford, J., *Fundamentals of Corporate Finance*, Pearson International, 2008, p. 489.

[135] Modigliani, F. and Miller, M., 'The Cost of Capital, Corporation Finance and the Theory of Investment', *American Economic Review*, 1958.

Figure 1 Static Trade-Off Theory



Source: Brealey, Myers, Allen, Corporate Finance, eighth edition

378. *Pecking order theory* assumes that firm management makes financing choices based on the signalling of management knowledge to investors. Financing through the use of retained earnings is least likely to signal investors and is therefore management's most preferred source of financing. Issuing debt signals that management is confident in the firm's ability to meet future interest and principal payments and so is next most preferred. Issuing equity is typically seen as a signal that management views the firm's stock as being overvalued and so is least preferred. This implies that retained earnings are depleted before debt is issued and that issuing equity is a last resort. The firm's capital structure is therefore an artefact of the many financing decisions made according to this *pecking order*.[136]

379. The *equity market timing hypothesis*, in contrast to pecking order theory, proposes that firm's management observe market conditions and subsequently issue equity instead of debt when the market value of equity is high compared to book value and historical values. Conversely, firms repurchase equity when the market value is low.[137]

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136 Barclay, M. and Smith, C., 'The Capital Structure Puzzle: The Evidence Revisited', *Journal of Applied Corporate Finance,* April 2005.

137 Baker, M. and Wurgler, J., 'Market timing and capital structure', *The Journal of Finance*, vol.57, no.1, 2002, pp. 1-2.

6.3.2 Practical considerations

380. While the firm's management knows the target capital structure, outside observers typically do not. Observed gearing at a given point in time can deviate from a company's target capital structure. This is because market values of outstanding securities used to measure gearing frequently change in value, market conditions change the feasibility of issuing capital or change the feasibility of issuing debt relative to equity, and issuance costs encourage infrequent but large capital raisings. More recent literature examines the dynamics of adjustment toward the target capital structure over time instead of assuming a static framework.[138]

381. The method of accounting for investments in associates can reduce the comparability of debt reported in firms' balance sheets. The method used depends on the investing firm's ability to control the investee where percentage of firm ownership in the investee is typically used as a proxy for firm control. This can complicate the estimation of the true target gearing level for each firm in the benchmark sample and thus, the benchmark firm. Adjustments should be made to ensure financial information in firm's balance sheets is comparable.

6.3.3 Other Regulators' estimates of the benchmark gearing

382. Recent decisions by Australian regulators on gearing are presented in Table 5.

Table 5 Benchmark gearing in the Australian regulatory decisions

Regulator	Year	Industry	Gearing
AER[139]	2018	Electricity	60%
ERA[140,141]	2018, 2017	Electricity and water	55%
QCA[142]	2018	Water, sewerage, stormwater drainage and other services	60%
IPART[143]	2018	Water, sewerage, stormwater drainage and other services	60%
ESCOSA[144]	2016	Water, sewerage, stormwater drainage and other services	60%

Source: Compiled by the ERA

138 For example, Zhou et al examine whether the sensitivity of the cost of equity to deviation from the target capital structure influences the speed at which gearing adjusts back toward target. See Zhou, Q., Tan, K., Faff, R. and Zhu, Y., 'Deviation from target capital structure, cost of equity and speed of adjustment', *Journal of Corporate Finance*, vol.39, pp. 99-120.

139 AER, *ElectraNet transmission final determination 2018-23 – Overview,* April 2018, p. 21.

140 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 – Return on Regulated Capital Base*, September 2018, p. 91.

141 ERA, *The efficient costs and tariffs of the Water Corporation, Aqwest and Busselton Water*, November 2017, pp. 337-343.

142 Queensland Competition Authority, *Seqwater Bulk Water Price Review 2018-21,* March 2018, p. 59.

143 Independent Pricing and Regulatory Tribunal, *WACC Biannual Update*, February 2018, p. 4.

144 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 125.

383. Australian regulators have consistently used a gearing assumption of 60 per cent for the cost of capital in the provision of various utility network services. This figure has been arrived at through directly observing gearing data for a benchmark sample of energy and water utilities in Australia and overseas, observing the actual gearing of the regulated entity in question and observing other regulators' decisions.

384. Gearing applied in some of the decisions in Table 5 that are not based on actual gearing can be traced back to a few key sources. These include the ERA and the AER 2013 rate of return guidelines, Lally's 2011 report on the estimated WACC for the QCA and the ERA 2013 Water Inquiry.[145]

385. In addition, other regulators have used a longer term 10-year period to estimate gearing levels.

386. The AER is currently undertaking a review of its rate of return guidelines.[146]

387. Other regulators' decisions can be used to cross-check the ERA's estimates. However, caution must be applied because following other regulators' decisions without understanding how the estimates are arrived at can result in a number of biases including:

- Anchoring and adjustment - relying too heavily on the original estimate and making insufficient subsequent adjustments to arrive at the correct result.
- Conservatism – relying too little on new information.
- Availability – placing too much weight on readily available information by discounting that which is difficult to access or understand.
- Confirmation – selectively valuing information that confirms beliefs and devaluing information that does not.
- Status quo – a predisposition to forego options that may bring about change.[147]

388. While the ERA considered the outcomes of the AER's review relevant to its own review of gearing, the values from the above referenced sources are not directly applicable to the ERA's assessment of gearing.

389. The ERA therefore used its review of current gearing data to determine a benchmark gearing level.

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145 AER, *Better Regulation, Explanatory Statement Rate of Return Guideline*, December 2013, p. 9.

ERA, *Explanatory Statement for the Rate of Return Guidelines, meeting the requirements of the National Gas Rules*, December 2013, p. 44.

ERA, *Inquiry into the efficient costs and tariffs of the Water Corporation*, Aqwest and the Busselton Water Board: Revised final report, March 2013, pp. 59-60.

Lally, M., *The estimated WACC for the SEQ Interim Price Monitoring*, January 2011, pp. 11-16.

146 AER, *Review of rate of return guideline*.

147 Epley, N. and Gilovich, T., 'Putting adjustment back in the anchoring and adjustment heuristic: Differential processing of self-generated and experimenter-provided anchors', *Psychological Science*, vol. 12, no. 5, 2001, pp. 391-396.

Hilbert, M., 'Toward a Synthesis of Cognitive Biases: How Noisy Information Processing Can Bias Human Decision Making', *Psychological Bulletin*, vol. 138, no.2, pp. 211-237.

Samuelson, W. and Zeckhauser, R., 'Status quo bias in decision making', *Journal of Risk and Uncertainty*, vol. 1, no. 1, 1988, pp. 7-59.

6.3.4 The ERA's estimates of the benchmark gearing

390. A regulatory gearing estimate contributes to a rate of return that reflects efficient financial costs for the next regulatory period.

391. Gearing requires estimates of the value of a firm's debt and equity, which can be obtained from a firm's financial statements or from market values of traded debt and equity securities.

392. In principle, the values of debt and equity should be obtained from the same information source, that is, obtained from either book or market data. However, liquidity limitations restrict the ability to source market data for debt securities and a proxy may have to be used.

393. To calculate gearing, the ERA used:

- Comparator firms in its benchmark sample of firms.
- A market based gearing level to reflect efficient financing.
- Gearing observed over a five-year period. This is consistent with the averaging period used for other parameters. Using inconsistent measures of gearing for de-levering and re-levering can result in under or overestimated equity betas in the Henry approach.
- Gearing estimates observed on an annual basis from financial statements and market data.
- A market value of equity equal to a firm's market capitalisation, which is equal to the share price multiplied by volume of shares issued.
- The book value of debt as a proxy, as the availability of market values of debt is limited. The book value of debt was calculated from current and non-current borrowings from financial statements.
- Debt at a gross level. That is, no deduction was made for cash or marketable securities. Gross debt was used as it was not possible to determine whether cash equivalents were used to repay debt or pay dividend.[148] In addition, an efficient network business would have some cash as part of its optimal asset mix.
- Debt adjusted to incorporate a firm's investments in associates and its associated debt, which may not have been reported on the firm's balance sheet. Debt from associates was added to parent debt in line with proportional ownership. For example, Spark Infrastructure was adjusted for its investments in SA Power Networks, Victoria Power Networks and TransGrid.
- Debt and equity adjusted to recognise the nature of hybrid securities. That is, hybrid securities which have equity characteristics were removed from debt. For example, some of Spark Infrastructure's loan notes were denoted as a debt product but have equity characteristics.

[148] Lally, M., Review of the AER's views on gearing and gamma, May 2018, p. 4.

394. In its February 2018 discussion paper on gearing, the AER detailed some of these practical considerations of calculating gearing.[149]

395. The ERA has observed trends in average gearing across various definitions of debt and equity and examined the drivers of the results.

396. The ERA's analysis, using the updated dataset to 2017, indicated that the estimated benchmark gearing level has reduced to 55 per cent.

397. Table 6 details the gearing for the benchmark entity based on market values.

Table 6 ERA market value gearing estimates

	APA	AST	DUE	SKI	Average
2008	73%	59%	76%	70%	69%
2009	69%	70%	80%	70%	72%
2010	54%	64%	80%	65%	66%
2011	54%	64%	79%	62%	65%
2012	47%	59%	72%	59%	59%
2013	46%	57%	71%	62%	59%
2014	45%	58%	64%	55%	55%
2015	50%	59%	62%	56%	57%
2016	49%	57%	51%	54%	52%
2017	49%	52%	-	52%	51%
5 year average	**48%**	**56%**	**62%**	**56%**	**55%**

Source: Annual reports, Bloomberg, ERA Analysis

398. The gearing levels of all firms in the benchmark sample have been declining over time. The gearing for three of the four firms in the benchmark sample is less than the benchmark gearing of 60 per cent established in the previous guidelines.[150]

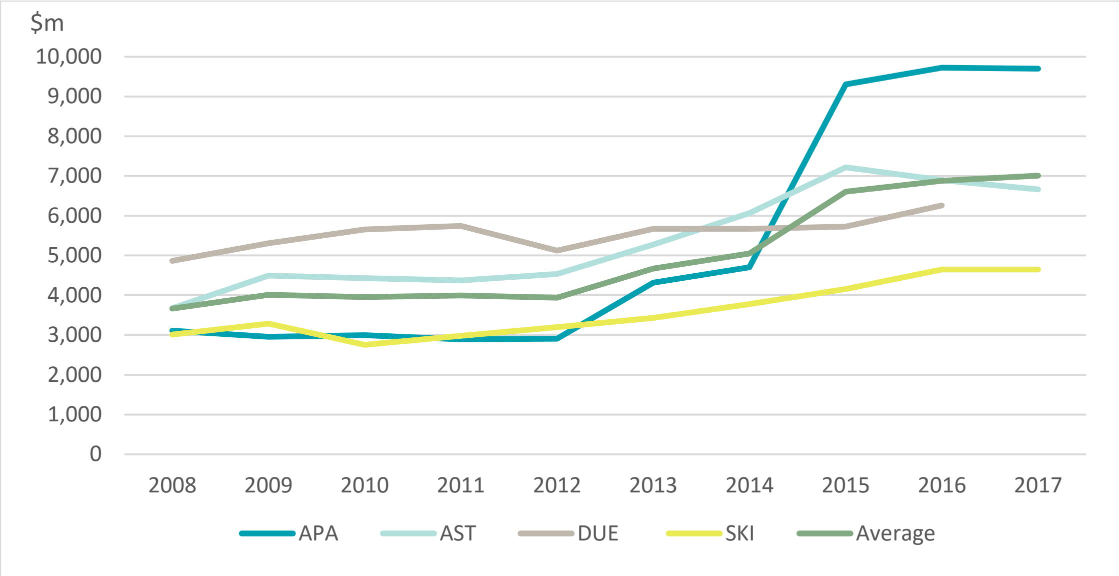
399. The downward trend can be the result of market capitalisation increasing, the book value of debt decreasing or both of these factors.

400. Figure 2 shows that debt levels have increased across the sample on average over most of the five year period from around $4.7 billion in 2013 to $7.0 billion in 2017.

149 AER, *Discussion Paper - Gearing*, February 2018.

150 ERA, *Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, 16 December 2013, p. 13.

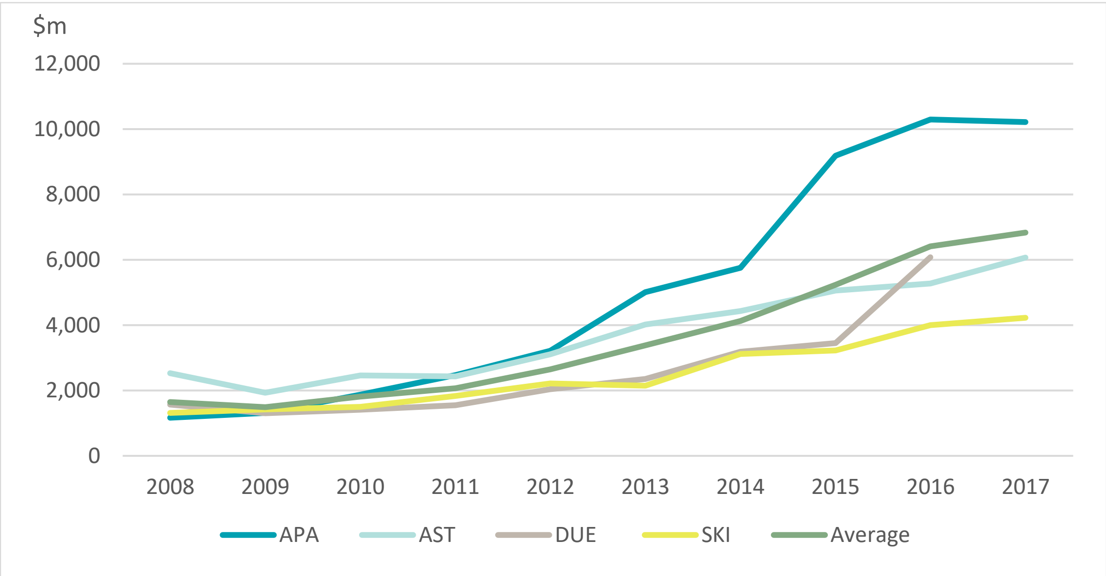
Figure 2 Benchmark firms' book value of debt



Source: Annual reports, ERA Analysis

401. Figure 3 shows that market capitalisation has increased across the sample on average over most of the five year period from around $3.4 billion in 2013 to just under $6.8 billion in 2017.

Figure 3 Benchmark firms' market capitalisation

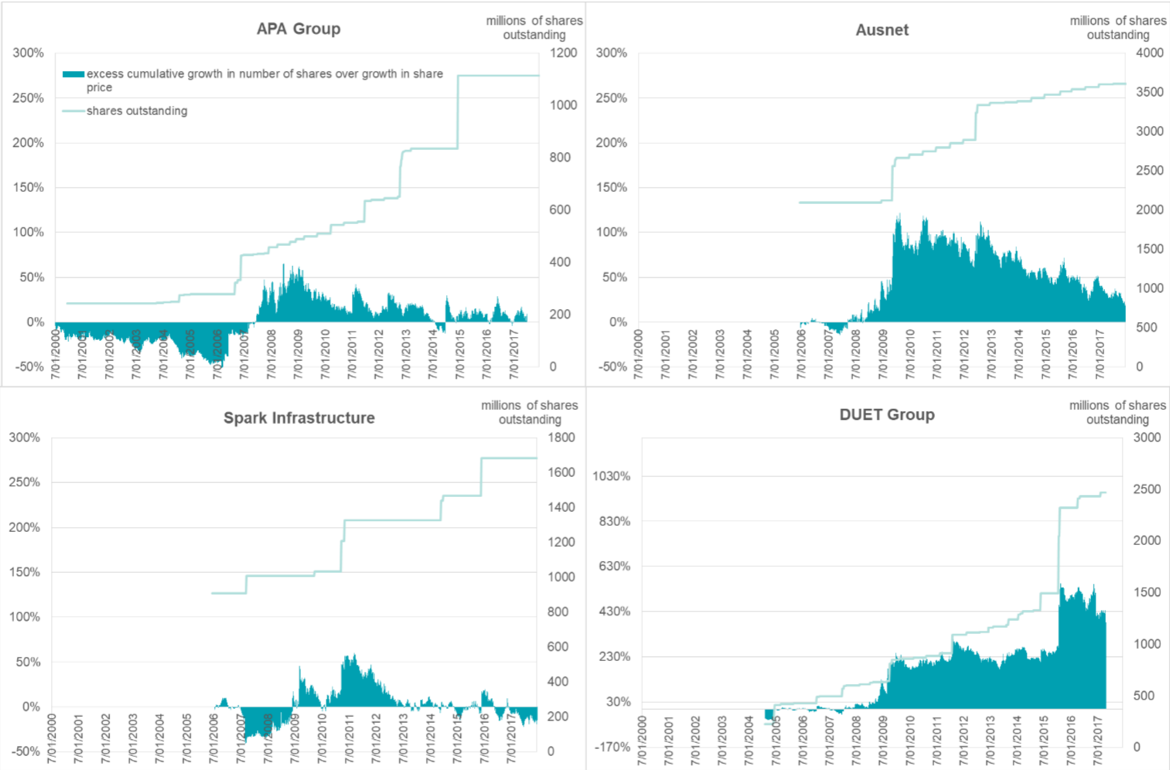


Source: Annual reports, Bloomberg, ERA Analysis

402. The strong increase in market capitalisation appears to be driven by strong growth in share issuance and share price growth,

403. All four firms have issued a considerable number of new shares over the past five years. Share issuance has outpaced share price growth. This is shown in Figure 4.

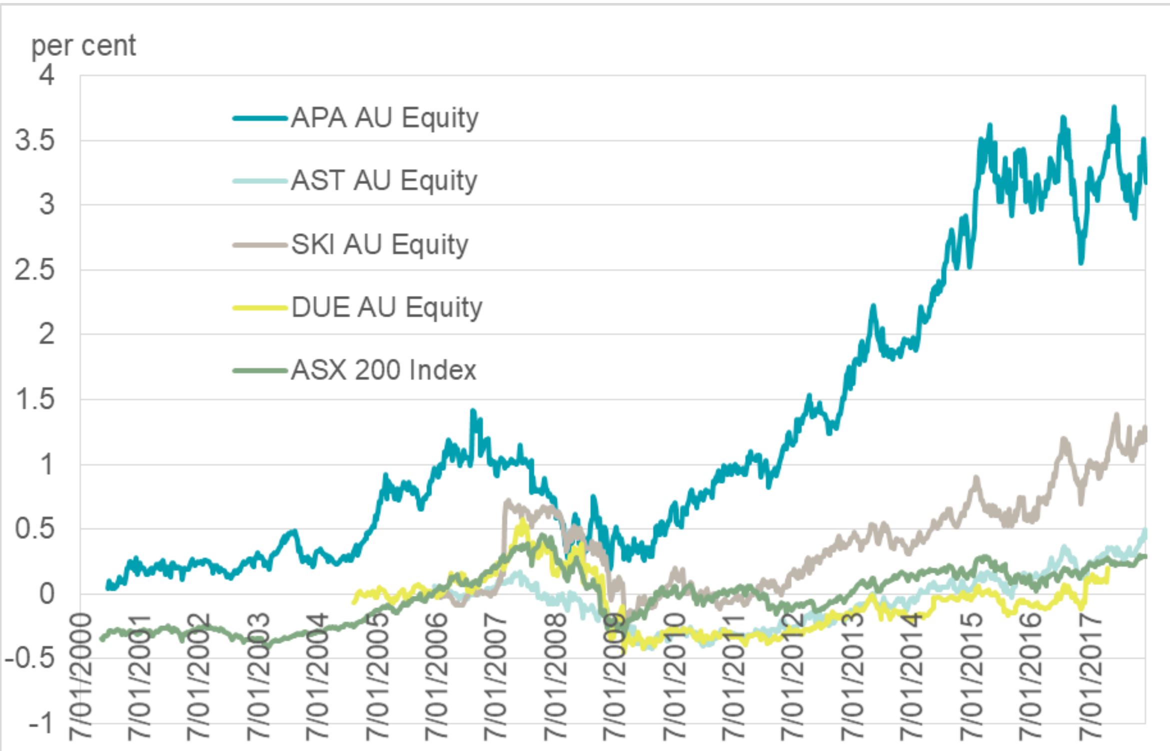
Figure 4 Excess growth in number of shares over share price growth



Source: Bloomberg, ERA Analysis

404. The issuance of shares has coincided with particularly strong share price growth during the period, as shown in Figure 5.

Figure 5 Share price growth from inception



Source: Bloomberg, ERA Analysis

405. The strong equity price growth is evident in the steep slopes of the cumulative price growth series for each firm compared with that of the Australian Securities Exchange 200 index. The issue of new equity during this high price growth period is consistent with the equity market timing hypothesis, which suggests that firms issue equity instead of debt when the market value of equity is high compared to book value and historical values. The analysis here is insufficient to ascertain causation. That is, it cannot ascertain whether strong share price growth has caused new equity issuance. However, the analysis is evident from the analysis above that growth in market capitalisation has outpaced growth in debt and that the main driver of growth in market capitalisation is growth in the number of shares while share price growth has also been strong. The high market value of equity for these firms is only a possible explanation for the increase in new equity issuance.

406. Data indicates that the decreasing gearing is mainly driven by the increasing market capitalisation from strong share price growth and share issuance from around 2009, without an equivalent rise in debt levels.

407. In addition, the "implementation of sophisticated tax structure and of high-geared investment vehicles may be more difficult to achieve given the more stringent terms on debt funding following the global financial crisis".[151]

408. The ERA also assessed a gearing measure based on book value of total debt to total assets. Book-value based measures of gearing provide an alternative measure of gearing. On this basis, average gearing has remained the same over the past five years, with a slight decline over 10 years (Table 7). This suggests that growth in debt to finance network investments has kept pace with the book value of equity.

Table 7 ERA book value gearing estimates

	APA	AST	DUE	SKI	Average
2008	71%	58%	76%	89%	74%
2009	70%	67%	79%	85%	75%
2010	68%	62%	79%	66%	69%
2011	63%	60%	77%	69%	68%
2012	64%	61%	77%	68%	68%
2013	63%	61%	79%	68%	68%
2014	65%	64%	76%	67%	68%
2015	68%	69%	74%	66%	69%
2016	71%	66%	65%	68%	67%
2017	71%	64%		69%	68%
5 year average	**68%**	**65%**	**73%**	**68%**	**68%**

Source: Annual reports, Bloomberg, ERA Analysis

[151] Deloitte Corporate Finance, *Regulated assets: Trends and investment opportunities*, July 2011, p. 5.

409. The increase in APA Group's gearing after December 2014 influences the trend in the average book value based gearing in Table 7. The increase in the APA Group's gearing coincides with its US $5 billion acquisition of the Queensland Curtis liquefied natural gas pipeline completed on 3 June 2015, which was funded with US $4.1 billion in debt.[152]

410. The analysis of gearing based on book values suggested that the target level of gearing has not increased and may or may not have declined since the last guidelines.

411. The AER's recent analysis has also shown that gearing levels, both on the basis of market values and book values, have been declining since 2007.[153]

412. In the draft guidelines, the ERA placed more reliance on the use of market value gearing estimates as they reflect the market's current information on the efficient financing of the benchmark entity. This gearing can then be used to inform the setting of efficient financing costs. Book values, however, are a historical measure and not representative of forward looking values.

413. It would be expected that new entrants would have a gearing consistent with currently observed market gearings.

414. The use of the market value of equity is consistent with the Henry (2014) approach to estimating equity beta.[154] This is because the Henry approach uses gearing based on the market value of equity to de-lever and re-lever between asset (unlevered) and equity (levered) beta estimates.

415. Lally also supports that use of market value for gearing.[155]

- Beta is mathematically derived from a number of assumptions, and the gearing parameter arises in the course of the derivation and is defined in market terms.

- Though the WACC formula is not derived, it is simply definitional. Its role within a regulatory context is to implement the NPV = 0 condition, that is, the present value of the future cash flows is equal to the initial investment. This condition requires that the allowed rate of return that determines cash flows is equal to an investor's discount rate. Therefore, the allowed rate of return would be a WACC with a market value gearing.

416. In the AER's expert evidence sessions, experts agreed that market-based estimates are the only appropriate measure of gearing.[156]

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152 See APA group, *ASX Announcements*, 2018, https://www.apa.com.au/news/asx-releases/2014/apa-expands-with-qclng-pipeline-acquisition-and-entitlement-offer/ and https://www.apa.com.au/news/asx-releases/2015/apa-completes-lng-pipeline-acquisition/, (accessed 4 January 2018)

153 AER, *Discussion Paper - Gearing*, February 2018, pp. 15-16.

154 See *Chapter 17 – Equity beta* for more details on this approach.

155 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, pp. 7-9.

156 Cambridge Economic Policy Associates, *Expert Joint Report,* April 2018, p. 27.

417. The ERA's 2017 analysis of efficient costs for water providers also updated the gearing estimate for energy.[157] Consistent with the above analysis, the ERA's 2017 analysis found:

- There is a declining trend in Australian gas and electricity network service provider gearing since 2011.
- Market capitalisation growth appears to have been outstripping debt issuance in the Australian electricity and gas network utility sector.
- On average, a decrease in gearing of five percentage points appears reasonable for Australian electricity and gas network utilities from the historic figure of 60 per cent.

418. The ERA's general gearing method involves observing actual gearing over the last five-year period.[158] Forecasts on the direction of debt relative to equity, which may include consideration of factors such as market capitalisation forecasts and debt issuance constraints, are not taken into account.

419. The estimated benchmark gearing of 55 per cent is lower than the 60 per cent that has been consistently used by Australian regulators for over a decade.

420. In the draft guidelines, the ERA considered that available data, presented in Table 6, supports lower gearing of 55 per cent on the basis that:

- There has been a general deleveraging trend, only interrupted by the effect of the global financial crisis on equity values.
- Recent gearing levels of 51 per cent suggest a step change away from gearing levels of 60 per cent.

421. Although 60 per cent gearing has been used for an extended period, it does not automatically follow that the gearing must be held constant at this value, particularly if evidence suggests otherwise. Appropriately incorporating new information on gearing as it becomes available assists in avoiding a number of well-documented analytical biases such as anchoring and adjustment, conservatism, availability, confirmation and status quo.[159] It also assists in avoiding larger changes or 'shocks' if declining trends continue. For example, making small adjustments at each review can avoid shocks resulting from large delayed adjustments that fail to incorporate new information as it becomes available.

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157 ERA, *The efficient costs and tariffs of the Water Corporation, Aqwest and Busselton Water*, November 2017, pp. 337-343.

158 ERA, *Explanatory Statement for the Rate of Return Guidelines,* December 2013, p. 52.

159 Epley, N. and Gilovich, T., 'Putting adjustment back in the anchoring and adjustment heuristic: Differential processing of self-generated and experimenter-provided anchors', *Psychological Science*, vol. 12, no. 5, 2001, pp. 391-396.

Hilbert, M., 'Toward a Synthesis of Cognitive Biases: How Noisy Information Processing Can Bias Human Decision Making*', Psychological Bulletin*, vol. 138, no.2, pp. 211-237.

Samuelson, W. and Zeckhauser, R., 'Status quo bias in decision making', *Journal of Risk and Uncertainty*, vol. 1, no. 1, 1988, p. 7-59.

422. Considering all the above information, for the draft guidelines the ERA used a debt to total assets ratio (gearing level) of 55 per cent and the equity to total assets ratio of 45 per cent.

6.4 Public submissions

423. AGIG, ATCO and ENA's submissions considered gearing. These submissions accepted the ERA's gearing approach in its draft guidelines and a gearing level of 55 per cent.[160] [161] [162]

424. In its submission GGT, which is rated BBB, argued that the benchmark credit rating of BBB+ and the benchmark gearing of 55 per cent were inconsistent.[163] GGT considered that it could not aspire to the benchmark BBB+ without lowering its gearing well below the 55 per cent benchmark gearing. GGT argued that the benchmark credit rating should be no higher than BBB for a benchmark gearing of 55 per cent.[164]

6.5 Independent Panel

425. The Independent Panel considered that the guidelines gearing level of 55 per cent was clearly linked to and well supported.[165]

426. The Panel considered that the ERA should consider the merit of checking the actual gearing of the firms it regulates because there may be scope to increase gearing.[166]

6.6 Final approach

427. The target gearing is the relevant gearing level in the cost of capital. The ERA considers that target gearing should be determined from observations of the gearing level of firms in the benchmark sample of Australian utility businesses.

428. The average gearing of the benchmark sample determines the benchmark efficient level of gearing.

429. The ERA observed trends in average gearing across various definitions of debt and equity and examined the drivers of the results. The ERA's recent analysis, using the updated data to 2017, indicates a benchmark gearing level of 55 per cent debt.

430. A gearing level of 55 per cent will be fixed until the next review of the guidelines.

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160 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 25-26.

161 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 6.

162 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, p. 3.

163 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, p. 2.

164 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, p. 5.

165 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 26.

166 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 26.

6.7 Final reasoning

431. In addition to its draft reasoning, the ERA has considered the public submissions and Independent Panel's comments.

432. To explain its view that the benchmark credit rating and gearing were inconsistent, GGT detailed that rating agencies pay close attention to the ratio of funds from operations to debt (funds from operations/debt ratio).

433. GGT said that:

- The benchmark credit rating of BBB+ was elevated by entities' financial strength and support of parent entities.
- A funds from operations/debt ratio greater than 8 per cent was required to achieve a BBB+ rating.
- A 55 per cent gearing would lead to funds from operations/debt ratios which are more aligned with a rating of BBB or below.

434. The ERA considers that available evidence from the benchmark sample of companies, presented in Table 6 above, supports a benchmark gearing level of 55 per cent, a reduction from the previous 60 per cent benchmark.

435. This figure has been arrived at through directly observing actual gearing data for a benchmark sample of energy networks in Australia.

436. The ERA discusses GGT's comments on the credit rating later in *Chapter 9 – Benchmark credit rating*.

437. An implication of adopting the benchmark firm is that the actual decisions of a service provider may differ (and often will differ) from the benchmark firm. However, under incentive regulation the regulator does not compensate the regulated service provider for its actual decisions, but compensates it as if it were operating efficiently.

438. The Independent Panel considered that the ERA should consider the merit of checking the actual gearing of the firms it regulates because there may be scope to increase gearing.[167]

439. The ERA considers that it is not appropriate to compensate a regulated service provider for its actual decisions on gearing. As discussed above, this would be contrary to the provision of incentives. Furthermore, the ERA recognises that, given current limitations of the regulatory accounts of its regulated entities, the ERA is not able to accurately measure actual gearing.

440. The ERA considers that the use of average gearing from the benchmark sample is appropriate. This is a commonly applied approach that involves averaging performance measures across similar firms to infer an attainable benchmark.[168]

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167 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 26.

168 This is a form of 'Yardstick' regulation. See Shleifer, A., 'A theory of yardstick regulation', *Rand Journal of Economics*, vol. 16, no.3, 1985, pp. 319-327.

441. The ERA also notes the AER's analysis of the estimates of gearing for the benchmark sample. The AER's analysis indicates that the average gearing for the benchmark sample is approximately 55 per cent for the five-year period.[169]

442. The ERA maintains its view that the five-year period is appropriate for the purpose of estimating gearing for Western Australian gas businesses within the ERA's rate of return framework.

443. On the basis of all available evidence, the ERA considers that the benchmark gearing of 55 per cent is appropriate.

[169] AER, Draft rate of return guidelines – Explanatory statement, July 2018, p. 164.

7. Return on debt

7.1 Background

444. Under the National Gas Rules, the ERA is required to estimate the return on debt in a way that contributes to the achievement of the allowed rate of return objective. As detailed in the National Gas Rules section 87(3):

> The *allowed rate of return objective* is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services.

445. Subject to that overarching requirement, the method adopted to estimate the return on debt may, without limitation, be designed to result in a return on debt that reflects:[170]

- The return that would be required by debt investors in a benchmark efficient entity if they raised debt at the time, or shortly before the time, that the regulator's decision on the access arrangement for that period is made.
- The average return that would have been required by debt investors in a benchmark efficient entity if they raised debt over an historical period prior to the commencement of a regulatory year in the access arrangement period.

  or

- Some combination of the above returns.

446. This chapter sets out the approach the ERA will adopt to estimate the return on debt and the reason for it.

7.2 Draft approach

447. In the draft guidelines, the estimate of the return on debt was based on a risk premium over and above the risk free rate, combined with an additional margin for administrative and hedging costs:

$$\text{Return on debt} = \text{risk free rate} + \text{debt risk premium} + \text{debt raising costs} + \text{hedging costs} \qquad \text{equation 5}$$

448. 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.

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

170 National Gas Rules 87(10).

450. Debt raising and hedging costs are direct costs incurred by businesses to raise and hedge debt.

451. The return on debt estimate was based on the hybrid trailing average approach. This method:

- Adopts a five-year bank bill swap rate, set on the day.
- Uses a 10-year trailing average for the debt risk premium, which is updated annually so that each year a new year's debt risk premium is estimated and the oldest estimate in the 10-year series is removed.

452. The on-the-day estimate of the risk free rate will be based on the observed yield of a five-year term bank bill swap rate, averaged over a 20-day period just prior to the regulatory period (see *Chapter 8 – Risk free rate of return*). The 20-day period will be nominated by the service provider in advance of the ERA's final decision. The five-year term reflects the NPV=0 principle that the term of debt should match the length of the regulatory period, which is five years.

453. The on-the-day debt risk premium will be derived from the yield of an observed sample of bonds, with a term of 10 years, issued by comparator firms with similar credit ratings as the benchmark efficient entity (see *Chapter 9 – Benchmark credit rating* and *Chapter 10 – Debt risk premium*). The ERA calculates the debt risk premium based on a 10-year hybrid trailing average, which will be updated annually. The ERA considers that this approach best approximates the NPV=0 principle while also recognising refinancing risk and the staggered nature of debt portfolio.

454. An annual allowance will be provided for debt raising and hedging costs (see *Chapter 14 – Debt and equity raising costs*). The annual allowances for these elements will be set once, at the start of the regulatory period.

7.2.1 Initial revenue path

455. The return on debt estimated for the first year of an access arrangement will contribute to the setting of the initial revenue path for the remaining years of the regulatory period (that is, for years two to five).

7.2.2 Annual update of the return on debt

456. The ERA will revise the return on debt each year to incorporate an annual update of the estimate of the debt risk premium.

457. Each year, the ERA will estimate the latest on-the-day value of the debt risk premium over the specified averaging period. It will then be incorporated in the 10-year trailing average, replacing the estimate made 10 years prior.

7.2.2.1 Implementing the annual update

458. The ERA will implement the annual update by setting tariffs for regulatory years two to five by including an automatic adjustment to the initial revenue path in each year.

459. The automatic adjustment will account for the change in revenue in each year that arises from the difference between the return on debt under the initial revenue path and that under the annually updated return on debt.

460. The difference in the return on debt will reflect the change in the debt risk premium. The other components of the return on debt – the risk free rate and the allowances for debt raising costs and hedging costs – will apply unchanged for each regulatory year in the regulatory period.

461. First, the cash flow allowance for the return on debt in any regulatory year t may be defined as:

$$RoD_t = (DRP_t + R_f + Drc + Hc).\frac{D}{(D+E)}.RAB_{Op,t} \qquad \text{equation 6}$$

where

RoD_t	is the return on debt in year t
DRP_t	is the initial debt risk premium
R_f	is nominal risk free rate
Drc	is the debt raising cost
Hc	is the hedging cost
$\frac{D}{(D+E)}$	is the gearing
$RAB_{Op,t}$	is the opening regulated asset base at the beginning of year t
t	ranges from year 1 to 5.

462. The 'initial revenue path' will be calculated in line with the above formula, using the estimated DRP_t for year 1 (that is, DRP_1).

463. Second, the formula for calculating the subsequent annual adjustment to the initial revenue path for a change in the estimate of the debt risk premium will be as follows:

$$\Delta RoD_t = \frac{D}{(D+E)}(\mathrm{DRP_t} \times \mathrm{RAB_{Op,t}} - \mathrm{DRP_1} \times \mathrm{RAB_{Op,1}}) \qquad \text{equation 7}$$

where

ΔRoD_t	is the change in the allowance for the return on debt in year t
$\frac{D}{(D+E)}$	is the gearing
DRP_1	is the initial debt risk premium estimated at the start of the regulated period
$RAB_{Op,1}$	is the opening Regulated Asset Base at the start of the regulated period

DRP_t is the debt risk premium estimated at the start of period t

$RAB_{Op,t}$ is the opening Regulated Asset Base at the beginning of year t

t is the regulatory year, ranging from year 2 to 5.

464. Under this formula, all return on debt amounts remain unchanged from those provided in the initial revenue path in the final access arrangement decision, except for the annual allowance ΔRoD_t, which reflects the change in the debt risk premium in the regulatory years two to five.

465. Revenue and prices to apply in the relevant regulatory year will be adjusted along with the updated return on debt, as part of the annual tariff update, through the automatic update mechanism.

466. As only the estimate of the debt risk premium is updated annually, the approach constitutes a partial update of the return on debt and the rate of return. This partial update is the approach that best meets the requirements of the National Gas Law, the national gas objective, the revenue and pricing principles, the National Gas Rules and the allowed rate of return objective, since it takes both efficiency and the desire of users for stability in gas pipeline tariffs into account.

7.2.3 Draft reasoning

467. The approach for determining the expected return on debt involves summing estimates of the risk free rate, the debt risk premium and an allowance for the administrative costs and hedging costs of issuing debt:

Return on debt = risk free rate + debt risk premium + debt raising costs + hedging costs

equation 8

468. The approach for estimating each component of the above equation is based on the hybrid trailing average method. Under the hybrid trailing average method, the risk free rate is set once (on-the-day), while the debt risk premium is a trailing average of the on-the-day rate and previous annual observations.

469. The hybrid trailing average compares to:

- The on-the-day approach – whereby both the risk free rate and the debt risk premium are set on the day.

- The full trailing average approach – whereby both the risk free rate and the debt risk premium are determined as trailing average estimates.

470. These three options for estimating the return on debt may be evaluated in terms of their ability to achieve the national gas objective, the revenue and pricing principles, the National Gas Rules and the allowed rate of return objective set out in National Gas Rule 87(3), as well as the other requirements of National Gas Rule 87. In line with these requirements, any approach to estimating the rate of return should, among other things:

- Promote efficiency, such that the regulated return on debt will achieve outcomes similar to those observed in markets with effective competition.

- Be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk in provision of reference services.

- Deliver 'effective incentives to promote efficient investment in, or in connection with a pipeline, efficient provision of pipeline services and efficient use of the pipeline'.[171]

- Minimise any differences between the regulated return on debt and that of the benchmark efficient entity, given this is a factor the ERA must consider under the National Gas Rules.[172]

- Remunerate efficient financing costs, over the lives of the assets, in net present value terms.[173]

- Minimise regulatory costs.[174]

7.2.4 The method for estimating the return on debt

471. Broad competing approaches for estimating the return on debt include:

- The on-the-day approach for estimating the risk free rate and the debt risk premium.

- The hybrid trailing average approach for estimating the debt risk premium, with annual updating. The hybrid approach includes elements of both an on-the-day approach and trailing approach.

- A full trailing average for both the risk free rate and the debt risk premium, with annual updating.

472. All approaches to estimating the return on debt have strengths and weaknesses. However, the full trailing average:

- Has inferior prediction properties for the risk free rate.

- Violates the present value principle for the risk free rate component since it has a 10-year term, and may increase costs for customers.

473. Furthermore, the forward-looking risk free rate is observable. For example, five-year Commonwealth Government Securities provide a proxy for the forward-looking risk free rate expected to apply over a subsequent five-year regulatory period. These rates are reported regularly. They reflect prevailing market prices for the underlying securities.

474. For these reasons, the ERA did not support the full trailing average.

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171 National Gas Rule 87(3); National Gas Rule 87(11)(c); national gas objective, revenue and pricing principles (see relevant parts of the *National Gas Access (WA) Act 2009*). See also Economic Regulation Authority, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, pp. 5–9.

172 National Gas Rule 87(11)(a).

173 Revenue and Pricing Principle 2 (*National Gas Access (WA) Act 2009*, s. 23, clause 24).

174 National Gas Rule 87(3) – least cost regulation is in the long term interests of consumers.

475. Both the on-the-day and the hybrid trailing average approaches allow for hedging of the risk free rate at the start of the regulatory period. Both approaches similarly allow for debt raising costs, hedging costs or regulatory costs.

476. The key differences between the on-the-day and the hybrid trailing average approach relate to the debt risk premium.

- There is some evidence that the on-the-day approach performs at least as well as the simple trailing average for the debt risk premium for the five-year regulatory period ahead, and may be superior. This analysis was based on a Diebold Mariano test of methods, however, limited data meant that it was not possible to be definitive about prediction performance. [175]

- In signalling efficient use by upstream and downstream users, the limited evidence suggests that the on-the-day approach performs at least as well as, and perhaps better than, the hybrid trailing average debt risk premium.[176]

- The trailing average approach to estimating the debt risk premium can be replicated exactly by the firm, whereas the on-the-day approach cannot, due to difficulties in hedging the debt risk premium. With the on-the-day approach, the firm is required to manage the ups and downs of prevailing rates, with its cost of debt sometimes exceeding the regulated return on debt, and sometimes undercutting it. On that basis, the hybrid trailing average approach is superior.

- To the extent that the trailing average may be matched by the regulated firm, it may lower credit risk (and hence cost) compared to the on-the-day approach. The result is that the return on debt from a staggered debt portfolio can be consistent with an efficient financing strategy. However, over time and on average, there are likely to be limited differences between the various approaches. Nevertheless, this consideration adds further support for the hybrid trailing average approach.

- Trailing average approaches can achieve the present value condition exactly at any point in time, whereas the on-the-day approach only approximates the condition, on average, over the longer term. [177] Again, this provides support for the hybrid trailing average approach.

- Annual updating – which is a requirement of the current hybrid trailing average approach – adds some complexity and resource intensiveness, compared to the on-the-day approach. However, the difference in regulatory cost is not large.

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175 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, December 2016, Appendix 4, p. 92.

ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines – Appendix 5*, December 2013.

176 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, December 2016, Appendix 4, p. 92.

ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines – Appendix 5*, December 2013.

177 The present value principle – also known as the financial capital maintenance principle – ensures that the present value of expected capital charges for an asset over its economic life should be equal to the initial value or purchase costs. The capital charge relating to assets comprises both the return on and the return of capital. For a summary of the issues, see Queensland Competition Authority, *Financial Capital Maintenance and Price Smoothing*, February 2014).

477. The ERA considered these strengths and weaknesses and adopted the hybrid trailing average approach.

7.2.5 Key features of the hybrid trailing average approach

478. The estimate of the return on debt was based on a simple hybrid trailing average which will:

- Comprise the sum of a debt risk premium and a base risk free rate, combined with a margin for administrative and hedging costs:

$$Return\ on\ Debt = Risk\ Free\ Rate + Debt\ Risk\ Premium + Debt\ raising\ costs + Hedging\ costs$$

- Estimate the risk free rate once, based on an averaging period at the start of the regulatory period (the 'on-the-day' approach for the risk free rate) (see *Chapter 8 – Risk free rate of return*).

- Adopt a 10-year term for the debt risk premium to estimate the debt risk premium consistent with the average term at issuance, being 10 years (see *Chapter 10 – Debt risk premium*).

- Continue to annually update the estimate of the debt risk premium, just prior to the start of each regulatory year, but now based on the updated hybrid trailing average estimate of the debt risk premium.

- Continue to feed into each annual tariff variation.

7.3 Public submissions

479. AGIG, ATCO and ENA's submissions considered the return on debt approach. These submissions accepted the ERA's overall return on debt approach in its draft guidelines.[178] [179] [180]

480. In addition, AGIG, ATCO and GGT provided comments on specific return on debt parameters, which are discussed in turn under those particular parameters.

7.4 Independent Panel

481. The Independent Panel considered that the Explanatory Statement did not provide a clear and complete explanation of the various approaches to estimating the return on debt and their advantages and disadvantages.[181]

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178 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, p. 4.

179 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 9.

180 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, p. 3.

181 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 33.

482. The Independent Panel recognised the importance of ensuring that the allowance for the cost of debt is consistent with achieving the NPV=0 condition while also taking effective account of refinancing risk. The Panel considered that the reasoning for meeting the NPV=0 principle was correct.[182]

483. The Panel considered that there was good information to support the hybrid trailing average approach but that the explanation needed to be improved.[183]

484. The Independent Panel considered that the use of a five-year risk free rate in the hybrid trailing approach meets the principle of NPV=0 and does not impose higher debt costs from the use of a 10-year risk free rate.[184]

- The Panel noted that the proposition that using a term different to the regulatory period would violate the NPV=0 condition has been accepted by the AER but the AER has preferred to retain a 10-year term based on a cautious approach to recognising refinancing risk.[185]

485. The Independent Panel considered there was sufficient information for stakeholders to implement the approach at a point in time, although this assumes relevant technical expertise in establishing the debt risk premium in particular. However, the Panel considered that it is important that the guidelines are self-contained through the inclusion of the instructions to facilitate automatic updating of formulas and estimates.[186]

486. The Independent Panel noted there is a need to consider whether and under what conditions the binding rate of return specification may need to be re-opened for material change in circumstances.[187]

7.5 Final approach

7.5.1 Approach

487. The estimate of the return on debt is based on a risk premium over and above the risk free rate, combined with an additional margin for administrative and hedging costs:

Return on debt = risk free rate + debt risk premium + debt raising costs
+ hedging costs

equation 9

488. 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.

[182] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 33.

[183] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 33.

[184] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 32.

[185] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 32.

[186] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 35.

[187] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 35.

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

490. Debt raising and hedging costs are direct costs incurred by businesses in raising and hedging debt.

491. The return on debt estimate is based on the hybrid trailing average approach. This method:

- Adopts a five-year bank bill swap rate, set on the day.
- Uses a 10-year trailing average for the debt risk premium, which is updated annually so that each year a new year's debt risk premium is estimated and the oldest estimate in the 10-year series is removed.

492. The on-the-day estimate of the risk free rate will be based on the observed yield of a five-year term bank bill swap rate, averaged over a 20-day period just prior to the regulatory period (see *Chapter 8 – Risk free rate of return*). The 20-day period will be nominated by the service provider in advance of the ERA's final decision. The five-year term reflects the NPV=0 principle that the term of debt should match the length of the regulatory period, which is five years.

493. The on-the-day debt risk premium will be derived from the yield of an observed sample of bonds, with a term of 10 years, issued by comparator firms with similar credit ratings as the benchmark efficient entity (see *Chapter 9 – Benchmark credit rating* and *Chapter 10 – Debt risk premium*). The ERA calculates the debt risk premium based on a 10-year hybrid trailing average, which will be updated annually. The ERA considers that this approach best approximates the NPV=0 principle while also recognising refinancing risk and the staggered nature of debt portfolios.

494. An annual allowance will be provided for debt raising and hedging costs (see *Chapter 14 – Debt and equity raising costs*). The annual allowances for these elements will be set once, at the start of the regulatory period.

495. The ERA considers that this return on debt approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.

7.5.2 Initial revenue path

496. The return on debt estimated for the first year of an access arrangement will contribute to the setting of the initial revenue path for the remaining years of the regulatory period (that is, for years two to five).

7.5.3 Annual update of the return on debt

497. The ERA will revise the return on debt each year to incorporate an annual update of the estimate of the debt risk premium.

498. Each year, the ERA will estimate the latest on-the-day value of the debt risk premium over the specified averaging period. It will then be incorporated in the 10-year trailing average, replacing the estimate made 10 years prior. (see *Appendix 7 – Automatic updating formulas for the return on debt*).

7.5.3.1 Implementing the annual update

499. The ERA will implement the annual update by setting tariffs for regulatory years two to five by including an automatic adjustment to the initial revenue path in each year.

500. The automatic adjustment will account for the change in revenue in each year that arises from the difference between the return on debt under the initial revenue path and that under the annually updated return on debt.

501. The difference in the return on debt will reflect the change in the debt risk premium. The other components of the return on debt – the risk free rate and the allowances for debt raising costs and hedging costs – will apply unchanged for each regulatory year in the regulatory period.

502. First, the cash flow allowance for the return on debt in any regulatory year t may be defined as:

$$RoD_t = (DRP_t + R_f + Drc + Hc).\frac{D}{(D+E)}.RAB_{Op,t} \qquad \text{equation 10}$$

where

RoD_t is the return on debt in year t

DRP_t is the initial debt risk premium

R_f is nominal risk free rate

Drc is the debt raising cost

Hc is the hedging cost

$\frac{D}{(D+E)}$ is the gearing

$RAB_{Op,t}$ is the opening regulated asset base at the beginning of year t

t ranges from year 1 to 5.

503. The 'initial revenue path' will be calculated in line with the above formula, using the estimated DRP_t for year 1 (that is, DRP_1).

504. Second, the formula for calculating the subsequent annual adjustment to the initial revenue path for a change in the estimate of the debt risk premium will be as follows:

$$\Delta RoD_t = \frac{D}{(D+E)} (DRP_t \times RAB_{Op,t} - DRP_1 \times RAB_{Op,1}) \qquad \text{equation 11}$$

where

ΔRoD_t is the change in the allowance for the return on debt in year t

$\frac{D}{(D+E)}$ is the gearing

DRP_1 is the initial debt risk premium estimated at the start of the regulated period

$RAB_{Op,1}$ is the opening Regulated Asset Base at the start of the regulated period

DRP_t is the debt risk premium estimated at the start of period t

$RAB_{Op,t}$ is the opening Regulated Asset Base at the beginning of year t

t is the regulatory year, ranging from year 2 to 5.

505. Under this formula, all return on debt amounts remain unchanged from those provided in the initial revenue path in the final access arrangement decision, except for the annual allowance ΔRoD_t, which reflects the change in the debt risk premium in the regulatory years two to five.

506. Revenue and prices to apply in the relevant regulatory year will be adjusted along with the updated return on debt, as part of the annual tariff update, through the automatic update mechanism.

507. As only the estimate of the debt risk premium is updated annually, the approach constitutes a partial update of the return on debt and the rate of return. This partial update is the approach that best meets the requirements of the National Gas Law, the national gas objective, the revenue and pricing principles, the National Gas Rules and the allowed rate of return objective, since it takes both efficiency and the desire of users for stability in gas pipeline tariffs into account.

7.6 Final reasoning

508. In addition to its draft reasoning, the ERA has given further consideration of the Independent Panel's comment on the return on debt.

7.6.1 Approaches to estimating the return on debt

509. The ERA has considered three approaches on the return on debt:

- on-the-day
- full trailing average
- hybrid trailing average

510. In considering the different approaches it is necessary to consider how they address major financial risks of debt financing, including:

- Interest rate risk – the risk of differences arising between the allowed return on debt costs and the actual cost of debt. Interest rate risk can be managed by the use of interest rate swap contracts.
- Refinancing risk – the risk of rolling over debt and the cost of debt at the time of issuing new debt. Refinancing risk can be managed by having multiple sources of debt, issuing longer term debt and staggering debt over different periods.

511. In its consideration of the overall rate of return approach and the term of the rate of return, the ERA has also considered the NPV=0 principle and the application of differing return on debt approaches (see detailed in *Chapter 4 – Overall rate of return*).

512. On balance, the ERA considers the hybrid trailing average best meets the national gas objective.

513. The ERA considers that this return on debt approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.

7.6.1.1 On-the-day approach

514. The on-the day approach sets the regulatory cost of debt over a short period immediately preceding the start of the regulatory period. The allowed cost of debt is subsequently reset before the start of the next regulatory period.

515. The strengths of the on-the-day approach include:

- The on-the-day approach is very simple to implement.
- The current cost of debt at the time of a regulatory determination provides a forward looking return, which provides the most appropriate signal for new investment.
- The approach meets the NPV=0 principle.

516. The weaknesses of the on-the-day approach include:

- It does not reflect that most capital has already been invested and is sunk so that the investment signals provided are of limited relevance. For sunk capital, focus needs to be on ensuring that it is efficiently financed consistent with the time of the investment.

- It assumes that all of the debt of a regulated entity can be financed at the prevailing rates in the short period just prior to the regulatory decision. This exposes a regulated business to large refinancing risks.

- It does not reflect that refinancing risk is a concern to a business, which drives a business to stagger its debt portfolios.

517. The on-the-day approach was the main approach adopted by regulators for regulated energy network businesses from the first decisions in the late 1990s until the AER adopted a trailing average cost of debt approach in its 2013 rate of return guidelines.

7.6.1.2 Full trailing average approach

518. A full trailing average approach measures the return on debt as a trailing average of the total cost of debt. Generally this approach is over 10 years and applies a simple weight of 10 per cent for each year of the trailing average. This assumes that all debt is contracted for 10 years and 10 per cent of the total debt portfolio is refinanced each year.

519. A variant of the full trailing average is a weighted average where new capital expenditure is financed at the current rate but the trailing average applies to the existing capital base.

- Proponents of this method argue that this provides more efficient signals for financing new investment than the standard full trailing average approach.

- The Queensland Competition Authority, however, examined the approach and found the effect was minor.[188]

- In addition, in its evaluation of whether to the accept the simple hybrid trailing average approach in the draft decision for the Dampier to Bunbury Natural Gas Pipeline, the ERA determined that there were costs and benefits of the capital expenditure weighting overlay. [189] On balance, the ERA was not convinced that limited evidence for the benefits of the capital expenditure weighted approach outweighed the clear regulatory costs of the additional complexity. [190]

520. The strengths of a full trailing average approach include:

- It is effective in addressing refinancing risk. This assumes that the weights for the trailing average are reasonable estimates for what the benchmark firm employs and the assumed 10-year term of debt actually applies.

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[188] Queensland Competition Authority, *Final decision – Trailing average cost of debt,* April 2015, pp. 24-27.

[189] ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, December 2016, Appendix 4, p. 118.

[190] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, December 2016, Appendix 4, p. 162.

- It better reflects how regulated firms refinance their debt in practice.
- It reduces the volatility of the cost of debt and the resulting volatility for regulated services.
- It can take account of extreme events that affect both the risk free rate and the debt risk premium.
- It recognises that most capital is sunk.

521. The weaknesses of a full trailing average approach include:

- It violates the NPV=0 condition. The Queensland Competition Authority considered that the full trailing average approach violates the NPV=0 condition and it required rate of return parameters to match the term of the regulatory cycle.[191]
- It may deliver higher costs of debt to regulated entities, as firms can exploit the typical upward sloping yield curve to issue debt at lower cost. The Queensland Competition Authority considered that the overstatement of debt costs issue was a potential efficiency concern.[192]
- It introduces additional complexity through annual updating. However, the difference in regulatory costs when compared with the on-the-day is not large.

522. Recognising the large refinancing risk and potential for price volatility, regulators started adopting trailing average approaches in 2013.

7.6.1.3 Hybrid trailing average approach

523. The hybrid trailing average approach combines elements from the on-the-day and the full trailing average approaches. A risk free rate is set at the start of the regulatory period matching the term of the regulatory period. A debt risk premium is estimated as a trailing average over 10 years, whereby a weight of 10 per cent is applied for each year of the trailing average.

524. The strengths of the hybrid trailing average approach:

- The use of the current risk free rate matching the regulatory period is important for ensuring that the NPV=0 principle is met.
- It reduces the ability of firms to exploit the slope of the yield curve. The use of a risk free rate longer than the regulatory period would mean that the allowed return was larger than needed to finance investment given the regulatory resets that occur. The use of a five-year risk free rate ensures that firm would not benefit from a higher margin allowed in a 10-year rate while at the same time entering into five-year debt contracts.
- It reduces refinancing risk. Refinancing risk provides justification for adopting some form of trailing average method. Refinancing risk can be, and is, further reduced through allowing costs for hedging.

191 Queensland Competition Authority, *Final decision – Trailing average cost of debt,* April 2015, pp. 27-28.

192 Queensland Competition Authority, *Final decision – Trailing average cost of debt,* April 2015, pp. 27-28.

- If firms did issue 10-year debt and prices are reset after five years, at the next regulatory reset the cost of debt will likely differ. This would result in prices diverging from actual costs.
- Compared to a full trailing average approach, it better minimises interest rate risk by linking revenues to a five-year risk free rate, which is reset at the end of the regulatory period. Interest rate risk can be further managed with the allowance for hedging costs.
- It better reflects how regulated firms refinance their debt in practice.
- It recognises that most capital is sunk.

525. The weaknesses of the hybrid trailing average approach:

- It does not reduce refinancing risk to the degree of the full trailing average.
- It introduces additional complexity through annual updating. However, the difference in regulatory costs when compared with the on-the-day approach is not large.

526. In 2014 the Queensland Competition Authority put out a draft decision on the trailing average cost of debt, which recognised that the hybrid approach has certain advantages over the trailing average approach.[193] In 2015 the Queensland Competition Authority's position was maintained on the relative merits of the hybrid approach compared to the trailing average approach.[194] The Queensland Competition Authority was informed by expert advice from Lally, which found that the hybrid approach was preferred over the on-the-day approach and the full trailing average.[195]

527. From 2015, the ERA has implemented the hybrid trailing average approach for all of Western Australia's regulated gas pipelines through access arrangement determinations. The ERA's method used all available information in developing an initial 10-year hybrid trailing average and therefore no transitional arrangements were required for implementation.

7.6.2 Detail of automatic updating

528. The Panel considered that it was important to refer to the instructions that have been provided to facilitate automatic updating of formulas and estimates.

529. To ensure that the guidelines are self-contained the ERA has developed a detailed process for updating the debt risk premium. This is discussed in detail in the *Chapter 10 Debt Risk Premium*, and Appendices 6 and 7.

530. Automatic updating formulas are also provided in Appendix 7.

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193 Queensland Competition Authority, *Draft decision – Trailing average cost of debt,* August 2014.

194 Queensland Competition Authority, *Final decision – Trailing average cost of debt,* April 2015, p. 33.

195 Lally, M., The Trailing Average Cost of Debt, Report for the Queensland Competition Authority, March 2014.

7.6.3 Ability to re-open

531. The Panel considered there was a need to consider whether and under what conditions the binding rate of return specification may need to be re-opened for material change in circumstances. [196]

532. The ERA considers that the hybrid trailing average approach and the allowance for hedging costs provide an ability to manage changing circumstances.

- The five-year risk free rate allows regulated firms to match any changing circumstances at the time.
- The 10-year debt risk premium term minimises the effect of changing circumstances in any one year and allows firms some discretion around the issuing of bonds in any one year.
- The allowance of hedging costs allow firms to enter into appropriate arrangements to manage financial risks.

533. Consistent with the proposed legislation the binding rate of return instrument regulatory discretion is not allowed, therefore the ERA will not reopen the return on debt over the period that the binding instrument is in place.

534. The approach to return on debt can be reassessed at the next review of the binding instrument.

7.6.4 Final return on debt approach

535. On the basis of the above considerations and consistent with the draft guidelines, the ERA continues to support the return on debt approach detailed below.

536. The estimate of the return on debt is based on a risk premium over and above the risk free rate, combined with an additional margin for administrative and hedging costs:

$$\text{Return on debt} = \text{risk free rate} + \text{debt risk premium} + \text{debt raising costs} + \text{hedging costs}$$

equation 12

537. 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.

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

539. Debt raising and hedging costs are direct costs incurred by businesses in raising and hedging debt.

[196] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 35.

540. The return on debt estimate is based on the hybrid trailing average approach. This method:

- Adopts a five-year bank bill swap rate, set on the day.
- Uses a 10-year trailing average for the debt risk premium, which is updated annually so that each year a new year's debt risk premium is estimated and the oldest estimate in the 10-year series is removed.

541. The on-the-day estimate of the risk free rate will be based on the observed yield of a five-year term bank bill swap rate, averaged over a 20-day period just prior to the regulatory period (see *Chapter 8 – Risk free rate of return*). The 20-day period will be nominated by the service provider in advance of the ERA's final decision. The five-year term reflects the NPV=0 principle that the term of debt should match the length of the regulatory period, which is five years.

542. The on-the-day debt risk premium will be derived from the yield of an observed sample of bonds, with a term of 10 years, issued by comparator firms with similar credit ratings as the benchmark efficient entity (see *Chapter 9 – Benchmark credit rating* and *Chapter 10 – Debt risk premium*). The ERA calculates the debt risk premium based on a 10-year hybrid trailing average, which will be updated annually. The ERA considers that this approach best approximates the NPV=0 principle while also recognising refinancing risk and the staggered nature of debt portfolios.

543. An annual allowance will be provided for debt raising and hedging costs (see *Chapter 14 – Debt and equity raising costs*). The annual allowances for these elements will be set once, at the start of the regulatory period.

544. The ERA considers that this return on debt approach best approximates the NPV=0 principle while also recognising interest rate risk, refinancing risk and the staggered nature of debt portfolios.

545. The return on debt estimated for the first year of an access arrangement will contribute to the setting of the initial revenue path for the remaining years of the regulatory period (that is, for years two to five).

546. The ERA will revise the return on debt each year to incorporate an annual update of the estimate of the debt risk premium.

547. Each year, the ERA will estimate the latest on-the-day value of the debt risk premium over the specified averaging period. It will then be incorporated in the 10-year trailing average, replacing the estimate made 10 years prior. (See *Appendix 7 – Automatic updating formulas for the return on debt*).

8. Risk free rate of return

8.1 Background

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

549. 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.

550. The risk free rate of return can be estimated as either a nominal or real risk free rate. The nominal risk free rate includes compensation to investors for the reduction in purchasing power caused by inflation. The real risk free rate of return would prevail if the expected inflation rate was zero during an investment period. The National Gas Rules requires the ERA to use a nominal vanilla rate of return in regulatory decisions,[197] so in this section, the term 'risk free rate' refers to the *nominal* risk free rate.

551. This chapter outlines the ERA's approach to determining the risk free rate used to calculate the rate of the return.

8.2 Draft approach

552. The ERA will use a five-year term to maturity to estimate the risk free rate of return for the return on equity and for the return on debt.

553. The ERA will set the risk free rate of return at the start of a regulatory access arrangement period and will be fixed for the length of that period.

554. Commonwealth Government Security bonds are the best proxy for risk free assets in Australia.

555. The ERA will use observed yields from these Commonwealth Government Security bonds – as reported daily by the RBA – to estimate the risk free rate of return for the purpose of estimating the return on equity.

556. It is not common to observe a Commonwealth Government Security bond with remaining term to maturity that exactly matches that of the regulatory period.[198] Therefore, for the return on equity, the ERA will use a linear interpolation of the observed yields of Commonwealth Government Security bonds to estimate the risk free rate.

197 National Gas Rules 87(4).

198 In the linear interpolation approach, two bonds are selected with terms to maturity that fall on either side of the date on which the term of the regulatory period ends The dates on these bonds are referred to as the 'straddle' dates. Linear interpolation estimates the yields on the regulatory period term by assuming a linear increase in yields between the straddle dates on the two bonds observed.

557. For the return on debt, the ERA will use estimates of the prevailing interest rate swaps of appropriate terms for estimating the return on debt. The swap rate is referred to as the 'base rate' in the return on debt calculation. It incorporates a spread to the rate on Commonwealth Government Security bonds and is available at specified terms from data providers such as Bloomberg.

558. The ERA will select an 'averaging period' to set the rate of return parameters that are calculated using market data (being the risk free rate used to estimate the return on equity, and the base rate to be used in the estimate of the return on debt for the coming five-year period). The averaging period will:

- have a duration of 20 consecutive trading days
- be as close as possible to the commencement of the regulatory period
- be nominated prior to any of its dates taking place.

8.3 Draft reasoning

559. Three key issues were considered when developing the risk free rate of return for use in the determination of the regulated rate of return. These were:

i. the choice of the proxy for risk free assets

ii. the term to maturity for assessing the risk free rate

iii. the averaging period.

560. This section addresses each of those issues.

8.3.1 The choice of the proxy for the risk free rate

8.3.1.1 The proxy for estimating the return on equity

561. Australian regulators have consistently adopted the observed yields to maturity of Commonwealth Government Security bonds as an appropriate proxy for the nominal risk free rate of return.

562. Commonwealth Government Security bonds are a good proxy for the risk free rate in Australia.

- Commonwealth Government Securities are essentially free from default risk. The Australian Government has consistently received the highest possible credit rating from both Standard and Poor's, and Moody's. Payments from these bonds are guaranteed by the Australian Government.
- These bonds are relatively liquid assets in Australia in terms of the volume at issuance, various terms to maturity and narrow spreads between bid-ask yields.
- The observed yields of these bonds are transparently recorded and reported by the RBA on a daily basis.

563. The use of the Commonwealth Government Security risk free rate is therefore the approach that best meets the allowed rate of return objective. It is robust, transparent and replicable.

564. To balance the trade-off between reflecting prevailing conditions and smoothing out the influence of idiosyncratic yields, the ERA will use an estimate of the risk free rate averaged over a period just prior to the regulatory period. This is known as the 'on-the-day' approach.

8.3.1.2 The proxy for estimating the return on debt

565. The ERA will use swap rates to determine the risk free rate when estimating the return on debt.

566. Interest rate swaps are derivative contracts, which typically exchange – or swap – fixed interest rate payments for floating interest rate payments. They provide a strong means to hedge and manage risk. Investment and commercial banks with strong credit ratings are swap market makers.

567. The five-year interest rate swap spread captures the credit risk of financial institutions. The interest rate swap rate is the index rate at which financial institutions borrow and lend from each other. This rate is higher than the Commonwealth Government Security yield of an equivalent term with the spread over the Commonwealth Government Security capturing the credit risk of financial institutions.

568. The rationale for using a swap rate is that it is difficult to hedge government bonds. This means that regulated firms can be exposed if the risk free rate does not correlate with the swap rate.

569. For the purposes of determining the cost of debt, the use of the interbank swap rate is also more convenient for businesses and regulators. Use of the swap rate simplifies the calculation of the debt risk premium (the alternative approach would be to use the Commonwealth Government Security and incorporate the spread to swap in the debt risk premium). On that basis, use of the swap rate is not inconsistent with the use of the Commonwealth Government Securities as the proxy for the risk free rate.

570. The difference between a Commonwealth Government Security risk free rate and a swap rate of similar term is called the spread of swap. Though interbank lending has a cost above that of Commonwealth Government Securities used to calculate the cost of equity, the use of the interbank rate is equivalent to using a Government Security and separately adjusting the debt risk premium.

571. If debt risk premiums are estimated consistently with the chosen base – whether that base be the Commonwealth Government Security risk free rate or the swap rate – there should be no difference in the resulting build-up of the overall return on debt. The two approaches just represent 'two different ways of splitting up the total interest rate', with:[199]

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199 Chairmont Consulting, *Comparative Hedging Analysis*, 12 June 2013, p. 14.

$$Yield = R_f + SS + DRP_s \qquad \text{equation 13}$$

where:

Yield	is the return on debt
R_f	is the Commonwealth Government Security risk free rate
SS	is the spread of swaps to the Commonwealth Government Security rate
DRP_s	is the debt risk premium to the underlying swaps rate base.

572. Dr Martin Lally also found that using the swap rate rather than the Commonwealth Government Security rate as the base rate in setting the allowed cost of debt produces a closer match between the allowed cost of debt and that actually incurred by the firm.[200]

573. The spread of swap can vary. Typically it is not large, being in the range of 40 to 60 basis points, although sometimes the spread may be higher.[201] Firms typically base their hedges on swap rates, as the swap markets are deep, and the approach allows hedging of both the underlying risk free rate and the spread of swap.

574. For estimating the return on debt, the ERA will use the five-year swap mid-rate, as published on Bloomberg (Last Price), over the relevant averaging period for each regulatory year. This will simplify the understanding of the estimate, but remain consistent with the underlying Commonwealth Government Security rate that is used more broadly for the decision. The difference will be the spread between the two.

8.3.2 The term of the risk free rate

575. Some Australian regulators use Commonwealth Government Securities with a 10-year term to maturity whereas others use Commonwealth Government Securities with a five-year term to maturity or less. The AER, for example, has adopted a 10-year term for a nominal risk free rate of return.[202]

576. Recent Australian regulatory practices for the term of the risk free rate of return are summarised in Table 8.

200 Lally, M., *The Trailing Average Cost of Debt, Report for the Queensland Competition Authority*, March 2014, p. 49.

201 Chairmont Consulting, *Comparative Hedging Analysis*, 12 June 2013, p. 17.

202 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-38.

Table 8 Terms of a risk free rate of return in Australian regulatory decisions

Regulator	Year	Industry	Term of the risk free rate of return (Years)
ERA[203 204]	2016, 2018	Gas and electricity	5
AER[205 206]	2017, 2018	Electricity network	10
QCA[207]	2018	Various	3
IPART[208]	2018	Various	10
ESCOSA[209]	2016	Water, sewerage, stormwater drainage and other services	10
ACCC[210]	2015	Fixed Line Services (Telecommunications)	10

Source: Compiled by the ERA

577. An important regulatory principle is the present value condition (NPV=0), which helps ensure that investors are compensated at a level to encourage efficient investment. This condition means that the present value of the future stream of expected cash flows of a firm is equal to the regulatory asset base. That is, the regulatory asset base maintains its value and the regulated businesses are not over or under compensated.

578. In order to ensure that NPV=0, the ERA believes that the appropriate term for the risk free rate in the current regulatory setting is five years. The rate of return is reset every five years, consistent with the term of the access arrangement.

579. The present value principle is detailed in the ERA's consideration of the overall rate of return and term (see *Chapter 4 – Overall rate of return).*

203 Aligns with the length of the regulatory period.

ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 12.

204 Aligns with the length of the regulatory period.

ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 2016, p. 11.

205 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-38.

206 The AER's terms in its April 2018 final decision on ElectraNet was consistent with that detailed in its draft decision.
AER, *Draft Decision ElectraNet transmission determination 2018 to 2023,* October 2017, p. 3-42.

207 The 3 year term aligns with the length of the regulatory period for Seqwater.

Queensland Competition Authority, *Seqwater Bulk Water Price Review 2018-21,* March 2018, p. 61.

208 Independent Pricing and Regulatory Tribunal, *WACC Biannual Update*, February 2018, p. 2.

209 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 124.

210 Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 66.

8.3.3 The length of the averaging period

580. The risk free rate and the debt risk premium (see *Chapter 9 – Debt risk premium*) are calculated using market data. To set these parameters, it is necessary to choose the period over which market data will be considered. This period is called the 'averaging period'.

581. As there can be unexplained day-to-day volatility, taking an average over a period reduces the risk of over or under compensating regulated businesses. When selecting the averaging period, there is a trade-off between efficiency and short term volatility considerations.

582. The current practice of Australian regulators is to adopt an averaging period in the range of 20 to 40 trading days for smoothing the day-to-day fluctuations of the observed risk free rate.[211]

583. Regulators generally apply a consistent averaging period when calculating the different components of the rate of return – for example, if a regulator uses a 40 trading day period for one decision, it will also use 40 trading days across its other decisions.

584. The length of the averaging period should be informed by both technical considerations and practical ones. The ERA's technical analysis indicated that an averaging period of up to 60 trading days, just prior to the commencement of the regulatory period, provides an acceptable predictor of the forward looking estimate of the risk free rate for the subsequent regulatory period.[212] Prediction performance is important for achieving the efficiency requirements of the national gas objective. If the averaging period is greater than 60 trading days, its predictive performance may be impaired. However, it may not be practically feasible for a service provider to nominate an averaging period 60 trading days ahead of time.

585. In its recent decisions, the ERA has accepted a 20 trading day period.[213] Allowing the service provider to nominate a 20 trading day period – agreed with the ERA – that falls close to the commencement of the regulatory period, or close to the submission of a tariff variation, meets both the technical requirements of efficiency and acceptable volatility, and is practical for the ERA and service providers.

586. The requirement to nominate the averaging period in advance is relevant for ensuring regulated businesses do not cherry pick the best outcome.

8.3.4 Interpolating the term to maturity

587. The RBA reports the yields of Commonwealth Government Securities each day, and these reported yields will form the basis for estimating the risk free rate of return. This risk free rate can be observed with reasonable certainty.

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

212 ERA, Appendices to the Explanatory Statement for the Rate of Return Guidelines: Appendix 4 – The Diebold Mariano test, December 2013, pp. 46-55.

213 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, May 2018, p. 14.
ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return, June 2016, p. 49.

588. However, it is not always the case that the remaining term to maturity of an existing Commonwealth Government Security will match the required term of the risk free rate. When this occurs, the ERA will observe the yield of two Commonwealth Government Securities that have maturities closest to, but less than and greater than, that of the required maturity. Linear interpolation between these two bonds will then be used to estimate the risk free rate of the required maturity.

8.4 Public submissions

589. In its submission AGIG agreed with the ERA's risk free rate for debt and its submission focused on the risk free rate for the return on equity. AGIG's submission can be summarised as follows: [214]

- Commonwealth Government Securities were supported as an appropriate proxy for the risk free rate.
- There was no reason to limit the length of the risk free rate for the return on equity to the five-year regulatory period.
- The risk free rate for the return on equity should reflect the long-term nature of investments, as it considered that equity as a going concern.
- Proposed the use of a 10-year term to maturity for Commonwealth Government Securities as the longest available risk free rate.

590. ATCO's submission accepted the ERA's draft guideline approach to the risk free rate for both the return on debt and return on equity.[215]

591. GGT's submission on the risk free rate can be summarised as follows: [216]

- The riskless asset is a theoretical construct under Sharpe Lintner CAPM, as no asset is without risk.
- The five-year regulatory period was not relevant to the estimation of the risk free rate, nor was any consideration of NPV = 0 principle.
- The term to maturity of Commonwealth Government Securities should be 10 years. GGT argues that the estimate of the risk free rate:
  - must be over the long term
  - is in the context of the market for all assets
  - has no particular relationship with any risky asset.

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214 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 13-14.

215 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 9, 13.

216 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, pp. 7-12.

8.5 Independent Panel

592. The Independent Panel considered that the conclusions for estimating the risk free rate of return as an input to the cost of equity and the cost of debt are well supported and clearly linked to relevant information. [217]

593. The Independent Panel supported the use of Commonwealth Government bonds to estimate the risk free rate for the purposes of the cost of equity. [218]

594. The Independent Panel supported the use of the swap rate as the risk free rate for the purposes of the cost of debt. It noted that the swap rate is more useful than the risk free rate in facilitating hedging and for use in estimating the return on debt. [219]

595. The Independent Panel considered that the use of a five-year risk free rate in the hybrid trailing approach meets the principle of NPV=0 and does not impose higher debt costs from the use of a 10-year risk free rate. [220]

596. The Independent Panel considered that the Explanatory Statement should provide more material explaining why the risk free rate should be for a period of five years to ensure the NPV=0 condition is met.[221]

597. The Panel considered it would also be helpful, for transparency, to provide the formula and a simple example of the linear interpolation that is proposed to be used for Commonwealth Government Securities.[222]

8.6 Final approach

598. The ERA will use a five-year term to maturity to estimate the risk free rate of return for the return on equity and for the return on debt.

599. The ERA will set the risk free rate of return at the start of a regulatory access arrangement period and will be fixed for the length of that period.

600. Commonwealth Government Security bonds are the best proxy for risk free assets in Australia.

601. The ERA will use observed yields from these Commonwealth Government Security bonds – as reported daily by the RBA – to estimate the risk free rate of return for the purpose of estimating the return on equity.

[217] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 37.

[218] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 36-37.

[219] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 36.

[220] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 32.

[221] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 36.

[222] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 36.

602. It is not common to observe a Commonwealth Government Security bond with remaining term to maturity that exactly matches that of the regulatory period.[223] Therefore, for the return on equity, the ERA will use a linear interpolation of the observed yields of Commonwealth Government Security bonds to estimate the risk free rate.

603. For the return on debt, the ERA will use estimates of the prevailing interest rate swaps of appropriate terms for estimating the return on debt. The swap rate is referred to as the 'base rate' in the return on debt calculation. It incorporates a spread to the rate on Commonwealth Government Security bonds and is available at specified terms from data providers such as Bloomberg.

604. An 'averaging period' will be selected to set the rate of return parameters that are calculated using market data (being the risk free rate used to estimate the return on equity, and the base rate to be used in the estimate of the return on debt for the coming five-year period). The averaging period will:

- have a duration of 20 consecutive trading days
- be as close as possible to commencement of the regulatory period
- be nominated prior to any of its dates taking place.

605. In the event that an averaging period is not nominated within 30 business days following an access arrangement draft decision, the ERA will use a default averaging period of the 20 consecutive trading days one month prior to the access arrangement final decision for the regulatory period.

8.7 Final reasoning

606. In addition to its draft reasoning, the ERA has considered public submissions and the Independent Panel's Review.

8.7.1 The choice of the proxy for the risk free rate

8.7.1.1 The proxy for estimating the return on equity

607. On the basis of the draft reasoning, the ERA will use Commonwealth Government bonds to determine the risk free rate.

608. Commonwealth Government bonds are:

- essentially free from default risk
- relatively liquid
- transparently and regularly reported.

[223] In the linear interpolation approach, two bonds are selected with terms to maturity that fall on either side of the date on which the term of the regulatory period ends The dates on these bonds are referred to as the 'straddle' dates. Linear interpolation estimates the yields on the regulatory period term by assuming a linear increase in yields between the straddle dates on the two bonds observed.

8.7.1.2 The proxy for estimating the return on debt

609. On the basis of the draft reasoning, the ERA will use swap rates to determine the risk free rate.

610. The use of swap rates:

- Provides a strong means to hedge and manage risk.
- Simplifies the calculation of the debt risk premium.
- Produces a closer match between the allowed cost of debt and that actually incurred by the firm.

611. If debt risk premiums are estimated consistently with the chosen base – whether that base be the Commonwealth Government Security risk free rate or the swap rate – there should be no difference in the resulting build-up of the overall return on debt.

8.7.2 The term of the risk free rate

8.7.2.1 Term of risk free rate for return on equity

612. In addition to the draft reasoning, the ERA has reviewed submissions and given further consideration to the appropriate term of the risk free rate for the cost of equity.

613. AGIG considered that the risk free rate for the return on equity should reflect the long-term nature of investments, consistent with its view of equity valuation.

614. GGT argued that when considering CAPM the five-year regulatory period was not relevant to the estimation of the risk free rate, nor was any consideration of the NPV=0 principle. GGT argued that the risk free rate is a market determined rate, which is not dependent on a regulatory framework or regulatory principles.

615. AGIG and GGT proposed the use of a 10-year Commonwealth Government Security as the longest available risk free rate.

616. Stakeholders have in the past objected to using a five-year risk free rate, preferring the 10-year term that is more consistent with the long life of the regulated assets.

617. CAPM theory does not provide guidance on the appropriate proxy for the risk free rate.

618. Aligning the term of the risk free rate with the term of the regulatory period is based on published research by Richard Schmalensee and Lally and demonstrates that 'term-matching' is required to satisfy the NPV=0 principle.[224]

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[224] Schmalensee, R., 'An Expository Note on Depreciation and Profitability Under Rate-of-Return Regulation', *Journal of Regulatory Economics*, Volume 1, No. 3, 1989.

Lally, M., 'Regulation and the Choice of the Risk Free Rate', *Accounting Research Journal*, 2004, vol. 17, no.1, pp. 18-23.

Lally, M., 'Regulation and the Term of the Risk Free Rate: Implications of Corporate Debt', *Accounting Research Journal*, 2007, vol. 20, no.2, pp. 73-80.

619. The ERA has previously commissioned Lally to undertake reviews of the use of the five-year risk free rate and of stakeholder submissions in this regard. Lally did not agree with the arguments presented against the use of a risk free rate with a term matching the regulatory cycle. [225] [226]

620. The Queensland Competition Authority has also considered the term of the risk free rate in its review of cost of capital market parameters. It concluded that its preferred approach to estimating the risk free rate for the return on equity was to align the term of the risk free rate with the term of the regulatory cycle.[227]

621. The Australian Competition Tribunal decision on the ERA's final decision on the Dampier to Bunbury Pipeline said:[228]

> The ERA had to use its discretion to determine an appropriate term to maturity for Commonwealth bonds over which to estimate the risk free rate of return. In the opinion of the Tribunal it carefully considered all the relevant material and arguments… it stated clearly its reasons for selecting the five-year term to maturity as the basis for its estimate of the risk free rate of return... Accordingly, the Tribunal finds that the ERA committed no conceptual or empirical error in its choice of the length of the term to maturity. Nor did the ERA's chosen estimation method involve any capriciousness or lack of consistency between the term to maturity used in estimating the risk free rate of return and in estimating the MRP. It exercised its discretion... to use a five-year term to maturity as the basis of its estimate of the risk free rate of return, and adequately explained its reasons for its selection of this five-year term to maturity, and this was a reasonable approach.

622. The ERA's requirement for a five-year risk free rate for the return on equity is based on the NPV=0 principle, whereby the appropriate term in the regulatory setting should be associated with the term of the access arrangement.

623. Even if investors view assets as long-term, this view has no bearing on the term for the risk free rate. If that term is not set equal to the term of the regulatory period then, in general, the allowed revenues will either under or over-compensate investors.

624. Matching the term to the regulatory period will result in NPV=0 for an investment over multiple periods. Essentially, the return on an investment over multiple periods can be expressed as income for the first year plus the net present value of return on investment in future years discounted by the risk free rate applicable in those periods. Therefore, no assumption about the interest expectation embedded in the risk free rate is necessary.[229] [230]

625. AGIG argued the investors require extra compensation for investing in long-lived assets and therefore concluded a 10-year risk free rate is superior to a five-year risk free rate. However, the problem AGIG describes is not logically connected to the term of the risk free rate. The difference between the 10-year and five-year risk free rates reflects compensation for interest rate risk. However, entities do not bear this interest rate risk as the risk free rate is reset every five years.

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225 Lally, M., *Review of arguments on the term of the risk free rate,* November 2015.

226 Lally, M., *Review of arguments on the equity risk premium and the risk-free rate*, May 2016.

227 Queensland Competition Authority, *Final decision – Cost of capital: market parameters*, August 2014.

228 *Application of DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14.*

229 Queensland Competition Authority, *Final decision – Cost of capital: market parameters*, August 2014, p. 12, Appendix B.

230 Lally, M., *Review of the AER's Methodology for the Risk Free Rate and the Market Risk Premium, Report for the Australian Energy Regulator, March 2013.*

626. When the ERA is establishing an allowed rate of return, it is not establishing the value of the regulated business based on the expected cash flows to perpetuity.[231] Rather, the ERA is seeking to establish the value of cash flows over the access arrangement period based on the value of the regulatory asset base.

627. Regulated equity returns are afforded a degree of protection against interest risk over the regulatory term. Therefore, the value of the firm in perpetuity from the next access arrangement forward will recognise the risk free rate expected to prevail at the start of the next access arrangement as the discounting factor.

628. The ERA remains of the view that it is appropriate to apply a five-year term for the risk free rate for the return on equity.

- Term-matching satisfies the NPV=0 principle regardless of the term structure of interest rates, while the 10-year rate in general will not satisfy it.
- The use of a 10-year risk free rate over-compensates the regulated firm's investors for interest rate risk that they do not bear when the term structure of interest is upward-sloping. It will also under-compensate investors when the term structure of interest rates is downward-sloping.

8.7.2.2 Term of risk free rate for return on debt

629. Consistent with the draft reasoning, the ERA considers a five-year risk free rate is the best approach for the return on debt. This approach meets the NPV=0 principle, while also ensuring that additional cost is not passed on to consumers.

630. In Chapter 4 – Overall rate of return and Chapter 7 – Return on debt the ERA considers the hybrid trailing average approach as the best approach to estimate the cost of debt. This approach uses a five-year on-the-day risk free rate.

8.7.3 The length of the averaging period

631. The ERA has given the averaging period further consideration, in light of the need to remove discretion under a binding framework.

632. The ERA will continue to use an averaging period that meets the following criteria:

- duration of 20 consecutive trading days
- being as close as possible to the expected access arrangement final decision for regulatory period
- nominated prior to any of its dates taking place.

633. In the event that an averaging period is not nominated within 30 business days following an access arrangement draft decision, the ERA will use a default averaging period of the 20 consecutive trading days one month prior to the access arrangement final decision for the regulatory period.

[231] Lally, M. endorses this view when he responds to similar arguments for the Queensland Competition Authority in the context of the risk free rate (see Lally M., *Response to submissions on the risk free rate and the MRP,* October 2013, p. 24.)

8.7.4 Interpolating the term to maturity

634. When the remaining term to maturity of an existing Commonwealth Government Security does not match the required term of the risk free rate the ERA will observe the yield of two Commonwealth Government Securities that have maturities closest to, but less than and greater than, that of the required maturity.

635. Linear interpolation between these two bonds will then be used to estimate the risk free rate of the required maturity.

636. The ERA obtains Commonwealth Government Securities data from the RBA's Table F16 for the five-year risk free rate calculation. [232]

637. There are five steps to calculate the annualised five-year risk free rate:

- Define the 'maturity dates', which are five years from each date of the predetermined averaging period. For example, if the predetermined estimation date is 2 March 2018, the five-year maturity date would be 2 March 2023.

- Choose two Commonwealth Government Securities that fall on either side of the 'maturity dates'

- Use the linear interpolation formula below to calculate the corresponding interest rate for each date of the averaging period:

$$5\ year\ interest\ rate_d = r_1 + (D - D_1) \times \frac{(r_2 - r_1)}{(D_2 - D_1)} \qquad \text{equation 14}$$

where

$5\ year\ interest\ rate_d$ is the interpolated five-year interest rate for date "d" in the predetermined averaging period

r_1 is the yield of treasury bond 1 that has a maturity less than five years

r_2 is the yield of treasury bond 2 that has a maturity greater than five years

D is the five years from date "d"

D_1 is the maturity date for bond 1 with a maturity less than five years

D_2 is the maturity date for bond 2 with a maturity greater than five years.

- Repeat the above calculation for each day of the predetermined averaging period. Then calculate a simple average of the interpolated five-year risk free rates.

- Annualise the semi-annual simple average five-year risk free rate calculated above using the formula below:

$$Annual\ R_f = \left(1 + \frac{semiannual\ R_f}{2}\right)^2 - 1 \qquad \text{equation 15}$$

232 RBA Table F16 – Indicative Mid Rates of Australian Government Securities https://www.rba.gov.au/statistics/tables/

9. Benchmark credit rating

9.1.1 Background

638. The benchmark credit rating is an input required to estimate the debt risk premium.

639. The credit rating is defined as the forward-looking opinion provided by a ratings agency of an entity's credit risk. Credit ratings provide a broad classification of a firm's probability of defaulting on its debt obligations. As a consequence, credit ratings represent the risk present in holding a debt instrument.

640. As a general rule, the debt risk premium is higher when the credit rating is lower, and vice versa. This is because lenders require increased compensation before they commit funds to a debt issuer with a lower credit rating. A lower credit rating can be associated with a higher risk of default, which leads to a higher debt risk premium.

9.2 Draft approach

641. Credit ratings provide a broadly uniform measure of default risk. That is, firms with the same credit rating at a particular point in time should have similar levels of default risk.

642. This characterisation of risk eliminates the need to rely on listed firms, as is the case for equity beta, because it is not measured relative to an index based on a domestic stock exchange. For this reason both listed and unlisted firms can be used where a credit rating is available.

643. The ERA used the median value approach to determine the credit ratings of the benchmark efficient entity.

644. The median value approach involves taking the median credit rating of a sample of comparator businesses and using this value as the credit rating for the benchmark efficient firm. These can be listed, unlisted or government-owned. This approach is relatively robust to the presence of outliers in the comparator business sample. The approach is somewhat superficial because it does not analyse the drivers of credit ratings in much detail and focuses on the prevalence of the final ratings. This approach suggests a credit rating around BBB+.

645. Other regulators' decisions are referred to as a cross-check. They support a credit rating of BBB+.

646. On the basis of the analysis and cross-checks, in the draft guidelines, the ERA determined a benchmark credit rating of BBB+ to be appropriate for application in the cost of debt estimations. This credit rating is fixed until the next review of the rate or return guidelines.

9.3 Draft reasoning

9.3.1 Median credit rating approach

647. To estimate the benchmark efficient entity's credit rating using a median credit rating approach, a benchmark sample of comparator companies must first be constructed. This does not have to be constrained to listed or privately owned companies, because the analysis takes parent and government ownership into consideration.

648. As set out in the chapter on the benchmark efficient entity and compensation for risk, it is appropriate to select Australian companies with similar risk for the benchmark sample, which is used to determine a benchmark credit rating. A company that is included in the sample is required to satisfy two characteristics. First, the company must be a network service provider in the gas and/or electricity industry in Australia. Second, its credit rating must be published by an international rating agency such as Standard & Poor's (S&P) or Moody's. Moody's credit ratings are converted into the equivalent S&P credit ratings because the ERA's debt risk premium approach uses S&P ratings.

649. The ERA has used the 2013 rate of return guidelines sample as a starting point for establishing the credit rating. This is shown in Table 9.

Table 9 2013 rate of return guidelines credit rating sample remapped to 2018 and final sample

2013 sample	2018 mapping	2018 sample
Alinta LGA Ltd/Jemena (AGL)/Singapore Power International Assets Australia	Jemena	Jemena
Alinta Network Holding Pty Ltd/WA Network Holdings Pty Ltd/ATCO Gas Australia LP	ATCO	ATCO
The CitiPower Trust	Victorian Power Networks	Victorian Power Networks
DBNGP Finance Co Pty Ltd	DBP	DBP
DBNGP Trust	DBP	
Diversified Utility and Energy Trusts (DUET) Group	Acquired	
ElectraNet Pty Ltd	Electranet	Electranet
Energy Partnership (Gas) Pty Ltd	Energy Partnerships	No data
Envestra Ltd	Australian Gas Networks	Australian Gas Networks
Envestra Victoria Pty Ltd	Australian Gas Networks	
Ergon Energy Corporation Ltd	Ergon Energy	Ergon Energy
Ergon Energy Queensland Pty Ltd	Ergon Energy	
ETSA Utilities Finance Pty Ltd	South Australian Power Networks	South Australian Power Networks
Gas Net Australia (Operations) Pty Ltd/APT Pipelines Ltd	APA Group	APA Group
Powercor Australia, LLC	Victorian Power Networks	
SP AusNet Group	Ausnet	Ausnet
SPI Australia Holdings (Partnership) LP	Ausnet	
SPI Electricity & Gas Australia Holdings Pty Ltd	Ausnet	
SPI Electricity Pty Ltd	Ausnet	
SPI PowerNet Pty Ltd	Ausnet	
United Energy Distribution Holdings Pty Ltd	United Energy Distribution	United Energy Distribution
United Energy Distribution Pty Ltd	United Energy Distribution	
-	-	Transgrid
-	-	Multinet Gas

Source: ERA Analysis

650. An entity's credit rating will generally provide a more appropriate indicator of the risk profile for a business than will the credit rating of instruments issued by the business. This is because credit ratings for instruments can be improved due to practices such as credit wrapping.[233] For this reason many of the companies in the sample have been consolidated by sourcing the S&P long term local currency issuer rating that applies to the parent of the duplicates. DUET Group was acquired by AGIG in April 2017. AGIG now owns DBP, Australian Gas Networks and Multinet Gas. Additional credit ratings for Transgrid and Multinet are available in Spark Infrastructure and DUET Group's annual reports. The ratings are used to augment the 2018 sample. This resulted in a sample of 13 companies with credit ratings.

233 Credit wrapping is a type of credit enhancement whereby a bond insurer guarantees to meet interest and principal payments if the issuer cannot.

651. Credit rating companies often take government and parent ownership into account, implicitly or explicitly, when producing ratings. This is because a parent or government with a strong credit rating is seen as a source of credit support for the entity. For this reason the ERA has considered a benchmark credit rating from the following sample and sub-samples based on Table 9:

- A sample including both Australian gas and electricity companies (*Sample 1*).
- A sample excluding gas and electricity businesses with any form of government ownership (*Sample 2*).
- A sample including all privately-owned (non-government owned) gas and electricity businesses excluding businesses with support from their parent companies (*Sample 3*).

652. An outline of government and parent ownership for the sample is shown in Table 10.

Table 10 Ownership of firms in benchmark credit rating sample

Firm	Parent (51 per cent plus control)	Government ownership
ATCO Gas Australia	ATCO Group	No
ElectraNet Pty Ltd	None	State Grid (Chinese Government)
Jemena Ltd	State Grid (Chinese Government)	State Grid (Chinese Government)
United Energy Distribution Holdings Pty Ltd.	Cheung Kong Infrastructure Holdings Limited and Power Assets Holdings	State Grid (Chinese Government)
Australian Gas Networks	Cheung Kong Infrastructure Holdings, Cheung Kong Property and Power Assets Holdings	No
DBP	Cheung Kong Infrastructure Holdings, Cheung Kong Property and Power Assets Holdings	No
Multinet Gas	Cheung Kong Infrastructure Holdings, Cheung Kong Property and Power Assets Holdings	No
APA Group	None	No
Ausnet	None	State Grid (Chinese Government)
Victorian Power Networks (Citipower & Powercor)	Cheung Kong Infrastructure Holdings Limited and Power Assets Holdings	No
SA Power Networks	Cheung Kong Infrastructure Holdings Limited and Power Assets Holdings	No
Transgrid	None	NSW Government (99 year lease)
Ergon Energy	None	QLD Government

Source: ERA Analysis

653. In this analysis, the ERA considers the median credit rating of the above samples for the period of five years from 2013 to 2017. The results of the analysis are shown in Table 11.

Table 11 Median credit rating approach results

	2013	2014	2015	2016	2017	Number of firms
Sample 1 - All firms	BBB	BBB+	BBB+	BBB+	BBB+	13
Sample 2 - excluding government ownership	BBB	BBB+	BBB+	BBB+	BBB+	7
Sample 3 - excluding government ownership and parent control	BBB	BBB	BBB	BBB	BBB	1

Source: ERA Analysis

654. Samples 1 and 2 produce the same results. The analysis therefore does not exhibit any difference to credit rating on the basis of government ownership. However, this could be an artefact of the small sample sizes involved. Sample 3 produces results one notch lower from 2014 on. This suggests that parent ownership and control may improve credit rating (from BBB in sample 3 to BBB+ in sample 2), but again, this may be an artefact of the small sample sizes. The analysis shows that credit rating has generally been improving over the period with all samples indicating a BBB rating in 2013 and BBB+ credit rating in 2017.

9.3.2 Other regulators' decisions

655. Current Australian regulatory decisions on credit ratings are presented in Table 12 below.

Table 12 Credit rating in the Australian regulatory decisions

Regulator	Year	Industry	Credit rating
AER[234 235 236]	2017, 2018	Electricity network	BBB+
AER[237]	2013	Gas Networks	BBB+
ESCOSA[238]	2016	Water, sewerage, stormwater drainage and other services	BBB
QCA[239]	2014	Various	BBB+
IPART[240]	2014	Various	BBB/BBB+

Source: ERA analysis.

656. While some of the analyses were carried out over four years ago, most regulatory credit ratings support the BBB+ rating.

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234 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-130.

235 The AER's credit rating in its April 2018 final decision on ElectraNet is consistent with that detailed in its draft decision.

AER, *Draft Decision ElectraNet transmission determination 2018 to 2023,* October 2017, p. 3-115.

236 This benchmark credit rating is the same rating proposed in its 2013 Rate of Return Guidelines.

237 Australian Energy Regulator, *Rate of Return Guideline,* December 2013, p. 21.

238 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 124.

239 Queensland Competition Authority, *Cost of debt estimation methodology: Final Decision,* August 2014, p. 10.

240 Independent Pricing and Regulatory Tribunal, *New Approach to Estimating the Cost of Debt: Use of the RBA's Corporate Credit Spreads*, February 2014, p. 3.

657. The AER also applied the BBB+ credit rating to decisions that were upheld before the Australian Competition Tribunal.[241] [242] [243] The Tribunal has also observed that the more recent years firmly point toward a BBB+ credit rating for the benchmark efficient entity.[244]

658. On the basis of the analysis and cross-checks the ERA determined a benchmark credit rating of BBB+ to be appropriate for application in the cost of debt estimations.

9.4 Public submissions

659. AGIG's submission can be summarised as follows: [245]

- AGIG argued that the rating for gas transmission firms appeared to be BBB and gas distribution firms BBB+.
- AGIG requested that separate credit ratings should be provided to different parts of the gas industry, reflecting their different risks. AGIG requested a similar approach to the ERA's rail WACC guidelines, which used different credit ratings for each of the three railways.
- To the extent that a credit rating of BBB+ is used, to address a small sample size, AGIG recommended that the ERA augment the BBB+ credit rating to expand the bond sample to include other credit ratings. AGIG recommended that the ERA apply a similar method to the ERA's rail WACC approach, which augments the selection of bonds with credit rating above and below the benchmark credit rating, and then adjusts for directional bias.

660. ATCO's submission accepted the ERA's draft guideline benchmark credit rating of BBB+. [246]

661. ATCO also noted that the draft guidelines do not state whether a minimum number of bonds matching the credit rating are required to estimate the debt risk premium. ATCO was of the view that the bond sample should be expanded to the BBB-/BBB/BBB+ credit band in circumstances in which the number of BBB+ bonds is insufficient to estimate the debt risk premium.

662. GGT's submission considered the benchmark gearing and was concerned with the use of a BBB+ credit rating. GGT's submission can be summarised as follows: [247]

- GGT, which is rated BBB, argued that the benchmark credit rating of BBB+ and the benchmark gearing of 55 per cent were inconsistent.

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241 Australian Competition Tribunal, *Applications by Public Interest Advocacy Centre Ltd and Ausgrid [2016] ACompT 1*, 26 February 2016, para 993.

242 AusNet Transmission Group Pty Ltd, *Transmission Revenue Review 2017–2022 regulatory proposal*, 30 October 2015, pp. 191, 196.

243 AusNet Transmission Group Pty Ltd, *Transmission Revenue Review 2017–2022 revised regulatory proposal*, 21 September 2016, pp. 137, 167.

244 Australian Competition Tribunal, *Applications by Public Interest Adocacy Centre Ltd and Ausgrid [2016] ACompT 1,* 26 February 2016, para 993.

245 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 20-22.

246 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 9-11.

247 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, pp. 2-5.

- GGT considered that some credit ratings were elevated by reference to the financial strength and support of parent entities.
- GGT has noted that some entities are 'double counted' because each of the corporate entities have been included in the AER's credit rating table.
- GGT considered that it could not aspire to the benchmark BBB+ without lowering its gearing well below the 55 per cent benchmark gearing.
- GGT argued that the benchmark credit rating should be no higher than BBB for a benchmark gearing of 55 per cent.

9.5 Independent Panel

663. The Independent Panel considered that there was a clear link between the information and the conclusions of a BBB+ credit rating. [248]

664. The Panel noted that aspects of the regulatory arrangements provide sufficient information to support the conclusion of at least a BBB+ credit rating for the Western Australian regulated gas network businesses. These regulatory arrangements include the application of a building blocks model at five-year intervals, the assurance that the model provides for cost recovery and the revenue cap form of regulation. [249]

665. The Independent Panel considered more explanation was required as to how the sample of 13 comparator businesses was chosen for setting a benchmark credit rating.[250]

9.6 Final approach

666. Credit ratings provide a broadly uniform measure of default risk. That is, firms with the same credit rating at a particular point in time should have similar levels of default risk.

667. This characterisation of risk eliminates the need to rely on listed firms, as is the case for equity beta, because it is not measured relative to an index based on a domestic stock exchange. For this reason both listed and unlisted firms can be used where a credit rating is available.

668. The ERA uses the median value approach to determine the credit ratings of the benchmark efficient entity.

[248] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 39.

[249] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 39.

[250] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 38.

669. The median value approach involves taking the median credit rating of a sample of comparator businesses and using this value as the credit rating for the benchmark efficient credit rating. These can be either listed or unlisted or government-owned. This approach is relatively robust to the presence of outliers in the comparator business sample. The approach is somewhat superficial because it does not analyse the drivers of credit ratings in much detail and just focuses on the prevalence of the final ratings. This approach suggests a credit rating around BBB+.

670. Other regulators' decisions are referred to as a cross-check. They support a credit rating of BBB+.

671. On the basis of the analysis and cross-checks the ERA determines a benchmark credit rating of BBB+ to be appropriate for application in the cost of debt estimations.

672. This credit rating is fixed until the next review of the rate of return guidelines.

9.7 Final reasoning

673. In addition to its draft reasoning, the ERA has considered public submissions and the Independent Panel comments.

674. Public submissions requested that separate credit ratings should be provided to different types of gas pipelines.

675. The ERA considers that Western Australian gas pipelines are not reliant on any one customer or industry and are not exposed to higher risk than the benchmark entity. Regulated Western Australian gas transmission businesses have good pipeline utilisation rates and in some cases have a large number of customers on long-term contracts.

676. Consistent with its approach to developing a benchmark sample, the ERA uses the best available comparable firms of Australian energy networks. The ERA's benchmark sample includes those available in Western Australia.

677. The ERA does not consider that Western Australian gas transmission pipelines have higher risk than those included in the benchmark sample. The ERA continues to support the estimation of credit rating from its benchmark sample.

678. The ERA considers that differences in the risk profiles of Western Australian rail businesses do exist, while this is not the case for Western Australian network businesses. For example, one of the Western Australian rail businesses lacks diversification and exclusively services a small number of miners exposed to a single commodity, while another services metropolitan passengers. Therefore, for railways the ERA considers that different credit ratings appropriate.

679. The ERA considers there is a sufficient number of bonds to perform debt risk premium estimates for a BBB+ credit rating. This is discussed in *Chapter 10 – Debt risk premium*.

680. The ERA notes GGT's view that:

- Funds for operation/debt greater than eight per cent was required to achieve a BBB+ rating.
- 55 per cent gearing would lead to funds for operation/debt ratios which are more aligned with a rating of BBB or below.

681. The ERA considers that credit ratings are not solely based on the funds for operation/debt ratios.

682. The ERA acknowledges that credit rating agencies such as S&P use credit metrics to assess the credit ratings. However, this assessment is only one component of the credit rating process. Qualitative information has played a significant role in the S&P process of assessing the credit rating for a business.[251]

683. The ERA received a July 2018 report from a credit rating agency that considered proposed changes to Australia's regulatory rules and the AER's draft guidelines. The rating agency assessed the implications of the revised rate of return from the AER's draft guidelines on regulated energy networks. The agency believed that networks and their shareholders would implement countermeasures to protect their credit profiles in the lead-up to the implementation of new rules. Further, it was believed that, on balance, the proposed adoption of a clearly defined binding rate of return, which uses longstanding regulatory principles, should maintain the high predictability of revenue for the networks, the key factor underpinning these companies' credit profiles.

684. The ERA considers that aspects of the regulatory framework help reduce the risk of Western Australian gas network businesses and this supports a higher credit rating.

685. The ERA has given the matter of parental ownership further consideration. The ERA has consistently maintained its view across regulated businesses that the benchmark entity is an efficient 'pure-play' gas network business operating within Australia without parental ownership, with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services. As such, the ERA is of the view that a discussion on parental ownership is irrelevant and there is no elevation of the credit rating from the benchmark sample due to the parental ownership.

686. The ERA considers that the benchmark sample is developed on a basis of well-established practice of Australian regulators. Regulatory practice considers the median credit rating from various energy networks included both private and public. The AER initiated this practice in 2008 during its review of the WACC.[252]

687. The ERA considers that available evidence from the benchmark sample of companies, presented in Table 11 above, supports a benchmark credit rating of BBB+.

688. Adjusting and consolidating corporate entities does not change this result.

689. On the basis of all available evidence, the ERA considers that the benchmark credit rating of BBB+ is appropriate.

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251 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2012, p. 337.

252 AER, *Explanatory Statement, Electricity Transmission and Distribution Network Service Providers – Review of the Weighted Average Cost of Capital,* December 2008, pp. 273-83.

10. Debt risk premium

10.1 Background

690. 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.

691. This chapter outlines the ERA's approach to estimating the debt risk premium.

10.2 Draft approach

692. In the draft guidelines, estimating the debt risk premium involved the following steps:

- Step 1: Identifying a sample of relevant corporate bonds that reflect the credit rating of the benchmark efficient entity.
- Step 2: Converting the bond yields from the sample into hedged Australian dollar equivalent yields inclusive of Australian swap rates.
- Step 3: Estimating yield curves on this data by applying the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson techniques.
- Step 4: Calculating the simple average of their three yield curves' 10-year cost of debt to arrive at a market estimate of the 10-year cost of debt.
- Step 5: Calculating the debt risk premium by subtracting the 10-year interest rate swap rate from the 10-year cost of debt.

693. These steps determine the debt risk premium at a point in time, being the date of calculation. The ERA refers to this method as the 'revised bond yield approach'.

694. To determine the debt risk premium used to calculate the gas rate of return, the ERA constructs a 10-year trailing average debt risk premium. This will consist of a debt risk premium for the current year and a debt risk premium for each of the nine prior years. The 10-year trailing average debt risk premium must be updated each year.[253]

695. The following sections provide more detail on the ERA's methods for identifying the benchmark sample, converting bond yields into hedged Australian dollar equivalent yields, estimating yield curves and constructing the 10-year trailing average.

253 For a worked example of this method, refer to Appendix 4 of the ERA's *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020.* (Economic Regulation Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline: Appendix 4 Rate of Return*, 30 June 2016.)

10.2.1 Identifying the benchmark sample

696. The ERA's revised bond yield approach uses international and domestic bonds identified by Bloomberg as having Australia as their country of risk to estimate the cost of debt each year.

697. The ERA will apply the following criteria to identify international and domestic corporate bonds to be included in the benchmark sample:[254]

- The credit rating of each bond must match that of the benchmark efficient entity, as rated by S&P (*Chapter 9 – Benchmark credit rating* discusses the credit rating of the benchmark efficient entity).
- The time to maturity must be two years or longer.
- Issued bonds must specify the country of risk as Australia,[255] and must be denominated in either AUD, USD, Euros or GBP (all compliant bonds are included, except those issued by the financial sector).[256]
- The benchmark sample will include both fixed bonds[257] and floating bonds.[258]
- The benchmark sample will include both bullet and callable/puttable redemptions.[259]
- Bonds will have at least 50 per cent of observations for the averaging period (that is, 10 yield observations over the required averaging period of 20 trading days are required).
- The bonds are not called perpetual, a duplicate, or inflation-linked.

698. The averaging period for the debt data series for any given year will:

- be specified before the start of the regulatory period
- be as close as practical to the start of the relevant regulatory year

254 ERA, *Discussion Paper – Measuring the Debt Risk Premium: A Bond Yield Approach*, December 2010, p. 11.

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

256 As classified by Bloomberg Industry Classification System level 1.

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

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

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

- not overlap with any other regulatory year's debt averaging periods
- be confidential.

10.2.2 Converting bond yields to Australian dollar equivalent yields

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

700. The ERA will then convert this denominated currency credit to Australian dollar terms by accounting for hedging costs.[260]

10.2.3 Estimating yield curves

701. The ERA will apply three curve-fitting techniques to the bond yield data to estimate the cost of debt. These are the Gaussian Kernel method, the Nelson-Siegel method and the Nelson-Siegel-Svensson method.

702. The ERA will then average the results of these three methods to arrive at a market estimate of the 10-year cost of debt.

10.2.4 Constructing the 10-year trailing average

703. The estimate of the debt risk premium for each year will be a simple trailing average, as discussed in *Chapter 7 – Return on debt*.

704. The ERA analysis for the 2013 guidelines indicated that the term at issuance for a benchmark efficient entity is about 10 years.[261] Consequently, the trailing average is constructed over a 10-year period, to ensure consistency with the average term of debt issued by the benchmark efficient entity and its staggered debt portfolio.

705. The ERA began calculating annual debt risk premiums in April 2015, and will use these as inputs when constructing the 10-year trailing average.

706. For years prior to 2015, the ERA will adopt a third-party source for debt risk premiums, being the RBA's historical credit spreads for 10-year non-financial corporate bonds.

707. The trailing average debt risk premium over the most recent 10 years will be a simple average of each year's debt risk premium (that is, the calculation will weight each year's debt risk premium at 10 per cent).

708. The ERA will refer to this approach as a 'hybrid trailing average approach', reflecting its use of both the ERA's on-the-day calculations and historical figures from the RBA.

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

[261] ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, December 2013, p. 39.

709. The 10-year trailing average debt risk premium will be updated each year by adding in the most recent estimate of the debt risk premium and dropping the estimate from 10 years ago.

710. Hence, the automatic formula for the simple, equally-weighted 10-year trailing average is:

$$TA\ DRP_0 = \frac{\sum_{t=0}^{-9} DRP_t}{10} \qquad \text{equation 16}$$

where:

$TA\ DRP_0$ is the equally weighted trailing average of the debt risk premium to apply in the following year as the annual update of the estimate used in the current year

DRP_t is the debt risk premium estimated for each of the 10 regulatory years t = 0, -1, -2…. , -9.

711. For detailed information on the automatic formula for annually updating the return on debt (which includes updating the debt risk premium), refer to Appendix 7 of the explanatory statement for the guidelines.

10.3 Draft reasoning

10.3.1 Theoretical considerations

712. The debt risk premium compensates lenders for the additional risk of providing debt capital, over and above the risk free rate. The extent of the compensation, or 'credit spread', is closely related to the risk of the business. When issuing debt in the form of bonds, a credit rating can be assigned which reflects the probability of default of the issuer and hence the risk present in the bond. *Chapter 9 – Benchmark credit rating* discusses the credit rating of the benchmark efficient entity.

713. The debt risk premium for the benchmark efficient firm is estimated by first observing the credit spread on bonds with equivalent credit ratings to that of the benchmark firm. The yield of corporate bonds reflects the discount rate of the cash flows arising from the purchase of a bond and as a consequence reflects the promised return of the bond. Because cash flows are constrained by the promised coupons and face value, the promised yield can be directly observed via the traded price of the bond[262] and is quoted by financial services such as Bloomberg.

[262] By setting the price of the bond equal to the promised cash flows of the bond and solving for the discount rate.

714. As these bonds carry a risk of non-payment, it is possible that these cash flows will not be realised in the event of default. As a consequence, the stated yield to maturity is the maximum possible yield to maturity that can be realised by the purchase of the bond, and not the true expected return. In order to produce an unbiased estimate of the expected return for a bond, estimates of the expected losses due to default are required.[263] Therefore, observing the yield of corporate bonds for the purposes of estimating the debt risk premium is conservative. The ERA considers that the observed yields on existing bonds in the market are the best proxy for the cost of debt of the benchmark efficient entity, as they reflect the upper bound of the market's expected return.

715. A benchmark sample of corporate bonds is intended to capture the characteristics of the benchmark firm because the firms in the sample have the same credit rating assigned by an international rating agency such as S&P. Therefore, the corporate bonds in the sample have a similar level of risk to that faced by the benchmark efficient entity and thus have the same level of expected return. The benchmark sample of bonds will reflect the prevailing market conditions for funds of the benchmark efficient entity, consistent with market expectations. As a consequence, any method used to estimate the debt risk premium must first rely on a sample of corporate bonds with a similar degree of risk.

716. Credit rating agencies such as S&P and Moody's explicitly take economy-wide and company-specific factors into account when assigning credit ratings to debt securities. For example, S&P determines the credit rating by evaluating the business risk (qualitative assessment) and financial risk (quantitative assessment) faced by holders of debt securities. Table 13 presents the S&P risk profile used to determine the credit rating for a particular business.

Table 13 Standard & Poor's risk profile matrix

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

Source: S&P

717. S&P considers a broad list of factors in its assessment of financial risk, including accounting, financial governance and policies/risk tolerance, cash flow adequacy, capital structure/asset protection and liquidity/short-term factors. Its assessment also incorporates business risk factors, including country risk, industry risk, competitive position and profitability/peer group comparisons.[264]

[263] Cooper, I., and Davydenko, S., *Using Yield Spreads to Estimate Expected Returns on Debt and Equity*, London Business School, February 2003.

[264] S&P Ratings Services, *Methodology: Business Risk/Financial Risk Matrix Expanded*, 18 September 2012, p. 3.

718. Assigning a credit rating to a debt security of a business involves an independent assessment made by an independent rating agency. This process considers both qualitative and quantitative statements that reflect the likely risk of holding a debt security. Therefore, bonds with the same credit rating have a similar probability of default and therefore similar level of risk. As a result, the credit rating is the most appropriate measure for determining the efficient financing costs incurred by a benchmark efficient entity with a similar degree of risk.

10.3.2 Methods adopted by other regulators for estimating the debt risk premium

719. The generally-accepted approach to estimating the return on debt involves estimating a debt risk premium, which is added to the estimate of the risk free rate. The main components used to estimate the return on debt are:

- the credit rating of the benchmark service provider
- the resulting debt risk premium of the benchmark service provider
- debt raising and hedging costs.

720. Australian and international economic regulators have frequently adopted this method for determining the cost of debt. For example, the New Zealand Commerce Commission (NZCC) estimates an average debt premium.[265]

721. However, alternative approaches to estimating the cost of debt have also been adopted by regulators.

- The AER estimates the return on debt by reference to independent third party data series from the RBA and Bloomberg. The AER does not directly estimate a debt risk premium.
- Ofgem in the United Kingdom estimates the cost of debt directly from a sample of corporate bonds (without separately identifying the risk free rate or debt risk premium).

722. Table 14 shows recent Australian regulatory approaches to estimating the debt risk premium.

[265] New Zealand Commerce Commission, *Gas Distribution Services Input Methodologies Determination 2012,* Consolidated 3 April 2018, p. 64.

Table 14 Estimating the debt risk premium and cost of debt in Australian regulatory decisions

Regulator	Year	Industry	Cost of debt approach
AER[266 267 268]	2017, 2018	Gas and electricity	Average of the BBB-rated Bloomberg and RBA curves
ERA[269 270]	2016, 2018	Gas and electricity	ERA's revised bond yield approach
ESCOSA[271]	2016	Water, sewerage, stormwater drainage and other services	RBA bond yield curve
ACCC[272]	2015	Fixed Line Services (Telecommunications)	Average of the A-rated BVAL and RBA curves
IPART[273]	2014	Various	RBA bond yield curve
QCA[274]	2014	Various	PwC econometric approach

Source: Compiled by the ERA

723. The AER has used RBA data and Bloomberg Valuation Service (BVAL) data to estimate the cost of debt. It defined the benchmark bond as a 10-year corporate bond with a BBB+ credit rating. It measured the cost of debt by taking a simple average of the RBA broad-BBB rated 10-year curve, extrapolated to an effective term of 10 years and the BVAL broad-BBB rated curve. The BVAL curve depends on the maximum term published at the time – being either the 10-year estimate where it is available, the seven-year estimate extrapolated to a 10-year term, or the five-year estimate extrapolated to a 10-year term.[275]

266 AER, *Rate of Return Guideline,* December 2013, p. 21.

267 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-354.

268 The AER's approach to cost of debt in its April 2018 final decision on ElectraNet is consistent with that detailed in its draft decision.

AER, *Draft Decision ElectraNet transmission determination 2018 to 2023,* October 2017, p. 3-11.

269 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 2016, p. 148.

270 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, May 2018, p. 50.

271 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p.123.

272 Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 66.

273 Independent Pricing and Regulatory Tribunal, *WACC - IPART's New Approach to Estimating the Cost of Debt*, April 2014, pp. 1-2.

274 Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, pp. 2-10.

275 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-354.

724. In its final access determination for fixed line services, the Australian Competition and Consumer Commission (ACCC) also used a simple average of BVAL and RBA bond yield data to estimate the cost of debt. For this decision, the ACCC used curves for A-rated instruments.[276]

725. The Essential Services Commission of South Australia has used RBA bond yield data for corporate bonds in the range BBB- to BBB+ (that is, the broad-BBB rated curve), noting that this data extends back far enough in time to construct a 10-year trailing average.[277] The Independent Pricing and Regulatory Tribunal of New South Wales also relies wholly on RBA bond yield data to estimate the debt risk premium, having moved to this approach in 2014.[278]

726. The Queensland Competition Authority (QCA) considered the merits of various third-party data providers in its 2014 review of methods to estimate the cost of debt, but decided in favour of using an in-house econometric approach developed by PricewaterhouseCoopers. The QCA uses BVAL and RBA estimates as a crosscheck, when applying its econometric approach.[279]

727. Overseas regulators such as the NZCC have also adopted a similar approach to the bond yield approach.[280] In the NZCC's method, the debt risk premium is calculated as the spread between corporate bonds and New Zealand government bonds. The bid yields to maturity for New Zealand corporate bonds, issued by an electricity or gas distribution business, denominated in New Zealand dollars, publicly traded, and with a remaining maturity of five years, are used. The bid yields for New Zealand government bonds are interpolated for the remaining term to maturity of five years.

728. Ofgem has used the real cost of debt calculated directly from iBoxx data, a fixed income benchmark index, which is deflated using the Bank of England's 10-year breakeven inflation index. The iBoxx indices consist of an average of the non-financial sector's broad A and BBB rated corporate bonds.[281]

10.3.3 The revised bond yield approach (estimate of on-the-day debt risk premium)

729. In 2010, the ERA adopted the bond yield approach to estimate the debt risk premium in its regulatory decisions.[282] The bond yield approach constructs a sample of bonds with the same credit rating as that of the benchmark efficient entity. From this sample, the debt risk premium is estimated for each bond from its observed yields and then weighted.

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276 Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 66.

277 Essential Services Commission of South Australia, *SA Water Regulatory Rate of Return 2016-2020: Final Report to the Treasurer*, March 2015, p. 34.

278 Independent Pricing and Regulatory Tribunal, *WACC - IPART's New Approach to Estimating the Cost of Debt*, April 2014, pp. 1-2.

279 Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, pp. 2-10.

280 New Zealand Commerce Commission, *Gas Distribution Service Input Methodologies Determination 2012* (including all amendments as of 28 February 2017), 28 February 2017, pp. 222-224.

281 Ofgem, *Guide to the RIIO-ED1 electricity distribution price control: guide*, 18 January 2017, p. 60.

282 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, 31 October 2011, p. 158.

730. In 2015, the ERA reviewed its bond yield approach and augmented it to allow:

- the estimation of a yield curve[283]
- the inclusion of Australian bonds denominated in foreign currencies (USD, EUR and GBP).

731. The ERA refers to this approach as 'the revised bond yield approach' in its guidelines and in its decisions. The revised bond yield approach:

- Is transparent, because the sample of bonds underlying the bond yield approach estimates is published.
- Provides flexibility in sampling bonds within particular credit rating bands.
- Directly addresses the issue of the effective tenor of the RBA corporate credit spread estimates being less than 10 years.
- Is more robust to anomalous market yields by virtue of using 20 to 40 days of yield observations instead of using methods based on one day of observations.

10.3.3.1 The benchmark sample

732. A bond price (or its observed yield) is determined by the markets, not by the companies or the regulators.[284] Therefore, relying on market data will provide the best means of estimating the proxy for the cost of debt. This means that observed bond yields play a fundamental role in the method of estimation.

733. Market relevance is also important, as it takes account of the fact that new bond issuers consider the prevailing market conditions prior to the issuance of the bonds. In particular, issuers will consider issuing longer-term bonds in a 'normal' market situation, whereas shorter-term bonds may be more appropriately issued during very unstable market conditions. As a result, the observed yields of bonds currently traded in the market will reflect the nature of the prevailing market conditions prior to the issuance of the bonds.

734. Many Australian corporate bonds are denominated in foreign currencies.[285] Furthermore, overseas markets have assumed greater importance for the longer end of the yield curve.

735. As long as the majority of bond issuances of the various markets and currencies can be captured, then the associated outcomes are 'market relevant' and should be included in the benchmark sample.

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283 ERA, *Final decision on 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. 144.

284 ERA, *Measuring the debt risk premium: the bond-yield approach*, 30 November 2010.

285 RBA, *New Measures of Australian Corporate Credit Spreads, Bulletin*, December quarter 2013, p. 17.

736. The decision to issue bonds in the Australian or overseas financial markets lies with businesses. There may be a cost advantage in issuing bonds overseas taking into account all possible risks associated with the process such as exchange rate risk. Alternatively, it may be more convenient to issue longer-term bonds and/or bonds with larger amounts at issuance in overseas markets given the Australian financial market is generally considered smaller in comparison with markets in the United States of America, Europe and United Kingdom.

737. Consequently, Australian corporate bonds denominated in selected foreign currencies should be included in the benchmark sample, given the changing nature of debt markets and the clear trend to foreign issuance. Doing so will increase the sample size of the benchmark sample, which leads to a more robust estimate of the debt risk premium. The ERA will include Australian bonds denominated in USD, Euros or GBP in the benchmark sample under its revised bond yield approach.

738. Further, it is standard practice to exclude firms operating in the financial sector, because these firms have a different capital structure.[286]

739. The revised bond yield approach criteria are outlined in Table 15.

Table 15 Bonds in sample with country of risk of Australia

Criteria	ERA's approach
Remaining term	>= 2 years
Amount at issuance	N/A
Denominated currency	AUD, USD, EUR and GBP
Industry of issuers	Non-financial corporates only
Country of risk	Australia
Maturity type	Bullet, Callable and Puttable
Exclude	Perpetual, inflation linked, called instruments
Consolidate	Duplicate issues

Source: Bloomberg and ERA analysis

740. The country of risk criterion ensures that yields and credit spreads estimated on the bonds issued are reflective of risks primarily linked to economic and financial market conditions in Australia.

741. Perpetual, inflation-linked and called instruments are excluded. This is because these instruments appear infrequently in sampling and require additional complexity in calculating yields that are comparable to those of the other instruments. The additional benefit of including such instruments does not justify the additional complexity of including them.

742. Duplicate issues such as those that are reported by Bloomberg as both privately placed and publically issued are excluded to avoid double counting their yields in the sample.

[286] The RBA estimates exclude financial sector bonds.

10.3.3.2 Converting bond yields to Australian dollar equivalents

743. The ERA's approach for conversion into Australian dollar equivalents does not require estimates of a conversion factor, as it uses Bloomberg Swap Manager facilities directly.[287] This approach is transparent and replicable - anyone with access to a Bloomberg terminal with a Bloomberg Anywhere subscription can get the same hedged Australian dollar equivalent yield for any given bond, provided they use the same date, currency, payment frequency and deal type.

10.3.3.3 Data availability and the averaging period

744. The ERA must agree the averaging period applying to the estimator for the prevailing risk free rate and the annual trailing average debt risk premium estimates just prior to each regulatory year.

745. As discussed in *Chapter 8 – Risk free rate of return*, the ERA has adopted an averaging period of 20 trading days.[288]

746. Given the issues with pricing data of some bonds, the ERA employs a criterion that removes bonds that contain less than 50 per cent of observations over the averaging period.[289] Requiring bonds to have 100 per cent observed yields during the sample period reduces the number of bonds in the benchmark sample. Given the ERA's adoption of a 20-day averaging period, the ERA requires each bond to have at least 10 days of pricing data in this 20 trading day averaging period in order to be included in the benchmark sample. This maximises the number of bonds available in the benchmark sample.

10.3.3.4 Curve fitting techniques

747. There are different curve fitting techniques that could be used to estimate the cost of debt tenors beyond five years. However, the following three techniques are widely used:

- the Gaussian Kernel method
- the Nelson-Siegel method
- the Nelson-Siegel-Svensson method.

748. A simple average of these three techniques provides a robust approach, improving the validity of the yield estimates. Each of the techniques is described below.

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287 A detailed explanation of the ERA's process for converting foreign currency yields into Australian dollar equivalents can be found in Appendix 5 of the ERA's *Final Decision on the Proposed Revision to the Access Arrangement for the Mid West and South West Gas Distribution System*. (ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System: Appendix 5 Converting Foreign Currency Yields into Australian Dollar Equivalents*, 30 June 2015.)

288 ERA, *Final decision on proposed revisions to the access arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 30 June 2015, p. 216.

289 ERA, *Final decision on proposed revisions to the access arrangement for Western Power*, 2012.

Gaussian Kernel method

749. The ERA implements the Gaussian Kernel method in the same way as the RBA.[290]

750. The Gaussian Kernel method assigns a weight to every observation in the bond sample – informed by the distance of the observation's residual maturity from the target tenor – according to a Gaussian (normal) distribution centred at the target tenor.[291] This method recognises that the observed spreads on bonds with residual maturities close to the target tenor contain more information about the underlying spread at that tenor than spreads on bonds with residual maturities further away.

751. For the ERA's Gaussian Kernel estimates, bond issue amounts expressed in foreign currencies are converted to Australian dollar amounts before being applied as weights in the Gaussian Kernel estimates.[292] Consequently, where a bond is issued in a foreign currency the weighting in the Gaussian Kernel estimates uses the principal amount converted into an Australian dollar amount. The currency conversion uses the closing exchange rate on the date of the bond's issue.

752. Formally, the Gaussian Kernel average credit spread estimator $S(T)$ at target tenor T (say, five years) for a given broad rating and date is given by equation 19.

$$S(T)=\sum_{i=1}^{N} w_i(T;\sigma)\times S_i \qquad \text{equation 17}$$

where:

$w_i(T;\sigma)$ is the weight for the target tenor T of the i^{th} bond in the sub-sample of bonds with the given broad rating

S_i is the observed spread on the i^{th} bond in the sub-sample of N bonds with the given broad rating

σ *(sigma)*, which is measured in years, controls the weight assigned to the spread of each observation based on the distance between that bond's residual maturity and the target tenor. Sigma is the standard deviation of the normal distribution used to assign the weights. It determines the effective width of the window of residual maturities used in the estimator, with a larger effective window producing smoother estimates.

290 RBA, *New Measures of Australian Corporate Credit Spreads*, *Bulletin*, December quarter 2013.

291 RBA, *New Measures of Australian Corporate Credit Spreads*, *Bulletin*, December quarter 2013, p. 20.

292 ATCO Gas Australia, *Response to the Authority's Draft Decision on required amendments to the Access Arrangement for the Mid-West and South-West Gas Distribution System*, 27 November 2014, Appendix 9.2, p. 72.

753. The weighting function is as follows in equation 18.

$$w_i(T;\sigma) = \frac{K(T_i - T;\sigma) \times F_i}{\sum_{j=1}^{N} K(T_j - T;\sigma) \times F_j} \qquad \text{equation 18}$$

where:

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

F_i is the face value of the i^{th} bond.

754. The Gaussian Kernel may then be defined as below in equation 19.

$$K(T_i - T;\sigma) = \frac{1}{\sqrt{2\pi}\,\sigma} \exp\left[-\frac{(T_i - T)^2}{2\sigma^2}\right] \qquad \text{equation 19}$$

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

Nelson-Siegel method

756. The Nelson-Siegel method assumes that the term structure of the yield curve has the parametric form shown in the following equation:

1. $$Y_\tau = \beta_0 + \beta_1 \frac{1-e^{-\lambda_1 \tau}}{\lambda_1 \tau} + \beta_2 \left(\frac{1-e^{-\lambda_1 \tau}}{\lambda_1 \tau} - e^{-\lambda_1 \tau}\right) \qquad \text{equation 20}$$

where

β_0 is the constant long-run yield level

β_1 is the weighting for the short-end shift, defined as a downward or upward shift that then decays

β_2 is the weighting for the medium-term ‘hump’ $(\beta_2 > 0)$ or ‘trough’ $(\beta_2 < 0)$

λ_1 is the decay factor.

757. The Nelson-Siegel method uses observed data from the bond market to estimate the parameters $\beta_0, \beta_1, \beta_2, \lambda_1$ by using the observed yields and maturities for bonds.

758. With the estimated parameters, $\beta_0, \beta_1, \beta_2, \lambda_1$ a yield curve is produced by substituting these estimates into the above equation and plotting the resulting estimated yield Y_τ by varying the maturity $\boldsymbol{\tau}$. Y_τ has the interpretation of being the *estimated* yield for a benchmark bond with a maturity of $\boldsymbol{\tau}$ for a given credit rating..

Nelson-Siegel-Svensson method

759. The ERA uses the parametric form of the Nelson-Siegel-Svensson curve specified in Svensson's 1994 paper.[293] The notation for this parametric form is shown in the following equation:

equation 21

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

where

$y(\boldsymbol{\tau})$	is the yield at time t for maturity τ
$\beta_0, \beta_1, \beta_2, \beta_3, \lambda_1, \lambda_2$	are the parameters of the model to be estimated from the data.

760. The Nelson-Siegel-Svensson method is estimated in the same way as the Nelson-Siegel method, except it uses a different parametric form.

10.3.4 Estimates of the annual debt risk premia prior to the current on-the-day estimate

10.3.4.1 Source for prior-year estimates of the debt risk premia

761. The trailing average approach requires annual estimates of the debt risk premium for nine past years to combine with the ERA's current forward-looking annual debt risk premium estimate.

762. As annually updated trailing averages of the debt risk premium are now in place for the Gas Distribution System, the Goldfields Gas Pipeline and the Dampier Bunbury Natural Gas Pipeline, the past year estimates have already be determined.

763. These past year estimates are from two sources:

- Past ERA revised bond yield estimates (for years from 2015 when data was available to allow required calculation).
- RBA estimate (for years prior to 2015).

764. A third-party source for debt risk premia estimates for the past years has been incorporated into the initial trailing average used to determine the rate of return.

[293] Svensson, L., *Estimating and Interpreting Forward Interest Rates: Sweden 1992-1994*, Institute for International Economic Studies, University of Stockholm, Seminar Paper No 579, p. 6.

765. Various sources have been considered for debt risk premium estimates for the past years, including the RBA's credit spread estimates, Bloomberg's FVC estimates and BVAL estimates.[294]

766. The BVAL series is unsuitable because it does not go back past 2010.

767. The Bloomberg FVC does not include foreign bonds, which is inconsistent with the ERA's preferred approach.

768. The RBA data is available over a sufficient period and includes foreign bonds. A further advantage of the RBA data is the smaller extrapolation that is generally required (commonly between one and two years), as opposed to the three or more for the Bloomberg FVC (which only goes to tenors of seven years in more recent periods).

769. In the draft guidelines, the ERA considers that the RBA series is fit-for-purpose for estimating past debt risk premium returns. Over time, the historic RBA estimates will be progressively replaced in the trailing average by the ERA's own forward-looking estimates.

770. The ERA will not recalculate past estimates of debt risk premium. For example, changes to the benchmark credit rating will only affect the estimate of the ERA's current on-the-day debt risk premium estimate and the past nine annual debt risk premium estimates will not be recalculated.

10.3.4.2 Estimating the RBA debt risk premium

771. The Gaussian Kernel method used by the RBA to estimate the return on debt results in the effective tenor of the debt risk premium estimates varying between years, depending on the sample of bonds and their relative weighting in the estimate. In recent times, the actual effective tenor of the estimates has been less than the specified tenor of 10 years.

772. The ERA has overcome this problem in its own estimates by extrapolating the Gaussian Kernel estimates out to a 10-year term.

773. The ERA has adjusted the estimates from their effective tenors to the targeted 10-year tenor.

774. The method follows the simple extension technique laid out by Lally.[295] It uses the slope of the yield curve between the two observed tenors (say the effective seven and 10-year tenor spread to swap estimates or '7e' and '10e' tenors respectively) to linearly extrapolate the spread to swap at an exact 10-year tenor.

775. The formula used by the ERA is equivalent to that set out by Lally for return on debt as follows:[296]

[294] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline: Appendix 4 Rate of Return*, 30 June 2016, p. 164.

[295] Lally, M., *Implementation Issues for the Cost of Debt*, 20 November 2014, p. 38. The DBP proposed a comparable method (DBP, Proposed Revisions DBNGP Access Arrangement 2016 – 2020 Regulatory Period Rate of Return Supporting Submission: 12, p. 23).

[296] Lally, M., *Implementation Issues for the Cost of Debt*, 20 November 2014, p. 39.

$$RBA(10) = RBA(10e) + Base(10) - Base(10e) + \left[\frac{DRP(10e) - DRP(7e)}{10e - 7e}\right] \times (10 - 10e)$$

equation 22

where

$$RBA(10) = Base(10) + DRP(10)$$

$$DRP(10) = RBA(10e) - Base(10e) + \left[\frac{DRP(10e) - DRP(7e)}{10e - 7e}\right] \times (10 - 10e)$$

$$DRP(10) = DRP(10e) + \left[\frac{DRP(10e) - DRP(7e)}{10e - 7e}\right] \times (10 - 10e)$$

776. The ERA uses the last formula for DRP(10) for extrapolation of the debt risk premium estimates to exactly 10 year tenor.

777. The ERA also interpolates the monthly RBA estimates to daily estimates. The formula for achieving this step is shown in equation 23:

equation 23

$$y_t = yield_{start} + \left(\frac{yield_{end} - yield_{start}}{Date_{end} - Date_{start}}\right) x\ (t - Date_{start})$$

where:

y_t is the interpolated yield for any given date t

$yield_{start}$ is the first available yield in any given month

$yield_{end}$ is the last available yield in any given month

$Date_{start}$ is the date when first yield was available;

$Date_{end}$ is the date when the last available yield is available

t is the date for which the yield is being interpolated.

778. The ERA also annualises the RBA resulting annual data, as the RBA estimates may be generally interpreted as semi-annual rates. To do this, RBA basis point estimates are converted to percentage point numbers and then annualised:

Effective annual rate = 100 (1 + yield in basis points/100/2)*^{2} *– 100* equation 24

10.3.4.3 Estimating the 10-year trailing average debt risk premium

779. The trailing average estimate of the debt risk premium weights the past 10 years of estimates of the annual debt risk premium, consistent with the average term of debt issued by the benchmark efficient entity and its staggered debt portfolio.[297]

780. The resulting 10-year trailing average should be updated annually, adding in the most recent estimate of the debt risk premium, according to its weight, and dropping the estimate from 10 years ago. This replicates the cost of debt for the benchmark efficient entity under a strategy whereby it rolls over 10 per cent of its debt each year.

781. The weights for a simple hybrid trailing average debt risk premium estimate should be 10 per cent for each year's estimate of the debt risk premium over the most recent relevant 10 years.

782. The benchmark efficient entity can then replicate a simple 10-year trailing average by issuing one-tenth of its debt each year. While a simplification of practice, this would closely replicate the cost of debt under the observed financing strategies of benchmark efficient entities.

10.4 Public submissions

783. AGIG's submission broadly accepted the ERA's approach to estimating the cost of debt. In its submission: [298]

- AGIG recommended that the ERA carefully considers whether its approach meets the requirements under the proposed binding rate of return legislation.
- AGIG requested the ERA to provide explicit instructions on how to replicate its approach to estimating the cost of debt, particularly the annual update of the debt risk premium.
- AGIG expressed a desire to have the process self-contained in the final guidelines.

784. ATCO's submission accepted the ERA's draft guideline method to estimate the debt risk premium. ATCO's submission can be summarised as follows: [299]

- ATCO considered that in order to meet the requirements of the new binding rate of return framework the process should be self-contained in the final guidelines.

[297] Analysis in the Rate of Return Guidelines supported a term at issuance for the benchmark efficient entity of around 10 years. (ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, December 2013, p. 39).

[298] AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 19-20.

[299] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 11-12.

- ATCO also considered that some additional process information should be included in the final guidelines.

785. ATCO noted that the draft guideline did not state whether a minimum number of bonds matching the credit rating are required to estimate the debt risk premium. ATCO was of the view that the bond sample should be expanded to the BBB-/BBB/BBB+ credit band in circumstances in which the number of BBB+ bonds is insufficient to estimate the debt risk premium.

786. GGT's submission expressed concern with the annual return on debt update process's application under a binding rate of return framework.[300]

787. In response to stakeholder comments expressed at the public forum and in submissions, the ERA prepared further technical debt risk premium process documents and accompanying tools. These documents and tools were consistent with the debt risk premium method detailed in the draft guidelines. On 5 November 2018, the ERA sought submissions on these technical process documents.

788. AGIG's submission argued that the Nelson-Siegel-Svensson (NSS) model should be abandoned and that some contingencies should be amended. AGIG's submission can be summarised as follows:[301]

- AGIG considered the NSS model was unsuitable for mechanistic implementation. While acknowledging that the NSS model is popular among central banks and that the ERA's implementation has improved, AGIG argued that the model has proven difficult to implement and has increased the complexity of the process. AGIG considered that the ERA cannot reasonably assure itself that the NSS model will find an optimal solution.

- AGIG provided some technical discussion on the use of lambda constraints in the NSS model.[302] AGIG considered that the lambda constraints may not work well all the time. AGIG argued that the NSS model required the fine-tuning of lambdas, which is not permitted under a binding framework.

- AGIG recommended abandoning the NSS model as a first best option or modifying it as a second best option. AGIG proposed two possible alternative approaches: 1) de Pooter 2007;[303] and 2) Bjork and Christensen 1999[304].

- AGIG requested that the ERA be mindful of resourcing costs for the debt risk premium estimation.

300 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, p. 6.

301 AGIG, *Submission on the ERA's implementation of the Debt Risk Premium estimation process*, November 2018.

302 The NSS model has two decay factors, known as lambda one and lambda two. These decay factors apply to the first hump/trough and second hump trough in the model. The NSS model can perform better when the lambda are constrained.

303 de Pooter, M., *Examining the Nelson-Siegel Class of Term Structure Models,* June 2007, pp. 10-11.

304 de Pooter, M., *Examining the Nelson-Siegel Class of Term Structure Models,* June 2007, pp. 8-9.

- AGIG discussed contingencies:
  - Contingency A – Bond Size. This contingency is triggered when there are less than 15 bonds in the sample and the contingency event expands the bond sample to a sample of BBB, BBB+ and A- bonds. AGIG requested that the ERA outline steps to ensure that A- bonds were not over-represented.
  - Contingency C – Bloomberg data unavailable. This contingency is triggered when Bloomberg data is unavailable and the contingency event relies on RBA data. AGIG recommended that the contingency event should include an additional data source to the RBA data.

789. ATCO sought advice on the debt risk premium process from the Competition Economists Group (CEG) and provided a detailed submission. ATCO's submission can be summarised as follows:[305]

- ATCO expressed concern with the proposed debt risk premium process and argued that:
  - The results were not replicable as it considered that the use of the differential evolution solver in the NSS model meant that there is randomness each time the process is run.
  - The process could not be applied without discretion. ATCO considered that the download of data required the use of discretion. ATCO considered that the process could not pre-specify a set of rules that can adequately anticipate all potential circumstances and therefore discretion was needed.
  - The proposed change to a BBB+ credit rating from broad BBB increases the likelihood of volatile estimates.
  - R is not widely adopted and is considered a niche skillset, which may result in additional costs.
- ATCO considered that the ERA should adopt the AER's method for averaging the RBA, Bloomberg and Reuters yield curve. ATCO argues that this method was a simpler, more transparent and replicable estimate of the debt risk premium.
- ATCO commissioned CEG to review the ERA's proposed process. CEG did not identify any errors in the R code that may impact the running and output of the code. CEG found that the R process was more statistically robust than Excel.
- If the ERA was to continue the use of its process, ATCO considered that the ERA should adopt CEG's recommended changes. CEG found improvements that would reduce the dependence on a limited sample of bonds, reduce the influence of outliers and reduce volatility of results.
  - Exclude bonds with a maturity of greater than 30 years. CEG considered that the yield curve for longer maturities did not follow the same yield curve as bonds with shorter maturities around 10 years.

305 ATCO, *Re: Implementation of the Debt Risk Premium Estimation Process*, November 2018.

  - Broaden the bond sample to include BBB, BBB+ and A- bonds. CEG considered that this materially increases the number of bonds in the sample and bonds around the 10-year tenor. CEG considered that broadening the sample would improve the stability of results and reduce the influence of outliers.
  - Adjust the weighted average of the estimates to apply a 50 per cent weight to the Gaussian Kernel, 25 per cent to Nelson-Siegel and 25 per cent to Nelson-Siegel-Svensson. CEG considers the Nelson-Siegel and Nelson-Siegel-Svensson methods were only slightly different and the change would ensure that the Nelson Siegel class of estimates are not overweighted.
- CEG recommended some amendments to the contingencies.
  - Contingency A – Bond size. CEG considered that there should be at least 14 bonds from at least 10 different issuers with maturity between five and 15 years. CEG considered that if there is not a sufficient number of bonds in the sample the ERA should rely on the AER method.
  - Contingency B – Estimation divergence. Under this contingency if the standard deviation of the three yield estimates is greater than or equal to 100 basis points, then the ERA reverts to the sole use of the Gaussian Kernel curve. CEG considered that the divergence could just as easily be due to the Gaussian Kernel estimate being anomalous. Therefore CEG considered that when there is large estimation divergence the ERA should rely on the AER's method.
- Contingency C – Bloomberg data unavailable. ATCO suggested that both the RBA and Reuters data sources be used based on the AER's method.

790. GGT's submission expressed concern that the ERA's proposed debt risk premium process was not consistent with the binding rate of return framework. GGT's submission can be summarised as follows: [306]

- GGT argued that, in the use of complex statistical methods, good practice first required the examination of the underlying data and then subsequently the examination of the results.
- GGT considered that such examinations were not possible under the requirements of a binding rate of return framework.
- GGT suggested that the ERA should rely on independent third party estimates.

[306] GGT, *GGT submission: implementation of debt risk premium estimation*, November 2018.

10.5 Independent Panel

791. The Independent Panel reviewed the debt risk premium information and the ERA models to which stakeholders have access. The Independent Panel considered that the ERA's bond yield approach would provide appropriate and robust estimates to ensure efficient financing.[307]

792. The Independent Panel considered there was sufficient information for stakeholders to implement the approach at a point in time. However, this would assume that stakeholders had the technical expertise to implement the revised bond yield approach. The Panel noted that maintaining confidentiality precludes replication of the estimate by stakeholders other than the regulated company.[308]

793. The Independent Panel considered that the approach could be implemented under the current requirements or the binding rate of return requirements.[309]

794. The Independent Panel considered that it would be useful for the ERA to explain why it had adopted the revised bond yield approach rather than other methods, in particular the AER's use of the RBA data and the Bloomberg valuation service.[310]

795. The Independent Panel supported international debt data being used to help determine debt parameters. The Independent Panel considered this approach was appropriate, given the reasonable assumption of stronger integration of debt markets than equity markets, the ready observability of promised returns on debt and assuming the country of risk is classified as Australia.[311]

796. The Independent Panel considered it would be useful to provide reference to the sample size and statistical diagnostic results for the approach.[312]

797. The Independent Panel considered it would be helpful, at a broad level, to explain the three estimation techniques and their relative merits, and why a simple average of their estimates was appropriate.[313]

798. The Independent Panel noted that the Explanatory Statement should contain a clear justification for estimating the hybrid trailing average over a 10-year period, that is, adopting the assumption that the typical term for issue debt is 10 years.[314]

[307] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 41, 43.

[308] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 43.

[309] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 42.

[310] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 41.

[311] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 20.

[312] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 41.

[313] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 42.

[314] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 33.

799. The Independent Panel noted that past estimates of the debt risk premium would not be recalculated if there was a change in the credit rating. The Independent Panel considered that this was reasonable when including new information on an incremental basis as per the trailing average approach.[315]

10.6 Final approach

800. Estimating the debt risk premium involves the following steps:

- 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 hedged Australian dollar equivalent yields inclusive of Australian swap rates.
- Step 3: Averaging yields over the averaging period – Calculating an average AUD 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 simple average of their three yield curves' 10-year cost of debt to arrive at a market estimate of the 10-year cost of debt.
- Step 6: Calculating the debt risk premium - Calculating the debt risk premium by subtracting the 10-year interest rate swap rate from the 10-year cost of debt.

801. These steps determine the debt risk premium at a point in time, being the date of calculation. The ERA refers to this method as the 'revised bond yield approach'.

802. To determine the debt risk premium used to calculate the gas rate of return, the ERA constructs a 10-year trailing average debt risk premium. This will consist of a debt risk premium for the current year and a debt risk premium for each of the nine prior years. The 10-year trailing average debt risk premium must be updated each year.

803. The following sections provide more detail on the ERA's methods for identifying the benchmark sample, converting bond yields into hedged Australian dollar equivalent yields, estimating yield curves and constructing the 10-year trailing average. The detailed debt risk premium process is provided in Appendix 5 and Appendix 6.

804. An allowance for debt risk premium estimation costs will be reviewed in the ERA's assessment of efficient operating expenditure for a regulated business' access arrangement and does not form part of the rate of return. The regulated business should propose an efficient level of annual debt risk premium estimation costs as part of its access arrangement proposal.

[315] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 42.

10.6.1 Identifying the benchmark sample

805. The ERA's revised bond yield approach uses international and domestic bonds – identified by Bloomberg as having Australia as their country of risk – to estimate the cost of debt each year.

806. The ERA will apply the following characteristics to identify international and domestic corporate bonds to be included in the benchmark sample:[316]

- The credit rating of each bond must match that of the benchmark efficient entity, as rated by S&P (*Chapter 9 – Benchmark credit rating* discusses the credit rating of the benchmark efficient entity).
- Time to maturity must be two years or longer.
- Issued bonds must have the country of risk specified as Australia,[317] and must be denominated in either AUD, USD, Euros or GBP (all compliant bonds are included, except those issued by the financial sector).[318]
- The benchmark sample will include both fixed bonds[319] and floating bonds.[320]
- The benchmark sample will include both bullet and callable/puttable redemptions.[321]
- Bonds will have at least 50 per cent of observations for the averaging period (that is, 10 yield observations over the required averaging period of 20 trading days are required).
- The bonds are not called perpetual, a duplicate, or inflation-linked.

807. The averaging period for the debt data series for any given year will be:

- specified before the start of the regulatory period
- as close as practical to the start of the relevant regulatory year
- confidential.

316 ERA, *Discussion Paper – Measuring the Debt Risk Premium: A Bond Yield Approach*, December 2010, p. 11.

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

318 As classified by Bloomberg Industry Classification System level 1.

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

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

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

808. The averaging period is to be confidential so as not to adversely affect a regulated entity's ability to obtain finance.

809. In the event that an averaging period for the debt data series is not nominated before the start of the regulatory period, the ERA will use a default debt averaging period of the 20 consecutive trading days ending two months prior to each regulatory year.

10.6.2 Collecting data and converting bond yields to Australian dollar equivalent yields

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

811. The ERA will then convert this denominated currency credit to Australian dollar terms by accounting for hedging costs.[322]

10.6.3 Averaging yields over the averaging period

812. The ERA will average the AUD equivalent bond yield for each bond across the averaging period.

10.6.4 Estimating yield curves

813. The ERA will apply three curve-fitting techniques to the bond yield data to estimate the cost of debt. These are the Gaussian Kernel method, the Nelson-Siegel method and the Nelson-Siegel-Svensson method.

10.6.5 Estimating the cost of debt

814. The ERA will then average the results of these three methods to arrive at a market estimate of the 10-year cost of debt.

10.6.6 Estimating the debt risk premium

815. The ERA will then subtract the average of the 10-year AUD interest rate swap rate from the estimate 10-year cost of debt.

10.6.7 Constructing the 10-year trailing average

816. The estimate of the debt risk premium for each year will be a simple trailing average, as discussed in *Chapter 7 – Return on debt*.

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

817. The ERA analysis for the 2013 guidelines indicated that the term at issuance for a benchmark efficient entity is about 10 years.[323] Consequently, the trailing average is constructed over a 10-year period, to ensure consistency with the average term of debt issued by the benchmark efficient entity and its staggered debt portfolio.

818. The ERA began calculating annual debt risk premiums in April 2015, and will use these as inputs when constructing the 10-year trailing average.

819. For years prior to 2015, the ERA will adopt a third party source for debt risk premiums, being the RBA's historical credit spreads for 10-year non-financial corporate bonds.

820. The trailing average debt risk premium over the most recent 10 years will be a simple average of each year's debt risk premium (that is, the calculation will weight each year's debt risk premium at 10 per cent).

821. The 10-year trailing average debt risk premium will be updated each year by adding in the most recent estimate of the debt risk premium and dropping the estimate from 10 years ago.

822. The automatic formula for the simple, equally-weighted 10-year trailing average is:

$$TA\ DRP_0 = \frac{\sum_{t=0}^{-9} DRP_t}{10} \qquad \text{equation 25}$$

where

$TA\ DRP_0$ is the equally weighted trailing average of the debt risk premium to apply in the following year as the annual update of the estimate used in the current year

DRP_t is the debt risk premium estimated for each of the 10 regulatory years t = 0, -1, -2…. , -9.

823. For detailed information on the automatic formula for annually updating the return on debt (which includes updating the debt risk premium), refer to Appendix 7 of the explanatory statement for the guidelines.

10.7 Final reasoning

824. In addition to its draft reasoning, the ERA has considered public submissions and the Independent Panel's report.

[323] ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines*, December 2013, p. 39.

10.7.1 Approaches to estimating the debt risk premium

825. Approaches to estimating the debt risk premium include:

- use of RBA data
- use of Bloomberg valuation
- the ERA's revised bond yield approach.

826. Approaches that use RBA data and Bloomberg valuation are simpler. However, these methods have some limitations.

- They rely on third-party estimates.
- They only produce estimates of the cost of debt for broad BBB and broad A bands. That is, they do not calculate the cost of debt for the specific BBB+ benchmark.
- The RBA only produces monthly data.

827. 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.

828. Through its 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. This is discussed in more detail below.

829. The ERA continues to consider that the revised bond yield approach provides the best estimate of the debt risk premium.

10.7.2 Term of debt

830. The Independent Panel sought additional justification for estimating the hybrid trailing average over a 10 year period.

831. The ERA needs to determine a benchmark debt term to calculate the debt risk premium for a service provider. The benchmark debt term also establishes the period over which the trailing average is calculated.

832. The ERA has reviewed the analysis that Chairmont undertook for the AER on the actual cost of debt of service providers versus that allowed by the AER.[324]

[324] Chairmont Advisors, *Aggregation of Return on Debt Data,* April 2018.

833. The ERA considers that a benchmark term of 10 years should be used for the reasons detailed below:

- Conceptually, a valid financing strategy for service providers is to issue long-term debt where possible to reflect the lives of their long-term assets and minimise refinancing risk.
- Chairmont's analysis of actual debt practices over the 2013 to 2017 period did not reach clear conclusions. The time period assessed by Chairmont was complicated by factors that probably affected the financing strategies of sample service providers. These factors included regulatory appeals and the privatisation of some of the networks.
- The AER's introduction of, and transition to, a new debt approach is also likely to have affected service providers' financing practices. Therefore, current financing strategies may not reflect longer term efficient strategies.
- As detailed by network stakeholders, Chairmont's simple average term of 7.4 years for the sample of actual debt may understate the term of debt. Service providers' actual debt included short term debt facilities that have been refinanced numerous times over the period without growing in value. Therefore, short term debt facilities are refinanced multiple times in any one year, which has the effect of reducing the term of debt.

834. The ERA continues to consider that a 10-year term of debt is appropriate to calculate the debt risk premium.

10.7.3 Debt risk premium updating process

10.7.3.1 Updated and improved process

835. At the ERA's public forum and in submissions on the draft guidelines, stakeholders requested that the ERA provide a detailed technical process to implement the guidelines' debt risk premium method. Stakeholders requested that this be self-contained in the final guidelines.

836. Following these comments, the ERA prepared and published technical debt risk premium process documents and accompanying tools. The ERA then sought feedback on these debt risk premium documents and tools.

837. To develop technical process documents and accompanying tools, the ERA worked to improve the ease of implementation and the statistical robustness of its method. The ERA engaged external data scientists, Pink Lake Analytics, to review the process and develop an R package to implement the debt risk premium method.

838. In estimating the debt risk premium, the ERA will solely rely on the R statistical process detailed in the *R DRP Process*. The estimation of the debt risk premium through R is better implemented and maintained, and statistically more robust than Excel.

839. To provide stakeholders with accessibility options, the ERA also provided an accompanying *Excel DRP Process*. However, the ERA did not rely on this *Excel DRP Process* and the Excel debt risk premium estimate will only provide an approximate debt risk premium estimate.

840. The ERA has given further consideration to the debt risk premium process in light of submission received.

10.7.3.2 Curve estimation techniques

Techniques

841. The ERA uses three curve estimation techniques to estimate a return on debt with a tenor of 10 years.

842. The ERA has further considered the curve estimation techniques it uses to estimate bond yields.

843. The Gaussian Kernel method is consistent with the approach used by the RBA.[325] This method recognises that the observed spreads on bonds with residual maturities close to the target tenor contain more relevant information for estimation, which has advantages over other more simple weighting methods. This method is robust and is capable of producing estimates even when the number of available observations is relatively small.

844. The ERA also uses the Nelson-Siegel method and Nelson-Siegel-Svensson method in deriving its debt risk premium estimate. Nelson-Siegel and Nelson-Siegel-Svensson are the most used parametric models for yield curve estimation and have been adopted by many central banks in the world.[326]

845. The Nelson-Siegel model is a popular term structure estimation method. It is capable of capturing many of the typical observed shapes that the yield curve assumes over time.[327]

846. The Nelson-Siegel-Svensson model is an extension of the Nelson-Siegel model. By adding two additional parameters, it incorporates additional flexibility to more precisely capture the curve movement of a more volatile market.

847. The ERA's updated debt risk premium process has improved the implementation of the Nelson-Siegel-Svensson model through:

- Applying constraints on lambda one and lambda two decay rates to avoid them taking on problematic values.
- Improving the optimisation process with the use of a differential evolution algorithm, which better solves for global optimisation.

325 RBA, '*New Measures of Australian Corporate Credit Spreads'*, Bulletin, December quarter 2013, pp. 15-26.

326 A parametric model or parametric family or finite-dimensional model is a family of distributions that can be described using a finite number of parameters.

327 de Pooter, M., *Examining the Nelson-Siegel Class of Term Structure Models,* 2007.

Lambda time decay constraints

848. AGIG raised concerns with the constraints placed on the lambda decay rate values.[328] AGIG noted that Gilli, Groβe and Schumann developed these constraints for fitting Nelson-Siegel-Svensson curves to German government bond data. AGIG argued that these constraints may sometimes happen to work well in fitting Nelson-Siegel-Svensson curves to Australian corporate bond data, but not necessarily all the time.

849. The ERA considers that the best way to interpret the constraints on lambda are as nuisance parameters, that is, as parameters that must be accounted for in analysis but which are not of immediate interest.

850. The Nelson-Siegel-Svensson model is an extremely flexible model, able to fit a wide range of yield curve scenarios, and hence its popularity when modelling yield curves. This flexibility allows the estimated parameters of the model to compensate for any tethering of the constraints on the lambda nuisance parameters to a specific range.

- By this, one range of lambda constraints would result in a consequent set of factor estimates, whereas a second range of lambda constraints would result in a second set of factor estimates.

- While the resulting parameter estimates may be different both yield curves, and their resulting cost of debt estimates, will be markedly similar.

- The constraints are in practice required as they avoid over-compensatory behaviour by the different parameters in the model, and thus ensure model identifiability.

851. When different constraint ranges on the lambda decay rates are trialled there is little difference in the debt risk premium estimate. This conclusion is supported by CEG's findings that a simple case of extending the constraint ranges placed on lambda values influenced the estimate debt risk premium by two basis points on average.[329]

852. The ERA agrees that direct economic interpretation of the factor loadings may well be confounded when both lambda estimates approach the shared constraint boundary, or where one of the lambdas approaches zero. While the difficulty of parameter identifiability may be argued, the ERA considers that the compensatory behaviour of the model estimates will largely ensure that the debt risk premium estimate is reliably estimated.

853. The ERA considers that the lambda constraints are appropriate and do not need to be adjusted over the period of the binding instrument.

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[328] AGIG, *Submission on the ERA's implementation of the Debt Risk Premium estimation process*, November 2018, p. 5.

[329] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 18.

Replicability

854. AGIG expressed concern with the Nelson-Siegel-Svensson model and cited de Pooter.[330]

> The nonlinear [Svensson] model structure seems to pose serious difficulties for optimisation procedures to arrive at reasonable estimates.

855. de Pooter's statement precedes the two innovations of Gilli, Groβe and Schumann that: [331]

- Firstly, places mutually exclusive constraints on the lambda decay factors, alongside, constraints on the other terms in the model.
- Secondly, implements the differential evolution solver for an optimisation problem that contains multiple inequality constraints.

856. Without these innovations the Nelson-Siegel-Svensson model does pose some model fitting issues. However, as has been demonstrated, the Nelson-Siegel-Svensson model is able to accurately fit a model following the innovations of Gilli, Groβe and Schumann. The ability to implement the innovations of Gilli, Groβe and Schumann justifies the move from Excel to the R computing environment.

857. CEG found that the R estimates are superior in the sense that they result in a lower sum of squared residuals than the Excel estimates.[332] AGIG noted that from a technical standpoint, the adoption of this solver is a sensible and well thought out solution.[333]

858. ATCO considered that the debt risk premium process was not replicable given its use of the differential evolution algorithm for the Nelson-Siegel-Svensson method. ATCO argues that this means that it cannot be assumed that the estimate will always be the same.[334] CEG concluded that it may be advisable for the ERA to set the same seed to be used in its differential evolution algorithm.[335]

859. The scale of variability in the solutions provided by the differential evolution solver for the Nelson-Siegel-Svensson model may readily be evaluated by running the differential evolution solver a large number of times and measuring the standard error of the resulting debt risk premium estimate. Following 2,500 iterations of the differential evolution solver on the current data, the annualised Nelson-Siegel-Svensson estimate of the cost of debt reported a standard error of 0.05 basis points. As the Nelson-Siegel-Svensson estimate is assigned a third weighting in the final debt risk premium estimate then the standard error of the debt risk premium estimate is lower, at 0.02 basis points.

860. The scale of variability that is induced by the stochastic nature of the differential evolution solver is materially negligible. The ERA considers that there is no need to assign a specified random seed for the differential evolution solver.

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330 de Pooter, M, 2007, *Examining the Nelson-Siegel Class of Term Structure Models*, p. 2.

331 Gilli, M., Groβe, S. and Schumann, E., *Calibrating the Nelson-Siegel-Svensson model,* COMISEF Working Papers Series, 2010, p. 13.

332 CEG, *Report on ERA cost of debt estimation*, November 2018, p. 4.

333 AGIG, *Submission on the ERA's implementation of the Debt Risk Premium estimation process*, November 2018, p. 5.

334 ATCO, *Re: Implementation of the Debt Risk Premium Estimation Process*, November 2018, p. 7.

335 CEG, *Report on ERA cost of debt estimation*, November 2018, p. 17.

861. If there was large variation in the differential evolution solutions to the Nelson-Siegel-Svensson parameter estimates, then any single random seed would likely introduce a form of sampling bias. A better strategy would be to run the differential evolution solver a large number of times to acquire the average. However, this is unnecessary given the low scale of the differential evolution solver induced variability.

862. The ERA considers the debt risk premium process is robust and replicable.

Use of the Nelson-Siegel-Svensson model

863. AGIG considered the Nelson-Siegel-Svensson model was unsuitable for mechanistic implementation. AGIG argued that the model has proven difficult to implement and has increased complexity. [336]

864. On the basis of the improvements to the Nelson-Siegel-Svensson model implementation and the discussion above, the ERA considers that the Nelson-Siegel-Svensson model is a robust and flexible model.

865. While the Nelson-Siegel and Nelson-Siegel-Svensson may currently be similar, this may not always be the case. The Nelson-Siegel-Svensson model is a more robust in the face of differing market conditions.

866. The ERA is confident of the robustness of the Nelson-Siegel-Svensson model. The ERA has developed a process and tools to reliably and relatively easily implement the Nelson-Siegel-Svensson model.

867. The ERA continues to support the use the Nelson-Siegel-Svensson model to estimate the debt risk premium.

Weight of estimators

868. The ERA's process applied an equal weight to its three estimation methods, the Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson estimators.

869. CEG proposed taking the average of the Nelson-Siegel and Nelson-Siegel-Svensson estimates and averaging these with the Gaussian Kernel estimate. CEG's proposal gives the Nelson-Siegel and Nelson-Siegel-Svensson estimates 25 per cent weight each and the Gaussian Kernel estimate 50 per cent weight. CEG argued that the Nelson-Siegel and Nelson-Siegel-Svensson estimation methods are only slightly different (in the same class of estimators) and giving them equal weight overweights this class of estimator. [337]

870. CEG finds that the model reweighting makes little material difference for the debt risk premium estimate given the current data: at most two basis points when averaged over the last four years.[338]

871. While the current estimates for the Nelson-Siegel and Nelson-Siegel-Svensson are similar, this is not guaranteed in the future as market conditions change. Hence, the value of the Nelson-Siegel-Svensson is as a risk hedging strategy for changing market conditions.

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[336] AGIG, *Submission on the ERA's implementation of the Debt Risk Premium estimation process*, November 2018, p. 5.

[337] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 32.

[338] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 32.

872. Due to the merits of each estimation method and their strengths under differing market conditions, the ERA continues to take the simple average from the three estimation methods.

10.7.3.3 Assessment of process

873. The ERA has further considered the debt risk premium process in light of submissions.

Complexity and transparency

874. To increase transparency of the debt risk premium process the ERA has:

- updated and published the debt risk premium process
- developed and published tools, including an Excel spreadsheet and R code, to facilitate the estimation of the debt risk premium
- sought comment on the updated process and tools.

875. To ensure the best estimates of the debt risk premium, while also facilitating ease of use, the ERA utilises R code and Excel spreadsheets. The ERA provides the R code and spreadsheets, and details the steps for their use.

876. CEG found that the R code ran smoothly and generated the final cost of debt estimates fairly smoothly.[339] The Excel and R packages agree on the Gaussian Kernel 10-year estimate and the R package results in a better fit (lower sum of squared errors) for the Nelson-Siegel and Nelson-Siegel-Svensson curves.[340]

877. ATCO considered that R was not widely adopted and considered it a niche skillset.[341]

878. To facilitate ease of use the ERA provides the tools and instructions to estimate the debt risk premium.

879. The ERA considers that R is not a niche skill amongst data analysts. Over half of Institute of Analytics Professionals of Australia survey respondents have R skills, which is the second most populous skill after SQL.[342]

880. The ERA considers that the debt risk premium estimation process is transparent to stakeholders, while balancing the need to produce robust estimates.

339 CEG, *Report on ERA cost of debt estimation*, November 2018, p. 16.

340 CEG, *Report on ERA cost of debt estimation*, November 2018, p. 18.

341 ATCO, *Re: Implementation of the Debt Risk Premium Estimation Process*, November 2018, p. 7.

342 https://www.iapa.org.au/resources/article/2017-skills-salary-survey-report

Discretion

881. ATCO considered that the process could not be applied without discretion. ATCO considered that the download of data required the use of discretion. ATCO was also of the view that the process could not pre-specify a set of rules that can adequately anticipate all potential circumstances and therefore discretion was needed.[343]

882. GGT argued that, in the use of complex statistical methods, good practice first required the examination of the underlying data and then subsequently the examination of the results.

883. The ERA considers that failed data requests will only be a result of poor data connection. This is not an analytical issue. This is a matter of checking that the data download is complete, a requirement that arises from any third party data extraction.

884. Due to the merits of each estimation method and their strengths under differing market conditions, the ERA considers that the debt risk premium is able to accommodate varying market conditions.

885. The ERA has provided the detail, process and tools to mechanically apply the process.

886. The ERA considers that the debt risk premium estimation process does not require the use of discretion.

Long-term bonds

887. CEG considered that the process could be improved through excluding bonds with a maturity of greater than 30 years. CEG was of the view that the yield curve for longer maturities did not follow the same yield curve as bonds with shorter maturities around 10 years.[344]

888. The Gaussian Kernel model with a bandwidth of 1.5 years will apply minimal weight to bonds with extreme maturities when estimating the bond yield curve locally at the target tenor. Hence, bonds with extreme maturities have no bearing on the Gaussian Kernel estimate.

889. Both the Nelson-Siegel and, more so, the Nelson-Siegel-Svensson models are flexible models. However, for best cost of debt estimation it is preferable to have as many 'tie' points in the regression as possible, so as to aid model identification and hence the convergence of the model estimation procedure. Hence, including the extreme maturity bonds in the sample becomes a mitigating strategy against the risk of a lack of model identification. In practice, with the current bond sample, the inclusion or exclusion of the extreme maturity observations has little material impact (in the order of two basis points).

890. The ERA considers that including longer term bonds provides additional information and helps with model identification, with minimal influence on the debt risk premium estimate. The ERA considers that bonds with maturities greater than 30 years have little influence on the debt risk premium estimates as the models (Gaussian Kernel, Nelson-Siegel and Nelson-Siegel-Svensson) are sufficiently flexible to accommodate long term bonds.

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[343] ATCO, *Re: Implementation of the Debt Risk Premium Estimation Process*, November 2018, p. 7.

[344] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 31.

891. The ERA will continue to incorporate information from long term bonds in the debt risk premium process.

Sample

892. CEG considered that widening the sample to include both A- and BBB bonds would reduce the dependence on a limited sample of bonds, reduce the influence of outliers and reduce the volatility of results.[345]

893. To overcome under/over representation of the addition of A- and BBB bonds, CEG recommended that the weights for each observation be adjusted to ensure that similar maturity A- and BBB bonds receive the same weight – such that the average credit rating of the (weighted) observations in the sample is always BBB+.[346] AGIG also requested that, in the event the band sample is expanded to BBB, BBB+ and A- bonds, the ERA should outline steps to ensure that A- bonds were not over-represented.

894. The ERA has given consideration to widening the sample to include BBB, BBB+ and A- bonds.

895. Widening the sample to include BBB and A- bonds could over or under represent the A- and BBB bond samples. The ERA has reviewed CEG's approach to addressing this over/under representation.

896. CEG is correct that widening the bond sample will reduce the inter-year volatility of the debt risk premium estimate. However, by widening the bond sample, the debt risk premium estimate may become biased by other bonds in the widened sample that are not BBB+ rated. There is a trade-off between the variance of with the smaller BBB+ sample and bias introduced by widening the sample.

897. The debt risk premium is calculated as a 10-year trailing average. Hence, the variance of the 10-year debt risk premium estimate will be markedly lower than the variance of the annual debt risk premium estimate. Any bias that may be introduced into the estimate through widening the sample will, however, not diminish if the source of that bias is consistently present through time; for example, if the A- sample is consistently larger than the BBB+ sample.

898. CEG's proposed weighting approach to address over/under representation is to:

- Assign a weight of one to each BBB+ bond.
- Determine the number of bonds for three tenor intervals (0-7, 7-13 and 13+ years) for each BBB and A- bond sample.
- If the number of A- bonds is less than the number of BBB bonds:
  - A- bonds are assigned a weight of one.
  - BBB bonds are assigned a weight equal to the number of A- bonds divided by the number of BBB bonds.

[345] CEG, *Report on ERA cost of debt estimation*, November 2018, pp. 29-31.

[346] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 31.

- If the number of BBB bonds is less than the number of A- bonds:
  - BBB bonds are assigned a weight of one.
  - A- bonds are assigned a weight equal to the number of BBB bonds divided by the number of A- bonds.

899. CEG provided no literature that demonstrated the superiority of this weighting scheme. Without supporting evidence, the choice of weighting scheme could be viewed as discretionary.

900. Given current bond sample sizes:

- For the zero to seven year tenor bracket the overall weighting assigned to BBB+ bonds ranged between approximately 30 to 50 per cent of the total weighting from year to year.
- For the seven to 13 year tenor bracket the overall weighting assigned to BBB+ bonds was more variable as the sample sizes of bonds falling within each bond rating was low.
- BBB bond yields appeared greater in the seven to 13 year tenor bracket, suggesting a positive bias.

901. CEG's proposal may introduce a positive bias as suggested in Table 5.3 of its report, where the four-year average of the debt risk premium estimate proposed by the ERA matches that of the AER. CEG's two methods differ from both the ERA's and the AER's estimates for the four-year average.[347] However, the scale of the difference is small. CEG has advised the ERA of a correction to its calculations in Table 5.3, which slightly increases this difference.

902. The volatility of the BBB bond yields appears greater in the seven to 13 year tenor bracket. Outliers may be influencing this result, leading to greater variance in the debt risk premium estimate. The seven to 13 year tenor bracket has the greatest influence on the annual debt risk premium estimate. Therefore, the variance of the debt risk premium estimate derived from the weighted approach may not be greatly reduced when widening and weighting the bond sample.

903. The ERA considers that the superiority of widening and weighting the bond sample has not been demonstrated. The proposed approach should be evaluated in the context of the variance-bias trade-off, and not variance alone. The longer-term 10-year trailing average approach should also be considered in addition to the annual debt risk premium estimate, which is known to be more volatile. Averaged over the four-year period, the ERA considers that there is little material difference in estimates between the debt risk premium derived from BBB+ and those proposed by CEG.

904. The ERA continues to support the use of the BBB+ sample to estimate the annual debt risk premium.

905. The ERA implements contingencies to increase the robustness of the process under different data scenarios. Contingencies are discussed further below.

[347] CEG, *Report on ERA cost of debt estimation*, November 2018, p. 34.

Contingencies

906. The ERA's updated debt risk premium process included three contingency approaches, detailed below.

Table 16 ERA's initial contingency approaches to data related issues

Event	Changes to Approach
Contingency A – Bond Size	**Expansion of credit rating sample**
The contingency is triggered when the total number of bonds in the sample for the benchmark credit rating is less than 15. The ERA has carried out heuristic testing and considered other market yield curve providers' practice to arrive at this minimum bond requirement. Bloomberg requires at least 15 bonds;[348] while Thomson Reuters requires at least 5 bonds for the yield curve to be constructed.[349]	Once the event has been triggered, the sample of bonds will be expanded to include the credit ratings above and below the benchmark credit rating. Expanding the sample credit rating band will increase the number of bonds in the sample. For example, if the total number of bonds in the BBB+ credit rating sample is less than 15, the bond sample criteria will be expanded to include the BBB, BBB+ and A- credit ratings. The same debt risk premium estimation method will be used on this larger bond sample.
Contingency B – Estimation divergence	**Use of Gaussian estimate**
The three curve estimation techniques diverge to a large extent. Contingency triggered when the standard deviation of the three yield estimates (Gaussian Kernel, NS and NSS) is equal to or greater than 100 basis points.	The divergence indicates that the bond sample results in non-robust parametric curve estimates from techniques. Under this circumstance the Gaussian Kernel will be used as the sole method to estimate debt risk premium. The Gaussian Kernel estimate is that produced from the method detailed in the steps above.
Contingency C – Bloomberg data unavailable	**Use of RBA bond curves**
Bloomberg stops producing bond data and bond data becomes unavailable.	This contingency will use the RBA Table F3 "Aggregate Measures of Australian Corporate Bond Spreads and Yields" data.[350] The RBA only publishes 10-year broad A-rated and broad BBB-rated estimates. Therefore, under this contingency, the 10-year BBB+ cost of debt estimate will be calculated by the sum of: • 1/3 of the broad A-rated estimate • 2/3 of the broad BBB-rated estimate. The debt risk premium estimate will then be calculated by removing the risk free rate.

907. The ERA has given further consideration to contingencies in light of submissions. The detailed debt risk premium technical process documents have been updated to reflect the following considerations.

Contingency A

908. CEG considered that there should be at least 14 bonds from at least 10 different issuers with maturity between five and 15 years. CEG proposed that should this contingency be triggered that the ERA should consider defaulting to the AER method of estimating the cost of debt.

909. AGIG commented on Contingency A and requested that the ERA outline steps to ensure that A- bonds were not over-represented.

910. The ERA has further considered the minimum number of bonds to trigger Contingency A.

911. Bloomberg's bond count requirements are:[351]

- at least 15 bonds across the term structure
- at least five bonds with maturities between five and 10 years
- at least five bonds with maturities beyond 10 years.

912. The ERA continues to support a minimum number of bonds in the sample of at least 15 across the term structure.

913. Recognising the importance of observations around the 10-year tenor, the ERA also includes an additional criterion that the sample must have at least 10 bonds between the maturities of five and 15 years.

914. As discussed above, the ERA has reviewed expanding the bond sample to BBB, BBB+ and A-. The ERA recognises that this may result in under/over representation of the BBB and A- bond samples. CEG's method to adjust for this under/over representation has not been adequately justified.

915. Therefore, in the event that minimum bond sample requirements are not met, the ERA has revised its contingency approach to use the AER's method to calculate the cost of debt using RBA, Bloomberg and Thompson Reuters' data sources.

916. Under this contingency, the 10-year BBB+ cost of debt estimate will be calculated by the sum of:

- 1/3 of the broad A-rated estimate
- 2/3 of the broad BBB-rated estimate.

917. The debt risk premium will then be calculated by removing the risk free rate.

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348 ACCC, Regulatory Economics Unit, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 18.

349 ACCC, Regulatory Economics Unit, *Thomson Reuters Credit Curve Methodology Note for the AER*, April 2017, p. 5.

350 RBA Table F3: Aggregate Measures of Australian Corporate Bond Spreads and Yields – Non-financial Corporate Bonds:

351 ACCC, Regulatory Economics Unit, *Return on debt estimation: a review of the alternative third party data series*, August 2014, p. 18.

Contingency B

918. CEG considered that the divergence between estimators could be due to the Gaussian Kernel estimate being anomalous. Therefore, CEG considered that when there is a large estimation divergence the ERA should rely on the AER's method.

919. In the event that estimators diverge, the ERA recognises that an anomaly may rest in either of the three estimation techniques. Therefore, the Gaussian Kernel estimate could be anomalous.

920. In the event that the standard deviation of the three yield estimates is equal to or greater than 100 basis points, the ERA has revised its contingency approach to use the AER's method.

Contingency C

921. In the event that Bloomberg data is unavailable, AGIG and ATCO suggested that the contingency approach be expanded to include both RBA and Thompson Reuters' data.

922. The RBA data is based on Bloomberg data, and although it is possible that the RBA would continue producing the series using a different data source, it is under no obligation to do so.

923. Therefore, the ERA has revised its contingency approach to use both the RBA and Thompson Reuters' data based on the AER's method. This approach mitigates the risk that the RBA also stops producing the data series.

Updated debt risk premium process

924. The ERA is satisfied its approach to estimating the debt risk premium process is clear, robust and meets the binding rate of return requirements.

925. Appendix 5 sets out the *R DRP Process* and Appendix 6 sets out the *Excel DRP Process*.

926. In estimating the debt risk premium, the ERA will solely rely on the R statistical process detailed in the *R DRP Process*. The estimation of the debt risk premium through R is better implemented, maintained and statistically more robust than Excel.

927. To provide stakeholders with accessibility options, the ERA also provides an accompanying *Excel DRP Process*. However, the ERA does not rely on this *Excel DRP Process* and the Excel debt risk premium estimate will only provide an approximate debt risk premium estimate.

928. The accompanying tools, including the R code and Excel spreadsheets, are available on the ERA's website.

11. Return on equity

11.1 Background

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

931. 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 for the market as a whole.

932. 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.

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

934. This form of 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.

935. National Gas Rule 87(7) states that regulators must have regard to the prevailing conditions in the market for equity funds when estimating the return on equity.

936. At the same time, under National Gas Rule 87(5), regulators must have regard to relevant estimation methods, financial models, market data, and other evidence.

937. An overarching requirement under the National Gas Rule 87(3) is to achieve the allowed rate of return objective.

938. In this chapter the ERA sets out its approach to estimating the return on equity.

11.2 Draft approach

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

940. In the draft guidelines, the ERA determined a single point estimate for the return on equity using the Sharpe Lintner CAPM:

$$R_i = R_f + \beta_i \left(R_m - R_f \right) \quad \text{equation 26}$$

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 $\beta_i = \mathrm{cov}(R_i, R_m)/\mathrm{var}(R_m)$

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

941. To estimate the return on equity the ERA will separately estimate:

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

11.3 Draft reasoning

11.3.1 Models of the return on equity

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

943. The previous National Gas Rules specifically referred to this variant of the CAPM as being an example of a 'well accepted' financial model.[352]

944. Other asset pricing models in the CAPM family build on the standard Sharpe Lintner CAPM, and include:

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

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

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

352 Other regulators, such as Ofgem in the United Kingdom and the New Zealand Commerce Commission have adopted the Sharpe Lintner CAPM as the prime means to estimate the return on equity. Ofgem, for example, elected in 2010 to continue the use of the Sharpe Lintner CAPM under its 'RIIO' regime as the main model for determining the return on equity (Ofgem 2010, Regulating energy networks for the future: RPI-X@20 Recommendations: Implementing Sustainable Network Regulation, www.ofgem.gov.uk, p.130).

- the Build-up Method.

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

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

947. The ERA reviewed these asset pricing approaches, in terms of their ability to contribute to the achievement of the allowed rate of return objective, and considered that only the Sharpe Lintner CAPM model is relevant for informing the estimation of the prevailing return on equity for the regulated firm.

948. The Sharpe Lintner CAPM remains the dominant asset pricing model used to estimate the return on equity.

11.3.2 Estimating the return on equity

949. The ERA will determine a single point estimate for the return on equity using Sharpe Lintner CAPM.

950. To estimate the return on equity the ERA will separately estimate:

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

951. The on-the-day estimate of the risk free rate will be based on the observed yield of a five-year term Commonwealth Government Security, averaged over a 20-day period just prior to the regulatory period (see *Chapter 8 – Risk free rate of return*). The 20-day period will be nominated by the service provider in advance of the ERA's final decision. As it is set once, this rate will apply in each year of the regulatory period. The five-year term reflects the present value principle that the term of debt should match the length of the regulatory period, which is five years.

952. The equity beta will be derived through the methods set out in Henry's advice to the Australian Competition and Consumer Commission (ACCC) in 2009 to define the equity beta estimation approach.[353] Henry's study was updated in 2014, but remained essentially unchanged (see *Chapter 13 – Equity beta)*.[354] The equity beta will remain fixed for the period of the guidelines.

953. In the draft guidelines, the ERA considered different approaches to determine the market risk premium for the current regulatory framework and under a binding rate of return framework, in the event it is introduced (see *Chapter 12 – Market risk premium*).

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

[354] Henry, O., *Estimating beta: An update*, April 2014.

954. National Gas Rule 87(5)(a) directs the ERA to have regard to relevant estimation methods, financial models, market data and other evidence. Any methods, models, market data, or other evidence used by the ERA must meet this requirement, while also meeting the broader requirements of the National Gas Law and National Gas Rules.

11.3.3 Theoretical considerations

955. The estimate of the rate of return on equity is forward-looking, since investors make investments based on their expectations of the stream of net cash flows that those investments will generate over the future period.

956. The equity investor is principally concerned with the risks relating to the expected future stream of net cash flows. If an investor could expect to achieve the same return elsewhere at lower risk, then it would be irrational to invest in the regulated asset, as the expected present value would be lower than for the alternative investment. The efficient rate of return should just compensate the investor for the additional risk of holding the asset, over and above the risk free asset. This is the key insight of the Markowitz portfolio theory, as well as of the CAPM.[355]

11.3.3.1 Ex ante expected returns versus ex post outcomes

957. The fundamental purpose of using asset pricing models for regulatory decisions is to ensure that the decision meets the allowed rate of return objective and the other requirements of National Gas Rule 87.

958. The return on equity needs to be commensurate with the efficient financing costs of the benchmark efficient entity, allowing for the degree of risk involved.[356]

959. The regulator must consider the prevailing conditions in the market for equity funds,[357] which implies that the return on equity must reflect the return that investors require to invest in the asset over the regulatory period.

960. Realised returns (actual returns) may differ from expected returns (required returns). When equity prices are in equilibrium in the market, the required return is equal to the expected return. However, there is no guarantee that expectations will be realised, or that prices are always in equilibrium.[358] If there were a guarantee that expectations would be realised, then the asset would have no risk.[359] This view is expressed well by Davis:[360]

> The required returns are also referred to as expected returns by financial economists by relying on an assumption that asset prices equilibrate in efficient markets through supply and demand influences. If, given the current price of an asset, investors' expectations about future cash flows or future market value of that asset imply an expected return different to their required return, they will buy or sell that asset causing its price to adjust until it equates expected and required returns. Thus, the theories are simultaneously

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

356 National Gas Rules 87(3).

357 National Gas Rules 87(7).

358 Partington, G. and Satchell, S., *Report to the ERA: The Cost of Equity and Asset Pricing Models*, May 2016, p. 6.

359 Partington, G. and Satchell, S., *Report to the ERA: The Cost of Equity and Asset Pricing Models*, May 2016, p. 7.

360 Davis, K., *Cost of equity issues: a report for the AER*, January 2011, p. 3.

theories of equilibrium asset prices and *required* and *expected* returns. The theories do not purport to fully explain actual returns, since these can differ from expected returns due to a variety of factors including news about future cash flows which cause investors to reassess the appropriate price of an asset. If actual returns are a poor proxy for expected returns, the ability of a theory of *expected* returns to explain *actual* returns may be limited.

11.3.3.2 Systematic and non-systematic risks

961. Not all risks will be compensated in the return on equity.

962. Only those risks that are systematic are 'priced'. Specifically, the exposure of the asset to systematic risks will drive the covariance of the return of the specific asset to the variance of the returns on the overall market for securities.

963. Non-systematic or idiosyncratic risks for the return on equity may be diversified away by the investor. Where idiosyncratic risks influence the variance of the expected returns to the asset, then this may be exactly offset through holding other assets in the efficient market portfolio with corresponding offsetting risk and variance.

964. In addition, models of the return on equity tend to assume that systematic risks are symmetric, providing equal chance of out-performance as under-performance. As a consequence, risks that are not symmetric may be unpriced.

965. Where asymmetric systematic risks can be established, there may be a case to provide explicit recompense for these identified risks in the cash flows.

11.3.3.3 Risk and the benchmark efficient entity

966. Estimates of the return on equity need to be based on the expected returns of securities with similar risks, as the actual risks of the underlying assets of any firm are rarely observable.[361]

967. Provided that the risks of the underlying asset and the observed securities are similar, then the observed returns on equity from those securities should reflect the opportunity costs of investing in the underlying assets.

968. In this context, the National Gas Rules 87(3) allowed rate of return objective refers explicitly to the need for the benchmark efficient entity to have "a similar degree of risk as that which applies to the service provider in respect of the provision of the reference services". As noted in *Chapter 5 – The benchmark efficient entity*, the ERA interprets a 'similar' degree of risk as allowing for reasonable differences in the degree of risk among firms informing the benchmark, which recognises the significant uncertainties in the risks and the associated confidence intervals.

11.3.3.4 Prevailing conditions

969. The National Gas Rules require the regulator to consider prevailing conditions for the return on equity.[362]

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

[362] National Gas Rules 87(7).

970. McKenzie and Partington succinctly capture the rationale for the need to consider prevailing conditions:[363]

> In principle then, what we first need to do is to measure the risk of the investment. We then discount the expected future cash flows from the investment at the current equilibrium expected return in the capital market, for securities with the investment's level of risk. The word 'current' is important here. In any required return calculation we should be using current values because if capital markets are efficient current values contain the best information available on future values. In particular historic values for the rate of return on equity, or interest rates, are not relevant except to the extent that they help us estimate the current rates. Since current interest rates are readily observable, historic interest rates typically have no place in determining the required rate of return. If the current interest rates differ from historic rates then there will have been windfall gains or losses that are already reflected in the current value of equity.

971. The ERA will estimate the prevailing return on equity that compensates investors for holding securities with similar risk of return as the regulated asset. In what follows the ERA considered the tools that may be used to establish estimates for the prevailing rate of return on equity.

11.3.4 Models of the return on equity

972. Australian regulators use the Sharpe Lintner CAPM to quantify the return on equity.

973. The previous National Gas Rules specifically referred to this variant of the CAPM as being an example of a well-accepted financial model.[364]

974. Other asset pricing models in the CAPM family build on the standard Sharpe Lintner CAPM, including:

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

975. There is also an extensive range of other models which seek to estimate the return on equity.

976. The ERA reviewed each of these approaches when developing the guidelines in 2013[365] and concluded that only the Sharpe Lintner CAPM model was relevant to inform the ERA's estimation of the prevailing return on equity for the regulated firm.

977. In the draft guidelines, the ERA considered that the Sharpe Lintner CAPM model remains relevant to for the estimation of return on equity.

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

364 Other regulators, such as Ofgem in the United Kingdom and the New Zealand Commerce Commission have adopted the Sharpe Lintner CAPM as the prime means to estimate the return on equity. Ofgem, for example, elected in 2010 to continue the use of the Sharpe Lintner CAPM under its 'RIIO' regime as the main model for determining the return on equity (Ofgem 2010, *Regulating energy networks for the future: RPI-X@20 Recommendations: Implementing Sustainable Network Regulation*, p. 130).

365 ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines* - Appendix 8 – Evaluation of models for the return on equity, 16 December 2013.

978. The AER has also noted the Sharpe Lintner CAPM remains the dominant asset pricing model used to estimate firms' cost of capital.[366]

979. In 2016, the Australian Competition Tribunal found that the AER had not erred in applying the Sharpe Lintner CAPM.[367]

980. In making its case for the use of the Sharpe Lintner CAPM, the AER said that it:[368]

- 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 and verifiable, comparable and timely and clearly sourced
- was sufficiently flexible to allow for changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

981. Other models and approaches are not relevant within the Australian context at the current time, in the absence of new developments in theoretical foundations or empirical evidence.

982. In the draft guidelines, the ERA gave full weight to the Sharpe Lintner CAPM to estimate the return on equity.

983. It is unlikely that there will be significant new developments over the course of the life of these guidelines; consequently, the ERA expected to be able to rely on these guidelines to make its decisions until the guidelines are next reviewed.

11.3.5 Estimation of individual Sharpe-Lintner CAPM parameters

984. The ERA's 2013 guidelines detailed a five-step approach to generate a single point estimate for the return on equity.[369]

985. This previous approach was developed as a framework to:

- Deal with multiple relevant estimation methods, financial models, market data and other evidence informing the return on equity.
- Allow estimates to be derived as ranges and for the determination of a single point estimate for input to relevant estimation methods and models.
- Allow the ERA to give weight to each piece of information according to its merits.

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

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

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

369 ERA, *Explanatory Statement for the Rate of Return*, 16 December 2013, p. 127.

986. For the purposes of the 2018 guidelines, and in place of the five step approach, the ERA will separately detail the approach to estimating each of the CAPM parameters.

11.4 Public submissions

987. ATCO accepted the overall method in the ERA's draft guideline to estimate the return on equity, which determines a single point estimate through the use of the Sharpe Lintner CAPM. [370]

11.5 Independent Panel

988. The Independent Panel noted that the CAPM was the most widely used model in finance and business and in economic regulation in Australian and several other regulatory jurisdictions. It has been the subject of extensive analysis and review in Australia for the purposes of economic regulation.[371]

989. The Independent Panel considered that the ERA's full reliance on the Sharpe Lintner CAPM was based on sufficient information. The Panel supported the use of the Sharpe Lintner CAPM as the best primary model for informing an estimate of the allowed return on equity.[372]

990. The Independent Panel considered that the ERA's proposed approach could be implemented under both the current requirements and the binding rate of return requirements.

991. The Independent Panel considered that other models and methods may be used to help arrive at the best estimates of the parameters of the CAPM, consistent with the other parts of the guidelines. [373]

992. The Independent Panel did note that it was not practical to implement an international CAPM and it was not considered necessary for establishing an efficient financing benchmark. The Independent Panel agreed that the domestic CAPM, recognising foreign influence, was the best practical alternative.[374]

11.6 Final approach

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

994. The ERA will determine a single point estimate for the return on equity using the Sharpe Lintner CAPM:

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[370] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 13.

[371] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 9.

[372] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 45.

[373] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 45.

[374] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 20.

$$R_i = R_f + \beta_i \left(R_m - R_f \right) \qquad \text{equation 27}$$

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.

995. To estimate the return on equity the ERA will separately estimate:

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

11.7 Final reasoning

996. The reasoning for the ERA's final approach for estimating the return on equity is consistent with its draft reasoning and detailed below.

997. Australian regulators use the Sharpe Lintner CAPM to quantify the return on equity.

998. The previous National Gas Rules specifically referred to this variant of the CAPM as being an example of a well-accepted financial model.[375]

999. There is also an extensive range of other models which seek to estimate the return on equity.

1000. The ERA reviewed each of these alternative approaches when developing the guidelines in 2013[376] and concluded that only the Sharpe Lintner CAPM model was relevant to inform the ERA's estimation of the prevailing return on equity for the regulated firm.

375 Other regulators, such as Ofgem in the United Kingdom and the New Zealand Commerce Commission have adopted the Sharpe Lintner CAPM as the prime means to estimate the return on equity. Ofgem, for example, elected in 2010 to continue the use of the SLintner CAPM under its 'RIIO' regime as the main model for determining the return on equity (Ofgem 2010, *Regulating energy networks for the future: RPI-X@20 Recommendations: Implementing Sustainable Network Regulation*, p. 130).

376 ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines* - Appendix 8 – Evaluation of models for the return on equity, 16 December 2013.

1001. The ERA considers that the Sharpe Lintner CAPM model remains relevant to for the estimation of return on equity.

1002. The AER has also noted the Sharpe Lintner CAPM remains the dominant asset pricing model used to estimate firms' cost of capital.[377]

1003. In 2016, the Australian Competition Tribunal found that the AER had not erred in applying the Sharpe Lintner CAPM.[378]

1004. In making its case for the use of the Sharpe Lintner CAPM, the AER said that it:[379]

- 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 and verifiable, comparable and timely and clearly sourced
- was sufficiently flexible to allow for changing market conditions and new information to be reflected in regulatory outcomes, as appropriate.

1005. Other models and approaches are not relevant within the Australian context at the current time, in the absence of new developments in theoretical foundations or empirical evidence.

1006. The Independent Panel noted that the CAPM was the most widely used model in finance and business and in economic regulation in Australian and several other regulatory jurisdictions. It has been the subject of extensive analysis and review in Australia for the purposes of economic regulation.[380]

1007. The Independent Panel considered that the ERA's full reliance on the Sharpe Lintner CAPM was based on sufficient information. The Panel supported the use of the Sharpe Lintner CAPM as the best primary model for informing an estimate of the allowed return on equity.[381]

1008. The ERA will give full weight to the Sharpe Lintner CAPM to estimate the return on equity.

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

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

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

[380] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 9.

[381] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 45.

12. Market risk premium

12.1 Background

1009. The ERA uses the Sharpe Lintner CAPM to estimate the return on equity (as explained in *Chapter 11 – Return on equity*). The market risk premium is a parameter of the Sharpe Lintner CAPM.

1010. 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. In establishing the cost of capital it is the ex ante market premium that is relevant.

1011. 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.[382] Therefore, the market risk premium represents an investor's required expected return, over and above the risk free rate of return, on a fully diversified portfolio of assets. This is a forward-looking concept.

1012. The market risk premium is calculated as follows:

$$MRP = R_M - R_F \qquad \text{equation 28}$$

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.

1013. 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 investors' 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. The ERA's forward looking market risk premium is estimated over a five-year period, consistent with the term of the regulatory period.

1014. In estimating the expected market risk premium it is common to use equity indices (for example, the Australian Securities Exchange 200 Index) of listed companies as a proxy for the market portfolio and sovereign debt (for example, Australian Treasury bonds) as a proxy for the risk-free asset. The widespread use of these proxies is testament to the proposition that they are effective proxies. Given this resolution, the question then becomes which approach is best to estimate the expected market risk premium.

[382] 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.

1015. This chapter discusses how the market risk premium is to be estimated.

12.2 Draft approach

1016. The ERA's estimation of the market risk premium has in the past involved a level of regulatory discretion.

1017. For the purposes of setting the guidelines and future binding instrument, the ERA considered how best to set a market risk premium under the current regulatory framework and, if implemented, under the proposed binding rate of return framework.

1018. The level of discretion applied under the current framework will be informed by matters considered for the adoption of a binding framework.

12.2.1 Under current regulatory framework

1019. Under the current regulatory framework the ERA will determine an estimate of the market risk premium through the use of the historic market premium, the dividend growth model and other conditioning variables. This will involve a level of regulatory discretion.

1020. The ERA will estimate the market risk premium at each determination.

1021. Under this approach:

- The ERA will 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 that historical averages provide the best source of evidence available to estimate the market risk premium.

- The ERA will 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 some weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias.

1022. The ERA will determine a final point estimate of the market risk premium by using its regulatory judgement considering the relative merits of all relevant material, including conditioning variables:

- the default spreads
- the five-year interest rate swap spread
- dividend yields
- a stock market volatility index
- the debt risk premium.

1023. The level of discretion applied under the current framework in the final guidelines will be informed by matters that the ERA considered in its assessment of the market risk premium, including related to the adoption of a binding framework.

12.2.2 Under binding regulatory framework

1024. In the draft guidelines, the ERA considered and sought stakeholder comment on three options to determine the market risk premium under a binding rate of return framework. These options removed regulatory discretion over the period of the binding instrument.

1025. These options include:

- a fixed market risk premium
- a mechanical approach
- a historic approach.

12.2.2.1 Initial regulatory discretion and then fixed for the period

1026. This method would be based on the same approach as proposed under the current regulatory framework, detailed above. This method allows regulatory discretion in the determination of a market risk premium.

1027. However, the market risk premium would be calculated once and remain fixed over the period of the binding instrument.

12.2.2.2 Mechanical approach

1028. This method would use a mechanical approach that applies a fixed weight to the historic market premium and the dividend growth model.

1029. The market risk premium would be calculated at each determination.

12.2.2.3 Historic approach

1030. This method would solely use the historic market premium to estimate the market risk premium.

1031. The market risk premium would be calculated once and remain fixed over the period of the binding instrument.

12.2.3 Historic market premium

1032. In the draft guidelines, the ERA placed more reliance on the historic market premium to estimate the market risk premium, relative to the dividend growth model.

1033. The historic market premium is the average realised annual return that stocks have earned in excess of the five-year government bond rate. This historic market premium can be directly measured.

1034. While not forward looking, the historic approach has been used to estimate the forward looking market risk premium as past outcomes contribute to investors' forward expectations.

1035. The main historic market premium approach is that established by Ibbotson. This approach has been widely accepted.

1036. The ERA's method to calculate the historic market premium is summarised below.

- Arithmetic and geometric averages of the historic market premium observations are calculated using the Brailsford, Handley and Maheswaran (BHM) and NERA Economic Consulting (NERA) datasets.

- Six overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017, 1988-2017 and 2000-2017) are used for averaging periods, to reflect different economic conditions.

- A simple average of the lowest arithmetic and highest geometric means of the produced historic market premium matrix is then used to estimate the lower bound of the historic market premium.

12.2.4 Dividend growth model

1037. In the draft guidelines, the ERA placed less reliance on the dividend growth model to estimate the market risk premium, relative to the historic market premium.

1038. 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.

1039. The ERA will use the two-stage dividend growth model to estimate the market risk premium.

12.3 Draft reasoning

12.3.1 Overview of the market risk premium

1040. The market risk premium consists of the nominal risk free rate and the market return on equity.

1041. The market risk premium is commonly defined, in both finance and academic literature, as the return the market portfolio makes above the prevailing risk free rate.

1042. Table 17 summarises the recent history of estimates of the value of market risk premiums by Australian regulators.

Table 17 Estimating the market risk premium in Australian regulatory decisions

Regulator	Year	Industry	MRP (%)
ERA[383]	2018	Electricity	6.0%
AER[384]	2018	Electricity and gas	6.0%
AER[385]	2018	Electricity network	6.5%
QCA[386]	2018	Various	7.0%
IPART[387]	2018	Various	6.0%
AER[388]	2017	Gas distribution network	6.5%
ERA[389] [390]	2016	Gas transmission	7.4%
ESCOSA[391]	2016	Water, sewerage, stormwater drainage and other services	6.0%
ACCC[392]	2015	Fixed line services (Telecommunications)	6.0%
QCA[393]	2014	Various	6.5%

Source: Compiled by the ERA

12.3.2 Theoretical considerations

1043. The market risk premium cannot be directly observed, unlike other market-based parameters such as the risk free rate and debt risk premium. Rather, the market risk premium is a forward-looking concept that is subject to high levels of uncertainty in the short term.

383 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 65.

384 AER, *Draft Rate of Return Guidelines Explanatory Statment*, July 2018, p. 42.

385 The AER's terms in its April 2018 final decision on ElectraNet was consistent with that detailed in its draft decision. AER, *Draft Decision ElectraNet transmission determination 2018 to 2023,* October 2017, p. 3-42.

386 The 3 year term aligns with the length of the regulatory period for Seqwater.

Queensland Competition Authority, *Final Report: Seqwater Bulk Water Price Review 2018-21,* March 2018, p. 62.

387 Using the IPART's 10 year estimate. IPART uses a range of forward looking methods and then applies a 50/50 weighting the historic and forward looking estimate to arrive at 7.6 per cent.

Independent Pricing and Regulatory Tribunal, *WACC Biannual Update*, February 2018, p. 2.

388 AER, *Attachment 3 – Rate of return | Final decision: TasNetworks distribution determination 2017–19,* April 2017, p. 3-47.

389 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 2016, p. 189.

390 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 2016, p. 298.

391 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 124.

392 Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 66.

393 Queensland Competition Authority, *Final decision – Cost of capital: market parameters*, August 2014, p. iv.

1044. The ERA is required to estimate the market risk premium for a time period. As the return on equity will be set over a regulatory period and represents the forward looking return required by equity investors for that period, the forward looking market risk premium is estimated over a period of five years. This period is consistent with the term for the risk free rate.

1045. Market risk premium estimation methods can be classified as either historic-based or forward-looking. Historic-based methods use actual returns as a proxy for future returns. Forward-looking methods use forecasts, current market variables and predictions to estimate future returns.

1046. The two main methods commonly used to estimate the market risk premium are the historic market premium and the dividend growth model.

1047. Stakeholders, at varying times, have also recommended that the ERA use the Wright approach. The Wright approach is discussed in more detail below.

1048. Any method used to estimate the market risk premium will make an implicit assumption regarding the relationship that exists between the market risk premium and risk free rate. There are three theoretical conditions that may exist: (i) a negative relationship; (ii) no relationship; and (iii) a positive relationship. Underlying this is the question of whether the return on equity is implied to be stable and how this affects the market risk premium under the Sharpe Lintner CAPM.

1049. To develop the 2013 guidelines, the ERA reviewed the theoretical considerations that underpin the market risk premium, and the empirical and academic evidence for a relationship between the market risk premium and the risk free rate.[394]

1050. This 2013 review considered the stationarity and statistical relationship between the risk-free rate and the return on equity. This past review found empirical evidence that there is no statistically reliable relationship between the risk free rate and the return on equity. It found no convincing evidence of mean reversion of the equity risk premium. The return on equity, however, did appear to be mean reverting and thus more predictable. [395]

12.3.2.1 Historic market premium

1051. The historic market premium approach is a historic-based method. It uses realised returns from market data in order to calculate a historic average of returns above a determined risk free rate.

1052. Much previous regulatory practice has implicitly assumed that no relationship exists between the risk free rate and market risk premium, and therefore a long-term average market premium is the most appropriate method for a forward-looking estimate of the market risk premium. The historical risk premium approach assumes a constant expected risk premium; any change in the risk free rate results in a one-for-one change in the return on equity.

[394] ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, 16 December 2013, pp. 137-147; and appendices referred to therein.

[395] ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, 16 December 2013, p. 144; and appendices referred to therein.

1053. The historic risk premium approach is based on the assumption that – given a sufficient amount of time – the market risk premium will revert to a long-run historical average. This implies that the long-run historical average is a good forecast of the market risk premium, despite the short-term fluctuations around the average.

1054. In contrast, forward-looking approaches such as the dividend growth model implicitly assume a negative relationship between the market risk premium and the risk free rate. In other words, the dividend growth model assumes that the market cost of equity never changes over time, which implies that any change in the risk free rate is perfectly offset by an opposite change in the market risk premium.

12.3.2.2 Wright approach

1055. The Wright approach is an alternative specification of the Sharpe Lintner CAPM. Stakeholders in the past have suggested that the Wright approach is a forward looking method.

1056. In the Wright approach, the market risk premium is not an individual parameter, rather it is defined as the difference between the return on equity estimate and the prevailing risk free rate.

1057. The relevance of the Wright approach is dependent on whether there is an inverse relationship between the market risk premium and the risk free rate.

1058. There have been diverging views in the past on the role of the Wright approach.

1059. To inform the 2013 guidelines, the ERA conducted statistical analysis of the long run average market return on equity, the yield on bonds and the market risk premium to confirm the appropriateness of the Wright approach.[396]

1060. The ERA analysis used the Dickey Fuller statistical test[397] to test for a random walk[398] and draw conclusions on the stationarity of the long-term data. The results:

- Found the market return on equity is stationary (not a random walk).
- Found that yields on bills and bonds are 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.

1061. This analysis informed the ERA's position on the Wright approach for subsequent decisions made by the ERA.

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

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

[398] 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.

1062. The ERA is now aware of new information from a Partington and Satchell review of the ERA's statistical analysis.[399] The Partington and Satchell analysis raised the following concerns with the ERA's analysis.

- Following a random walk is not the only type of non-stationarity. For example, a process of market evolution will not meet the criteria of 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.

- The analysis may have been better done on levels of prices rather than on returns. Partington and Satchell note that, except in very unusual circumstances, returns are stationary. Prices better 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, the resulting error term being stationary).

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

1063. Partington and Satchell advised that they are unconvinced by the Wright approach for estimating the market risk premium and recommended 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". [400]

1064. 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.[401]

1065. Furthermore, the AER has stated that it does "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."[402]

1066. Based on the above information, the ERA considered that there were theoretical and empirical concerns with the Wright approach.

1067. The ERA will not consider the Wright approach when estimating the market risk premium.

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

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

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

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

12.3.2.3 Dividend growth model

1068. The dividend growth model is considered a forward-looking method to estimate the market risk premium. 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.

1069. 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.

1070. 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 it is unreliable on its own.[403]

1071. McKenzie and Partington note the sensitivity of the model to assumptions and input values:[404]

> 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 Gordon model this leads to an overestimate of the MRP.

1072. To evaluate the dividend growth model, the ERA considered all available information, which included new information not available at the time of its Dampier to Bunbury Natural Gas Pipeline decision. This included the April 2017 Partington and Satchell report on estimation of the return on equity, which reviewed the role of the dividend growth model in estimating the market risk premium.[405]

1073. The Partington and Satchell report considered the appropriateness of:

- the dividend growth model to estimate the market risk premium
- applying an equal weighting to the dividend growth model and historical excess returns.

1074. The Partington and Satchell report raises a range of concerns with the dividend growth model, including:

- the sensitivity of the dividend growth model to its assumptions
- that forecasts of future earnings and dividends are fairly inaccurate over more than two years

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

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

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

- that the dividend growth model is subject to upward bias from the smoothed or sticky nature of dividends[406]

- that biases in analyst forecasts can lead to a biased dividend growth model forecast of the market risk premium.

1075. Partington and Satchell report that despite the dividend growth model consistently giving numbers above 7 per cent for a predicted market risk premium since the 2013 guidelines, the market risk premium is more likely to be below the long run average than above it.[407]

1076. In summary, Partington and Satchell found that:

> Due to the foregoing considerations and other weaknesses of the DGM, on which we have previously commented extensively, see for example Partington and Satchell (2016 pages 25 to 29), we think it very unlikely that the DGM will produce a forward looking MRP commensurate with the prevailing conditions in the market for funds.[408]

1077. Given the concerns with the dividend growth model it was unclear to Partington and Satchell that it was appropriate to apply equal weights to the historic market risk and the dividend growth model.[409]

1078. In the draft guidelines, the ERA considered that the dividend growth model also had the following weaknesses.

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

- Forecasts of earnings and dividends are inaccurate and are likely to be upwardly biased.

- The dividend growth model is likely to be upwardly biased due to current low interest rates. Experts have advised that with low interest rates, as currently experienced, the dividend growth model can produce upwardly biased results due to the sensitivity of the model formula to low interest rates. [410]

- 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. The estimate therefore extends beyond the five year period for which the ERA needs to estimate the market risk premium. If a lower nominal Gross Domestic Product estimate is expected than used in the model – say for the two years beyond the three actual dividend growth rate forecasts incorporated in the model – then the estimates of the dividend growth model

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[406] The sticky nature of dividends can create a disconnect between assumptions where slowly changing dividends may not appropriately correspond with rapidly changing share prices. In addition, dividends are particularly sticky downwards as opposed to upwards, which creates an asymmetry in effects

[407] Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017, pp. 16-19.

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

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

[410] Lally, M., *Review of the AER's proposed dividend growth model*, December 2013, pp. 11–12.

should be lower than that reported. The implications would be that the five-year forward looking market risk premium would also be lower.

1079. There are concerns with the reliability of the dividend growth model, its suitability for the regulatory task and the manner that a regulator takes it into account when exercising discretionary judgement.[411]

1080. In the past, the ERA took the mid-point between the historic estimate and the dividend growth model as a starting point for its evaluation of the market risk premium.

1081. 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 in the averaging and the extent that the estimates are unbiased.

1082. On the basis of available information, the ERA placed less reliance on the dividend growth model, relative to the historic market premium.

12.3.3 Estimating the market risk premium

1083. The following sections discuss the calculation of the market risk premium under the two different approaches.

12.3.3.1 Historic market risk premium estimate

1084. The ERA will determine the historic market premium estimate using the Ibbotson approach.

1085. The Ibbotson approach is a well-accepted method for calculating the market premium using historical data. It calculates the averages of a series of annual market premium observations. The market premium is calculated for each calendar year spanning back over the longest period of time for which data is available. There are annual Australian market 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.

[411] AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, p. 3-80.

The robustness of historical risk premium approaches

1086. In their 2012 study, Dimson, Marsh and Staunton concluded that the historical average approach on equity risk premium remains the most relevant approach for estimating the market risk premium as there are no better forecasting methods available.[412] The authors argued that there were good reasons to expect that the equity premium varies over time. Market volatility clearly fluctuates and investors' risk aversion also varies over time. However, these effects are likely to be brief. Sharply lower (or higher) stock prices may have an effect on immediate returns, but the effect on long-term performance will be diminished. Moreover, volatility does not usually stay at abnormally high levels for long and investor sentiment is also mean reverting. For practical purposes, the authors concluded that for forecasting the long-run equity premium, it was hard to improve on extrapolation from the longest history that was available at the time the forecast was being made.

1087. However, there is also evidence indicating that estimates of the market risk premium using historical data on equity risk premia are biased. For example, McKenzie and Partington[413] and Damodoran[414] concluded that an estimate of the market risk premium using an historical average of the equity risk premium was likely to overestimate the true expectation due to the presence of survivorship bias. In this method of deriving an estimate for the market risk premium, a national stock exchange index is used as a proxy for the equity market return. For example, in Australia, a proxy for the equity market return is the Australian All Ordinaries Index. Stocks with consistently negative returns that are no longer in the market have been excluded from the Australian All Ordinaries Index.

1088. Siegel (1999) considered that historical equity returns were likely to overstate returns actually realised because of early market limitations including historically high transaction costs and the historical lack of low cost opportunities for diversification.[415] The implication is that the long-term forward-looking market risk premium is expected to be lower over time relative to the historical estimate.

1089. Similarly, Bianchi, Drew and Walk found that while the Australian historic market risk premium is volatile, there is a declining secular trend. [416]

1090. Brailsford, Handley and Maheswaran (BHM) noted that, for the purposes of asset valuation in Australia, historical estimates of the market risk premium have been used. Using a more comprehensive data set than previous studies, they found estimates that were substantially lower. They attributed this to lower estimated stock returns prior to 1958 and, to a lower extent, higher debt returns prior to 1960.[417]

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412 Dimson, E, Marsh, P. and Staunton, M., *Credit Suisse Global Investment Returns Sourcebook 2012*, February 2012, p. 37.

413 McKenzie, M. and Partington, G., *Equity market risk premium*, 21 December 2011, pp. 6–7.

414 Damodoran, A. *Equity risk premiums: determinants, estimation and implications—the 2012 edition,* March 2012, p. 24.

415 Lally, M., *Cost of equity and the MRP*, July 2012, p. 8.

416 Bianchi, R., Drew, M. and Walk, A., 'The equity risk premium in Australia – 1900 to 2014', *Financial Planning Research Journal,* vol 2(1), 2016, pp. 80-98.

417 Brailsford, T., Handley, J. and Maheswaran, K., 'Re-examination of the Historical Equity Risk Premium in Australia', *Accounting and Finance*, 2008, vol.48, p. 95.

1091. The ERA is also aware that well-regarded financial services providers such as Credit Suisse, and Duff and Phelps provide risk premium reports based on historical averages of equity risk premium data.[418] This information indicates that investors are likely to place some weight on historical information on equity risk premiums to form their expected market risk premium. Therefore, historical estimates of the mean of the market premium provide relevant evidence for any forward-looking market risk premium in the Australian context.

Data sources for historical risk premium approaches

1092. The Ibbotson approach uses historical market premium data to calculate the market risk premium.

1093. BHM have produced the furthest backdated source of historical equity risk premium data for Australia. BHM's data series is, in part, based on a series constructed by Lamberton and the Sydney Stock Exchange (SSE, now the ASX).[419] BHM investigated the Lamberton/SSE data and confirmed the SSE/ASX had previously adjusted the data set by a factor of 0.75[420] to account for a probable upward bias since it consisted of unweighted yields and excluded non-dividend paying shares.[421] BHM considered this adjustment was appropriate.[422]

1094. The adjustment originated with the SSE/ASX and was not one that BHM took upon itself to make. Nevertheless, the adjustment has been the subject of some controversy.

1095. In 2013 NERA raised concerns about the possibility of a downward bias in some of the older data observations in this dataset and produced an adjusted version of the BHM data.[423]

1096. Professor Handley has since responded to concerns about the BHM data by highlighting shortcomings in NERA's adjusted series,[424] which NERA disputes.[425] NERA has also expressed concern about the credibility of the SSE/ASX adjustment used in BHM's original study.[426]

418 See Duff and Phelps, *Risk Premium Report,* 2013, available www.duffandphelps.com/expertise/publications/pages/ResearchReportsDetail.aspx?itemid=89
and *Credit Suisse Global Investment Returns Year Book*, 2012, available
www.credit-suisse.com/investment_banking/doc/cs_global_investment_returns_yearbook.pdf

419 Brailsford, T., Handley, J. and Maheswaran, K., 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, pp. 78-79.

420 Brailsford, T., Handley, J. and Maheswaran, K., 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 80.

421 Brailsford, T., Handley, J. and Maheswaran, K., 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 79.

422 Brailsford, T., Handley, J. and Maheswaran, K., 'Re-examination of the historical equity risk premium in Australia', *Accounting and Finance*, Vol. 48, 2008, p. 81.

423 NERA, *The market size and value premiums*, June 2013.

424 Handley, J., *Report prepared for the Australian Energy Regulator: Further advice on the return on equity*, April 2015, p. 8.

425 NERA Economic Consulting, *Historical Estimates of the Market Risk Premium*, February 2015, pp. v-vii; NERA, *Further assessment of the historical MRP: Response to the AER's final decisions for the NSW and ACT electricity distributors*, June 2015 – pp. i-iii.

426 NERA Economic Consulting, *Historical Estimates of the Market Risk Premium*, February 2015, p. v.

1097. HoustonKemp has argued that the ERA should solely use the NERA adjustments and refrain from using the BHM adjustments (and so refrain from using the BHM data prior to 1958).[427] HoustonKemp refers to a NERA June 2015 report.[428]

1098. The AER has reviewed the underlying datasets and the June 2015 NERA report. The SA Power Networks final decision describes how there are more concerns with pre-1958 data than those that NERA attempts to address with its adjustment and this creates a problem for any dataset.

> Fourth, and arguably most important, the above discussion crystallises the central issue on the consideration of earlier data. That is, there are significant problems with the earlier data, regardless of which adjustment is used. This finding, in part, informs our position to consider different sampling periods.[429]

1099. The AER has chosen to continue the sole use of the BHM dataset.

> We do not consider NERA's adjustment, which is based on less than ten data points out of 300, represents a material improvement in reliability. NERA has also not reconciled the data it uses for its adjustment to the data of the original series.[430]

1100. The relative merits of the NERA and BHM datasets prior to 1958 are subject to some controversy. There is a significant difference between the NERA and BHM estimates for the period between 1883 and 1936. After 1936, NERA and BHM produce similar estimates.

1101. Given this uncertainty, it is reasonable to use both the BHM and NERA datasets to minimise any error by favouring one source over the other. Placing more weight on one dataset risks introducing bias. Pink Lake Analytics also considered the two data sources and confirmed this approach.

> If the data prior to 1958 are retained then an 'equanimeous' position of weighting the BHM and NERA estimates equally should also be retained, given the data prior to 1958 are uncertain in nature.[431]

1102. The ERA will use the average of the NERA and BHM data, thereby minimising any potential error by incorrectly favouring one source over the other.

Tax imputation credit yields

1103. The introduction of tax imputation credits in 1988 has affected investor returns.

1104. For the purposes of calculating historic market returns, which are required to estimate the market risk premium, it is necessary to adjust market returns to account for the added value of tax imputation credits.

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427 HoustonKemp Economists, A Constructive Review of the ERA's Approach to the MRP, June 2017.

428 NERA, *Further Assessment of the Historical MRP: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors,* June 2015

429 AER, *Final decision: SA Power Networks determination 2015-16 to 2019-20, Attachment 3 – Rate of Return,* October 2015, p. 3-380.

430 AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, p. 3-88.

431 Pink Lake Analytics, *Estimation of the Market Risk Premium – A review of weighting of arithmetic and geometric means*, December 2017, p. iv.

1105. For the purposes of calculating the market premium, ERA will assume that:

- Dividends are 83 per cent franked with utilisation rate (theta) being 60 per cent between 1988 and 1998.
- Dividend imputation is consistent with the ATO data on credit yields from 1998 onward.[432]

Sampling periods

1106. The ERA will use six sampling periods to calculate the market premium. The dates of four of the selected sampling periods (1883, 1937, 1958 and 1980) reflects changes to the quality of the underlying data, while two of the periods reflect changes to the tax system (the introduction of the imputation tax system in 1988 and the Goods and Services Tax in 2000).

1107. Partington and Satchel have reviewed the sampling period for calculating the market premium and favour using as much information as possible. They considered that there are valid reasons for using multiple sampling periods, including structural breaks in the data and issues of data quality. Partington and Satchel recognised that the more recent sample periods are likely to provide changing information regarding changes to the taxation and current regimes.[433]

1108. There are strengths and weaknesses in taking multiple sampling periods, including that:

- longer time series contain more observations and produce a lower statistical error
- data quality markedly improved in 1937, 1958 and 1980
- more recent sampling periods reflect the current financial environment
- shorter periods are more affected by the current environment or one-off events.

1109. Having considered these strengths and weakness, and given that no one data period has been assessed as superior, the ERA will use six overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017, 1988-2017 and 2000-2017).

> Until one data scenario may be clearly proven superior to another then it is advisable that the Authority retains its compromise strategy of averaging across the data scenarios.[434]

1110. Although simple averages of six overlapping time-periods are used to estimate the expected market risk premium, the method gives greater weight of returns in later years. This is because whilst the later years are included in every time period, the earlier years are not.

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432 ATO data on credit yields is available from 1998. https://www.ato.gov.au/Rates/Company-tax---imputation--average-franking-credit---rebate-yields/

433 McKenzie M. and Partington G., *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 45–46.
AER, *Final Decision AusNet distribution determination - Attachment 3 - rate of return*, May 2016, p. 62.

434 Pink Lake Analytics, *Estimation of the Market Risk Premium – A review of weighting of arithmetic and geometric means*, December 2017, p. iv.

1111. For the guidelines the ERA will use the six sampling periods when estimating the market risk premium.

Averaging method

1112. The historic market risk premium uses the concept of a long-run average market risk premium as today's best forecast of the market risk premium into the future, and combines this average with an on-the-day risk free rate to arrive at an on-the-day estimate of the market risk premium.

1113. When applying the historic market risk premium an averaging method must be selected to apply to historical returns. The ERA has used both the arithmetic and geometric means to calculate the market premium.[435]

1114. There are mixed views as to the best averaging technique to apply to estimate the historic market premium.

1115. An arithmetic average will tend to overstate returns, whereas a geometric average will tend to understate them. These biases are empirically significant. The biases result from the fact that cumulative performance is a non-linear function of average return, and that the sample average is necessarily a noisy estimate of the population mean. Bias is a function of both the imprecision of the estimate and of the forecast horizon.[436] [437]

- When compounding the arithmetic average over time, it is the sampling error in the measurement of the arithmetic average return that causes the upward bias in the expected return.[438] [439]

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[435] The arithmetic mean is also called simple average, which is the sum of all numbers in the series divided by the count of all numbers. The arithmetic mean formula is:

$$Arithmetic\ Mean = \frac{\sum_{i=1}^{n} x}{n} = \frac{x_1 + x_2 + \cdots + x_n}{n}$$

The geometric mean is the average of a set of products. The geometric mean formula is:

$$Geometric\ Mean = \left(\prod_{i=1}^{n} x\right)^{\frac{1}{n}} = \sqrt[n]{x_1 \cdot x_2 \cdots\cdot x_n}$$

When geometric mean works with percentage returns, the formula is altered to reflect the compounding effect, as below:

$$Geometric\ Mean\ for\ \%\ return = \sqrt[n]{(1 + x_1\%) \cdot (1 + x_2\%) \cdots\cdot (1 + x_n\%)} - 1$$

[436] An often-overlooked presumption of the textbook definition of mean is that the forecaster knows the true values of the parameters for the mean and variance. In practice, of course, these are estimated, and even using the best estimation techniques, the estimators are subject to sampling error. Symmetric errors in the estimate of the mean therefore have asymmetric effects on returns.

[437] Jacquier, E., Kane, Al. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal*, 59, 2003.

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

[439] Jacquier, E., Kane, Al. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal*, 59, 2003, p. 3.

- The geometric average normally gives a downward biased measurement of expected returns.[440] The geometric mean can understate returns as it is based on an ideal consistent compounding, which does not account for sampling error and the actual variability of returns over time.

1116. The academic literature concludes there is no unequivocal case for relying exclusively on either the arithmetic mean or the geometric mean to estimate a forward looking market risk premium.[441]

1117. An unbiased estimate of the market risk premium is likely to be somewhere between the geometric average and the arithmetic average.[442] [443]

1118. The ERA has sought to minimise any error with over-reliance on one of the two types of average by using the simple average of the lowest arithmetic mean and highest geometric mean.

1119. The respective advantages of the two types of averaging methods have also been considered at length in previous AER decisions.[444] Based on this information the AER has reaffirmed that using both averages is the best use of all information available.

1120. In its April 2017 TasNetwork decision the AER continued to use both the arithmetic and geometric means, tempered by an understanding of the potential biases in both.[445] [446]

1121. In the draft guidelines, the ERA continued the use of both arithmetic and geometric means.

Historic market premium estimate

1122. The following table details the ERA's estimates of the historic market premium.

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

441 Damodoran, A., *Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2016 edition*, March 2016, p. 33

JP Morgan, *The Quest for the Market Risk Premium*, May 2008, p. 4

442 McKenzie, M. and Partington, G., *Supplementary report on the equity MRP*, February 2012, p. 5.

443 Jacquier, E., Kane, Al. and Marcus, A., 'Geometric or Arithmetic Mean: A Reconsideration', *Financial Analysts Journal*, 59, 2003, p. 4.

444 Partington G. and Satchell S., *Return of equity and comment on submissions in relation to JGN*, May 2015, p. 1.

445 AER, *Final decision: TasNetworks distribution determination 2017-19, Attachment 3 – Rate of return*, April 2017, p. 3-88.

446 McKenzie, M. and Partington, G., *Report to the AER: Supplementary report on the equity MRP*, February 2012 Partington, G. and Satchell, S., *Report to the AER: Analysis of criticism of 2015 determinations*, October 2015, pp. 44-45.

Table 18 Draft guideline estimates of the market premium

	Arithmetic			Geometric		
	BHM	NERA	Average	BHM	NERA	Average
1883-2017	6.82%	6.47%	6.65%	5.47%	5.12%	**5.29%**
1937-2017	6.24%	6.29%	6.27%	4.40%	4.45%	4.42%
1958-2017	6.75%	6.75%	6.75%	4.42%	4.42%	4.42%
1980-2017	6.53%	6.53%	6.53%	4.26%	4.26%	4.26%
1988-2017	6.11%	6.11%	**6.11%**	4.50%	4.50%	4.50%
2000-2017	6.13%	6.13%	6.13%	4.32%	4.32%	4.32%

Source: ERA Analysis

1123. The ERA takes the average of the lowest arithmetic mean (6.11 per cent) and the highest geometric mean (5.29 per cent) to develop an estimate of the historic market premium of 5.7 per cent.

12.3.3.2 Dividend growth model

1124. The ERA's preferred construction of the dividend growth model is the two-stage dividend growth model set out in the DBNGP decision.[447] The two-stage model assumes that dividends grow at the long-term growth rate following the dividend forecast period.

1125. 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.[448]

1126. The AER also uses the Lally rate of 4.6 per cent in its model and applies an upper (5.1 per cent) and lower (3.86 per cent) sensitivity. The AER has considered the 4.6 per cent a reasonable estimate:

> We consider our estimated long term growth rate of the nominal DPS of 4.6 per cent to be reasonable, if not 'somewhat on the generous side'.[449]

1127. The ERA also considered the use of a point estimate of 4.6 per cent was a reasonable assumption. The ERA noted that there was evidence that the 4.6 per cent growth rate is on the high side.[450]

1128. 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.[451]

[447] 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.

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

[449] AER, *AusNet Services determination 2016-20, Attachment 3 – Rate of return,* October 2015, p. 3-328.

[450] Partington, G., *Report to the AER: Return on equity (Updated)*, April 2015, pp. 26, 53.

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

- With a growth rate of 4.6 per cent, the two-stage dividend growth model produces slightly higher results than the three-stage model.[452]
- 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.

1129. Most academic literature tends towards the belief that a single well-constructed dividend growth model should provide sufficient information when considered correctly.[453]

1130. 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 produced an estimate of 7.6 per cent.

12.3.3.3 Conditioning variables

1131. The ERA's previous approach determined a range for the market risk premium, with a lower and an upper bound.

1132. To inform its determination of a point estimate for the market risk premium, the ERA used four conditioning variables or forward-looking indicators and regulatory discretion.

1133. Conditioning variables are readily available market data which allow the ERA to take into account current market conditions. Conditioning variables should be considered symmetrically through time to avoid bias.

1134. The interpretation of conditioning variables is subject to regulatory judgement. Under a binding rate of return framework the use of regulatory judgement is not allowed once the binding instrument is set. Therefore, the use of conditioning variables would only be appropriate to initially set a fixed market risk premium for the period of the guidelines.

Default spread

1135. The default spread, which is the difference between the five-year yield from the AA Australian Corporate Bloomberg Fair Value Curve and the yield on a five-year Commonwealth Government bond.

1136. The default spread will tend to be high during poor economic times. Fama argues that:

> persistent poor times may signal low wealth and higher risks in security returns, both of which can increase expected returns.[454]

1137. Therefore, it can be argued that there is a positive relationship between default spreads and the market risk premium.

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

[453] Partington, G. and Satchell, S., *Report to the AER: Discussion of Estimates of the Return on Equity*, April 2017, pp. 25-26.

[454] Fama, E., 'Efficient Capital Markets: II', *Journal of Finance*, Vol 46, 1991, p. 1585.

Interest rate swap spread

1138. The five-year interest rate swap spread is the difference between the five-year interest rate swap rate and the yield on a five-year Commonwealth Government bond.

1139. Similar to the default spread there is a positive relationship between the swap spread and the market risk premium.

Dividend yields

1140. The dividend yields on the ASX All Ordinaries Analyst Consensus Dividend Yield. The dividend yield is the ratio of the dividends paid to the stock or portfolio's price.

1141. From a dividend growth model perspective, the dividend yield has a positive relationship with the market risk premium.

Implied volatility

1142. The implied volatility is the ASX 200 volatility index (VIX).

1143. The CAPM embodies a positive relationship that exists between the market risk premium and volatility of returns to the market portfolio.

Debt risk premium

1144. The ERA considered the relevance of the debt risk premium as a conditioning variable.

1145. Debt and equity funding are substitutes to a degree. Therefore, it theoretically makes sense that there will be a positive relation between these two sources of funding.

1146. The AER has previously used cross-checks that included the comparison of the debt risk premium and the market risk premium.

1147. An Australian Competition Tribunal decision suggested that such a comparison between the market risk premium and the debt risk premium was an appropriate and an obvious cross-check, which could provide reasonable evidence for the overall return on equity decision. Such consideration did not tend to suggest that the overall return on equity estimate was too low.[455]

1148. Therefore, it can be argued that there is a positive relationship between the debt risk premium and the market risk premium.

12.3.4 Options to determine market risk premium point estimate

1149. The ERA's estimation of the market risk premium has, in the past, involved a level of regulatory discretion.

1150. For the purposes of setting the guidelines and future binding instrument, in the draft guidelines, the ERA considered how best to set a market risk premium under the current regulatory framework and, if implemented, under the proposed binding rate of return framework.

[455] Australian Competition Tribunal, *Applications by PIAC Ltd and AusGrid AComT1*, February 2016, p. 222.

1151. The level of discretion applied under the current framework will be informed by matters considered for the adoption of a binding framework.

1152. On this basis, the ERA sought comments on the following options to determine the market risk premium.

12.3.4.1 Under current regulatory framework

1153. Under the current regulatory framework, the ERA will determine an estimate of the market risk premium through the use of the historic market premium, the dividend growth model and other conditioning variables. This will involve a level of regulatory discretion.

1154. The ERA will estimate the market risk premium at each determination.

1155. Under this approach:

- The ERA will 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 considered historical averages provided the best source of evidence available to estimate the market risk premium.

- The ERA will 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 some weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias.

- The ERA will determine a final point estimate of the market risk premium by using its regulatory judgement considering the relative merits of all relevant material, including conditioning variables:

  - the default spreads
  - the five-year interest rate swap spread
  - dividend yields
  - a stock market volatility index
  - the debt risk premium.

1156. The level of discretion applied under the current framework will be informed by matters considered for the adoption of a binding framework.

12.3.4.2 Under binding regulatory framework

1157. The ERA considered three options to determine the market risk premium for the binding instrument. These options remove regulatory discretion over the period that the binding instrument is in place.

1158. These options include:

- a fixed market risk premium
- a mechanical approach
- a historic approach.

Initial regulatory discretion and then fixed for the period

1159. This option would be based on the same approach as proposed under the current regulatory framework, detailed above. This method allows regulatory discretion in the determination of a market risk premium.

1160. However, the market risk premium would be calculated once and remain fixed over the period of the binding instrument.

1161. The ERA considered that the market risk premium was fairly stable over time, given the way it was calculated. Therefore the market risk premium would be fairly constant for the four year period that the instrument would be in place.

1162. In addition, to avoid the use of regulatory discretion over the period of the binding instrument it would not be possible to use regulatory judgement to interpret conditioning variables and then also use judgement to determine the required adjustment to the estimate of the market risk premium. This further supported fixing the market risk premium over the period of the binding instrument.

1163. The ERA considered that fixing the market risk premium was not going to systematically over- or under-estimate the market risk premium over the four year period of the guidelines.

1164. Fixing the market risk premium provides investor certainty. The ERA considered that fixing the market risk premium over the period of the binding instrument would promote stability, predictability and consistency of the allowed rate of return, consistent with the national gas objective.

1165. The ERA recognised that there may be some distortions through time. However, distortions to the market are generally short-term events, which do not detract from the fact that a fixed market risk premium provides a reasonable estimate for the market risk premium over the period.

1166. An example of a distortion is the global financial crisis. The ERA considered that sourcing equity during this period may not necessarily reflect an efficient financing strategy given the potentially high market risk premium. This would tend to be confirmed by network businesses only sourcing limited amounts of equity finance at the peak of the global financial crisis.

1167. Should changes to market conditions be ongoing the market risk premium will be updated as part of the review of the next guidelines.

Mechanical approach

1168. Under this option, the ERA would determine an estimate of the market risk premium through the use of the historic market premium and the dividend growth model.

1169. An estimate of the market risk premium would be calculated at each determination.

1170. Such an approach may be appropriate if the market risk premium varies to a large degree within a four year period.

1171. Given the binding rate of return legislation requires the removal of regulatory discretion in setting the rate of return for determinations, a fixed weight would be applied to the historic market premium and dividend growth model.

1172. For the reasons detailed above, this weighting would place more reliance on the historic market premium and less reliance on 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 risk premium are widely used by financial practitioners and regulators in Australia. The ERA considered that historical averages provided the best source of evidence available to estimate the market risk 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 some weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias.

1173. The ERA sought stakeholder views on what an appropriate weight may be under a mechanical approach.

Historic approach

1174. Under the historic approach the ERA would determine an estimate of the market risk premium through the sole use of the historic market premium.

1175. The market risk premium would remain fixed over the period that the binding instrument is in place.

1176. Given significant concerns with the dividend growth model it may be appropriate to fully discount the dividend growth model and therefore solely use the historic market premium.

1177. As discussed in detail above, the ERA considered that the dividend growth model suffered from various weaknesses that may mean it was not appropriate in this regulatory context.

1178. The ERA considered that the market risk premium was fairly stable over time, given the way it is calculated. Therefore, the market risk premium would be fairly constant for the four year period that the guidelines would be in place.

1179. Fixing the market risk premium provides investor certainty. The ERA considered that fixing the market risk premium over the period of the binding instrument would promote stability, predictability and consistency of the allowed rate of return consistent with the national gas objective.

12.4 Public submissions

1180. Submissions from AGIG, APGA, ATCO, ENA and GGT considered the market risk premium.[456] [457] [458] [459] [460] The submissions are summarised below.

12.4.1 Historic market risk premium

1181. AGIG, APGA and ATCO accepted the use of the historic market risk premium.

1182. GGT argued that the ERA provided no justification as to why the historic market risk premium, through the Ibbotson approach, was linked to the investor expectations.

1183. AGIG, APGA, ATCO, ENA and GGT submitted that the historic market risk premium was best derived from the arithmetic mean.

- Submissions referred to a Berk and DeMarzo view that because investors are interested in expected return, the correct average to use is the arithmetic average.[461]

- Submissions 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'.[462]

1184. AGIG argued that, to the extent that the ERA continues to use the geometric mean, the use of the mid-point between the arithmetic and geometric mean was incorrect. AGIG argued for use of the Indro and Lee approach to adjust and minimise the bias of means. Indro and Lee use a formula, which includes factors for the length of the historic period and the length of the forecast period, to weight the arithmetic and geometric means.[463]

1185. AGIG and APGA submitted that the historic market risk premium should be derived from NERA data. AGIG argued that the NERA dataset is supported by it being solely used by Dimson, March and Staunton, and Credit Suisse.

1186. AGIG and APGA argued that the time period 2000-2017 should be ignored. APGA noted that the AER's expert panel considered this period as too short. GGT also considered that the periods 1980-2017, 1988-2017 and 2000-2017 were too short, but did not detail why. GGT expressed a view from Brailsford, Handley and Maheswaran that the 1958-2017 period was more reliable than earlier data and was preferred.

[456] AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 5-13.

[457] APGA, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, pp. 3.

[458] ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 15-25.

[459] ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, pp. 5-19.

[460] GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, pp. 22-33.

[461] Berk, J. and DeMarzo, P., *Corporate Finance,* Pearson 2017, p. 406.

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

[463] 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.

1187. Based on its augmented method, AGIG produced a historic market risk premium estimate of 6.43 per cent to 6.47 per cent. AGIG argued the historic market risk premium should set a lower bound.

1188. Based on its augmented method, ATCO considered that the most conservative historic market risk premium estimate was 6.11 per cent.

1189. Based on its augmented method, GGT considered that a historic market risk premium estimate was 6.5 per cent.

12.4.2 Dividend growth model

1190. AGIG and ATCO considered that the dividend growth model remained an important consideration because it produces a forward-looking estimate of the market risk premium. GGT considered that the dividend growth model was the only estimate of the forward looking market risk premium.

1191. AGIG, APGA, ATCO and ENA expressed concern with the drop in the weight given to the dividend growth model between the Western Power draft and final decisions.

1192. ATCO considered that less reliance on the dividend growth model meant that service providers would no longer be provided with a reasonable opportunity to recover at least the efficient costs because the market risk premium would not incorporate the prevailing conditions in the market for equity funds over the forthcoming period.

1193. AGIG, APGA, ATCO, ENA and GGT considered that there was not a clear case supporting a reduction in the weight applied to the dividend growth model. Submissions argued that the ERA had raised similar concerns with the dividend growth model in the past.

1194. GGT argued that the dividend growth model may have weaknesses, but the AER's concurrent expert session agreed that it:

- tracked variations in short run market risk premium
- was commonly used
- should receive material weight as it was forward-looking.

1195. ENA expressed concern that the ERA was deriving a market risk premium that was effectively invariant to changing market conditions. ENA argued that the ERA had produced no new evidence that the market risk premium was stable over time. Nor had the ERA changed its conclusions in the 2013 guideline that the market risk premium fluctuated depending on economic conditions.

1196. ATCO detailed the weight the ERA placed on the dividend growth model in past decisions. ATCO referred to an October 2017 rail decision that was determined by effectively giving 100 per cent weight to the dividend growth model.

1197. AGIG recognised that the dividend growth model had flaws and accepted the view of Partington that one might not use an equal weight for the dividend growth model and the historic market risk premium.

1198. AGIG was of the view that the dividend growth model should form an upper bound to the market risk premium estimate.

1199. ATCO considered that concern with the dividend growth model could be addressed by:

- selecting the best form of the dividend growth model (the guidelines should use the two stage model)
- fixing input assumptions, the guidelines should use Lally's 4.6 per cent growth assumption.

12.4.3 Conditioning variables

1200. AGIG was not opposed to the use of conditioning variables to inform some aspects of regulatory judgement when determining the market risk premium. However, AGIG said that this use needed to be clear. AGIG recommended that the ERA further consider whether market conditions had changed significantly from the DBNGP final decision to justify a significant change in the market risk premium.

1201. GGT generally was not supportive of the use of conditioning variables and considered that in the absence of a clear relationship between a conditioning variable and the market risk premium a conditioning variable should not be used. GGT considered a clear relationship was consistent with Frontier Economics' formal econometric mapping. GGT argued that if there was no well-defined relationship then conditioning variables could not inform either the level of the parameter estimate or a change in that level.

1202. Furthermore, GGT raised concern that if the market risk premium approach was to use an estimate from a long time series, then short series of conditioning variables were unlikely to point to any change in the estimate of the market risk premium.

1203. APGA commissioned an expert report to investigate linkages between debt and equity risk premia.[464] APGA argued that this report showed that the relationship between the market risk premium and debt risk premium was not straightforward and therefore using it as a cross check would be in error.

1204. GGT considered the comparison between the long historic market risk premium and the current values of the debt risk premium was conceptually unsound and could not be relied on.

12.4.4 Approach, weight and estimate

Approach

1205. The ERA sought stakeholder comment on three options to determine the market risk premium under a binding framework.

- Option 1 – Initial regulatory discretion and then fixed for period. This would be based on an approach similar to the current approach considering all available evidence.
- Option 2 – A mechanistic approach of applying a fixed weight to the historic market risk premium and the dividend growth model.

[464] HoustonKemp, *The relation between the equity and debt risk premiums: A Report for the APGA,* September 2018.

- Option 3 – A historical approach of relying solely on historical market risk premium estimates.

1206. AGIG, APGA and GGT supported Option 1 to fix the market risk premium for the period of the guidelines. AGIG, APGA and GGT considered that the market risk premium was not observed or mechanistic, but rather requires careful consideration of evidence and the use of some discretion.

1207. ATCO supported the ERA's second option, the mechanistic approach. ATCO did not detail why it preferred this option.

1208. ATCO requested a further round of consultation and the opportunity to comment on the ERA's approach to the market risk premium before the publication of the final guidelines.

1209. ATCO and the ENA interpreted the proposed binding amendments to the National Gas Rules as a requirement to have regard to all relevant financial models. They argue that Option 3, the historic approach, did not have regard to the dividend growth model (that is, it was not forward-looking) and could not give rise to the national gas objective. They also argued that Option 3 was not commensurate with the prevailing conditions in the market.

Weight

1210. AGIG submitted that it would be pragmatic to apply a 30 per cent weight to the dividend growth model. However, AGIG was of the view that this should be done only with its proposed changes to the historic market premium.

1211. ATCO and GGT considered that selecting the mid-point between the historic market risk premium and the dividend growth model (a 50 per cent weight to the dividend growth model) was most appropriate. ATCO argued that neither approach was ideal, and both were likely to have useful and relevant information that contributed to a robust estimate.

1212. ENA argued that weights should be disclosed in the interest of transparency – either explicitly or at least in the form of a ranking of the importance of each piece of evidence.

Estimate

1213. AGIG, APGA and ENA requested that the final guidelines provide greater clarity on the approach to estimating the market risk premium. The ERA's 2016 DBNGP final decision was given as an example of a clear approach to estimating the market risk premium.

1214. AGIG said that, since the ERA calculated its market risk premium above the five-year risk free rate and the AER used a 10-year risk free rate, the ERA's 6.0 per cent market risk premium for Western Power was 30 to 40 basis points lower than that proposed by the AER. ENA also submitted that the comparison of other regulators' market risk premia should be adjusted, including for the difference in the term of the risk free rate.

1215. Based on its augmented method, AGIG argued for a market risk premium estimate of between 6.7 per cent and 6.8 per cent.

1216. Based on its augmented method, ATCO argued for a market risk premium of 6.9 per cent.

1217. GGT considered there was no reason for a market risk premium estimate of less than 6.5 per cent and expected a higher estimate if some weight were given to the dividend growth model.

12.5 Independent Panel

1218. The Independent Panel considered that the ERA's approach under the current regulatory framework was sensible and clearly signalled that the ERA would place more reliance on the historic market premium to estimate the prevailing market risk premium was clear. The ERA's reasons for relying on the historic market risk premium were also clear. [465]

1219. The Independent Panel discussed the relationships between the market risk premium and the risk free rate. It noted a characterisation of this relationship was that the assumption of a constant market risk premium implied a lock step transmission from the risk free rate to the cost of equity whereas a constant rate of return to equity implied a one-for-one inverse relationship between the market risk premium and the risk free rate. They were two extremes and there was conflicting evidence. It would not be unreasonable for there to be variation in the market risk premium but the relationship to the risk free rate was not well established.[466]

12.5.1 Dividend growth model

1220. The Independent Panel considered the discussion of the dividend growth model to be clear and the reasons for reducing reliance on it well-explained. In particular, the Independent Panel noted the dividend growth model was sensitive to its assumptions and subject to bias, particularly when analysts' forecast of dividends were used. [467]

12.5.2 Historic market risk premium

1221. The Independent Panel considered the overview of the historic market risk premium and its estimation in the explanatory statement was, on the whole, well explained. [468]

1222. The Independent Panel noted that it was not obvious that using the historic risk premium necessarily implied a reversion to a long-term historic average. The Independent Panel noted a report that found that while the Australian historic market risk premium was volatile, there was a declining secular trend.[469] [470]

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[465] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 51, 61.

[466] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 54.

[467] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 55.

[468] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 53, 55.

[469] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 54.

[470] Bianchi, R., Drew, M. and Walk, A., 'The equity risk premium in Australia – 1900 to 2014', *Financial Planning Research Journal,* vol. 2(1), pp. 80-98.

12.5.2.1 Averaging method

1223. The Independent Panel noted that biases in the arithmetic mean and the geometric mean were not necessarily of the same order of magnitude. Taking a simple average of the two kinds of means does not provide an unbiased estimated average, although as noted in the draft guidelines (where the number of future periods is less than the number of past periods) an unbiased estimate of the market risk premium is likely to be somewhere between the geometric average and the arithmetic average.[471]

1224. The Independent Panel noted that academic literature indicated there may be better ways of averaging than using a simple average. The Independent Panel noted that Damodaran favoured a weighted average with the weight on the geometric mean increasing with the term period.[472] Blume also suggested a differential weighting approach.[473] [474]

1225. The Independent Panel noted the different views of experts in the AER Expert Joint Report, with some experts supporting an arithmetic average, some supporting the use of both an arithmetic and geometric average, and some noting that investors form expectations over longer periods than one year.[475] [476]

1226. The Independent Panel noted that the process for setting prices by the AER was not directly determined by the time frame that investors typically focus on to determine their expectations. The Independent Panel considered that if the regulated return is intended to be an annual return (or some other period), this should be made explicit in the guidelines, along with the reasons.[477]

12.5.3 Conditioning variables

1227. The Independent Panel considered the reasoning in support of the conditioning variables to be clear and well-justified. [478]

[471] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 57.

[472] Damodaran, A., *Equity Risk Premiums (ERP): Determinants, Estimation and Implications – the 2016 Edition*, March 2016, Stern School of Business

[473] Blume, M., 'Unbiased Estimators of Long-Run Expected Rates of Return', *Journal of the American Statistical Association*, Vol. 69 No. 347, pp. 634-638.

[474] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 58.

[475] Cambridge Economic Policy Associates, *Expert Joint Report,* April 2018, pp. 57-58.

[476] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 59.

[477] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 59.

[478] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 59.

12.5.4 Selection of a market risk premium point estimate

1228. The Independent Panel noted that it was unclear how the ERA would use its regulatory discretion to use the dividend growth model and apply the conditioning variables, and also whether those variables were exhaustive of the allowable set.[479]

1229. The Independent Panel considered that it was unclear exactly how the present guidelines would be revised if the proposed binding framework was adopted.[480]

1230. The Independent Panel considered that given the present regulatory arrangements were supported by well-reasoned arguments and evidence against relying solely on the historic market risk premium or a weighted combination of the historic risk premium and dividend growth model, these two options appeared to be “straw man” alternatives. The Independent Panel noted it seemed anomalous to rule out the second and third options under the current regulatory arrangement and then propose stakeholder comment on those options if a binding instrument regulatory regime was adopted.[481]

1231. The Independent Panel noted that an advantage of the current system which provided for regulatory discretion and flexibility when estimating the market risk premium was that relevant updated information could be used to weight the contribution of each of the historic market risk premium, dividend growth model and other conditioning variables.[482]

1232. The Independent Panel considered that it was not obvious that the market risk premium varied significantly over four years to support the mechanistic approach that moved the market risk premium only slightly over the four year period.[483]

12.6 Final approach

1233. The ERA’s estimation of the market risk premium has in the past involved a level of regulatory discretion.

1234. For the purposes of setting the guidelines and future binding instrument, the ERA considered how best to set a market risk premium under the current regulatory framework and, if implemented, under the proposed binding rate of return framework.

12.6.1 Historic market premium

1235. The ERA places more reliance on the historic market premium to estimate the market risk premium, relative to the dividend growth model.

[479] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 52, 61.

[480] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 61.

[481] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 52.

[482] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 52.

[483] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 60.

1236. The historic market premium is the average realised annual return that stocks have earned in excess of the five-year government bond rate. This historic market premium can be directly measured.

1237. While not forward-looking, the historic approach has been used to estimate the forward-looking market risk premium as past outcomes contribute to investors' forward expectations.

1238. The main historic market premium approach is that established by Ibbotson. This approach has been widely accepted.

1239. The ERA's method to calculate the historic market premium is summarised below.

- Arithmetic and geometric averages of the historic market premium observations are calculated using the BHM and NERA datasets.
- Six overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017 and 1988-2017) are used for averaging periods, to reflect different economic conditions.
- A simple average of the lowest arithmetic and highest geometric means of the produced historic market premium matrix is then used to estimate the historic market risk premium.

12.6.2 Dividend growth model

1240. The ERA places less reliance on the dividend growth model to estimate the market risk premium, relative to the historic market premium.

1241. 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.

1242. The ERA will use the two-stage dividend growth model to estimate the market risk premium. The ERA's dividend growth model estimate will use a growth rate from Lally of 4.6 per cent.

12.6.3 Conditioning variables

1243. The ERA uses conditioning variables to determine a final point estimate, including:

- the default spreads
- the five-year interest rate swap spread
- dividend yields
- a stock market volatility index.

1244. To assess current market conditions, the ERA considers how the current value of each conditioning variable compares to its historic average.

12.6.4 Under current regulatory framework

1245. Under the current regulatory framework, the ERA will determine an estimate of the market risk premium through the use of the historic market premium, the dividend growth model and conditioning variables. This will involve a level of regulatory discretion.

1246. The ERA will estimate the market risk premium at each determination.

1247. Under this approach:

- The ERA will 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.

- The ERA will 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 some weaknesses including the form of the model, its input assumptions, its sensitivity to assumptions and its upward bias.

- The ERA will determine a final point estimate of the market risk premium by using its regulatory judgement, including conditioning variables.

1248. In determining a point estimate for the market risk premium these factors are exhaustive of all that will be considered.

1249. The ERA will round the final point estimate of the market risk premium to one decimal figure.

12.6.5 Under binding regulatory framework

1250. The ERA has considered how best to determine the market risk premium under a binding rate of return framework.

1251. In the event that a binding rate of return framework is introduced, the ERA's method to set the market risk premium will be based on the same approach as proposed under the current regulatory framework, detailed above.

- The ERA will place more reliance on the historic market premium, relative to the dividend growth model.

- The ERA will place less reliance on the dividend growth model, relative to the historic market premium.

- The ERA will determine a final point estimate of the market risk premium by using its regulatory judgement, including conditioning variables.

1252. However, the market risk premium will be calculated once and remain fixed over the period of the binding instrument. The market risk premium will not be recalculated at each determination. Fixing the market risk premium will remove regulatory discretion over the period.

1253. At this time, the ERA estimates a market risk premium of 6.0 per cent.

1254. Under a binding rate of return framework, the ERA will use a 6.0 per cent market risk premium until the next rate of return guideline review.

12.7 Final reasoning

1255. In addition to its draft reasoning, the ERA has considered public submissions and the Independent Panel's comments.

1256. Following new analysis and information the ERA has considered it appropriate to change its previous approach to estimating the market risk premium.

12.7.1 Historic market risk premium

1257. The historic market risk premium is the average realised return that stocks have earned in excess of the five-year government bond rate. This historic market risk premium can be measured directly. While not forward looking, the historic approach has been used to estimate the forward looking market risk premium, as past outcomes contribute to investors' forward expectations.

1258. The benefits of using an historic market risk premium, as identified by McKenzie and Partington,[484] include that the method and results:

- are transparent
- have been well studied
- are widely used.

1259. In their 2012 study, Dimson, Marsh and Staunton concluded that the historical average equity risk premium is the most relevant approach for estimating the market risk premium as there are no better forecasting methods available.[485]

1260. Public submissions accepted the use of the historic market risk premium, though there were diverging views about how best to calculate it.

[484] McKenzie, M. and Partington, G., *Report to Corrs Chambers Westgarth: Equity market risk premium*, December 2011, pp. 5–6.

[485] Dimson, E., Marsh, P. and Staunton, M., *Credit Suisse Global Investment Returns Sourcebook 2012*, February 2012, p. 37.

1261. The Independent Panel considered that the reasons for relying on the historic market risk premium were clear.[486] The Independent Panel considered the overview of the historic market risk premium and its estimation in the explanatory statement was, on the whole, well-explained.[487]

1262. For purposes of the final guidelines the ERA considers that the historic market risk premium approach is well-accepted. The ERA will place the most reliance on the historic market risk premium approach.

1263. For the purpose of this final rate of return guidelines, the ERA will determine the historic market premium estimate using the Ibbotson approach. This approach is a well-accepted method for calculating the market premium using historical data.

12.7.1.1 Data sources for historic market risk premium

1264. The ERA has given further consideration to the data source/s used to calculate the historic market risk premium.

1265. Public submissions argued that the historic market risk premium should be derived solely from the NERA data.

1266. The ERA continues to consider that the relative merits of the NERA and BHM datasets prior to 1958 are subject to some controversy. There is a significant difference between the NERA and BHM estimates for the period between 1883 and 1936. After 1936 NERA and BHM produce similar estimates.

1267. NERA's adjustment to the BHM dataset, which is based on less than 10 data points, may not provide a material improvement in reliability and NERA has not reconciled the data it uses for its adjustment to the data of the original series.

1268. The ERA maintains its decision from the draft rate of return guidelines that it will use the average of the NERA and BHM data, thereby minimising any potential error by incorrectly favouring one source over the other.

12.7.1.2 Sampling periods

1269. The ERA has given further consideration to the sampling periods used to calculate the historic market risk premium.

1270. Public submissions submitted that some time periods were too short and should be ignored. There was a common view across submissions that the 2000-2017 period was too short.

1271. As discussed in the draft rate of return guidelines, the ERA maintains its view that there are strengths and weaknesses for each of the sampling periods to determine the market risk premium.

- longer time series contain more observations and produce a lower statistical error

486 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 51, 61.

487 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 53, 55.

- data quality markedly improved in 1937, 1958 and 1980
- more recent sampling periods reflect the current financial environment
- shorter periods are more affected by the current environment or one-off events.

1272. The ERA will continue to use multiple sampling periods.

1273. The ERA has reassessed the use of the 2000-2017 period. The AER's expert session discussed the use of the 2000-2017 period and considered that the period was likely not large enough to be statistically reliable.[488]

1274. The ERA considers that the 2000-2017 period is too short and the ERA will not include this period for the purposes of calculating the historic market risk premium.

1275. For the final guidelines the ERA will use five sampling periods (1883-2017, 1937-2017, 1958-2017, 1980-2017 and 1988-2017) when estimating the market risk premium.

12.7.1.3 Averaging method

1276. The ERA has given further consideration to the averaging method used to calculate the historic market risk premium.

1277. Submissions from the regulated entities considered that the historic market risk premium was best derived from the arithmetic mean. AGIG argued that, to the extent that the ERA continues the use of the geometric mean, the use of the mid-point between the arithmetic and geometric mean was incorrect.

1278. The Independent Panel also provided detailed commentary on the averaging method. The Independent Panel noted that taking the simple average of the two kinds of mean does not provide an unbiased estimated average. The Independent Panel considered that an unbiased estimate of the estimate of the market risk premium was likely to be somewhere between the geometric and the arithmetic average.

1279. The ERA recognises that there are mixed views as to the best averaging technique to apply in estimating the historic market risk premium.

1280. Blume's 1974 paper helped establish some accepted findings regarding averaging.[489] Blume:

- Shows that compounding the arithmetic average of one period returns gives an upwardly biased estimate of expected return over N periods.
- Shows that compounding the geometric average of one period returns underestimates the expected return over N periods when the sample period T exceeds N.
- Shows that an unbiased estimate of the expected N period returns lies between the compounded value of the arithmetic mean and the geometric mean.

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[488] AER, Concurrent Evidence Session 2, Proofed Transcript, p.60.

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

1281. Academics have proposed alternative methods to combine the geometric and arithmetic averages to give an approximately unbiased estimate of expected returns.[490] [491]

1282. Indro and Lee extend Blume's analysis.[492] Indro and Lee:

- Confirmed Blume's finding that biases exist 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 tend to be exacerbated in the presence of autocorrelation in returns.
- Found that bias arising from the use of the arithmetic average increases as the investment horizon lengthens and also as the volatility of the returns increases.
- Found that bias arising from the geometric average increases as volatility of returns increases.

1283. Lally report on the arithmetic mean being consistent with the 'present value principle'.[493] Lally found that an arithmetic mean was applied to a discounting model.

1284. 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 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.

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

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

492 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.

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

1285. 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.[494] Consistent with a study by Blume,[495] McKenzie and Partington considered that:[496]

- First, when compounding the arithmetic mean over time, it is the sampling error in the measurement of the arithmetic mean return that causes the upward bias in the expected return.
- Second, with a finite sample of returns, there is an upward bias when the arithmetic average is compounded over more than one period.

1286. 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;[497] and Jacquier, Kane and Marcus, which reached the same conclusion.[498]

1287. 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.[499] 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.[500]

1288. McKenzie and Partington concluded that:[501]

> 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.

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494 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.

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

496 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.

497 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.

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

499 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.

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

501 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.

1289. In response to public submissions to the AER's 2018 draft guidelines, Partington and Satchell provided further advice on the averaging method.[502] Partington and Satchell considered that it was clear that some weight should be attached to the geometric return.[503]

1290. 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.[504]

- 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.[505]

- Some weight should be attached to the geometric return and that weight should be greater the more the concern for accuracy relative to unbiasedness.[506]

- Partington did not propose a weight and considered a regulator inevitably needs to exercise judgement in making this determination.[507]

1291. 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.

1292. 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.

1293. In its final guidelines, 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.

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

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

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

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

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

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

- That an unbiased estimate of the historical market risk premium is likely to be somewhere between the geometric average and the arithmetic average.

1294. The ERA has therefore sought to minimise any error with over reliance on one of the two types of average by continuing the 50/50 weighting of the arithmetic and geometric means.

12.7.1.4 Historic market risk premium estimate

1295. The ERA's revised estimates of the historic market risk premium are presented in Table 19.

Table 19 The estimates of the market risk premium as at October 2018

	Arithmetic mean			Geometric mean		
	NERA	BHM	Average	NERA	BHM	Average
1883-2017	6.82%	6.46%	6.64%	5.46%	5.11%	**5.29%**
1937-2017	6.23%	6.28%	6.26%	4.39%	4.44%	4.41%
1958-2017	6.73%	6.73%	6.73%	4.40%	4.40%	4.40%
1980-2017	6.50%	6.50%	6.50%	4.24%	4.24%	4.24%
1988-2017	6.08%	6.08%	**6.08%**	4.47%	4.47%	4.47%

Source: ERA analysis

1296. These estimates suggest a downward trend in the market risk premium. The AER has also found evidence that suggests a downward trend in realised market risk premium.[508]

1297. The ERA takes the average of the lowest arithmetic mean (6.08 per cent) and the highest geometric mean (5.29 per cent) to develop an estimate of the historic market premium of 5.7 per cent.

12.7.2 Dividend growth model

12.7.2.1 Reliance on the dividend growth model

1298. As detailed in the draft guidelines, the ERA considered existing and new evidence to assess the reasonableness of using the dividend growth model approach to estimate the market risk premium.

1299. The ERA has given further consideration to expert views, public submissions and the AER's considerations that address the dividend growth model approach in its draft rate of return guidelines.[509]

1300. The ERA has given further consideration to public submissions and the Independent Panel's comments on its draft guidelines.

1301. Submissions from regulated entities argued that the dividend growth model remained an important consideration because it produces a forward-looking estimate of the market risk premium. Submissions argued that there was no clear case supporting a reduction in the weight applied to the dividend growth model.

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

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

1302. Submissions expressed differing views around how to use the dividend growth model including applying a 50 per cent weight to the dividend growth model and a 'pragmatic approach' to apply a 30 per cent weight to the model.

1303. The Independent Panel considered the discussion of the dividend growth model was clear and the reasons for reducing the reliance on it well explained. The Independent Panel noted the dividend growth model was sensitive to its assumptions and subject to bias, particularly when analysts' forecasts of dividends were used. [510]

1304. On the basis of all available information, there is concern 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.[511]
- McKenzie and Partington note the sensitivity of the model to assumptions and input values:[512]
  - 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 possible 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 in estimating the market risk premium raised a number of concerns.[513]
  The Partington and Satchell report on the estimation of the return on equity raised a range of concerns with the dividend growth model. 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.[514]

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510 *Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines*, October 2018, p. 55.

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

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

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

514 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;

- 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.[515]

- The AER has stated that the dividend growth model has some merit as a theoretical model but that concerns about inputs, biases and sensitivities have limited its use.[516]

- 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.[517]

- Furthermore, the AER did not propose to use the dividend growth model to directly inform the market risk premium estimate.[518]

1305. 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.

1306. The ERA recognises that it has had past concerns with the use of the dividend growth model, and notes stakeholder views that some of these 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 considerations have given the ERA cause to give greater weight to these weaknesses of the dividend growth model.

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

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

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

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

1307. 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 in the averaging and the extent that the estimates are unbiased.

1308. 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 that model, relative to the historic market premium.

1309. The ERA's preferred construction of the dividend growth model is the two-stage dividend growth model set out in the DBNGP decision.[519] The two-stage model assumes that dividends grow at the long-term growth rate following the dividend forecast period.

1310. 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 Lally's analysis.[520]

1311. 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.[521]
- With a growth rate of 4.6 per cent, the two-stage dividend growth model produces slightly higher results than the three-stage model.[522]
- 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.

1312. As at 31 October 2018, the ERA's two-stage dividend growth model produced an estimate for the market risk premium of 7.6 per cent.

12.7.3 Conditioning variables

1313. In addition to its reasoning in the draft guidelines, the ERA has given further consideration to conditioning variables following public submissions and the Independent Panel's comments.

[519] 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.

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

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

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

1314. Some public submissions did not oppose the use of conditioning variables to inform some aspects of regulatory judgement. However, these submissions argued that this use needs to be clear. Other submissions argued that conditioning variables should not be used unless they are formally econometrically mapped to mechanically determine the level of change and the effect on the market risk premium.

1315. Submissions argued that it was inappropriate to compare the market risk premium and the debt risk premium. APGA commissioned an expert report to investigate links between the debt and equity risk premia. This report found there was no direct link between the debt and equity risk premia.

1316. The Independent Panel considered the reasoning in support of conditioning variables to be clear and well-justified. The Independent Panel noted that it was unclear how the ERA would use its regulatory discretion in applying the conditioning variables.

1317. The ERA has also reviewed conditioning variables based on updated information. Each of these conditioning variables is presented in turn below.

12.7.3.1 Default spread

Figure 6 Updated AA bond five year default spread from August 1999 to October 2018

Source: Bloomberg data and ERA analysis

1318. The current default risk is below its historic average, while within a standard deviation from the mean. The ERA considers that the default spread therefore supports a market risk premium estimate around the lower end of its range.

12.7.3.2 Interest rate swap spread

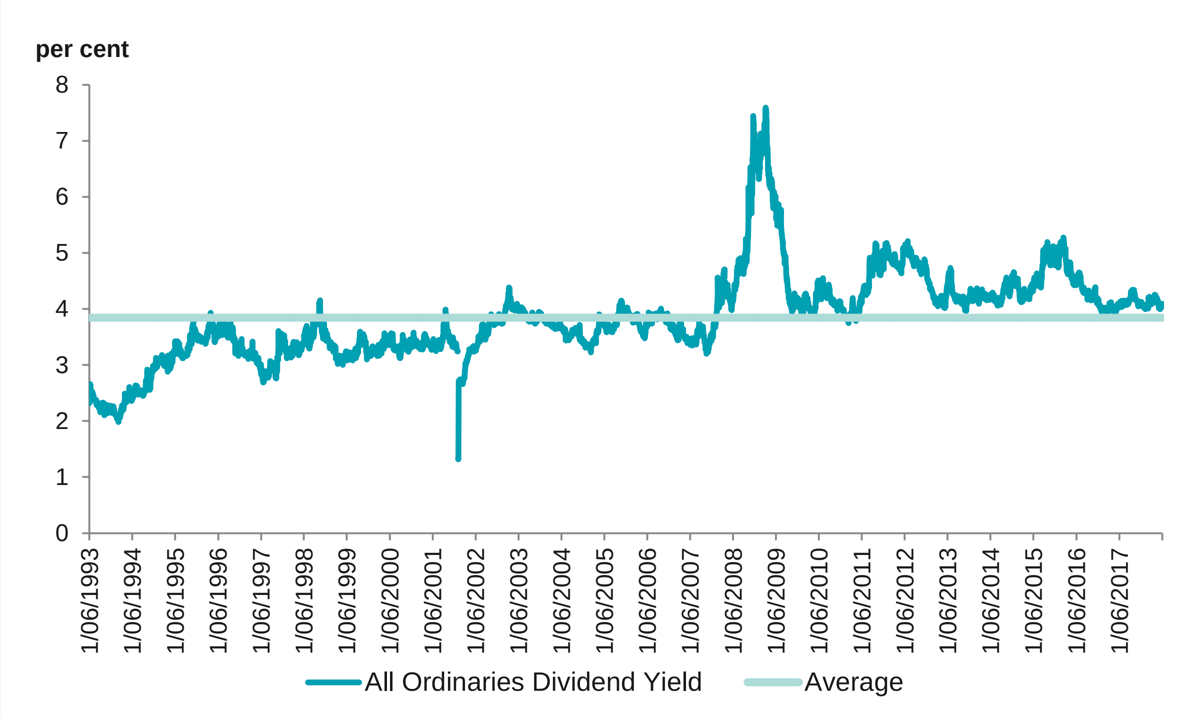
Figure 7 Updated five year interest rate swap spread to Commonwealth Government bond (basis points) from interest rate swap, August 1999 to October 2018

Source: Bloomberg data and ERA analysis

1319. The current swap spread continues to be around its lowest level since 1999. The ERA considers that the swap spread therefore supports a market risk premium estimate around the lower end of its range.

12.7.3.3 Dividend yields

Figure 8 Updated All Ordinary Index annual dividend yield from June 1993 to October 2018



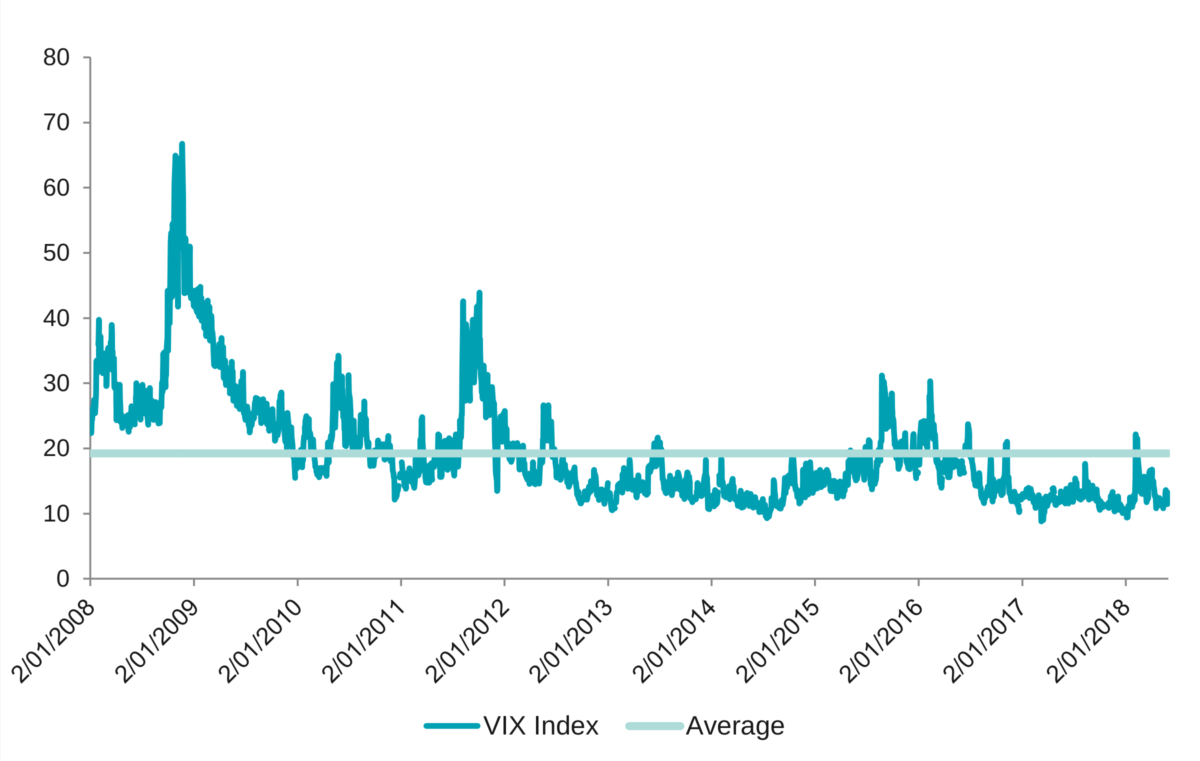
Source: Bloomberg data and ERA analysis

1320. The dividend yield for the last five years has been higher than the historical average. However, dividend yield has been tracking close to its series average.

1321. On balance, the ERA considers that dividend yields therefore support a market risk premium estimate around an average value.

12.7.3.4 Implied volatility

Figure 9 Updated Implied Volatility (ASX200 VIX) from January 2008 – October 2018



Source: Bloomberg data and ERA analysis

1322. Implied volatility has slightly increased above the historic average in the last days of the series. However, over the recent past has been tracking below the historic average.

1323. The ERA considers that implied volatility supports a market risk premium estimate at or below an average value.

12.7.3.5 Debt risk premium

1324. The ERA has given further consideration to the use of the debt risk premium as a conditioning variable for the market risk premium.

1325. The draft guidelines noted that debt and equity funding were substitutes to a degree. Therefore, it theoretically makes sense that there will be a positive relation between these two sources of funds. In addition, the AER has previously used cross-checks that included the comparison of the debt risk premium and the market risk premium. An Australian Competition Tribunal decision suggested that such a comparison between the market risk premium and the debt risk premium was an appropriate and obvious cross-check.[523]

[523] Australian Competition Tribunal, *Applications by PIAC Ltd and AusGrid AComT1*, February 2016, p. 222.

1326. The ERA notes the report APGA provided from HoustonKemp Economists on the relationship between equity and debt risk premiums.[524] APGA asked HoustonKemp to assess, as a theoretical matter, what relationship should exist between the equity risk premium and the debt risk premium. In this report HoustonKemp:

- Argued that as a theoretical matter the equity risk premium and debt risk premium need not move together in lockstep.
- Argued that as a theoretical matter the equity risk premium and the debt risk premium need not even necessarily move together.
- Did not rule out conditions under which the debt risk premium and market risk premium might move together.

1327. In response to public submissions to the AER's 2018 draft guidelines, Partington and Satchell provided further advice on the relationship of the debt risk premium to the market risk premium. Partington and Satchell agreed that the market risk premium and the debt risk premium need not move together. Depending on the variables that are changing and the direction of their change the risk premiums of debt and equity may move together or apart.[525]

1328. The ERA agrees that the relationship between the debt risk premium and the market risk premium is not always clear.

1329. For the purposes of the final guidelines, the ERA will not use the debt risk premium as a conditioning variable.

12.7.3.6 Use of conditioning variables

1330. No formal econometric mapping exists that mechanically identifies a change in conditioning variables and then applies that to change a market risk premium rate.

1331. In the use of conditioning variables, the ERA considers that regulatory discretion is required to:

- interpret the current level of the conditioning variable
- interpret how current conditions may affect the market risk premium.

1332. As detailed above, the ERA has reviewed conditioning variables based on updated information. The ERA's review supports a market risk premium around the average to lower end of its range.

1333. For the purposes of the final guidelines, the ERA will determine a final point estimate of the market risk premium by using regulatory judgement and considering the relative merits of all the relevant material. Conditioning variables are only part of the material that the ERA considers when determining a final point estimate.

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524 HoustonKemp Economists, *The relation between the equity and debt risk premiums – a report for the APGA,* September 2018.

525 Partington, G. and Satchell, S., *Report to the AER: Discussion of Submissions on the Draft 2018 Guideline,* November 2018, pp. 36-37.

12.7.4 Options to determine the market risk premium point estimate

1334. The ERA's estimation of the market risk premium has in the past involved a level of regulatory discretion.

1335. For the purposes of setting the guidelines and a future binding instrument, in its draft guidelines the ERA considered how best to set a market risk premium under the current regulatory framework and, if implemented, under the proposed binding rate of return framework.

1336. GGT argued that the market risk premium should not be below 6.5 per cent. While ATCO argued that the market risk premium should not fall below 6.9 per cent.

12.7.4.1 Under the current regulatory framework

1337. Under the current regulatory framework the use of regulatory discretion is allowed over the period of the guidelines and at each determination.

1338. Under the current framework the ERA will continue the approach to determine the market risk premium at each determination. This process is summarised below.

1339. The ERA uses the Ibbotson approach to calculate the historic market premium. This approach is summarised below:

- Arithmetic and geometric averages of the historic market premium observations are calculated using the BHM and NERA datasets.

- Five overlapping time periods (1883-2017, 1937-2017, 1958-2017, 1980-2017, and 1988-2017) are used for averaging periods, to reflect different economic conditions.

- A simple average of the lowest arithmetic and highest geometric estimates of the produced historic market premium matrix is then used.

1340. To the extent that any weight is applied to the dividend growth model, the ERA will use the two-stage dividend growth model to estimate the market risk premium.

1341. The ERA will use the following approach to estimate the market risk premium.

- The ERA will 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.

- The ERA will 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.

- The ERA will determine a final point estimate of the market risk premium by using its regulatory judgement considering the relative merits of all relevant material, including conditioning variables.

1342. In determining a point estimate for the market risk premium these factors are exhaustive of all that will be considered.

1343. The final point estimate of the market risk premium will be rounded to one-decimal figure.

12.7.4.2 Under a binding regulatory framework

1344. Under a binding regulatory framework, the binding instrument would set out how the rate of return would be automatically applied in each regulatory determination without the exercise of any discretion. There is, however, scope for regulatory discretion in establishing the approach and estimates for rate of return parameters in specifying the binding instrument.

1345. The draft guidelines proposed three options to determine the market risk premium:

- Option 1: Initial regulatory discretion and then fixed for the period – the ERA's current approach of using discretion to choose a point estimate, which is fixed for the period of the guideline.

- Option 2: Mechanical approach – applying a fixed weight to the historic market risk premium and the dividend growth model.

- Option 3: Historic approach – relying solely on the historic market risk premium estimate.

1346. Submissions by AGIG, APGA and GGT supported Option 1, fixing the market risk premium for the period of the guidelines. AGIG, APGA and GGT considered that the market risk premium was not observed or mechanistic, but rather required careful consideration of evidence and the use of some discretion. ATCO supported the ERA's second option, the mechanical approach.

1347. The ERA has not sought a further round of public comments on the market risk premium as requested by ATCO. Stakeholders have been given the opportunity to comment on all of the ERA's proposed options to set the market risk premium under a binding framework.

1348. The Independent Panel considered that given the present regulatory arrangements were supported by well-reasoned arguments and evidence against relying solely on the historic market risk premium or a weighted combination of just the historic risk premium and dividend growth model, these two options appeared to be "straw man" alternatives. The Independent Panel noted it seemed anomalous to rule out the second and third options under the current regulatory arrangement and then proposed stakeholder comment on these options if a binding regulatory regime was adopted.[526]

[526] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 52.

1349. The Independent Panel noted that an advantage of the current system, which provides for regulatory discretion and flexibility when estimating the market risk premium, is that relevant updated information can be used to weight the contribution of each of the historic market risk premium, the dividend growth model and other conditioning variables.[527]

1350. The ERA acknowledges that the initial regulatory judgements made under Option 1 may be subject to change over the period of the binding instrument. There is a trade-off between being able to use discretion and being able to make a decision that uses updated information.

1351. The ERA considers that the identified weaknesses with the dividend growth model requires a level of discretion and judgement to be exercised in interpreting its results. The mechanical process could not be used under a binding framework.

1352. Review of the historic market risk premiums suggests that it is reasonably stable. Given the increased reliance on the historic approach, fixing the market risk premium in the instrument becomes less of a concern.

1353. However, the ERA considers that the use of the historic market risk premium alone does not provide the flexibility to recognise and account for updated information.

1354. On balance, the ERA considers that it is appropriate to adopt Option 1 for the purpose of determining the point estimate of the market risk premium in the final guidelines under a binding framework.

1355. The ERA recognises the market risk premium is not easily observable. The ERA considers a level of discretion is required to incorporate available information and determine the best single estimate of the market risk premium that applies for the period of the binding instrument.

12.7.5 Fixed market risk premium estimate under a binding framework

1356. For the purposes of determining a fixed market risk premium under a binding framework, the ERA has determined a market risk premium using its current method, as detailed above.

- The ERA has placed 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.

- The ERA has placed 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, sensitivity to assumptions and upward bias.

[527] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 52.

- The ERA has determined a final point estimate of the market risk premium by using its regulatory judgement considering the relative merits of all relevant material, including conditioning variables.

1357. On the basis of all available information, the ERA considers that a market premium estimate of 6.0 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.

1358. This rate will remain fixed until the next rate of return guideline review.

13. Equity beta

13.1 Background

1359. 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.

$$R_i = R_f + \beta_i\left(R_m - R_f\right) \qquad \text{equation 29}$$

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 $\beta_i = \mathrm{cov}(R_i, R_m)/\mathrm{var}(R_m)$

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

1360. 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.

1361. 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.

1362. Two risk factors are generally considered to impact 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.

13.2 Draft approach

1363. The ERA's 2013 guidelines relied on the methods set out in Henry's advice to the Australian Competition and Consumer Commission (ACCC) in 2009 to define the equity beta estimation approach.[528] Henry's study was updated in 2014, but remained essentially unchanged.[529]

1364. Henry's analysis uses various time periods over which the data for equity beta estimation is observed. This includes the longest available, the post-tech boom excluding the global financial crisis and the last five years.[530]

1365. For the length of the data period, there is a trade-off between relevance of the data and statistical robustness. Longer periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions. However, shorter periods may produce estimates that are less statistically robust.

1366. For example, structural breaks can occur where a 'new normal' persists. In these instances a data observation period as short as one year may be preferable because they are reflective of future conditions. However, it is difficult to know this, before the fact. It is possible that deviations from the past may be short term and in the future the data may exhibit reversion to a long term average. In these instances, the longest observed time period may be more suitable.

1367. In the draft guidelines, the ERA considered that a five-year period balances these trade-offs whilst being consistent with the regulatory reset period.

1368. The ERA's recent analysis, using the updated dataset to 2017, indicated that an equity beta value of 0.7 was appropriate.

1369. This equity beta value will be fixed over the period of the guidelines.

13.3 Draft reasoning

13.3.1 Theoretical considerations

1370. Conceptually, the systematic risk of a regulated energy network would be less than the systematic risk of the market average entity, and hence, less than one.

1371. There are two main types of systematic risk relevant for conceptual analysis: business risk and financial risk.

- Business risk is affected by the type of business, and associated capital assets, that the firm operates measured by asset or 'un-levered' beta.

- Financial risk is affected by the amount of financial leverage (gearing) employed by the firm which levers or 'amplifies' the asset beta.

1372. It is generally agreed that the business activities of regulated businesses have less systematic risk than the average firm (which has an equity beta of one by definition).

528 Henry, O., *Estimation Beta: Advice Submitted to the Australian Competition and Consumer Commission*, 2009.

529 Henry, O., *Estimating beta: An update*, April 2014.

530 Henry, O., *Estimating beta: An update*, April 2014, p. 4.

1373. However, regulated businesses have higher financial leverage than the average firm (given average gearing of 55 per cent for regulated businesses versus gearing of 30 per cent for the average firm). Therefore, some have argued that regulated businesses have higher financial risk.

1374. The two effects of business risk and financial risk operate in different directions. There was no compelling reason to suggest which of these effects should be greater than the other.

1375. In the past, some regulated businesses and consultants have proposed that the appropriate expectation is that the equity beta for these regulated businesses is no different from that of the average firm, which is one.

1376. However, there is evidence to suggest that higher leverage provides a signal for investors as to the stability of cash flows and the overall viability of the network businesses.[531]

1377. The AER's recent assessment of these risks concluded that:

- Business risk of the benchmark efficient entity is low, driven for example by monopoly characteristics and the regulatory regime.
- Though leverage may be relatively high for the benchmark efficient entity, this does not necessarily correspond to high financial risk, given the stability of earnings and its ability to service debt.[532]

1378. McKenzie and Partington's conceptual analysis also supports the view that the theoretical beta of the benchmark firm is low.[533]

1379. Overall, the ERA considered that the lower cash flow risk of regulated businesses results in a lower equity beta compared with the market, even with the observed higher gearing levels.

13.3.2 Estimating equity beta

1380. To estimate equity beta the ERA relies on the methods set out in Henry's advice to the ACCC in 2009 to define the equity beta estimation approach.[534] Henry's study was updated in 2014, but remained essentially unchanged.[535]

1381. Using the Henry approach, the ERA updated its equity beta estimate for the sample of benchmark firms and current market information.

1382. In the draft guidelines, the ERA has used data for firms meeting the criteria for a benchmark efficient firm outlined in *Chapter 5 Benchmark Efficient Entity*.

531 Klein, L., O'Brien, T. and Peters, S., 'Debt vs. Equity and Asymmetric Information: A review', *The Financial Review,* vol. 37, 2002, pp. 317-350.

532 AER, *Discussion Paper – Equity Beta*, March 2018, pp. 20-23.

533 McKenzie, M. and Partington, G., *Estimation of equity beta*, April 2012, p. 15.
McKenzie, M. and Partington, G., *Report to the AER, Part A: Return on equity*, October 2014, pp. 11-12.
McKenzie, M. and Partington, G., *Report to the AER: Return on equity (Updated)*, April 2015, pp. 31-32.

534 Henry, O., *Estimation Beta: Advice Submitted to the Australian Competition and Consumer Commission*, 2009.

535 Henry, O., *Estimating beta: An update*, April 2014.

1383. Comparable benchmark entities which are publicly traded and have available data, are chosen. The four available sample companies are APA Group, DUET Group, SP Ausnet and Spark Infrastructure. These are presented in Table 20.

Table 20 Sample of companies and data period from the ERA's 2017 analysis

Name	Bloomberg ticker	From	To
APA Group	APA	14/12/2001	Going concern
DUET Group	DUE	20/08/2004	5/04/2017
SP Ausnet	AST	23/12/2005	Going concern
Spark Infrastructure Group	SKI	16/12/2005	Going concern
All Ordinaries Index	**AS30**	**4/01/2002**	**Ongoing**

Source: Bloomberg

1384. The ERA has consistently used weekly data to estimate beta. This practice is based on Henry's advice to the AER that the weekly frequency offers a reasonable trade-off between the noise in daily data and the small sample issues associated with monthly data.[536]

1385. Total returns are measured through the combination of price and dividends.

1386. The ERA acquires price data for all stocks through the Bloomberg Terminal based on the last daily price provided by the Australian Securities Exchange. Dividend data used in the study was gross dividends including cash distributions, but omitting unusual items such as stock distributions and rights offerings.

1387. To account for total returns to investors, the dividend was then added to the closing price on the Friday after the ex-dividend dates.[537] For the All Ordinaries index the gross last dividend per share was used, which includes the net dividend and any tax credit where applicable. No adjustments were made to historical volume in Bloomberg.

1388. For the length of the data period, there is a trade-off between relevance of the data and statistical robustness. Longer time periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions. However, shorter time periods may produce estimates that are less statistically robust. The ERA considered that a period of five years balances these trade-offs.

1389. Returns in the ERA CAPM regressions are based on continuously compounded returns which is presented in equation 30 below.

$$r_{i,t} = \ln\left[(p_{i,t} + d_{i,t}) / p_{i,t-1}\right] \qquad \text{equation 30}$$

where:

$r_{i,t}$ is the continuously compounded return for asset i in day t

[536] Henry, O., *Estimation Beta: Advice Submitted to the Australian Competition and Consumer Commission*, 2009, p. 5.

[537] This is the first day the price would reflect the payout of the dividend in the data.

p_{it} is the price of asset i in day t

d_{it} is the dividend payout to asset i on day t.

1390. Henry outlined in his advice to the AER that beta is estimated by applying or 'fitting' the following equation in regression analysis:[538]

$$r_{i,t} = \hat{\alpha}_i + \hat{\beta}_i r_{m,t} + \varepsilon_{i,t} \qquad \text{equation 31}$$

where:

$\hat{\beta}_i$ is the equity beta for asset i

r_{it} is the observed raw returns to asset i in year t

r_{mt} is the observed market returns in year t

$\hat{\alpha}_i$ is a constant specific to asset i

ε_{it} are the residuals.

1391. Based on this advice, the ERA has adopted equation 31 as the basis for empirically estimating equity beta.

1392. Henry suggested using the Least Absolute Deviations (LAD) estimator, to reduce the influence of outliers on the resulting Ordinary Least Squares (OLS) beta estimate.

1393. In addition to these methods the ERA has employed: (i) the maximum likelihood robust method (MM) and (ii) the Theil-Sen (T-S) method. They have been introduced as alternative ways of addressing the influence of outliers on the OLS estimate. This should reduce any bias associated with the exclusive reliance on LAD to overcome the influence of outliers.[539]

1394. The MM regression is a form of robust regression that has a high breakdown point (50 per cent) and high statistical efficiency (95 per cent).[540] For this reason, the ERA has adopted it.

[538] Henry, O., *Estimation Beta: advice submitted to the Australian Competition and Consumer Commission*, 2009, p. 2.

[539] Detail on the econometric techniques for estimating equity beta can be found in ERA, *Explanatory Statement for the Final Rate of Return Guidelines, Appendix 17*, 16 December 2013.

[540] The breakdown point of a regression is the smallest percentage of incorrect observations a regression estimator can tolerate before becoming incorrect. Statistical efficiency refers to minimum variance in an unbiased estimator.

1395. Fabozzi suggests the use of the T-S estimator for estimating the appropriate value for the equity beta in response to the OLS estimator being acutely sensitive to outliers.[541] Fabozzi proposes that outliers in financial data are far more common than is usually assumed and that it is surprising that the T-S estimator is not more widely used and appreciated. This was one of the main reasons behind the ERA's adoption of the method in its 2013 study.

1396. The application of the above four methods to calculate beta is consistent with the ERA's 2013 guidelines. Further details on these methods are in Appendix 17 of the ERA's 2013 rate of return guidelines.[542]

1397. All equity betas are de-levered using the sample firm's average gearing ratio over the latest five-year period. These asset betas are then re-levered by the benchmark gearing. The Brealey-Myers formula to de- and re-lever is used.

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

equation 32

where:

β_a is the asset beta

β_e is the equity beta

D is the value of debt

E is the value of equity.

1398. De-leveraging involves multiplying the equity beta estimated by one minus this five-year average gearing level to arrive at the asset or 'de-levered' beta. One minus gearing gives the weight applied to equity. The asset beta is the firm's systematic risk as if it carried no debt.

1399. The use of debt (gearing) increases or 'levers up' asset beta. Dividing asset beta by one minus gearing re-levers to equity beta.

1400. The logic is outlined in equation 33 which assumes debt beta is equal to zero.

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

[542] Detail on the econometric techniques for estimating equity beta can be found in ERA, *Explanatory Statement for the Final Rate of Return Guidelines, Appendix 17*, 16 December 2013. All regression results from applying these methods, associated standard errors and test statistics, are computed using R 3.0.2 open source software.

$$\begin{aligned}\beta_a &= \frac{D}{(D+E)} \times \beta_d + \frac{E}{(D+E)} \times \beta_e \\ &= \beta_d \times G + \beta_e \times (1-G) \\ &= \beta_e \times (1-G) \\ \beta_e &= \frac{\beta_a}{(1-G)}\end{aligned}$$ equation 33

where:

β_a is asset or 'unlevered' beta

G is gearing defined as net debt divided by the sum of net debt plus the market value of equity

β_d is debt beta, assumed to be zero

β_e is equity or 'levered' beta.

1401. The de-levering and re-levering process is a major factor in determining equity beta. This is because gearing is typically greater than zero and so dividing the asset beta by one minus gearing, as shown in the equation above, results in a sizeable multiplication factor. The magnitudes of this multiplication factor are shown in Table 21.

Table 21 Gearing and multiplication factors

Gearing (G)	Multiplication factor [1/(1-G)]
10%	1.11
20%	1.25
30%	1.43
40%	1.67
50%	2.00
60%	2.50
70%	3.33
80%	5.00
90%	10.00
100%	Undefined as dividing by 0

Source: ERA Analysis

1402. De-levering out low levels of gearing and re-levering in higher levels of gearing results in higher equity beta estimates. De-levering out high levels of gearing and re-levering in relatively low levels results in lower equity beta estimates. This means any disparity between the benchmark gearing and the average actual gearing observed across firms from which the asset beta is estimated can also have a considerable effect on the final equity beta estimate.

1403. Asset betas are re-levered using the 55 per cent benchmark gearing level arrived at in *Chapter 6 Gearing*. This figure is consistent with the overall averages of actual gearing observed across the firms in the benchmark sample and results in a multiplication or re-levering factor of 2.22.

1404. The beta estimates are then averaged, using both equal and market-weighted averages, to determine a point estimate. Equally-weighted portfolios simply assign a weight of ¼ to each of the four firms in the benchmark sample. To calculate a value-weighted portfolio the average market capitalisation was calculated for each firm.[543]

1405. Thin trading, which introduces a bias in the estimation of β, was found not to be in evidence during the 2013 analysis through a series of Dimson's tests.[544] For this reason thin trading is not addressed here.

1406. Table 22 reports estimates of each firm's beta across the different regression methods, with a data set from April 2013 to March 2018. Equally-weighted and value-weighted portfolios are also reported.

Table 22 Estimates of equity beta for individual firms and the two weighted portfolios in 2018 for different estimation methods using gearing of 55 per cent

	APA	AST	DUE	SKI	Mean of firms	Equally weighted mean[545]	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
Gearing	0.489	0.564	0.608	0.557	**0.554**	0.554	0.544	**0.549**	**0.553**
OLS	0.883	0.786	0.449	0.662	**0.695**	0.618	0.759	**0.689**	**0.693**
LAD	0.947	0.813	0.423	0.698	**0.720**	0.699	0.804	**0.752**	**0.731**
MM	0.939	0.791	0.458	0.738	**0.732**	0.669	0.807	**0.738**	**0.734**
T-S	0.916	0.775	0.445	0.718	**0.714**	0.650	0.779	**0.714**	**0.714**
Mean of techniques (OLS, LAD, MM, T-S)	**0.921**	**0.791**	**0.444**	**0.704**	**0.715**	**0.659**	**0.787**	**0.723**	**0.718**

Source: ERA analysis

1407. The OLS beta estimates were lower than that of any of the other robust estimates. The mean OLS beta across all portfolios and stocks produced a beta of 0.693, which compared to the mean of all robust estimates across all portfolios and stocks of 0.718.

1408. Bootstrapping was used to assign measures of accuracy to sample estimates. This method relies on random sampling and replacement as outlined in Appendix 23 of the 2013 Guidelines.[546]

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543 For each firm in the portfolio, its weight is determined by the ratio between the average of a single firm and the sum of the averages of all firms in each portfolio in terms of market capitalisation.

544 ERA, *Explanatory Statement for the Final Rate of Return Guidelines*, 16 December 2013, pp. 176-177. Dimson, E. and Marsh, P., 'The stability of UK risk measures and the problem in thin trading', *Journal of Finance*, vol. 38 (3), 1983, pp. 753-784.

545 The equally weighted mean will be different than the mean of firms. The equally weighted mean approach calculates an equally weighted portfolio at each time period, which is then regressed against market returns. While the mean of firms uses the separate firm betas and takes the mean of these four points.

546 ERA, *Appendices to the Explanatory Statement for the Rate of Return Guidelines: Meeting the requirements of the National Gas Rules*, December 2013, Appendix 23.

Table 23 Summary bootstrap simulated statistics of OLS beta estimators (B=10,000, n=261)

Model	Estimator	APA	AST	DUE	SKI	Mean of firms	Equally weighted wean	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
OLS	$\hat{\beta}$	0.883	0.786	0.449	0.662	**0.695**	0.618	0.759	**0.689**	**0.693**
	Standard error $\hat{\beta}$	0.098	0.082	0.114	0.107	**0.100**	0.061	0.084	**0.072**	**0.091**
	Bootstrap $\hat{\beta}$	0.884	0.785	0.449	0.662	**0.695**	0.618	0.759	**0.689**	**0.693**
	Bootstrap S.E. $\hat{\beta}$	0.104	0.086	0.109	0.112	**0.102**	0.068	0.090	**0.079**	**0.095**
	Bootstrap bias	0.001	-0.001	0.000	0.000	**0.000**	0.000	0.000	**0.000**	**0.000**
	Bootstrap LB 2.5%	0.674	0.611	0.241	0.434	**0.490**	0.479	0.574	**0.527**	**0.502**
	Bootstrap median	0.885	0.787	0.446	0.666	**0.696**	0.620	0.762	**0.691**	**0.694**
	Bootstrap UB 97.5%	1.081	0.952	0.666	0.872	**0.893**	0.743	0.930	**0.837**	**0.874**

Source: ERA analysis

1409. All OLS estimates of β were statistically significant at the 5 per cent significance level, as evidenced by the bootstrapped 95 per cent confidence band excluding the value of zero (Table 23). The bootstrapped upper 97.5 per cent confidence bound was 0.893 when averaged across all four assets, and 0.837 for the mean of the portfolios (Table 23).

1410. Given their estimation approaches, standard errors cannot be estimated for the LAD estimator and the T-S estimator. For the LAD and T-S estimators the bootstrapped standard error is therefore used in drawing inference about β. Bootstrapped standard errors of β for the robust estimators (LAD, MM, T-S) were consistently lower than that of the OLS estimator, to within 0.01 of the OLS estimator, when considering the mean β across both the assets and portfolios.

1411. The 97.5 per cent upper bound for the robust estimators was greater than for the OLS estimates (Table 24); the upper bound for the bootstrapped OLS β estimate was 0.874 when averaged across all models, compared to 0.939 for the LAD estimate. MM and T-S estimates for this upper bound lay between the OLS and LAD upper bounds.

1412. The robust estimates of β were higher than that of the OLS β estimate when averaged across both the assets and the portfolios. This difference between estimators was more pronounced for the portfolio estimates than for the assets themselves. The key reason for this difference appears to be the weight placed on the APA Group asset: it has both the estimate with the lowest gearing and the highest market capital value (with a weight of 38.4 per cent in the variance weighted portfolio).

Table 24 Summary of bootstrap simulated statistics of robust beta estimators (B=10,000, n=261)

Model	Estimator	APA	AST	DUE	SKI	Mean of firms	Equally weighted mean	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
LAD	$\hat{\beta}$	0.947	0.813	0.423	0.698	**0.720**	0.699	0.804	**0.752**	**0.731**
	Standard error $\hat{\beta}$ [1]	-	-	-	-	**-**	-	-	**-**	**-**
	Bootstrap $\hat{\beta}$	0.936	0.825	0.474	0.725	**0.740**	0.685	0.802	**0.744**	**0.741**
	Bootstrap S.E. $\hat{\beta}$	0.096	0.093	0.112	0.106	**0.102**	0.076	0.081	**0.079**	**0.094**
	Bootstrap bias	-0.011	0.013	0.051	0.027	**0.020**	-0.014	-0.002	**-0.008**	**0.011**
	Bootstrap LB 2.5%	0.759	0.649	0.263	0.554	**0.556**	0.510	0.636	**0.573**	**0.562**
	Bootstrap median	0.935	0.817	0.452	0.707	**0.727**	0.703	0.807	**0.755**	**0.737**
	Bootstrap UB 97.5%	1.136	1.031	0.718	0.980	**0.966**	0.796	0.970	**0.883**	**0.939**
MM	$\hat{\beta}$	0.939	0.791	0.458	0.738	**0.732**	0.669	0.807	**0.738**	**0.734**
	Standard error $\hat{\beta}$	0.096	0.083	0.087	0.103	**0.092**	0.059	0.081	**0.070**	**0.085**
	Bootstrap $\hat{\beta}$	0.937	0.790	0.461	0.736	**0.731**	0.669	0.806	**0.738**	**0.733**
	Bootstrap S.E. $\hat{\beta}$	0.094	0.087	0.094	0.096	**0.093**	0.057	0.081	**0.069**	**0.085**
	Bootstrap bias	-0.002	-0.001	0.002	-0.002	**-0.001**	0.000	-0.001	**0.000**	**-0.001**
	Bootstrap LB 2.5%	0.748	0.62	0.273	0.546	**0.547**	0.557	0.642	**0.600**	**0.564**
	Bootstrap median	0.939	0.790	0.462	0.736	**0.732**	0.669	0.808	**0.738**	**0.734**
	Bootstrap UB 97.5%	1.113	0.957	0.645	0.925	**0.910**	0.779	0.962	**0.870**	**0.897**

Source: ERA analysis

Table 25 Summary of bootstrap simulated statistics of robust estimators (B=10,000, n=261) (Continued)

Model	Estimator	APA	AST	DUE	SKI	Mean of firms	Equally weighted mean	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
T-S	$\hat{\beta}$	0.916	0.775	0.445	0.718	**0.714**	0.650	0.779	**0.714**	**0.714**
	Standard error $\hat{\beta}$ [1]	-	-	-	-	**-**	-	-	**-**	**-**
	Bootstrap $\hat{\beta}$	0.912	0.775	0.447	0.718	**0.713**	0.649	0.778	**0.714**	**0.713**
	Bootstrap S.E. $\hat{\beta}$	0.099	0.086	0.097	0.105	**0.097**	0.065	0.084	**0.075**	**0.089**
	Bootstrap bias	-0.004	0.000	0.001	0.000	**-0.001**	-0.001	0.000	**-0.001**	**-0.001**
	Bootstrap LB 2.5%	0.713	0.607	0.261	0.514	**0.524**	0.516	0.609	**0.563**	**0.537**
	Bootstrap median	0.916	0.776	0.447	0.719	**0.714**	0.65	0.779	**0.714**	**0.714**
	Bootstrap UB 97.5%	1.096	0.944	0.636	0.923	**0.900**	0.773	0.937	**0.855**	**0.885**

Source: ERA analysis

1413. The above tables (Table 23, Table 24 and Table 25) provided the ERA with confidence in the robustness of the β estimates.

1414. With reference to the updated dataset to 2018, the ERA considered an equity beta value of 0.70 was appropriate.

1415. The ERA considered that the above method used to estimate equity beta has been proven to be robust, with sound theoretical and empirical backing.

1416. The equity beta will be fixed over the period of the guidelines. Fixing the equity beta during the guidelines will promote stability, predictability and consistency of the allowed rate of return consistent with the national gas objective.

13.4 Public submissions

13.4.1 Beta estimation

1417. AGIG's submission discussed beta estimation.[547] AGIG accepted the ERA's beta statistical estimate of 0.7 and the estimation approach. AGIG's submission can be summarised as follows:

- AGIG supported the ERA's use of a five-year observation period. AGIG agreed that this reflected prevailing market conditions, while providing a reasonable compromise between statistical robustness and the potential for structural breaks.
- AGIG supported the benchmark firms used by the ERA in its estimation.
- AGIG was of the view that the use of an average across portfolios and firms was a double-counting of the firm results. It considered that it was only necessary to consider the averages of portfolios.
- AGIG submitted that the ERA's description of how it selected a beta point estimate in the draft guideline was less clear than it was in the 2016 DBNGP final decision. AGIG suggested that the ERA adopt the explanation in the DBNGP final decision.

1418. APGA's submission discussed beta estimation.[548] APGA broadly supported the way the ERA estimated beta, suggesting minor improvements to improve clarity and detail, based on member feedback.

1419. APGA also included its submission to the AER's draft guidelines. This included a HoustonKemp analysis of Australian gas, electricity and mixed energy betas.[549] APGA argued that this new analysis demonstrated that the appropriate beta to account for greater risk faced by regulated gas businesses should be at least 0.7. APGA argued that Western Australian gas pipelines were exposed to higher levels of systematic risk than the benchmark sample of firms and this should be reflected in higher beta estimates.

1420. ATCO's submission considered beta estimation.[550] ATCO accepted the draft guidelines beta estimate of 0.7.

- ATCO noted that the ERA's estimate of beta may be conservative as:
  - it included the DUET Group, which had a low beta and was no longer listed
  - if the set of comparator firms were expanded the beta estimate would increase, though detail was not included
  - if low beta bias were given weight the beta estimate would increase.

547 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 15-16.

548 APGA, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, pp. 1-2.

549 HoustonKemp Economists, *Australian estimates of the equity beta of a gas business: A Report for the APGA*, September 2018.

550 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 25-26.

- ATCO argued that over time the degree of risk faced by a 'pure play' gas distribution business may increase relative to a 'pure play' electricity network due to the increasing contestability of gas connection points and appliances. ATCO considered that this may lead to different betas for gas distribution networks relative to gas transmission and electricity networks in the future.

1421. ENA's submission considered beta estimation.[551] ENA accepted that the ERA's method of calculating beta as clear and transparent, and gave rise to an appropriate statistical best estimate of beta.

1422. GGT argued in its submission that an equity beta of 0.7 seemed to be at the low end of a range because:

- Western Australian gas pipelines were exposed to higher systematic risks than the benchmark sample firms.

- It did not adjust for low beta bias.

13.4.2 Low beta bias and Black CAPM

1423. AGIG, APGA, ENA and GGT's submissions discussed low beta bias.[552] [553] [554] [555]

1424. AGIG and GGT commissioned Frontier Economics to provide new analysis on low beta bias.[556] ENA also commissioned a Frontier Economics report on low beta bias, which was effectively the same as that from AGIG and GGT.[557]

1425. AGIG's submission on low beta bias can be summarised as follows:

- In light of new evidence provided by Frontier Economics, AGIG submitted that low beta bias should be considered by regulators.

- The ERA's consideration of low beta bias in its 2016 DBNGP review focused on evidence of actual returns. At the time, the ERA could not support low beta bias given its concern with the comparison of actual returns to expected returns. The ERA considered that the change from expected returns to actual returns reflected movements in many factors that could not be reasonably foreseen.

- AGIG's Frontier report claimed to present new evidence drawn from expected returns that supported low beta bias and adds to previous analysis on actual returns. AGIG argued that this new evidence showed that the bias was statistically significant.

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551 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, p. 3.

552 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 16-19.

553 APGA, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, pp. 1-3.

554 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, pp. 3, 19-20.

555 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, pp. 14-21.

556 Frontier Economics, *Low-beta bias and the Black CAPM: Report prepared for Australian Gas Infrastructure Group and APA Group,* September 2018.

557 Frontier Economics, *Low-beta bias and the Black CAPM: Report prepared for Energy Networks Australia,* September 2018.

- The ERA did not need to change its overall CAPM framework for considering expected equilibrium equity returns. However, it is important to recognise that all models are based upon assumptions and are therefore subject to imprecision and bias. The ERA needs to make some adjustments for the identified imperfections from low beta bias.

- AGIG recommended that the ERA explains in its final guideline how it has factored low beta bias into its judgement on an appropriate return on equity allowance. However, AGIG did not propose a particular change to beta or the allowed return on equity.

- AGIG considered that low beta bias was one reason why a 0.7 beta estimate was a minimum beta allowance.

1426. APGA and ENA's submission on low beta bias can be summarised as follows:

- APGA agreed with a 2013 ERA position that low beta bias should be considered a separate issue from the estimation of beta itself.

- APGA and ENA expressed concern that the draft guidelines did not address low beta bias.

- APGA argued that regulators must take-into account flaws in models like the CAPM and, specifically, low beta bias.

- Given new evidence from Frontier Economics, APGA and ENA urged the ERA to reconsider its position on low beta bias. APGA and ENA did not provide a recommendation on how to adjust for low beta bias.

- APGA saw a 0.7 beta as the low end of a possible range of beta estimates for Western Australian gas pipelines.

1427. GGT's submission on low beta bias can be summarised as follows:

- GGT referred to a paper by Brav, Lehavy and Michaely that sought to test a number of asset pricing models, including the Sharpe Lintner CAPM, using returns expectations data rather than using actual returns.[558] GGT argued that this paper found a linear model fitted to expected returns data had a positive and significant intercept: for low beta stocks, observed return expectations were higher than the expected returns predicted by the Sharpe Lintner CAPM. Frontier Economics was asked to replicate the study by Brav, Lehavy and Michaely using Australian data.

- GGT noted that Frontier Economics' conclusions may not be sufficient to propose specific adjustments to the Sharpe Lintner CAPM and, in particular, to propose a specific upward adjustment to the expected rate of return for an asset which has a beta less than one.

- GGT considered a pragmatic response to low beta bias when using the Sharpe Lintner CAPM was to choose a beta estimate at the upper end of the statistical range.

[558] Brav, A., Lehavy, R. and Michaely, R., 'Using Expectations to Test Asset Pricing Models', *Financial Management*, Autumn 2005, pp. 5-37.

13.5 Independent Panel

1428. The Independent Panel considered that the statistical techniques used to estimate beta were appropriate and reasonably well explained. [559]

1429. The Independent Panel considered that while it was reasonable to give primary consideration to relevant comparators listed in Australia, consideration should be given to the inclusion of relevant foreign firms with similar risk characteristics to improve the beta parameter in the CAPM.[560]

13.6 Final approach

1430. The ERA relies on the methods set out in Henry's advice to the ACCC in 2009 to define the equity beta estimation approach.[561] Henry's study was updated in 2014, but remained essentially unchanged.[562]

1431. Henry's analysis uses various time periods over which the data for equity beta estimation is observed. This includes the longest available period, the post-tech boom excluding the global financial crisis and the last five years.[563]

1432. For the length of the data period, there is a trade-off between relevance of the data and statistical robustness. Longer periods can include behaviour in the data that is no longer relevant due to changing economic and market conditions. However, shorter periods may produce estimates that are less statistically robust.

1433. For example, structural breaks can occur where a 'new normal' persists. In these instances data observation periods as short as one year may be preferable because they are reflective of future conditions. However, it is difficult to know this, before the fact. It is possible that deviations from the past may be short term and in the future the data may exhibit reversion to a long term average. In these instances the longest observed time period may be more suitable.

1434. The ERA considers that a five-year period balances these trade-offs whilst being consistent with the regulatory reset period.

1435. The ERA's recent analysis using the updated dataset indicates that an equity beta value of 0.7 was an appropriate estimate.

1436. The ERA will make no adjustment for low beta bias or Black CAPM.

1437. For the final guidelines the ERA will use an equity beta of 0.7.

1438. This equity beta value will be fixed over the period of the guidelines.

[559] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 62.

[560] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 21, 63.

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

[562] Henry, O., *Estimating beta: An update*, April 2014.

[563] Henry, O., *Estimating beta: An update*, April 2014, p. 4.

13.7 Final reasoning

1439. In addition to the reasoning detailed in its draft reasoning, the ERA has further considered equity beta in light of public submissions and Independent Panel comment.

13.7.1 Beta estimation

1440. The ERA has considered the argument put by submissions that Western Australian gas transmission pipelines have higher systematic risk in comparison with the benchmark sample firms. Submissions argued that Western Australian transmission pipelines are exposed to larger demand risks from commodity markets than eastern states firms and the benchmark sample. No evidence was provided to support this claim.

1441. Western Australian gas pipelines are not reliant on any one customer or industry and are not exposed to higher systematic risk. Pipelines service a diverse range of customers including power generation, minerals processing, industrial and retail gas. Regulated Western Australian gas pipelines have good pipeline utilisation rates and in some cases have a large number of customers on long-term contracts. These have the effect of hedging systematic risk.

1442. The ERA considers that gas pipelines are similar to other Australian energy networks. Regulated Western Australian gas pipelines operate under a similar regulatory framework to other Australian energy networks. Both gas and electricity service providers face limited competition risk by virtue of being regulated monopolies.

1443. In the AER's expert session there was no agreement on whether different benchmarks were warranted. Partington noted difficulty in reliably measuring risk within different segments of the benchmark sample, Johnstone noted the possibility of upside risks and Gray noted there may be discussions needed on whether risks are partially non-systematic.[564]

1444. Consistent with its approach to developing a benchmark sample, the ERA uses the best available comparable firms of Australian energy networks. The ERA's benchmark sample includes those available businesses in Western Australia.

1445. The ERA does not consider that Western Australian gas pipelines have higher systematic risk than those included in the benchmark sample. The ERA continues to support the estimation of beta from its benchmark sample.

1446. HoustonKemp's report on Australian estimates of the equity beta of a gas business, prepared for APGA,[565] argued that there was no evidence from recent data that the equity beta of a pure play gas portfolio sat below 0.7, and any earlier evidence relies on the use of data from the technology boom and the global financial crisis.[566]

564 Cambridge Economic Policy Associates*, Rate of Return Guideline Review – Facilitation of Concurrent Expert Evidence Expert Joint Report,* April 2018, p. 49.

565 HoustonKemp Economists, *Australian estimates of the equity beta of a gas business – A report for the APGA,* September 2018.

566 HoustonKemp Economists, *Australian estimates of the equity beta of a gas business – A report for the APGA,* September 2018, p. vii.

1447. Though applying a different method, HoustonKemp's report confirmed the ERA's final estimate of beta of 0.7. However, Partington and Satchell have raised concern over HoustonKemp's approach, including its method to infer the market weights of each gas pipeline and its method of gearing adjustments.[567]

1448. The Independent Panel suggested the ERA should consider relevant foreign firms with similar risk characteristics to improve the beta parameter in the CAPM.

1449. Foreign comparators are unlikely to be aligned with a benchmark efficient entity for Australian regulated networks with a similar degree of risk in the provision of regulated energy services. Foreign firms are subject to different regulatory and policy environments, which have evolved in their individual ways over time. Therefore, this is not reflective of the current Australian regulatory environment or its evolution over time. In addition, foreign equity betas reflect changes in foreign markets, which are different to those of Australia.

1450. The ERA considers that it is unlikely that it can reliably quantify and then adjust beta estimates from foreign firms to make them comparable to estimates of Australian comparable firms.

1451. In summary, the ERA considers that as long as the differences of regulation environment and financial markets and other factors cannot be reliably quantified and adjusted, empirical estimates of beta from foreign firms cannot be used to determine the estimated beta for Australian energy networks.

1452. In its draft guidelines, the ERA updated its estimates of the equity beta for use in the Sharpe Lintner CAPM.

1453. The benchmark sample includes four comparable Australian firms (APA Group, AusNet services, DUET Group and Spark Infrastructure Group).

1454. The ERA's approach to estimating equity beta uses four different techniques including OLS, LAD, MM and T-S. The ERA considers these techniques have differing characteristics and their combined consideration contributes to a robust equity beta estimation.

1455. The ERA continues to consider it appropriate to assess the results of each technique, the mean of those techniques and differing combinations of portfolios.

1456. The ERA's estimates of equity beta are presented in Table 26 below.

567 Partington, G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline,* November 2018, pp. 17-18.

Table 26 The ERA's estimated beta using gearing of 55 per cent, March 2018

	APA	AST	DUE	SKI	Mean of firms	Equally weighted mean[568]	Value weighted mean	Mean of portfolios	Mean of firms & portfolios
Gearing	0.489	0.564	0.608	0.557	**0.554**	0.554	0.544	**0.549**	**0.553**
OLS	0.883	0.786	0.449	0.662	**0.695**	0.618	0.759	**0.689**	**0.693**
LAD	0.947	0.813	0.423	0.698	**0.720**	0.699	0.804	**0.752**	**0.731**
MM	0.939	0.791	0.458	0.738	**0.732**	0.669	0.807	**0.738**	**0.734**
T-S	0.916	0.775	0.445	0.718	**0.714**	0.650	0.779	**0.714**	**0.714**
Mean of techniques (OLS, LAD, MM, T-S)	**0.921**	**0.791**	**0.444**	**0.704**	**0.715**	**0.659**	**0.787**	**0.723**	**0.718**

Source: ERA analysis

1457. The OLS beta estimates are lower than any of the other robust estimates. The mean OLS beta across all portfolios and stocks produces a beta of 0.693, which compares to the mean of all robust estimates across all portfolios and stocks of 0.718.

1458. Given estimating equity betas involves a degree of imprecision, the ERA rounds its equity beta to one decimal place.

1459. The ERA continues to consider that 0.7 is the best equity beta estimate.

1460. The ERA considers its approach to estimating equity beta is robust, with sound theoretical and empirical backing, for the following reasons:

- It provides a reasonable compromise between statistical robustness and the potential for structural breaks.
- It uses four appropriate econometric approaches.
- Simulation techniques are also used to ensure the robustness of the estimates.
- It considers different scenarios, including estimates for individual firms and for portfolios of firms (both equally weighted and value weighted portfolios are used).

1461. On the basis of the above reasoning, the ERA considers that 0.7 is the best equity beta estimate for the final guidelines.

568 The equally weighted mean will be different than the mean of firms. The equally weighted mean approach calculates an equally weighted portfolio at each time period, which is then regressed against market returns. While the mean of firms uses the separate firm betas and takes the mean of these four points.

13.7.2 Low beta bias and Black CAPM

1462. The ERA has given further consideration to low beta bias and Black CAPM. The ERA agrees with the AER that low beta bias and Black CAPM are two different concepts, which need to be distinguished.[569]

- The low beta bias is an observation that ex-post returns from low beta stocks tend to outperform expected returns.
- The Black CAPM is an alternative model to the Sharpe Lintner CAPM. The main theoretical difference between the Black CAPM and the Sharpe Lintner CAPM relates to borrowing and lending assumptions.[570] As a result of different starting assumptions, the Black CAPM predicts a slope of estimated returns that can be flatter than for the Sharpe Lintner CAPM.

13.7.2.1 Background

1463. The ERA's 2013 rate of return guidelines recognised the concept of low beta bias and Black CAPM.

- In the 2013 guidelines, the ERA recognised that typical empirical applications of the Sharpe Lintner CAPM may under-estimate equity beta for low beta stocks, with the potential to lead to a downwards bias in the estimate of the return on equity. As a consequence, the ERA took this into account when determining the point estimate of the equity beta.[571]
- The ERA considered that there was no reliable estimate of the size of the bias and therefore it would use judgement to take it into account when determining the point estimate of equity beta for use in the Sharpe Lintner CAPM. [572]
- The ERA noted that it intended to undertake more work to quantify the extent of this potential bias. This work would then inform the degree to which the ERA might adjust up the point estimate of the equity beta within the estimated range, so as to account for the potential beta bias.

1464. In the ERA's 2016 Final Decision for DBNGP the ERA reconsidered the matter of low beta bias and Black CAPM. The ERA considers that there was no justification for adjusting the value of equity beta in the SL-CAPM for low beta bias and Black CAPM.[573]

- In this decision the ERA examined the arguments with regard to the bias in the Sharpe Lintner CAPM and did not support the case for any adjustment to equity beta in the Sharpe Lintner CAPM. Low beta bias and the Black CAPM would not be given any effect when selecting the equity beta point estimate.
- The ERA considered that there was little compelling evidence about the degree to which the α intercept term, or even part of it, should be included.

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569 AER, *Draft Rate of Return Guidelines Explanatory Statement*, July 2018, pp. 275-276.

570 The Sharpe Lintner CAPM assumes that investors can access unlimited borrowing and lending at the risk free rate. The Black CAPM relaxes this assumption, and instead assumes that investors can access unlimited short selling of stocks, with the proceeds immediately available for investment.

571 ERA, *Rate of Return Guideline Explanatory Statement, Appendices*, December 2013, p. 217.

572 ERA, *Rate of Return Guideline Explanatory Statement, Appendices*, December 2013, p. 217.

573 ERA. *Final Decision on proposed revisions to the access arrangement for the Dampier to Bunbury natural gas pipeline 2016 – 2020,* Appendix 4 *Rate of Return,* June 2016, pp. 63-64.

- A positive intercept in tests of the Sharpe Lintner CAPM does not automatically mean bias applies. Positive intercepts (α) in *ex-post* outcomes are not automatically estimates of a zero beta premium.

- The theory of the Sharpe Lintner CAPM does not include the α term. Rather, the presence of positive (or indeed, a negative value of) α relates to differences (so-called anomalies) between the required (or expected or equilibrium) returns and realised returns. That is, ex post returns may differ from ex ante returns due to changes in a range of factors that are not related to the issue of low beta bias.

- The ERA concluded that it was not convinced there was any empirical evidence at the current time to justify an adjustment to the Sharpe Lintner CAPM for expected α.

- The ERA noted that the Black CAPM was not widely adopted by academics or practitioners in Australia or overseas for estimating a return on equity.[574]

- The ERA considered that if any adjustment could be justified, it should apply to the 'α' intercept term in the Sharpe Lintner CAPM, thereby taking account of the alpha term arising in ex post tests of the model. However, the ERA was not convinced there was adequate evidence to justify making such an adjustment.[575]

1465. The Australian Competition Tribunal reviewed the ERA's position that there was inadequate evidence, at the time, to justify an adjustment to the Sharpe Lintner CAPM.[576] The Tribunal concluded that:

> …the ERA noted (correctly) that this conceptual difference between expectations and outcome is a major problem for *ex post* tests of asset pricing models, such as that proposed by the owners in the present case. The ERA said (correctly) that rational investors do not take on the additional risk of equity expecting it to deliver less than risky debt, yet this has been an actual outcome in the market over recent times. The ERA noted that the approach of the owners did not actually test the return on equity models against investors' expectations for that return, *ex ante*, as it would need to do in order to determine whether the outputs of the asset pricing models are biased. Rather, so the ERA said, the owners are testing those models against actual outcomes, realised in *ex post*.

1466. The AER's 2018 draft guidelines gave no weight to low beta bias and Black CAPM.

- Many of the tests and exercises which indicate low beta bias are themselves the subject of ongoing academic debate and carry limitations which throw doubt on their results and suitability for its regulatory task. [577]

- There are a number of explanations (for example, economic conditions) that do not imply a bias in equity beta. For example, Partington and Satchell have previously observed that beta for a given portfolio remains remarkably constant which suggests that it may not be bias in beta that explains non-zero alphas, but that it has more to do with economic conditions. [578]

574 ERA, *Final Decision on proposed revisions to the access arrangement for the Dampier to Bunbury natural gas pipeline 2016 – 2020,* Appendix 4 *Rate of Return,* June 2016, p. 67.

575 ERA. *Final Decision on proposed revisions to the access arrangement for the Dampier to Bunbury natural gas pipeline 2016 – 2020,* Appendix 4 *Rate of Return,* June 2016, p. 95.

576 Application by DBNGP (WA) Transmission Pty Ltd [2018] ACompT 1, 16 July, p. 124.

577 AER, *Draft Rate of Return Guidelines Explanatory Statement*, July 2018, pp. 277-278.

578 AER, *Draft Rate of Return Guidelines Explanatory Statement*, July 2018, pp. 277-278.

13.7.2.2 New Frontier report

1467. AGIG and GGT commissioned Frontier Economics to provide new analysis on low beta bias.[579] The ENA also submitted a Frontier Economics report on low beta bias it had commissioned, which was effectively the same as that from AGIG and GGT.[580]

1468. Frontier was engaged to provide advice on the issue of the role of low beta bias and Black CAPM in estimating the equity beta. Frontier's report concluded that new evidence finds that low beta bias exists on an ex ante basis for Australian data.

1469. A summary of Frontier's report is provided below.

- Frontier detailed the Black CAPM model, however, it did not provide any new analysis. Frontier's report rather focused on low beta bias.
- Frontier reviewed available theoretical evidence of bias in Sharpe Lintner CAPM returns, which it argued provides that a relationship between beta and observed returns had a higher intercept and a flatter slope than the Sharpe Lintner CAPM suggests.
- Frontier reviewed the empirical evidence in the context of ex ante returns. Previous empirical analysis had focused on ex post returns. Frontier followed Brav et al's approach to analysing and reporting excess return.[581]
- Frontier found that ex ante expected returns produce the same result that has been previously identified for ex post observed returns. Therefore, Frontier argued the relationship between beta and the required returns has a higher intercept and a flatter slope than the Sharpe Lintner CAPM would suggest (that is, low beta bias is supported).
- Frontier argued that independent experts and market practitioners commonly use an intercept above the prevailing government bond yield.
- Frontier argued a regulator should have regard to this bias. However, Frontier did not detail how the equity beta or the Sharpe Lintner CAPM should be adjusted for this bias.

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579 Frontier Economics, *Low-beta bias and the Black CAPM: Report prepared for Australian Gas Infrastructure Group and APA Group,* September 2018.

580 Frontier Economics, *Low-beta bias and the Black CAPM: Report prepared for Energy Networks Australia,* September 2018.

581 Brav, A., Lehavy, R. and Michaely, R., *'Using expectations to test asset pricing models', Financial managemen*t, vol. 34, 2005, pp. 31-64.

13.7.2.3 Consideration of the ERA

1470. The ERA's 2016 Final Decision for DBNGP gave this matter consideration.

1471. The ERA has given the matter of low beta bias and the Black CAPM further consideration and has reviewed public submissions and the new Frontier report. The views expressed in public submissions are similar to those detailed in the Frontier report.

1472. The AER has also been provided the report from Frontier Economics and public submissions on low beta bias and Black CAPM as part of public submissions on its draft guidelines. In response to this, the AER commissioned Partington and Satchell to provide advice on public submissions, which included low beta bias and the Black CAPM and the Frontier report.[582]

1473. Partington and Satchell found that no regard should be given to the low beta bias and the Black CAPM when estimating the forward-looking required return on equity.[583]

1474. Partington and Satchell's advice can be summarised as follows: [584]

- They considered that much of Frontier's report covered old ground that has been presented and reviewed across multiple past submissions to the AER.

- The new feature in Frontier's work was the use of analysts' forecasts to determine an implied rate of return, which is then taken as a proxy for the return investors expect.

- Partington and Satchell considered that the model that Frontier used to estimate the implied rate of return was a class of models known as implied cost of capital models. They considered that such models perform poorly and if this was not the case, they would be in widespread use to compute the cost of capital. Partington and Satchell provided evidence that it was well-established that the implied cost of capital is an upward biased estimator of expected returns.

- Partington and Satchell considered that available papers did not use ex ante required returns in the analysis. Instead, the literature used estimates of the implied cost of capital. This implied cost of capital is used as a proxy for the ex-ante required return. This proxy is not reliable.

- They considered that the use of analyst forecasts as a proxy for expected returns was upwardly biased.

- Partington and Satchell considered that observed returns were often used as a proxy for expected returns in empirical finance, but this did not mean that they were equally suitable for this use in all applications. The fundamental point was that actual returns equalled expected returns plus forecast error.

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582 Partington, G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline,* November 2018.

583 Partington G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline,* November 2018, p. 15.

584 Partington, G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline,* November 2018, pp. 6-17.

- They considered that while a higher intercept and a flatter slope was included in some academic literature, not all academic literature supported this result. Partington and Satchell pointed out deficiencies in the literature that made them sceptical of its empirical usefulness in determining the allowed rate of return.

- Partington and Satchell's previous reports discussed low beta bias, and the arguments to refute it, in detail. This past advice included their last 2018 report to the AER.[585] Partington and Satchell repeated these arguments, updating them in the context of Frontier's current report.

- Partington and Satchell did not support the proposition that low beta bias was a reason for increasing allowed return for regulated networks.[586]

1475. The ERA considers that limited new evidence has been provided on the Black CAPM.

1476. The ERA will not consider the Black CAPM when determining an estimate of the equity beta.

1477. The ERA concurs with the findings from Partington and Satchell's analysis. The ERA considers that the Frontier report detailed matters that have been previously reviewed. The ERA considers that the new evidence to support low beta bias presented by Frontier on ex ante returns is subject to theoretical and empirical concerns.

1478. The ERA will not consider low beta bias when determining an estimate of the equity beta.

13.7.3 Final equity beta estimate

1479. The ERA's analysis indicates that an equity beta value of 0.7 is appropriate.

1480. Submissions do not provide substantively new information. The ERA maintains its decision that no weight is given to low beta bias or Black CAPM.

1481. For the final guidelines the ERA will use an equity beta of 0.7.

1482. This equity beta value will be fixed over the period of the guidelines.

585 AER, *Report to the AER: Allowed Rate of Return 2018 Guideline Review,* May 2018.

586 Partington G. and Satchell, S., *Report to the AER: Discussion of submissions on the Draft 2018 Guideline,* November 2018, p. 6.

14. Debt and equity raising costs

14.1 Background

1483. Debt and equity raising costs and debt hedging costs are the administrative costs and other charges incurred by businesses when obtaining and hedging finance.

1484. This chapter outlines the ERA's approach to determining debt and equity raising costs used to calculate the rate of return.

14.2 Draft approach

14.2.1 Debt-raising costs

1485. Regulators across Australia have typically included an allowance to account for debt-raising costs in their regulatory decisions.

1486. These debt-raising costs should only include the direct cost components recommended by the Allen Consulting Group in its 2004 report to the ACCC.[587] The recommendations in this report have been generally accepted by Australian regulators since its publication.

1487. These direct costs will be recompensed in proportion to the average annual debt issuance, and will cover:

- gross underwriting fees
- legal and roadshow fees
- company credit rating fees
- issue credit rating fees
- registry fees
- paying fees.

1488. Indirect costs should not be included in the estimate of debt-raising costs and will not be compensated.

1489. An estimate of 0.100 per cent per annum (exclusive of hedging costs, which are discussed separately below) is currently the most accurate estimate of debt-raising costs for the benchmark efficient entity.

1490. The debt raising cost allowance will be added to the return on debt.

587 The Allen Consulting Group, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004.

14.2.2 Debt hedging costs

1491. An annual swap allowance of 0.114 per cent will be provided to firms to compensate for the cost of conducting hedging for exposure to movements in the risk free rate.

1492. The hedging cost allowance will be added to the return on debt.

14.2.3 Equity raising costs

1493. The ERA will provide an allowance for equity raising transaction costs in the capital expenditure (capex) building block, and so these costs do not form part of the rate of return.

14.3 Draft reasoning

14.3.1 Debt-raising costs

1494. Regulators across Australia have typically included an allowance to account for debt-raising costs in their regulatory decisions.

1495. Debt-raising costs may include underwriting fees, legal fees, company credit rating fees and any other costs incurred in raising debt finance. A company has to pay debt-raising costs over and above the debt risk premium. Such debt-raising costs are likely to vary between each issuance of debt depending on the borrower, lender and market conditions.

1496. Australian regulators use benchmark estimates when determining debt-raising costs. In doing 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.

1497. Based on the advice from the Allen Consulting Group in December 2004, the ACCC reaffirmed that debt-raising costs were a legitimate expense that should be recovered through the revenues of a regulated utility.[588] This conclusion was consistent with the ACCC's decisions on the issue of debt-raising costs in its regulatory decisions prior to 2004.[589]

1498. The costs included in the estimates of the debt-raising costs, as indicated by the Allen Consulting Group in its 2004 estimate and adopted by the ACCC, are outlined below:

- *Gross underwriting fee*: this includes management fees, selling fees, arrangement fees and the cost of an underwriter for the debt.

- *Legal and road show fee*: this includes fees for legal documentation and fees involved in creating and marketing a prospectus.

[588] 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.

[589] 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.

- *Company credit rating fee*: a credit rating is generally required for the issue of a debt-raising instrument, a company is charged annually by the credit rating agency for the services of providing a credit rating.
- *Issue credit rating fee*: a separate credit rating is obtained for each debt issue.
- *Registry fee*: the maintenance of the bond register.
- *Paying fee*: payment of a coupon and principal to the security holder on behalf of the issuer.

1499. In addition, the Allen Consulting Group considered that some debt transaction costs would continue to be incurred for the whole value of the investment.[590] It also took the view that the most appropriate means of recovering these debt raising costs would either be as an addition to the estimated WACC or as a direct allowance to operating expenses.[591]

1500. The debt-raising allowance is treated differently by different regulators. For example, the AER has considered this allowance is an operating expense, whereas State-based regulators, including the ERA, have generally incorporated this allowance in the rate of return calculations.

1501. The Allen Consulting Group's study determined debt-raising costs based on long-term bond issues, consistent with the assumptions applied in determining the costs of debt for a benchmark regulated entity. Debt-raising costs were based on costs associated with Australian international bond issues and for Australian medium-term notes sold jointly in Australia and overseas.[592]

1502. The ERA and several other Australian regulators have adopted an estimate of debt-raising costs of 12.5 basis points per annum in previous regulatory decisions. As shown in Table 27, while some regulators have continued to apply a figure of 12.5 basis points per annum (including the ERA in its past decisions), the ACCC, AER and Queensland Competition Authority (QCA) have elected to use somewhat lower estimates.

590 Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. xiii.

591 Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. xix.

592 Allen Consulting Group, *Debt and equity raising transaction costs: Final report to ACCC*, December 2004, p. 53.

Table 27 Debt raising costs in Australian regulatory decisions

Regulator	Year	Allowance (bppa)
ERA[593]	2018	10.0
AER[594]	2017	8.4 – 9.2
ERA[595]	2016	12.5
ESCOSA[596]	2016	12.5
ACCC[597]	2014	9.8 – 10.9
IPART[598]	2014	12.5
QCA[599]	2014	10.8

Source: Compiled by the ERA

1503. The ERA has investigated the allowances provided by various Australian regulators, and has given particular attention to research underpinning the QCA's 2014 *Cost of debt estimation methodology*.[600] In this report, the QCA reviewed the Allen Consulting Group's 2004 findings and the origins of the 12.5 basis points per annum estimate.

1504. The QCA found that the 12.5 basis points per annum figure was based on figures provided to the ACCC by Westpac in 2002.[601] This figure was discussed in the Allen Consulting Group's report in 2004, which noted that an allowance of 12.5 basis points per annum was likely to have been overstated. Specifically, the Allen Consulting Group stated that:

- The ACCC had inappropriately included a dealer swap margin in 2004, resulting in a double-count.[602]

- Without a swap margin, the ACCC's estimate would have been about 7.5 basis points per annum (which was closer to other estimates sourced by the ACCC from banks at the time).[603]

593 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, May 2018, p. 55.

594 AER, *Draft Decision: AusNet Services Gas access arrangement 2018 to 2022 – Attachment 3 – Rate of return,* July 2017, p. 3-446.

595 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 4 Rate of Return*, 2016, p. 177.

596 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 122.

597 Australian Competition and Consumer Commission, *AusNet Services Gas access arrangement: 2018 to 2022 Attachment 3 – Rate of return (Draft Decision)*, March 2014, p. 56.

598 Independent Pricing and Regulatory Tribunal, *New Approach to Estimating the Cost of Debt: Use of the RBA's Corporate Credit Spreads*, February 2014, p. 2.

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

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

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

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

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

1505. The QCA also noted that the AER had updated its debt-raising allowance, based on a 2011 analysis of debt-raising costs by PricewaterhouseCoopers (PwC).[604]

1506. The QCA had concerns about the inclusion of the swap margin and the age of the 12.5 basis points per annum estimate. Consequently, it engaged PwC to prepare updated advice on debt raising costs. PwC found that debt raising costs were within the range of 9.9 to 10.8 basis points per annum. PwC's method used the same cost categories identified by the Allen Consulting Group in 2004.[605]

1507. 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,[606] PwC's 2011[607] and 2013[608] estimates, and the ERA's own estimate in 2013[609] – have adopted essentially the same approach taken 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.

1508. Therefore, a debt-raising cost allowance of 10.0 basis points per annum was 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 AER. This allowance does not include the swap margin, which is captured separately in debt hedging costs.

14.3.2 Debt hedging costs

1509. 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.

1510. Hedging costs involved in converting from a typical 10-year fixed debt to the regulated five-year fixed rate will involve four legs:

- Swapping 10-year fixed for a base floating rate at the time of issuance – paying floating and receiving 10-year fixed.

- Swapping the base floating rate at the time of the regulatory reset for five-year fixed – receiving floating and paying five-year fixed.

1511. For each set of two legs, the following costs may be incurred:

- *A credit and capital charge* – compensates for the risk of the counterparty and will depend on the credit rating and the potential default loss.

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604 Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, p. 12.

605 Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, p. 12.

606 Deloitte, *Envestra Limited: Debt Financing Costs*, September 2010, p. 4.

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

608 PricewaterhouseCoopers, *A cost of debt methodology for businesses regulated by the Queensland Competition Authority*, June 2013.

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

- *An execution charge* – compensates the swap intermediary for the costs of transacting the swap.

1512. The benchmark efficient entity would potentially engage in four different transactions in hedging the base of its portfolio of debt:[610]

- Five-year floating to fixed Australian dollar swaps at start of an access arrangement for the full amount of the debt portfolio.

- Bond issuance potentially made up of three different issue types and hence requiring three different swap considerations.

- Foreign currency bonds, requiring a cross-currency swap into floating Australian dollars.

- Fixed-rate Australian dollar bonds, requiring a fixed-float Australian dollar swap.

1513. No swap will be required for floating rate Australian dollar notes.

1514. In 2016, the ERA engaged Chairmont Consulting to advise on the cost of undertaking swaps. Chairmont Consulting made estimates based on its own inquiries and on recent hedging transaction costs identified by the ERA.[611] Chairmont estimated the following costs:[612]

> *5-year swaps at the start of the [access arrangements].* The different submissions provide a range of estimated costs, i.e. Evans and Peck (2015) 5bp; UBS <5bp; Jemena <5bp (i.e. less than half of the total 8-10bp, as a 5-year swap costs less for capital and credit charges). This suggests approximately 4bppa is appropriate. This is also supported by informal discussions held by Chairmont with two banks in late 2014.
>
> *Cross-currency swaps*. There was only one estimate provided and that was by UBS which reported 18bp. Chairmont's discussions with the banks suggest that this estimate is at the high end of costs and is likely to overstate a swap in relation to a new issuance. It is important to understand that banks tend to be more aggressive on swap pricing when linked to other business. A lower level of 10bp appears to be reasonable, so for further calculation a mid-point of 14bp is used.
>
> *10-year AUD fixed-floating swaps.* The submissions are Evans and Peck (2015) 8bp; UBS 5bp; Jemena and Authority (implied) 5-7bp. Taking a mid-point such as 6bp appears reasonable for this component.

1515. Only a proportion of debt is raised overseas, requiring overseas credit and execution costs. For example, Competition Economists Group found that regulated energy companies had about 65 per cent of debt issued in Australian dollars in 2013, with the remainder in foreign currencies.[613] Further, it found that 24 per cent of debt amounts outstanding was already floating (typically bank loans).[614]

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610 Chairmont Consulting, *ERA Hedging Costs in the Cost of Debt*, 13 May 2015, p. 5.

611 These were sourced from Evans & Peck (2015), UBS (2014), and Jemena (2013), as detailed in: ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020: Appendix 4 Rate of Return*, 22 December 2015, p. 134.

612 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016-2020: Appendix 4 Rate of Return*, 22 December 2015, p. 135.

613 Competition Economists Group, *Debt strategies of utility businesses*, June 2013, p. 23.

614 Competition Economists Group, *Debt strategies of utility businesses*, June 2013, p. 22.

1516. Based on Chairmont Consulting's advice and work by the Competition Economists Group, the ERA calculated the weighted cost of hedging as follows:

- Five-year swap floating for fixed for the full amount of debt = 4 bppa x 100 per cent = 4.0 bppa; plus
- 10-year cross currency swaps for (100 – 65 =) 35 per cent of debt issuance = 14 bppa x 35 per cent = 4.9 bppa; plus
- 10-year fixed-float Australian dollar swaps for (65 – 24 =) 41 per cent of debt issuance = 6 bppa x 41 per cent = 2.5 bppa.

1517. That sum gives a total cost of hedging of 11.4 basis points per annum. Accordingly, the ERA allowed hedging costs of 11.4 basis points per annum.

14.3.3 Equity raising costs

1518. Firms may need to issue new equity in order to maintain the benchmark debt-to-equity ratio following increases in the regulated asset base.

1519. The issuance of new equity will have transaction costs, depending on the way in which the equity is raised.

1520. The ERA will account for these transaction costs as a part of the capex building block. Consequently, there is no allowance for equity raising costs in the rate of return.

14.4 Public submissions

1521. ATCO's submission accepted the debt raising and hedging costs proposed in the draft guidelines.[615]

14.5 Independent Panel

1522. The Independent Panel considered that the estimates of debt raising costs and debt hedging costs were justified based on the information provided.[616]

1523. The Independent Panel also considered that the approach of including equity raising transactions costs in the capital expenditure component of the building block was appropriate.[617]

615 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 12.

616 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 67.

617 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 67.

14.6 Final approach

14.6.1 Debt-raising costs

1524. Regulators across Australia have typically included an allowance to account for debt-raising costs in their regulatory decisions.

1525. These debt-raising costs should only include the direct cost components recommended by the Allen Consulting Group in its 2004 report to the ACCC.[618] The recommendations in this report have been generally accepted by Australian regulators since its publication.

1526. These direct costs will be recompensed in proportion to the average annual issuance, and will cover:

- gross underwriting fees
- legal and roadshow fees
- company credit rating fees
- issue credit rating fees
- registry fees
- paying fees.

1527. Indirect costs should not be included in the estimate of debt-raising costs and will not be compensated.

1528. An estimate of 0.100 per cent per annum (exclusive of hedging costs, which are discussed separately below) is currently the most accurate estimate of debt-raising costs for the benchmark efficient entity.

1529. The debt raising cost allowance will be added to the return on debt.

14.6.2 Debt hedging costs

1530. An annual swap allowance of 0.114 per cent will be provided to firms to compensate for the cost of conducting hedging for exposure to movements in the risk free rate.

1531. The hedging cost allowance will be added to the return on debt.

14.6.3 Equity raising costs

1532. The ERA will provide an allowance for equity raising transaction costs in the capex building block, and so these costs do not form part of the rate of return.

618 The Allen Consulting Group, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004.

14.7 Final reasoning

1533. The reasoning for the ERA's final approach for debt and equity raising costs is consistent with the draft reasoning and is detailed below.

14.7.1 Debt-raising costs

1534. Regulators across Australia have typically included an allowance to account for debt-raising costs in their regulatory decisions.

1535. The costs included in the estimates of the debt-raising costs, as indicated by the Allen Consulting Group in its 2004 estimate and adopted by the ACCC, are outlined below:

- *Gross underwriting fee*: this includes management fees, selling fees, arrangement fees and the cost of an underwriter for the debt.
- *Legal and road show fee*: this includes fees for legal documentation and fees involved in creating and marketing a prospectus.
- *Company credit rating fee*: a credit rating is generally required for the issue of a debt-raising instrument, a company is charged annually by the credit rating agency for the services of providing a credit rating.
- *Issue credit rating fee*: a separate credit rating is obtained for each debt issue.
- *Registry fee*: the maintenance of the bond register.
- *Paying fee*: payment of a coupon and principal to the security holder on behalf of the issuer.

1536. The latest report on debt raising costs was commissioned by the QCA. The QCA engaged PwC to prepare updated advice on debt raising costs. PwC found that debt raising costs were within the range of 9.9 to 10.8 basis points per annum. PwC's method used the same cost categories identified by the Allen Consulting Group in 2004.[619]

1537. Therefore, the ERA considers a debt-raising cost allowance of 10.0 basis points per annum appropriate.

14.7.2 Debt hedging costs

1538. 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.

1539. Based on Chairmont Consulting's advice and work by the Competition Economists Group, the ERA calculated the weighted cost of hedging as follows:

- Five-year swap floating for fixed for the full amount of debt = 4 bppa x 100 per cent = 4.0 bppa; plus

[619] Queensland Competition Authority, *Cost of debt estimation methodology: final decision,* August 2014, p. 12.

- 10-year cross currency swaps for (100 – 65 =) 35 per cent of debt issuance = 14 bppa x 35 per cent = 4.9 bppa; plus
- 10-year fixed-float Australian dollar swaps for (65 – 24 =) 41 per cent of debt issuance = 6 bppa x 41 per cent = 2.5 bppa.

1540. That sum gives a total cost of hedging of 11.4 basis points per annum. Accordingly, the ERA considers hedging costs of 11.4 basis points per annum appropriate.

14.7.3 Equity raising costs

1541. Firms may need to issue new equity in order to maintain the benchmark debt-to-equity ratio following increases in the regulated asset base.

1542. The issuance of new equity will have transaction costs, depending on the way in which the equity is raised.

1543. The ERA will account for these transaction costs as a part of the capex building block. Consequently, the ERA includes no allowance for equity raising costs in the rate of return.

15. Inflation

15.1 Background

1544. Inflation is the rate of change in the general level of prices of goods and services.

1545. Forecast inflation can be used to translate the nominal post-tax WACC to a real post-tax WACC.

1546. A nominal rate of return incorporates the real rate of return, compounded with a rate that reflects expectations of inflation. In line with the requirements of the National Gas Rules, the ERA will use a nominal vanilla rate of return for its decisions.[620]

1547. The size of the inflation component will have an impact on the nominal prices set for gas distribution and transmission networks. To ensure pricing meets the objectives of the National Gas Law and the National Gas Rules, the ERA must establish a method for estimating the inflation rate that will prevail over the five years of the relevant access arrangement.

1548. The resulting estimate of the expected inflation rate will be an input to the nominal modelling of the rate of return, as well as of other components of revenue. In particular, the expected rate of inflation will be required:

- For the roll forward of the regulatory asset base and for indexing purposes to determine annual depreciation allowances.[621]

- To back out the expected inflation underpinning the nominal building block allowances in the tariff variation mechanism, to allow accounting for subsequent actual inflation.

1549. The expected rate of inflation will also allow stakeholders to observe the real rates of change in tariffs and in the real rate of return, which is itself an important contributor to the real changes in tariffs.

1550. This chapter outlines the ERA's approach to determining the expected rate of inflation.

15.2 Draft approach

1551. In the draft guidelines, the ERA will estimate the expected inflation rate using the Treasury bond implied inflation approach.

1552. This approach uses the Fisher equation and the observed yields of:[622]

- Five-year Commonwealth Government Securities, which reflect a market-based estimate of the nominal risk free rate.

620 National Gas Rules 87(4).

622 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.

- Five-year indexed Treasury bonds, which reflect a market-based estimate of a real risk free rate.

1553. The ERA will estimate the expected inflation rate consistent with the estimate of the risk free rate by adopting an averaging period of 20 trading days. The averaging period must be nominated in advance and must be close to, and prior to, an access arrangement determination.

1554. The approach uses linear interpolation to derive the daily point estimates of both the nominal five-year risk free rate and the real five-year risk free rate, for use in the Fisher equation.[623] The term of the resulting average expected inflation rate is five years, consistent with the length of the access arrangement period.

1555. In this approach, estimates of both the nominal and real risk free rates of return are directly observed from the financial markets and so reflect the market expectation for inflation.

15.3 Draft reasoning

1556. The ERA matches the term of the expected rate of inflation with that of the risk free rate in order to ensure consistency across the WACC parameters. It is therefore appropriate that the term of the expected inflation rate be five years.

1557. It is also appropriate to match the averaging period for estimating the risk free rate – being 20 days – to ensure consistency.

1558. The ERA uses the Treasury bond implied inflation approach to estimate the inflation rate expected to prevail over the course of a regulatory control period.

1559. Australian regulators have adopted two methods for estimating expected inflation: (i) the Treasury bond approach; and (ii) the RBA inflation forecast approach. The choice of the two methods is influenced by the term of expected inflation to be forecast.

1560. Table 28 contains a summary of the approaches used by Australian regulators in recent regulatory decisions for estimating the expected inflation rate.

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

Table 28 Estimating the expected inflation rate in Australian regulatory decisions

Regulator	Year	Industry	Method	Term of expected inflation
ERA[624]	2018	Electricity network	Treasury bond implied inflation method	5 years
QCA[625]	2018	Various	RBA inflation forecast and mid-point of RBA inflation target range	5 years
AER[626]	2017	Gas and electricity networks	RBA inflation forecast and target band method	10 years
IPART[627]	2017	Various	RBA inflation forecast and target band method	10 years
ESCOSA[628]	2016	Water, sewerage, stormwater drainage and other services	RBA inflation forecast and target band method	10 years
ACCC[629]	2015	Fixed Line Services (Telecommunications)	RBA inflation forecast and target band method	10 years

Source: Compiled by the ERA.

15.3.1 The Treasury bond implied inflation approach

1561. The Treasury bond implied inflation approach derives the expected inflation rate using the Fisher equation from observed yields of, for example:

- Five-year Commonwealth Government Securities – which reflect market estimates of the nominal risk free rate.
- Five-year indexed Treasury bonds – which reflect market estimates of the real risk free rate.

1562. The ERA uses linear interpolation to derive both the nominal risk free rate and the real risk free rate. A moving average – often 20 days – of the nominal risk free rate and the real risk free rate is used to reduce the volatility of the estimate.

1563. This approach is based on the premise that yields on Commonwealth Government Securities and Treasury indexed bonds differ only by an inflation component.

[624] ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5 Return on Regulated Capital Base*, September 2018, p. 93.

[625] Queensland Competition Authority, *Seqwater Bulk Water Price Review 2018-21,* March 2018, p. 55.

[626] AER, *Regulatory treatment of inflation – Final position,* December 2017.

[627] Independent Pricing and Regulatory Tribunal, *WACC Biannual Update*, February 2018, p. 1.
Method detailed in *New approach to forecasting the WACC inflation adjustment,* March 2015.

[628] Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016 Final determination*, June 2016, p. 126.

[629] Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 72.

1564. The yield on Commonwealth Government Securities can be split into three components:

- The real yield, the compensation bond-holders demand for foregoing consumption.
- The expected inflation, the compensation for a reduction in purchasing power caused by the expected inflation rate.
- Premia, the compensation for changes in the real yield (known as the term premium) or changes in the inflation rate (known as the inflation premium) during the term of the bond.[630]

1565. In comparison, the yield on Treasury indexed bonds contains only the real yield and a term premium.

1566. By using the Fisher equation, the ERA can estimate the inflation rate and the inflation premium component of the Commonwealth Government Securities.

1567. This method assumes efficient pricing of the Treasury indexed bonds, in that observed yields must reflect the value that the market places on these instruments at a given moment in time. During the global financial crisis there was a decrease in liquidity for Treasury indexed bonds. Lack of frequent trading meant that observed yields were not likely to reflect efficient pricing. As a consequence, the ERA discontinued the use of this method in its regulatory decisions in 2009.[631]

1568. In recent years, however, the market liquidity for the Treasury index bonds has improved, and the ERA has again adopted the Treasury bond approach in deriving the estimate for expected inflation over a future regulatory control period.

1569. One criticism of the Treasury bond approach is that it has an inherent bias, due to investors demanding an inflation premium to compensate for being exposed to uncertainty around the future inflation rate.[632]

1570. Another criticism of this approach is the relatively small quantity of Treasury indexed bonds with maturities every five years on issue.[633] This contrasts with the large quantity of Commonwealth Government Securities currently on issue. As a consequence, the interpolation of Treasury indexed bonds is less accurate than the corresponding interpolation for Commonwealth Government Securities.

1571. However, now that the liquidity of index bonds has improved and apparent liquidity premiums have subsided, on balance, the implied bond approach produces more accurate estimates of inflation for the next five years.

630 The Australian Treasury, *Measuring market inflation expectations*, August 2012.

631 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline*, 31 October 2011, p. 158.

632 The Australian Treasury, *Measuring market inflation expectations*, August 2012.

633 RBA, *Extracting Information from Financial Market Instruments,* March 2012.

1572. The ERA is aware of other issues that have been raised with the use of the 10 year bond yield approach.[634] However, the ERA considered the size of these biases, if they exist, is small. Furthermore, using a shorter five-year period may likely further reduce the size of these potential effects. Therefore, the ERA considers that these biases do not detract from the bond yield's ability to forecast inflation relative to other methods.

1573. In the draft guidelines, the ERA preferred the Treasury bond inflation approach because this approach utilises both nominal and real risk-free rates which are directly observed from the market. As a consequence, these estimates will reflect the market's view of the expected inflation rate.

1574. The rationale for using market based approaches is that market prices reflect the aggregation of diverse market participant expectations. The forecasts of many different market participants is considered to contain more information and be more relevant than any one particular forecast model or method.

1575. The ERA considered that the Treasury bond implied inflation approach is the most robust measure of inflation expectations for a regulatory period. This method is consistent with and most appropriately aligns with the ERA's regulatory period.

15.3.2 Alternative methods

15.3.2.1 RBA inflation forecast and target band method

1576. Regulators that have taken a longer 10-year view of inflation expectations have used the RBA inflation forecast and target band method.

1577. This approach estimates the expected inflation rate using:

- The mid-point of the RBA's headline inflation rate forecast range for years one and two from the most recent *Statement on Monetary Policy*.
- The mid-point of the RBA's target inflation band of 2 to 3 per cent for years three to 10.

1578. In most cases, regulators use a 10-year geometric annualised average that is taken from the above 10 inflation points to determine the expected inflation rate over the regulatory period.

1579. The RBA's Statement of Monetary Policy is updated infrequently throughout the year and therefore at any point in time may not reflect changing inflation expectations. The RBA's inflation forecast is therefore not as dynamic as a market based measure.

1580. In addition, given the weight placed on the mid-point of the RBA's target inflation, the inflation forecast remains relatively constant over time and will not reflect changing inflation expectations. The mid-point of the RBA's inflation band is therefore not as dynamic as a market based measure.

634 ACCC/AER Working Paper # 11, *Considerations of best estimates of expected inflation: comparing and ranking approaches,* April 2017, pp. 33-36.

1581. There is evidence that the RBA inflation forecast and target band method has not responded to the changing inflation environment and leads to an overestimate of expected inflation.[635]

1582. Given the lag in the RBA inflation forecast method, it can result in a negative real risk free rate when the Fisher equation is used.[636] An expected negative real risk free rate is likely to have adverse regulatory implications, since investors would be unwilling to lend funds with an expected negative real rate of return, when withholding investment offers a zero per cent rate of return.

1583. Negative expected real rates of return may occur when the RBA overestimates the expected inflation rate. Applying the nominal risk free rate observed from the market, in conjunction with the inflation forecast from the RBA, to the Fisher equation will return a negative real risk free rate under these circumstances.[637]

15.4 Public submissions

1584. AGIG, ATCO and ENA's submissions accepted the ERA's draft guideline Treasury bond implied inflation approach as the best method to estimate the prevailing inflation rate over the regulatory period. [638] [639] [640]

15.5 Independent Panel

1585. The Independent Panel considered that the ERA's Treasury bond implied inflation approach was well-explained, based on sound reasoning and, given its use of appropriate market information, likely to be the best means of forecasting inflation. [641]

1586. The Independent Panel noted that there should be flexibility to adopt an alternative approach if there is sufficient evidence of problems with the pricing of Treasury Indexed bonds.[642]

15.6 Final approach

1587. The ERA will estimate the expected inflation rate using the Treasury bond implied inflation approach.

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635 CEG, *Best Estimate of Expected Inflation*, September 2016, p. 33.

636 See, for instance: ERA, *Final decision on proposed revisions to the access arrangement for Western Power*, 2012 p. 328.

637 The Fisher equation solved for the real risk free rate is: $r = \frac{(1+i)}{1+\pi^e} - 1$. A negative real risk free rate of return will occur if the expected inflation rate exceeds the nominal risk free rate, $\pi^e > i$.

638 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, p. 26.

639 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, p. 7.

640 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, p. 3.

641 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 69.

642 Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 69.

1588. This approach uses the Fisher equation[643] and the observed yields of:

- Five-year Commonwealth Government Securities, which reflect a market-based estimate of the nominal risk free rate.
- Five-year indexed Treasury bonds, which reflect a market-based estimate of a real risk free rate.

1589. The ERA will estimate the expected inflation rate consistent with the estimate of the risk free rate by adopting an averaging period of 20 trading days. The averaging period must be nominated in advance and must be close to, and prior to, an access arrangement determination.

1590. The approach uses linear interpolation to derive the daily point estimates of both the nominal five-year risk free rate and the real five-year risk free rate, for use in the Fisher equation.[644] The term of the resulting average expected inflation rate is five years, consistent with the length of the access arrangement period.

1591. In this approach, estimates of both the nominal and real risk free rates of return are directly observed from the financial markets, so reflect the market expectation for inflation.

15.7 Final reasoning

1592. The reasoning for the ERA's final approach for inflation is the same as its draft reasoning.

15.7.1 Flexibility to adopt alternative approaches

1593. Under a binding rate of return framework the ERA will not be able to use discretion over the four-year period of a binding instrument.

1594. The ERA is therefore not able to use regulatory discretion to interpret available information in deciding whether an alternative approach may have value.

1595. The ERA will continue the Treasury bond implied inflation approach until the next guideline review.

643 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.

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

16. Value of imputation credits (gamma)

16.1 Background

1596. The National Gas Rules require the ERA to set out its approach to estimating the value of imputation credits (gamma), a parameter in the post-tax revenue model.

1597. 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.

1598. 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 utilise 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.

1599. This chapter outlines the ERA's approach to determining gamma.

16.2 Draft approach

1600. In the draft guidelines, 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.

1601. 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 considered that the distribution rate is a firm-specific rather than a market-wide parameter.

1602. In estimating the distribution rate, the ERA relied on Lally's estimate of 0.83 for the distribution rate from financial reports of the 20 largest ASX-listed firms.[645]

1603. In the draft guidelines, the ERA considered that the distribution rate is at least 0.83. As detailed by Lally, the three energy network businesses for which data is available produce a higher distribution rate of one. However, relying on so few observations can be subject to manipulation. Addressing the problems of limited available data and ability for manipulation, the ERA considered the use of the 20 largest ASX listed firms as the best proxy for the distribution rate for the benchmark efficient entity.

1604. The utilisation rate is the value to investors of utilising imputation credits per dollar of imputation credits distributed. The ERA considers that the utilisation rate is a market-wide rather than a firm wide parameter.

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

1605. In estimating the utilisation rate, the ERA relied on the equity ownership approach to determine the percentage of domestic investors in the Australian equity market. The utilisation rate is estimated for all Australian equity from the national accounts of the ABS. The ERA considered that a utilisation rate of 0.60 was appropriate.

1606. The ERA estimated gamma as the product of the distribution rate and the utilisation rate to provide a gamma of 0.5.

1607. This gamma value will be fixed over the period of the guidelines.

16.3 Draft reasoning

16.3.1 Imputation credits in utility regulation

1608. National Gas Rule 87A accounts for the ability of imputation credits to reduce the effective corporate tax rate for equity investors.

1609. National Gas Rule 87A requires that the estimated cost of corporate income tax of a service provider for each regulatory year of an access arrangement period (ETC_t) is to be estimated in accordance with equation 34.

$$ETC_t = (ETI_t \times r_t)(1-\gamma) \qquad \text{equation 34}$$

where

ETC_t	is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of reference services if such an entity, rather than the service provider, operated the business of the service provider
ETI_t	is the estimated taxable income for the regulated entity
r_t	is the expected statutory income tax rate for that regulatory year as determined by the regulator
γ	is the value of imputation credits.

1610. Any value generated by the presence of franking credits in the Australian tax system must be accounted for in the return to equity – and hence the weighted average cost of capital – estimated for regulated businesses.

1611. Officer proposed a theoretical framework that detailed how franking credits alter the after-tax cost of capital.[646] This framework is widely accepted by Australian regulators. This provides a framework for calculation of a nominal pre-tax WACC, as follows:

[646] Officer, R., 'The Cost of a Company under an Imputation Tax System', *Accounting & Finance*, May 1994, pp. 1-17.

$$WACC_{nom} = R^{e}_{post} * \frac{1}{(1-T*(1-\gamma))} * \frac{E}{V} + R^{d}_{pre} * \frac{D}{V}$$ equation 35

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.

1612. The value generated by franking credits is represented by the parameter gamma, which is a product of two components:

- *Distribution rate* - the fraction of imputation credits created that are assumed to be distributed to shareholders.
- *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 1 and those unable to use them having a rate of zero.

1613. It follows that gamma can be represented by the formula set out in below.[647] This is known as the Monkhouse formula.

gamma = distribution rate x utilisations rate equation 36

1614. Experts differ in their interpretation of the best approach to estimating gamma in the regulatory setting. This is particularly the case for the value of the utilisation rate.

1615. Table 29 summarises recent Australian regulatory decisions on gamma.

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

Table 29 Estimates of gamma adopted by Australian regulators

Regulator	Year	Gamma
ERA[648]	2018	0.5
AER[649]	2018	0.5
QCA[650]	2018	0.46
AER[651]	2018	0.4
IPART[652]	2018	0.25
ERA[653,654]	2016	0.4
ESCOSA[655]	2016	0.5
ACCC[656]	2015	0.45

Source: Compiled by the ERA.

16.3.2 Recent litigation on the value of imputation credits

1616. 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 0.50.

1617. The Australian Competition Tribunal considered the estimate of gamma was an 'ongoing intellectual and empirical endeavour'.[657]

1618. The estimate of gamma under the National Electricity Rules and National Gas Rules has been the subject of several limited merits reviews by the 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.

648 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network – Appendix 5,* September 2018, p. 104.

649 AER, *Draft Rate of return guidelines – Explanatory Statement,* July 2018, p. 63.

650 Queensland Competition Authority, *Seqwater Bulk Water Price Review 2018-21,* March 2018.
Consistent with the Queensland Competition Authority, *Draft report Seqwater Bulk Water Price review 2018-21,* November 2017, p. 56.

651 AER, *ElectraNet transmission final determination 2018-23 – Overview,* April 2018, p. 21.

652 Independent Pricing and Regulatory Tribunal, *Review of our WACC method*, February 2018, p. 1.

653 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020: Appendix 5 Gamma*, 2016, p. 47.

654 ERA, *Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline*, 2016, p. 343.

655 Essential Services Commission of South Australia, *SA Water Regulatory Determination 2016*, June 2016, p. 136.

656 Australian Competition and Consumer Commission, *Public inquiry into final access determinations for fixed line services – Final Decision*, October 2015, p. 66.

657 Australian Competition Tribunal, *Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9*, 12 May 2011, paragraph 45.

In May 2017, the Full Federal Court upheld the AER's appeal in respect of the Tribunal's construction of the rules regarding gamma.[658]

- In June 2016, the Tribunal found in favour of ATCO Gas Australia 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.[659]
- 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.

1619. These all upheld the reasoning in the regulators' decisions and found no error with the value of 0.4 and how it was derived. This included clarifying the definition of value and gamma and the reasonableness of the use of the utilisation approach.

16.3.3 Definition of the domestic capital market

1620. For the purpose of these guidelines, the ERA has adopted a domestic CAPM, while allowing for the presence of foreign investors.

1621. As discussed in *Chapter 5 - The benchmark efficient entity*, the boundary should account for the full domestic data set, including any direct influences on the cost of capital for Australian based firms. This may include the influence of international investors in Australian markets for equity or the influence of international lenders supplying debt finance directly to Australian firms.

1622. Therefore, to maintain internal consistency, the ERA considered that the estimate of gamma needs to take into account the presence of international investors in the Australian domestic capital market.

1623. The role of foreign investors is discussed in more detail below.

16.3.4 Interpretation of gamma

1624. The ERA interpreted franking credits in the context of the Officer CAPM framework.[660] Officer adjusts CAPM to incorporate the value of imputation credits.

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

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

660 Officer assumes all dividends and imputation credits are fully paid out each period. Monkhouse allows some retained earnings and imputation credits (Officer, R., 'The Cost of Capital of a Company under an Imputation Tax System', *Accounting and Finance*, May 1994; Monkhouse, P., 'The Valuation of Projects Under the Dividend Imputation Tax System', *Accounting and Finance*, vol. 36, 1996.)

Handley notes that this assumption is unrealistic, such that any estimate of gamma that ignores retained credits will be an underestimate (Handley, J., *Advice on the Value of Imputation Credits*, 29 September 2014, p. 13).

1625. As indicated by the AER,[661] Gray[662] and Handley,[663] the Officer framework, and specifically Officer's definition of a nominal vanilla rate of return, provide the basis for the rate of return framework underpinning the National Gas Rules.

1626. The AER's position is that imputation credits should be valued on a pre-personal tax and pre-personal costs level to be consistent with the Officer model.[664]

1627. The ERA sought to maintain consistency with the Officer framework in its estimation of gamma.

1628. The ERA interpreted the benefit arising from imputation credits as the proportion of franking credits distributed multiplied by the proportion of these that are utilised by the representative investor.[665]

1629. The AER highlights the challenges inherent in estimating gamma.[666]

> Estimating the value of imputation credits is a complex and imprecise task. There is no consensus among experts on the appropriate value or estimation techniques to use. Further, with each estimation technique there are often a number of ways these may be applied resulting in different outcomes. Conceptually, the value of imputation credits must be between 0 and 1, and the range of expert views on the value of imputation credits is almost this wide.

1630. To deal with these challenges in estimating gamma the ERA has used multiple estimation techniques in the past.

1631. The AER released a discussion paper on gamma to facilitate consultation.[667] In addition, to help inform its consideration of gamma, the AER:

- Engaged Lally to review gamma, including previous information, the AER's views, expert views and submissions.[668]

- Sought clarification from the ATO on the use of tax statistics.

It is well understood that the value of a retained imputation credit is less than the value of a distributed imputation credit due to the delay in distribution – but the difficult question is how much less. Unfortunately the answer is unclear as there is currently no empirical evidence on the value of a retained credit. Any value attributable to credits retained in a period would be reflected in the observed capital for that period but there is no known method to identify that component. The suggestion that retained imputation credits are worthless is somewhat implausible.

Estimates of gamma using the traditional approach will, therefore, be downward biased to the extent that retained imputation credits have value. Although it is not possible to reasonably estimate the magnitude of the bias, the ERA considers its direction is clear.

661 AER, *TasNetworks distribution determination 2017-18 to 2018-19 – Attachment 4 – Value of imputation credits*, April 2017, p. 4-18.

662 SFG, *Response to submissions on the rule change proposals, Report for the AEMC*, 5 November 2012, para. 2.

663 Handley, J., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, 29 September 2014, pp. 7-8.

664 AER, *TasNetworks distribution determination 2017-18 to 2018-19 – Attachment 4 – Value of imputation credits*, April 2017, p. 4-23.

665 ERA, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System*, 14 October 2014, p. 210.

666 AER, *TasNetworks distribution determination 2017-18 to 2018-19 – Attachment 4 – Value of imputation credits*, April 2017, p. 4-10.

667 AER, *Discussion paper – Valuation of imputation credits*, March 2018.

668 Lally, M., *Review of the AER's views on gearing and* gamma, May 2018.

1632. On the basis of this new information, the ERA reviewed and reassessed its approach to estimating both the distribution rate and the utilisation rate, with a view to creating a more robust and reliable approach to estimating gamma.

16.3.5 Distribution rate

1633. The distribution rate is the fraction of imputation credits created that is assumed to be distributed to shareholders.

1634. The ERA's past approach to estimating the distribution rate was based on data for the cumulative payout ratio from ATO franking account balances, and related to listed and unlisted equity.

1635. To estimate the distribution rate, the following issues must be considered:

- Whether the data set used to estimate the distribution rate must be consistent with that used to estimate the utilisation rate.
- If consistency is not essential, the principles that should guide the choice of data for estimating the distribution rate.
- Whether to use data for listed equity or all equity.
- If listed equity is used, whether to use ATO data or data from the financial statements of companies.

1636. The distribution rate is the proportion of a firm's imputation credits that are distributed, and therefore is a firm-specific parameter. Thus, the distribution rate can be estimated using firm, industry or market-wide data according to which is judged to provide the best estimate for this firm-specific parameter.[669]

1637. The utilisation rate is a market-specific parameter and can be estimated using market-wide data.[670]

1638. Therefore, consistency between the data sources to estimate the distribution rate and the utilisation rate is not essential, but nor is it precluded.

1639. For the principles that should guide the choice of data, Lally has explained the trade-offs.[671] At one extreme, one could use data from the firm in question but, if the firm's dividends are fully franked, then it will be able to manipulate (raise) its price or revenue cap by reducing its dividends. Reducing its distributed credits lowers its distribution rate and therefore raises its cost of capital estimated from the Officer model used by regulators.

1640. An alternative would be to examine a set of large private-sector Australian firms that contain significant regulated businesses. However, the set of firms is not large and therefore the choice of whether or not to include certain marginal cases is likely to materially affect the resulting estimate.

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

670 Lally, M., *Review of the AER's views on gearing and* gamma, May 2018, p. 17.

671 Lally, M., *The Estimation of Gamma*, 23 November 2013, section 4.2.

1641. All of this points to the use of some type of market-wide data. However, there is considerable variation in the distribution rate across firms and therefore any market-wide average could be a poor indicator of the situation for any firm.

1642. Taking account of these competing considerations, the ERA favoured the use of some type of market-wide data. This matched the ERA's general practice to date.

1643. When deciding to use all equity or only listed equity, Handley, for example, found that the choice is significant when using ATO tax data. His estimate for the distribution rate for listed companies is about 80 per cent,[672] while that for unlisted companies is about 50 per cent, leading to an estimate for all companies of about 70 per cent.[673] Lally argued that, since it was always sensible to distribute credits if possible, and the only restriction on doing so was the size of the firm's cash dividends, the presumed cause of the difference in distribution rates between listed and unlisted firms was lower dividend payout rates in unlisted companies.[674]

1644. Lally went on to argue that the factors determining dividend policy in listed and unlisted businesses were different. Many unlisted companies were sole traders who have corporatised to reduce their tax rate (but only if they retained rather than distributed the profits), and many others were closely-held entities with dividend policy considerations quite different to those of listed companies. Furthermore, all of the privately-owned regulated businesses in Western Australia were listed firms or subsidiaries of listed firms, and this was typical across Australia.[675] Handley similarly argued for the use of only listed firms because unlisted businesses "by definition are financed in entirely different ways".[676]

1645. The ERA reviewed the arguments for using listed equity in estimating the distribution rate and considered that the above points made a strong case for the use of listed equity.

1646. If listed equity is to be used, the final question is whether to use ATO data or data from the financial statements of listed firms.

1647. Using the ATO data, the distributed credits, and hence the distribution rate, could be estimated using either tax data or dividend data. The results from these two approaches are markedly different. Hathaway provides estimates of 71 per cent and 47 per cent using these two approaches, and notes that the difference has not been reconciled.[677] This undermines the credibility of both figures.

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672 Following the same cumulative payout ratio approach used by Hathaway and NERA for all equity, Handley developed an estimate for only listed equity, based on ATO tax data, of 0.8 (see Handley, J., *Advice on the value of imputation credits*, 29 September 2014, p. 28).

673 Handley, J., *Advice on the NERA Report: Estimating Distribution and Redemption Rates from Taxation Statistics*, 20 May, 2015, p. 11.

674 Lally, M., *Gamma and the ACT Decision*, 23 May 2016, p. 26.

675 The privately owned businesses are the DBP, which is owned by the Australian Gas Infrastructure Group (which is owned by CK Infrastructure Holding, which is listed in Hong Kong), the GGP, which is 88% owned by APA (listed in Australia), and the Midwest South West Gas Distribution System, which is owned by ATCO Gas Australia who in turn is owned by the ATCO Group (listed in Canada).

676 Handley, J., *Advice on the Value of Imputation Credits*, 29 September 2014, p. 28.

677 Hathaway, N., *Imputation Credit Redemption: ATO data 1988-2011: Where have all the credits gone?* September 2013, section 1.3.

1648. In addition, the ATO data distribution rate is estimated for all firms, which is inappropriate for regulated businesses and would underestimate their distribution rate.[678]

1649. As part of the AER's 2018 review of its guidelines, it sought clarification from the ATO on the use of tax statistics. In May 2018, the ATO advised the AER that the taxation statistics data should not be used for detailed time series analysis of the imputation system. The ATO did not recommend using taxation statistics data as the basis of a detailed macro analysis of Australia's imputation system.[679]

1650. Given the credibility of the ATO data and its opinion regarding use of the data, the ERA considered it inappropriate to use ATO data to determine the distribution rate.

1651. Therefore, the alternative data source is from the financial statements of listed firms.

1652. Lally explains how data from the financial statements of listed firms does not have the same problems as the ATO data.[680]

- The financial statement data is audited.
- Researchers are able to personally identify the source data rather than having to rely upon the aggregation carried out by the ATO.
- Financial statement data is internally consistent, that is, there are no unexplained discrepancies in the financial statement data whereas there are major inconsistencies in the ATO data, which casts doubt on all of it.
- Data from listed firms will not include the effects of dividend policies associated with unlisted firms.

1653. As a proxy for the benchmark efficient entity's distribution rate Lally uses the 20 largest ASX firms. Using data from the financial statements of the 20 largest ASX firms Lally estimated the distribution rate at 0.83.[681]

1654. While recognising the limitations of using individual firm or industry data to set the distribution rate, Lally's analysis confirmed that the appropriate estimate for the distribution rate of the benchmark efficient entity is at least 0.83.

- Lally examined the distribution rates of firms within the industry over the last 10 years. The three energy network businesses for which data is available produced a distribution rate of one. This suggested that the distribution rate may be above 0.83.[682]

678 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 37.

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

680 Lally, M., *Estimating the Distribution Rate for Imputation Credits*, July 2015, p. 3.

681 Lally, M., *Estimating the Distribution Rate for Imputation Credits*, July 2015, Table 1.

682 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, pp. 19-20.

- Lally also detailed that for the purposes of estimating the distribution rate a benchmark efficient entity should be defined, and the distribution rate then estimated, from a set of firms that approximately match with the definition of the benchmark efficient entity. The benchmark efficient entity does not have foreign operations. Lally removed firms with significant foreign operations from the list of 20 firms and calculates a distribution rate of 0.92.[683] This also suggested that the distribution rate may be above 0.83.

1655. On the basis of the above analysis, in the draft guidelines, the ERA considered the use of the 20 largest ASX-listed firms as the best proxy for the distribution rate for the benchmark efficient entity.

1656. The ERA considered a distribution rate of 0.83 to be appropriate.

16.3.6 Utilisation rate

1657. The benefit of distributed imputation credits is determined by the proportion of franking credits received that is used by the representative investor. The estimate of this proportion is known as the utilisation rate.

1658. 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.

1659. The ERA's past approach to estimating the utilisation rate used three methods with different weightings given to each of the approaches. These three methods were the equity share approach, the taxation statistics approach and the dividend drop off method.

1660. The utilisation rate must be defined in accordance with a derivation of the Officer model. Therefore, the utilisation rate is a market-level parameter of all investors in the Australian market, meaning that the same value applies to all firms.[684]

1661. Individual investors have different utilisation rates. Investors who are able to fully use tax credits are assigned a value of one, while investors who cannot are assigned a value of zero. These individual utilisation rates may be weighted to produce the required market-level utilisation rate.[685,686]

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683 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 34.

684 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, pp. 17-18.

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

Lally, M. and van Zijl, 'Capital Gains Tax and the Capital Asset Pricing Model', *Accounting and Finance,* vol.43, 2003, pp. 187-210.

686 The normal source of the definition of a parameter within a model is the definition provided in the paper that derives the model. However, in this case, the seminal Officer paper has been interpreted by experts in different ways. However, the ERA considered that Lally and van Zijl provide a rigorous derivation of the Officer model.

In this derivation, the utilisation rate is a complex weighted-average over the utilisation rates of individual investors, where the utilisation rates for individual investors are 1 if they can fully use the credits to reduce their personal tax obligations and 0 if they cannot use the credits. The weights involve the proportion of risky assets held by each investor and other unobservable terms (Lally, M., *The Estimation of Gamma,* Report for the AER, November 2013, p. 11; and Lally. and van Zijl, *Capital Gains Tax and the Capital Asset Pricing Model*, *Accounting and Finance*, vol.43, 2003, pp.187-210.).

Lally notes that the unobservable terms may vary over investors but do not lend themselves to estimation and therefore one could act as if they are equal across investors in which case the utilisation rate is the proportion

1662. Therefore, the utilisation rate is a complex weighted average over all investors holding risky assets, where the weights incorporate each investor's investment in risky assets and their level of risk aversion.

1663. The estimate of the utilisation rate has attracted significant debate in the context of utility regulation. To estimate the utilisation rate, regulators and academics have used a variety of approaches, including the equity ownership approach, the taxation statistics approach and various market-based approaches (such as the dividend drop-off method).

1664. Three approaches are discussed below: the equity ownership approach, the taxation statistics approach and use of implied market value studies (including the dividend drop-off method).

1665. On the basis of the information detailed below, in the draft guidelines the ERA considered that the equity ownership approach is the most robust method to calculate the utilisation rate. The ERA will rely solely on the equity share approach to estimate the utilisation rate.

16.3.6.1 Equity ownership approach

1666. The utilisation rate, by definition, is a complex weighted average over the utilisation rates of individual investors. Utilisation rates for individual investors are one if they can fully use the credits to reduce their personal tax obligations and zero if they cannot use the credits. The weights recognise the proportion of risky assets held by each investor and other unobservable terms.

1667. If these other terms are equal across investors, then the market utilisation rate is the proportion of Australian risky assets held by investors who can use imputation credits. Furthermore, since this assumption cannot be confirmed or rebutted, because these other terms are unobservable, then realistically the utilisation rate should be treated as if it is the proportion of risky assets held by those investors who can use the credits.

1668. Assuming that all local investors can fully use the credits and foreign investors cannot, it follows that the utilisation rate is the proportion of Australian risky assets held by local investors. Accordingly, an estimate of the proportion of Australian equities held by local investors is an estimate of the utilisation rate.

1669. There have been stakeholder views expressed that the Officer model assumes national equity markets are fully segregated and therefore the only investors in the model would be local investors. This would result in an utilisation rate of one.

1670. Lally expanded on this by recognising that when applying a purely theoretical CAPM, and the Officer model, two limiting steps have been taken. The first is to assume that the assets available to any investor are only local assets, this is called market segmentation. The second limiting step in the model is to treat a portfolio compromising only equities as the local market portfolio. Lally goes on to explain that the belief that investors to which the CAPM, and the Officer model, relate include foreigners is inconsistent with these models.[687]

of risky assets held by investors who can use the imputation credits (Lally, M., *Gamma and the ACT Decision*, May 2016, p. 16).

687 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, pp. 21-23.

1671. However, Lally stated that the Officer model assumes complete segregation whilst the empirical reality is otherwise, but there is no suitable model for addressing partial integration. So, there is no easy solution to this problem. The usual approach has been to use the Officer model combined with parameter estimates for the utilisation rate that reflect the fact of partial integration.[688]

1672. The ERA and AER have both taken such a partial integration approach when estimating the utilisation rate.

1673. Lally said that it does not follow that the AER is wrong to include foreign investors when estimating the utilisation rate. This might be done to pragmatically incorporate the empirical reality of foreign investors into a model that implicitly precludes them, in the belief that this produces more realistic results.[689]

1674. Consistent with the AER approach, the ERA considered it as pragmatic to interpret this definition to recognise the existence of foreign investors. This approach therefore defined the utilisation rate as a weighted average over the utilisation rates of all investors in the Australian market, both foreign and local investors.

1675. Taking this approach also has the benefit of providing an estimator that can be fairly reliably estimated, which contrasts with difficulties of other approaches to estimating the utilisation rate.

1676. Lally favoured the use of all equity rather than only listed equity. This aligns with the CAPM model and does not rule out using it to estimate the cost of equity for an unlisted company (and some regulated businesses are unlisted).[690] [691]

1677. ABS information on equity ownership obtained from the Australian National Accounts can be used to estimate the utilisation rate.[692]

1678. The ABS has undertaken some quality assurance work for this historical data through its reviews of compilation methods and source data across the National Accounts. The time series was opened back to 1998 in this review. The Finance and Wealth publication has incorporated revisions as a result of the review.[693]

1679. Lally favoured an estimate for the utilisation rate of 60 per cent, based on ABS data for all equity.[694]

1680. The ERA has updated the equity ownership data for September 2017 after the ABS published the National Account revision.

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688 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 32.

689 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 23.

690 Lally, M., *Review of Submissions to the QCA on the MRP, Risk-Free Rate and Gamma,* March 2014, pp. 34-35.

Lally, M., *Gamma and the ACT decision*, May 2016, p. 18.

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

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

693 A technical note which provides details about the major quality assurance work that was undertaken can be found : http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/5232.0Technical+Note1Sep%202017

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

1681. When using this ABS data, the ERA has refined the equity ownership approach by filtering the national accounts data to focus on the type 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 AER. [695] 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 use imputation credits – 'households', 'pension funds', and 'life insurance corporations'.
- Sums the equity held by those classes of investor 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 utilise 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.

1682. The resulting domestic ownership for all equity has tended to lie in the range between 58 per cent and 70 per cent much of the time, with an average of 62 per cent over 118 quarterly observations.

1683. On the basis of this analysis, in the draft guidelines, the ERA considered Lally's recommended 60 per cent estimate for the utilisation rate was appropriate.

16.3.6.2 Taxation statistics approach

1684. Tax statistics estimate the use of imputation credits, which is a measure of the imputation credits redeemed by shareholders. This method uses ATO statistics to observe the proportion of distributed imputation credits that investors have used to reduce their personal taxation liabilities. It follows that the average market value of a franking credit is equal to the proportion of franking credits redeemed.[696]

1685. This approach implicitly assumes that the market value of a redeemed franking credit is equal to its face value, whilst an unredeemed franking credit has no value.

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

[696] NERA Economic Consulting, *The Value of Imputation Credits*, A report for the ENA, Grid Australia and APIA, 11 September 2008, p. 23.

1686. The redemption rate for one year therefore is the total credits redeemed divided by the total credits issued. If all credits issued to investors who can use them are redeemed, it follows that the redemption rate is the total credits issued to investors who can use them divided by the credits issued to all investors. In addition, if investors who can use the credits choose Australian stocks with the same ratio of imputation credits to equity value as do investors who cannot use the credits, the redemption rate would be the proportion of Australian equities held by investors who can use the credits. As discussed earlier, essentially this is the utilisation rate.[697]

1687. In the past, regulators have considered two studies – performed by Hathaway and Officer (2004) and Handley and Maheswaran (2008) – when estimating the utilisation rate.[698] These reports relied on company statistics published by the ATO.[699]

1688. Hathaway and Officer (2004) used ATO company statistics to estimate the proportion of redeemed imputation credits from 1988 to 2002.[700] They calculated that 71 per cent of company tax payments had been distributed as imputation credits on average and estimated that 40 per cent to 50 per cent of the distributed credits were redeemed by taxable investors.[701]

1689. Handley and Maheswaran (2008) used the same data to examine the reduction in individual tax liabilities due to imputation credits from 1988 to 2004.[702] Their study found that 67 per cent of distributed imputation credits were used to reduce personal taxes between 1990 and 2000, and this increased to 81 per cent over 2001 to 2004.

1690. However, Hathaway cautioned that greater reliance should be placed on estimates derived from post-2004, given reliability problems with ATO statistics from years prior to 2004.[703]

1691. Hathaway provided more recent estimates, using data for 2004 to 2011 – of 44 per cent or 62 per cent – depending upon whether ATO franking account balance data or ATO dividend data were used.[704] Rather than using ATO company statistics, which are subject to double counting errors, Hathaway provided separate estimates based on ATO franking account balance data and ATO dividend data,[705] and highlighted the large, and apparently non-reconcilable, discrepancy between the two datasets.[706]

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697 Lally, M., *Gamma and the ACT Decision*, 23 May 2016, pp. 18-19.

698 ERA, *Explanatory Statement for the Rate of Return Guidelines: Meeting the Requirements of the National Gas Rules*, 16 December 2013, p. 212.

699 Hathaway, N., *Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?* September 2013, p. 6.

700 Hathaway, N. and Officer, R., *The Value of Imputation Tax Credits,* working paper, Melbourne Business School, 2004, p. 14.

701 Hathaway, N. and Officer, R., *The Value of Imputation Tax Credits,* working paper, Melbourne Business School, 2004, p. 14.

702 Handley, J. and Maheswaran, K., ‘A Measure of the Efficacy of the Australian Imputation Tax System’, *The Economic Record*, vol. 84, No. 264, 2008, pp. 82-94.

703 Hathaway, N., *Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?* September 2013, para 32.

704 Hathaway, N, *Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?* September 2013, section 1.3.

705 Hathaway, N and Officer, R., *The Value of Imputation Tax Credits,* working paper, Melbourne Business School, 2004, p. 14.

706 Hathaway, N., *Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?* September 2013, p. 4.

1692. Hathaway has expressed concern with the ATO data, and cautioned about relying on it for estimating utilisation rates:

> Unfortunately, there are too many unreconciled problems with the ATO data for reliable estimates to be made about the utilisation of franking credits. The utilisation rate of franking credits is based on dividend data (from the tax office) and I have demonstrated that this data is questionable.[707]

1693. Lally has also noted that the ATO data from which the redemption rate is estimated contains significant unexplained discrepancies that give rise to two significantly different estimates of the redemption rate.[708]

1694. Hathaway gave more weight to the estimate based on ATO franking account balance data, stating that:[709]

> …I have more faith in the [ATO franking account balance] data than in the dividend data. The dividend data appears to be missing about $87.5 billion and the ATO has had substantial problems with the dividend data in the past.

1695. Hathaway's estimate using ATO franking account balance data has also been updated by various parties since it was originally calculated. NERA uses data for 2004 to 2012 and updates Hathaway's estimate using tax data for one additional year to 45 per cent.[710] Similarly, Gray uses data from 2004 to 2013 to arrive at an estimate of 46 per cent[711] and the AER uses data from 2004 to 2014 to arrive at an estimate of 48 per cent.[712]

1696. As part of the AER's 2018 review of its guidelines, it sought clarification from the ATO on the use of tax statistics. In May 2018, the ATO advised that taxation statistics data should not be used for detailed time series analysis of the imputation system. The ATO did not recommend using taxation statistics data as the basis of a detailed macro analysis of Australia's imputation system.[713]

1697. In the draft guidelines, given the credibility of the ATO data and the opinion expressed by the ATO, the ERA considered it inappropriate to use ATO data to determine the utilisation rate.

16.3.6.3 Implied market value studies and the dividend drop-off method

1698. Implied market value studies infer the value of distributed imputation credits from market prices.

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707 Hathaway, N., *Imputation credit redemption ATO data 1988–2011: Where have all the credits gone?*, September 2013, p. 39.

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

709 Hathaway, N., *Imputation credit redemption ATO data 1988-2011, Where have all the credits gone?* September 2013, p. 39.

710 NERA, Estimating Distribution and Redemption Rates from Taxation Statistics, March 2015, section 4.

711 Frontier Economics, *The Appropriate Use of Tax Statistics when Estimating Gamma*, 6 January 2016, pp. 31-32.

712 AER, *TasNetworks distribution determination 2017-18 to 2018-19 – Attachment 4 – Value of imputation credits*, April 2017, p. 4-15.

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

1699. Implied market value studies can be used to estimate the utilisation rate, based on empirical market data. Unlike the equity ownership approach and taxation statistics approach, they make inferences from market data.

1700. Implied market value techniques include:

- simultaneous price studies for individual stocks
- simultaneous price studies for share indexes
- time series analysis of returns
- dividend drop-off studies.

1701. Simultaneous price studies for individual stocks are not appropriate for estimating the utilisation rate at the current time because these studies have examined only a small number of stocks.[714]

1702. Simultaneous price studies for share indexes, overcome this concern with studies dealing with individual stocks. However, there is only one such study, using data from 2002 to 2005, and the resulting estimates of the coefficient on imputation credits are 0.52 and 0.55 from two different specifications.[715]

1703. NERA conducted time series analysis of returns, regressing returns on the imputation credit yield and various control variables, using data from 2000 to 2012 and estimating the coefficient on the credits at -1.95.[716] Since credits are at worst worthless, the highly negative estimate is implausible as noted by Ainsworth, Partington and Warren.[717] Accordingly, the ERA gave this study no weight.

1704. Dividend drop-off studies have been more widely used than simultaneous price studies or time series analysis of returns.

1705. 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.

1706. 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 to 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

714 ERA, *Explanatory Statement for the Rate of Return Guidelines*, 16 December 2013, p. 214.

715 Cummings and Frino, *Tax Effects on the Pricing of Australian Stock Index Futures*, *Australian Journal of Management*, Vol. 33, 2008, pp. 391-406, Table 2 and Table 4.

716 NERA, *Imputation Credits and Equity Prices and Returns*, 2013, section 3 and Table 3.5.

717 Ainsworth, A., Partington, G. and Warren, G., *Do franking credits matter? Exploring the financial implications of dividend imputation*, June 2015, CIFR Working Paper No. 058/2015, p. 17.

that investors will not fully value the combined package of the gross dividend,[718] the expected price drop-off should be less than that of the face value.

1707. 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.

1708. A paper by McKenzie and Partington highlighted the imprecision inherent in the dividend drop off method.[719] The authors showed that the drop-off ratio could vary considerably, depending on the particular specification or regression technique applied. As such, they were of the view that it was appropriate to consider the estimates of utilisation rate from various dividend drop-off studies.

1709. The estimation issues of dividend drop-off studies manifest themselves in the lack of consensus in the literature about the estimate of the utilisation rate.

1710. 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 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 atypical 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 of 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.[720]

- There is considerable evidence of irregular share price behaviour around ex days, which raises the possibility that any estimate of the utilisation rate from a dividend drop-off analysis would simply reflect that behaviour.[721]

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718 As explained previously, investors incur costs in obtaining franking credits, which result in franking credits and net dividends being valued at less than their face value. These costs include transaction costs, risk, lack of international diversification for domestic investors and international investors' inability to utilise franking credits.

719 McKenzie, M. and 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.

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

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

- 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.[722]

1711. Lally summarised the difficulties with using market based estimates well.

> …market based estimates are unreliable estimates of the average utilization 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 behaviour.[723]

1712. For these reasons, the ERA placed no weight on the dividend drop-off estimates and on the range of applied market value estimates more generally.

16.3.7 Estimation of gamma

1713. The value of imputation credits (gamma) is estimated as the product of the distribution rate and the utilisation rate.

1714. On the basis of the above analysis, the ERA considered that an appropriate estimate for:

- the distribution rate is 0.83
- the utilisation rate is 0.60.

1715. In the draft guidelines, therefore, the ERA estimated gamma as 0.50.

1716. This gamma value will be fixed over the period of the guidelines.

16.3.8 Consistency with the National Gas Law and National Gas Rules

1717. The Officer framework provides the basis for the rate of return framework in the National Gas Law and the National Gas Rules. It follows that estimating the value of imputation credits consistent with the Officer framework will best promote the national gas objective and the other requirements of the National Gas Rules.

1718. The ERA has also taken into account the revenue and pricing principles. The revenue and pricing principles provide, amongst other things, that:

- A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs providing regulated services and complying with regulatory obligations.
- A service provider should be provided with effective incentives in order to promote economic efficiency with respect to the regulated services it provides.
- A price, charge or tariff for the provision of a regulated service should allow for a return commensurate with the regulatory and commercial risks involved in providing the regulated service.

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

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

1719. Therefore, the gamma determined in these guidelines will promote the achievement of the national gas objective (via its application in the estimated cost of corporate income tax building block) if it takes into account the revenue and pricing principles, being:

- Not too low, in that it contributes to providing a reasonable opportunity to recover at least efficient corporate tax costs,
- Not too high, in that it contributes to a return that is not excessive and is commensurate with the relevant risks.

1720. The ERA was satisfied that the gamma value balanced the opportunity for service providers to recover at least the efficient costs the service provider incurs in providing the reference services.

1721. The ERA therefore considered that its estimate is fit for purpose.

16.4 Public submissions

1722. Submissions from AGIG, APGA, ATCO, ENA and GGT considered gamma. [724] [725] [726] [727] [728]

1723. ATCO's position was informed by a report it commissioned from Frontier Economics.[729]

16.4.1 General approach to gamma

1724. AGIG, APGA and GGT submitted that there was no case to change gamma and that gamma should be maintained at 0.4.

1725. AGIG noted the substantial past review, including Australian Competition Tribunal and legal review to determine a gamma of 0.4. AGIG submitted that new information from Lally and the ATO was no more conclusive than the information that preceded it.

1726. ATCO and ENA considered that gamma should be estimated directly from ATO data. Under this approach gamma would be estimated as the ratio of credits redeemed to credits created.

- ATCO argued that this method was simple and produced stable results. It would avoid the need to separately estimate the distribution rate and the utilisation rate.

724 AGIG, *Submission on the ERA's draft rate of return guideline*, September 2018, pp. 22-25.

725 APGA, *Draft Rate of Return Guidelines (2018) for Gas Transmission and Distribution Networks,* September 2018, p. 3.

726 ATCO, *Re: Draft Rate of Return Guidelines (2018)*, September 2018, pp. 9-11.

727 ENA, *Draft Rate of Return Guidelines 2018: Submission to the ERA*, September 2018, pp. 3-4, 21-31.

728 GGT, *Goldfields Gas Pipeline Rate of return guidelines review: Response to the ERA Draft Rate of Return Guidelines*, September 2018, pp. 34-37.

729 Frontier Economics, *The 'utilisation' estimate of gamma – Report prepared for ATCO Gas Australia,* August 2018.

- ATCO and ENA argued that there were not material concerns with the ATO estimates of credits created or credits redeemed, and the ATO tax data could directly estimate gamma. ATCO and ENA referred to a June 2018 Hathaway report that they considered confirmed the calculation from ATO data as a ratio of credits redeemed to credits credited.[730]

- ENA argued the ATO tax data provided a point estimate rather than an upper bound. However, ENA noted that the disadvantage of the ATO data was that it included unlisted equity. The distribution rate for listed equity may exceed that for unlisted equity. ENA considered that the ATO estimate would therefore be a lower bound for gamma for listed equity.

- ENA considered that the evidence supported a gamma range of 0.34 (based on ATO tax approach) to 0.39 (based on 20 ASX firm approach and equity ownership for listed equity).

- ATCO argued that gamma should be based on ATO data and the all equity gamma estimate of 0.34.

1727. ATCO and ENA considered it was internally inconsistent to estimate the proportion of credits that are distributed to one group of shareholders and the proportion that are redeemed by an entirely different group of shareholders. ATCO referred to this as a ‘cash flow’ interpretation of gamma.

16.4.2 Distribution rate

1728. AGIG, ATCO, ENA and GGT submitted that the top 20 ASX firms were not appropriate comparators for the benchmark efficient entity, as many of them were banks and most had foreign profits.

1729. AGIG and ENA raised concern that the Lally approach assumed that all reductions in the Franking Account Balance (FAB) related to credits being distributed to shareholders. AGIG and ENA argued that material reductions occurred for other reasons, for example tax refunds and corporate structures extinguishing credits.

1730. ATCO submitted the distribution rate estimates provided by Lally contained several unresolved issues, including its reliance on FAB data. AGIG and ENA also linked the ATO advice on the unreliability of its FAB data with Lally’s estimate of the distribution rate from company FAB data.

1731. AGIG considered the unreliability of data did not support the ERA moving away from its current practice and placing sole weight on the top 20 ASX firms. ENA considered that the evidence did not support placing 100 per cent weight on the Lally 20 ASX firms.

1732. AGIG and ENA argued that Lally’s approach should be interpreted as an upper bound rather than a point estimate.

[730] Hathaway, N., Capital Research Memorandum, 28 June 2018, available https://www.aer.gov.au/system/files/ENA%20-%20Capital%20Research%20Memorandum%20-%2028%20June%202018.pdf

16.4.3 Utilisation rate

1733. AGIG noted the use of dividend drop off studies to estimate the utilisation rate had been debated at length during recent regulatory and merits reviews, therefore AGIG did not intend to revisit this debate.

1734. AGIG and GGT considered that the dismissal of taxation statistics should be further investigated. AGIG and GGT considered that the ATO clarified its views on tax statistics on 21 June 2018 and considered that this supported the continued use of tax statistics. They also referred to June 2018 Hathaway advice that concluded there were no outstanding questions on the quality of ATO data on credits created and credits redeemed.[731]

1735. AGIG, ATCO, ENA and GGT noted that there were quality concerns with the ABS data used by the ERA.

- Submissions raised that the ABS itself had expressed quality concerns with the construction of equity ownership estimates.[732]
- ENA submitted that recent revised estimates released by the ABS raised more questions about the reliability of equity ownership estimates than were apparent at the time of the 2013 guideline.

1736. ATCO and ENA expressed concerns that the equity ownership approach did not reflect other reasons why tax credits might not be redeemed by investors in Australia.

1737. AGIG recommended that the ERA should reconsider whether it should solely rely on the equity ownership approach. AGIG considered that both the ABS and ATO datasets provided useful information but both were imperfect. AGIG considered one should not necessarily be given significantly greater weight than the other. AGIG submitted that tax statistics should be weighted no lower than other complementary datasets.

1738. GGT was of the view that relying on equity ownership statistics and not drawing on the evidence from tax statistics was unwarranted. GGT considered that greater weight should be accorded to estimates of the utilisation rate using tax statistics.

1739. ENA argued that evidence did not support the change to placing 100 per cent weight on the equity ownership approach. ENA considered that if the equity ownership approach is used, it should be interpreted as an upper bound rather than a point estimate.

16.4.4 Possible change in tax law

1740. ATCO considered gamma should be fixed until the next review.

1741. AGIG, ATCO and ENA raised the potential of Commonwealth Government changes to the tax imputation system.

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731 Hathaway, N. advice available https://www.aer.gov.au/system/files/ENA%20-%20Capital%20Research%20Memorandum%20-%2028%20June%202018.pdf

732 ABS memo available http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5306.0Feature%20Article150Jun%201992?opendocument&tabname=Summary&prodno=5306.0&issue=Jun%201992&num=&view

1742. AGIG advised caution when determining a fixed gamma and suggested that the ERA retains a degree of flexibility to accommodate tax change.

1743. ENA submitted that it was inappropriate to fix gamma for the duration of the guidelines.

1744. ATCO and ENA submitted that the final guidelines should set out how the estimate of gamma will be changed for any proposed change in tax law.

16.5 Independent Panel

1745. The Independent Panel considered that the information and reasoning supported a gamma of at least 0.5 and that stakeholders could implement the methodology at a point in time under both the current arrangements and a binding rate of return arrangement.[733]

1746. The Independent Panel noted that there was some further information that the Explanatory Statement could include in support of the ERA's preferred estimate of gamma. The Independent Panel considered that this information supported the proposition that the estimate of gamma was conservative in the sense that it is at least 0.5. [734]

1747. The Independent Panel considered that the proposed approach for the distribution rate was reasonable. The Independent Panel considered that it would be relevant to explain why it was better than using the distribution rate from the sample of four firms that were used to estimate benchmark gearing and beta. [735]

1748. The Independent Panel noted that the court decisions for the AER determinations supported the interpretation of the utilisation rate and affirmed the AER's conclusion about the value of gamma at the time. [736]

1749. The Independent Panel noted additional information that the equity ownership approach may represent a lower bound for the utilisation rate.

- Some experts argued that it was wrong to exclude from the equity ownership calculation, entities that were wholly owned by the public sector, and that doing so would mean that the utilisation rate was upwardly biased. However, there is an argument that the government sector in effect has a utilisation rate of one because company tax is in effect pre-payment of tax for domestic shareholders that can be used to reduce their overall tax liabilities but in the case of the government there is no further tax liability to offset and this is equivalent to assuming a utilisation rate of one. The AER has also noted that it could have assumed the government sector had a utilisation rate of one given the equity

[733] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 75.

[734] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 75.

[735] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 73.

[736] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 75.

was Australian owned and that an estimate of gamma that was reduced due to government entities being assumed not to redeem credits was not appropriate.[737]

- The equity ownership methodology assumed that the utilisation rate for foreign investors was zero, but no mention was made of whether double taxation agreements between Australia and other countries such as the United States effectively enabled some credit paid for company taxes paid in Australia.[738]

16.6 Final approach

1750. 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.

1751. 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.

1752. In estimating the distribution rate, the ERA relies on 0.9 for the distribution rate from financial reports of the 50 largest ASX-listed firms. [739]

1753. The ERA considers that the distribution rate is at least 0.9. As detailed by Lally, the three energy network businesses for which data is available produce a higher distribution rate of one. Addressing the problems of limited available data and ability for firm manipulation, the ERA considers the use of the 50 largest ASX listed firms as the best proxy for the distribution rate for the benchmark efficient entity. Lally also found that the distribution rate may be slightly higher with the removal of foreign operations. [740]

1754. 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.

1755. 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. The utilisation rate is estimated for all Australian equity from the national accounts of the ABS. The ERA considers that a utilisation rate of 0.60 is appropriate.

1756. The ERA estimates gamma as the product of the distribution rate and the utilisation rate to provide a gamma of 0.5, which is rounded to one decimal place.

1757. This gamma value will be fixed over the period of the guidelines.

[737] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, pp. 75-76.

[738] Independent Panel Review of Economic Regulation Authority Draft Rate of Return Guidelines, October 2018, p. 76.

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

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

16.7 Final reasoning

1758. In addition to considerations in its draft reasoning, the ERA has also given further consideration to gamma in response to:

- public submissions
- Independent Panel comment
- further clarifications from the ATO on the use of its data for the purpose of estimating gamma[741] [742] [743]
- new advice from Lally. [744] [745] [746]

16.7.1 Clarification of taxation statistics

1759. 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.

1760. 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 did not recommend using taxation statistics data as the basis of a detailed macro analysis of Australia's imputation system.[747]

1761. On 21 June 2018, the AER, ATO, experts and network stakeholders had an additional meeting to clarify the ATO's note. The minutes from this meeting are available on the AER's website.[748] 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.

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741 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

742 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

743 AER minute on meeting with ATO. 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

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

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

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

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

748 ATO note to the AER regarding imputation. 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

- 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.

1762. On 14 September 2018, the ATO provided a further note that clarified that taxation statistics data should not be applied to all aspects of the imputation system.[749]

1763. Lally, who also attended the June 2018 meeting, considered that the ATO's September 2018 note states unequivocally that no ATO data should be used for examining the imputation system.[750]

1764. Given the credibility of the ATO data and the opinion expressed by the ATO, the ERA continues to consider it inappropriate to use ATO data to determine gamma.

16.7.2 Lally review

1765. 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.

1766. The findings from Lally's July 2018 review of gamma are summarised below.[751]

- 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.[752]
- The review noted that the empirical reality was that the market was partially integrated.[753]

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[749] AER minute on meeting with ATO. 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

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

[751] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018.

[752] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.

[753] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.

- The review noted 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.[754]

- Lally favoured the use of ABS data for estimating the proportion of Australian equities held by local investors.[755]

- Lally disagreed with the three principal propositions from Frontier.[756]

  - 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.

  - There are deficiencies in the ABS data but not to the extent 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, these 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.

[754] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.

[755] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 17.

[756] Lally, M., *Review of gamma submission and the ERAWA's views on gamma,* 25 July 2018, p. 3.

1767. 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.[757]

- With regard to Frontier's concerns on Lally's distribution rate calculation:
  - Frontier argued that the problems with the use of the ATO 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 does not affect financial statement data from a stable list of companies.
  - Frontier argued that 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.
  - Frontier argued that 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.
- 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 is 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.[758]

1768. In separate advice to the AER, Lally extended his distribution rate analysis from the largest 20 ASX companies to the largest 50 ASX companies.[759] Lally's further analysis can be summarised as follows:

- Lally's further analysis estimates the distribution rate of the 50 largest ASX firms, using data from their financial statement for the period 2000 to 2017.
- Lally's expanded top 50 ASX company sample increases the distribution rate estimate to 89 per cent, compared to 83 per cent from the top 20 ASX companies.[760]

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

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

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

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

- Lally considered that 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.[761]

1769. Lally also reviews recent 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: [762]

- The ATO's September 2018 note states unequivocally that no ATO data should be used for examining the imputation system.[763]
- Lally reaffirmed his earlier rebuttals to Frontier's report.
- Lally 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.
- Lally found that removing foreign ownership increased the distribution rate.
- Lally considered whether an estimate of gamma based on the ATO data for all equity was appropriate. Lally considered that 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.[764]
- Lally 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.[765]
- Lally considered that the distribution rate should be estimated from financial statement data. Lally considered that the distribution rate should be estimated with a large set of firms (to avoid manipulation of price or revenue cap) and that firms should be selected on the basis of market cap (subject to deleting firms with substantial foreign operations).[766]
- Lally 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. [767]

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

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

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

764 Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 3.

765 Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, p. 8.

766 Lally, M., *The Estimation of Gamma: Review of Recent Evidence*, December 2018, pp. 3-4.

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

- Lally 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.[768]

- Lally considered that the best estimate for the utilisation rate was 0.65 rounded to the nearest 0.05. [769]

16.7.3 Estimating the distribution rate

1770. In addition to the reasoning in its draft reasoning, the ERA has given the distribution rate further consideration in light of new information.

1771. 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.[770] The ATO data also has the problem of being market wide, which means that it is not reflective of the benchmark efficient entity.

1772. Given the credibility of the ATO data and the opinion expressed by the ATO, the ERA continues to consider it inappropriate to use ATO data to determine the distribution rate.

1773. The ERA disagrees with concerns over the use of Lally's distribution rate calculation.

1774. The ERA considers that it is not necessary to use the same set of companies for estimating the utilisation and distribution rates.

1775. The ERA considers there is merit in extending the analysis of the distribution rate beyond the top 20 ASX listed companies. Extending the distribution rate to 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.

1776. The ERA recognises that foreign operations does 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. [771] 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.

1777. 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.

1778. For the final guidelines, the ERA considers a distribution rate of 0.9 appropriate.

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

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

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

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

16.7.4 Estimating the utilisation rate

1779. In addition to its draft reasoning, the ERA has given the utilisation rate further consideration in light of new information.

1780. There is no suitable model that addresses national equity markets being partially integrated:

- The ERA and AER have both taken a partial integration approach when estimating the utilisation rate.
- Lally considered that it did not follow that it was wrong to include foreign investors to estimate the utilisation rate. This might be done to pragmatically incorporate the empirical reality of foreign investors into a model that implicitly precludes them, in the belief that this produces more realistic results.[772]
- The ERA considers it as pragmatic to interpret this definition to recognise the existence of foreign investors. This approach therefore defines the utilisation rate as a weighted average over the utilisation rates of all investors in the Australian market, both foreign and local investors.
- Lally considered that 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.[773]
- Taking such an approach to define the utilisation rate also has the benefit of providing an estimator that can be fairly reliably estimated, which contrasts with difficulties of other approaches to estimating the utilisation rate.

1781. ABS information on equity ownership obtained from the Australian National Accounts for all equity can be used to estimate the utilisation rate.[774]

1782. When using this ABS data, the ERA has refined the equity ownership approach by filtering the national accounts data to focus on the type 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 AER.[775] 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'.
- Sums the equity held by the classes of investors that are not eligible to utilise imputation credits - 'the rest of the world'.

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772 Lally, M., *Review of the AER's views on gearing and gamma,* May 2018, p. 23.

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

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

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

- Determines the share of equity held by domestic private investors eligible to utilise 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.

1783. Based on the most recent updated ABS data,[776] all (listed and unlisted) equity suggests a range for the utilisation rate of between 0.6 to 0.7.

1784. 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.

1785. Given estimation accuracy, the ERA considers it appropriate to only round to one decimal place. Therefore, the ERA considers a utilisation rate of 0.6 is appropriate.

1786. The ERA notes the Independent Panel's discussion of the equity ownership approach representing a lower bound for the utilisation rate, given effects of government ownership and intercountry tax agreements. The ERA has not accounted for these possible effects.

1787. For the final guidelines, the ERA considers a utilisation rate of 0.6 appropriate.

16.7.5 Estimate of gamma

1788. Having considered all available information, the ERA considers that the following approach to gamma is appropriate for the final guidelines:

- The determination of gamma through the Monkhouse formula as the product of the distribution rate and utilisation rate.[777]

- 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.

- To estimate the distribution rate, the ERA is informed by the distribution rate from financial reports of the 50 largest ASX-listed firms.[778]

- The ERA considers that the distribution rate is at least 0.9. As detailed by Lally, the three energy network businesses for which data is available produce a higher distribution rate of 1. Addressing the problems of limited available data and ability for manipulation, the ERA considers the use of the 50 largest ASX listed firms as the best proxy for the distribution rate for the benchmark efficient entity.

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776 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

777 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.

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

Lally also found that the distribution rate may be slightly higher with the removal of foreign operations.

- 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 1 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 based parameter.

- 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. The utilisation rate is estimated for all Australian equity from the national accounts of the ABS. The ERA considers that a utilisation rate of 0.6 is appropriate.

- The ERA estimates gamma as the product of the distribution rate and the utilisation rate to provide a gamma of 0.5, rounded to one decimal place.

1789. The Independent Panel also considered that the information and reasoning support a gamma of at least 0.5.

1790. For the final guidelines, the ERA considers a gamma of 0.5 is appropriate.

16.7.6 Flexible gamma

1791. Submissions raised the potential of changes to the tax imputation system with a change of Commonwealth Government. These submissions argued for the ERA to retain a degree of flexibility to accommodate tax change.

1792. The ERA has given the potential for future tax reform further consideration.

1793. The ERA considers that the detail of any change to the tax imputation system and tax law is uncertain. There remains policy uncertainty over the extent of any change and its timing. It would, therefore, not be possible to design a change to gamma without the use of discretion.

1794. Furthermore, any required legislative change would only progress after the Federal election. After the election and the appointment of the Government it would take time to develop, draft and progress any change in tax law through Parliament.

1795. The ERA considers that the introduction of change to the tax imputation system will not be soon and likely to be closer to the new review of a binding instrument. The ERA will be better positioned to reflect any change to the tax imputation system as part of its next review.

1796. The ERA's position on gamma continues to be based on the current tax system.

1797. The ERA considers it is appropriate that the final guidelines fix gamma until the next review.

Appendix 1 List of Tables

Appendix 2 List of Figures

Appendix 3 Abbreviations

Acronym	Full text
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACT	Australian Competition Tribunal
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ATCO	ATCO Gas Australia
ATO	Australian Tax Office
BHM	Brailsford, Handley and Maheswaran
bppa	Basis points per annum
DBP	Dampier Bunbury Pipeline (and DBNGP (WA) Transmission Pty Ltd)
DRP	Debt Risk Premium
ERA	Economic Regulation Authority
ENA	Energy Networks Association
EUAA	Energy Users Association of Australia
GGT	Goldfields Gas Transmission
IPART	Independent Pricing and Regulatory Tribunal (of NSW)
MRP	Market risk premium
WAMEU	Western Australian Major Energy Users Inc
NER	National Electricity Rules
NERA	NERA Economic Consulting
NEL	National Electricity Law
NEM	National Electricity Market
NGL	National Gas Law
NGO	National Gas Objective
NGR	National Gas Rules
NSW T Corp	New South Wales Treasury Corporation
QTC	Queensland Treasury Corporation
RAB	Regulatory Asset Base
RBA	Reserve Bank of Australia
RPP	Revenue and Pricing Principles (Section 24 of the NGL)
SFG	Strategic Finance Group Consulting
WACC	Weighted average cost of capital

Appendix 4 Summary of main changes from previous guidelines

The following table summarises the main changes between the rate of return guidelines last published by the ERA in 2013, and this current iteration of the rate of return guidelines.

Parameter	Has there been changes since 2013 rate of return guidelines?	Details of change
The benchmark efficient entity	Yes	Benchmark sample of firms has been updated to reflect current available firms and data.
Gearing	Yes	Gearing moves from 60% to 55% to reflect updated data. Gearing to remain fixed over the guidelines.
Return on debt	No	Method remains the same.
Risk free rate of return	Yes	Averaging period moves from 40 days to 20 days.
Benchmark credit rating	Yes	Credit rating moves from the BBB band to BBB+ to reflect updated data. The credit rating is to remain fixed over the guidelines.
Debt risk premium	Yes	Consistent with the general approach in the Dampier to Bunbury Pipeline decision moved to the revised bond yield approach and a hybrid trailing average. Detailed documentation provided.
Return on equity	Yes	Moved from the five step approach to estimating the return on equity to reliance on Sharpe Lintner CAPM.
Market risk premium	Yes	Places less weight on the dividend growth model. Under current regulatory framework uses existing approach and varies at each determination. Under a binding rate of return framework fixing market risk premium over the period of instrument.
Equity beta	No	Method remains the same. Equity beta to remain fixed over the guidelines.
Debt and equity raising costs	Yes	Move from 12.5bppa for debt raising costs to 10bppa. This removes an identified double count. Consistent with the Dampier to Bunbury determination, debt hedging costs increase from 2.5bppa to 11.4bppa to recognise actual types of costs incurred. Debt raising and hedging costs to remain fixed over the guidelines.
Inflation	No	Method remains the same.
Gamma	Yes	The 2013 guidelines had a gamma range of 0.25 to 0.385. While the Dampier to Bunbury Pipeline determination is a gamma of 0.4. Gamma changes to 0.5 and remains fixed. The processes for estimating the distribution rate and utilisation rate have been reviewed as ATO data can no longer be used. For the distribution rate the ERA is informed by the ASX50. For the utilisation rate the ERA relies on the equity ownership approach.

Appendix 5 Debt risk premium process for updating in R

Provided as a separate attachment.

Appendix 6 Debt risk premium process for updating in Excel

Provided as a separate attachment.

Appendix 7 Automatic updating formulas for the return on debt

A8.1 Background

1. The ERA will construct the cost of debt as the sum of the:

   - the bank bill swap rate
   - debt risk premium
   - relevant debt raising and hedging transaction costs.

2. The bank bill swap rate is estimated with the same term as the regulatory period, being five years. The bank bill swap rate is estimated once every five years at the start of the regulatory period, and so does not require annual updating

3. The debt risk premium is estimated using a 10-year trailing average. The trailing average consists of a debt risk premium for the current year and a debt risk premium for each of the nine prior years (and so must be updated each year).

4. Each year's debt risk premium is:

   - based on a term to maturity of ten years
   - based on the BBB credit rating band prior to 2019
   - based on the BBB+ credit rating band from 2019
   - estimated using the ERA's revised bond yield approach
   - estimated using the corresponding 10-year bank bill swap rate estimation.

5. The revised bond yield approach uses international bonds with a country of risk identified by Bloomberg as Australia to estimate the cost of debt each year. The debt risk premium represents the risk spread of the cost of debt estimated over the 10-year bank bill swap rate estimate in any given year.

6. The debt raising and hedging transaction costs are estimated once at the start of the regulatory period and do not require annual updating.

7. This appendix sets out the methods and the automatic formulas for updating the debt risk premium for each regulatory year. The annual update will contribute to the revised tariff that is published at each annual tariff variation.

A8.2 Averaging period

8. The averaging period for each year's debt risk premium estimates will be 20 consecutive trading days.[779]

[779] Trading days are defined as days that Australian Commonwealth Government Security mid-rate data is available in the RBA's F16 statistical table.

9. This averaging period must fall within a window at least two months prior to, but no longer than six months before the regulatory period.

10. The averaging periods must be nominated prior to the ERA's Final Decision. The ERA does not require the nominated 20 trading day averaging period for each of the four years to be identical periods – only that they occur in the above window in each period.

A8.3 Method for estimating the debt risk premium

The simple equally weighted trailing average

11. The estimate of the debt risk premium for each year will be a simple trailing average.

12. The trailing average estimate of the debt risk premium will weigh the most recent ten years of annual debt risk premium estimates that have been estimated.

13. Annual updates of the resulting 10-year trailing average will involve adding the most recent estimate of the debt risk premium, and dropping the estimate from ten years ago. The weights for a simple hybrid trailing average debt risk premium estimate will be 10 per cent each.

14. The automatic formula for the equally weighted trailing average of the debt risk premium to apply in any regulatory year is shown below:

$$TA\ DRP_0 = \frac{\sum_{t=0}^{-9} DRP_t}{10} \quad \text{equation 1}$$

where

$TA\ DRP_0$ is the equally weighted trailing average of the DRP to apply in the following year as the annual update of the estimate used in the current year

DRP_t is the DRP estimated for each of the 10 regulatory years $t = 0, -1, -2 \ldots, -9$.

15. All years are in the same convention as year 0. For example, if year 0 is the regulatory year 2016, t = -9 is the calendar year 2007, because 2016 is a calendar year in the relevant access arrangement. Similarly, if year 0 is the regulatory year 2017, t = -9 is the calendar year 2008.

16. Using the same logic, if year 0 is regulatory year 2014-15, t = -9 is the financial year 2005-06.

17. So, for example, the debt risk premium trailing average estimate for a calendar year 2016 regulatory year will be:

$$\begin{aligned} TA\ DRP_{2016} = {} & 0.1 \times DRP_{2016} + 0.1 \times DRP_{2015} + 0.1 \times DRP_{2014} \\ & + 0.1 \times DRP_{2013} + 0.1 \times DRP_{2012} + 0.1 \times DRP_{2011} \\ & + 0.1 \times DRP_{2010} + 0.1 \times DRP_{2009} + 0.1 \times DRP_{2008} \\ & + 0.1 \times DRP_{2007} \end{aligned}$$

equation 2

Estimates of the forward-looking debt risk premium for inclusion in the trailing average debt risk premium estimate

18. The *forward-looking* estimates of the debt risk premium for each year will be estimated using the ERA's revised bond yield approach.

19. Resulting estimates of the debt risk premium will be included in the trailing average.

20. For example, say that the first estimate is made for the 20-day period ending 30 September 2019, which has been included in the estimate of the debt risk premium for calendar year 2020 in a given access arrangement decision.

21. The next estimate made would fall in the period 1 July to 31 October 2020 (DRP_{2021}) and would be incorporated in the trailing average debt risk premium to apply in 2021 (that is, $TA\ DRP_{2021}$).

22. The automatic formulas would apply, and would remain unchanged for the duration of the access arrangement period, and hence would apply for the estimates made for DRP_{2021}, as well as for the estimates for DRP_{2022}, DRP_{2023}, and DRP_{2024}.

Techniques to estimate the forward-looking debt risk premium

23. As detailed in the guidelines, the ERA will use the following three techniques as part of the automatic process to estimate the debt risk premium contributing to the annual updates:

- the Gaussian Kernel method;
- the Nelson-Siegel method; and
- the Nelson-Siegel-Svensson method.

24. Each of these techniques is discussed in turn below. Further detail is provided in the guidelines and appendices.

The Gaussian Kernel method

25. The Gaussian Kernel method is used by the RBA. This method assigns a weight to every observation in the bond sample – informed by the distance of the observation's residual maturity from the target tenor – according to a Gaussian (normal) distribution centred at the target tenor.

26. Formally, the Gaussian Kernel average credit spread estimator *S(T)* at target tenor *T* (say, five years) for a given rating (say, BBB+ bonds) and date is given by the following equation:

$$S(T) = \sum_{i=1}^{N} w_i(T;\sigma) \times S_i \qquad \text{equation 3}$$

where

$w_i(T;\sigma)$ is the weight for the target tenor T of the i^{th} bond in the sub-sample of bonds with the given broad rating.

S_i is the observed spread on the i^{th} bond in the sub-sample of N bonds with the given broad rating.

σ (sigma), which is measured in years, controls the weight assigned to the spread of each observation based on the distance between that bond's residual maturity and the target tenor. Sigma is the standard deviation of the normal distribution used to assign the weights. It determines the effective width of the window of residual maturities used in the estimator, with a larger effective window producing smoother estimates.

27. The weighting function is as follows:

$$w_i(T;\sigma) = \frac{K(T_i - T;\sigma) \times F_i}{\sum_{j=1}^{N} K(T_j - T;\sigma) \times F_j} \qquad \text{equation 4}$$

where

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

F_i is the face value of the i^{th} bond.

28. The Gaussian Kernel may then be defined as:

$$K(T_i - T;\sigma) = \frac{1}{\sqrt{2\pi}\,\sigma} \exp\left[-\frac{(T_i - T)^2}{2\sigma^2}\right] \qquad \text{equation 5}$$

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

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

31. Where a bond is issued in a foreign currency, weighting in the ERA's Gaussian Kernel estimate uses the principal amount converted into an Australian dollar amount. This currency conversion uses the closing exchange rate on the date of the bond's issues.

The Nelson-Siegel method

32. The Nelson-Siegel method assumes that the term structure of the debt risk premium has the parametric form shown below:

$$y_t(\tau) = \beta_{0t} + \beta_{1t}\frac{1-e^{-\lambda\tau}}{\lambda\tau} + \beta_{2t}\left(\frac{1-e^{-\lambda\tau}}{\lambda\tau} - e^{-\lambda\tau}\right) \qquad \text{equation 6}$$

where

$\hat{y}(\tau)$ is the credit spread (debt risk premium) at time t for maturity τ .

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

33. The Nelson-Siegel method uses observed data from the bond market to estimate the parameters $\beta_{0t}, \beta_{1t}, \beta_{2t}, \lambda$ by using the observed debt risk premium and maturities for bonds.

34. With the estimated parameters $\beta_{0t}, \beta_{1t}, \beta_{2t}, \lambda$ a yield curve is produced by substituting these estimates into the above equation and plotting the resulting *estimated* debt risk premium $\hat{y}(\tau)$ by varying the maturity τ . $\hat{y}(\tau)$ has the interpretation of the *estimated* debt risk premium for a benchmark bond with a maturity rating of τ for a given credit rating.

The Nelson-Siegel-Svensson method

35. The Nelson-Siegel-Svensson assumes that the term structure of the debt risk premium has the parametric form shown below:

$$\hat{y}_t(\tau) = \beta_{0t} + \beta_{1t}\frac{1-e^{-\tau/\lambda_1}}{\tau/\lambda_1} + \beta_{2t}\left[\frac{1-e^{-\tau/\lambda_1}}{\tau/\lambda_1} - e^{-\tau/\lambda_1}\right] + \beta_{3t}\left[\frac{1-e^{-\tau/\lambda_2}}{\tau/\lambda_2} - e^{-\tau/\lambda_2}\right] \qquad \text{equation 7}$$

where

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

$\beta_{0t}, \beta_{1t}, \beta_{2t}, \beta_{3t}, \lambda_{1,} \lambda_2$ are the parameters of the model to be estimated from the data.

36. The Nelson-Siegel-Svensson method is estimated in the same way as the Nelson-Siegel method, except that it uses a different parametric form.

A8.4 Automatic method for annual updating of the debt risk premium estimate

37. The ERA will use the following method to implement the automatic process for estimating the debt risk premium for each annual update:

- Develop the benchmark sample under the revised bond yield approach: (i) including corporate bonds denominated in domestic currency (Australian dollars) and foreign currencies including US dollars, euros and British pounds where the country of risk is Australia; and (ii) exclude bonds issued by the financial sector, duplicates, inflation-linked, called and perpetual instruments.

- Convert the foreign currency bond yields into hedged Australian dollar equivalent yields.

- Estimate the yield curves on the 20-day averages of the Australian dollar yield data applying the Gaussian Kernel, Nelson-Siegel, and Nelson-Siegel-Svensson methods.

- Use the simple average of these three yield curves' 10-year cost of debt estimates to arrive at the market estimate of the 10-year cost of debt.

- Subtract the corresponding 10-year bank bill swap rate to estimate the debt risk premium.

A8.5 Estimates prior to commencement of forward-looking DRP method

38. The RBA's data provides an available source of historic credit spreads for 10-year non-financial corporate bonds.

39. The ERA has determined to adopt RBA credit spread estimates for the historical debt risk premium estimates – up to 31 March 2015 – for incorporation in the trailing average.

40. The monthly RBA estimates are interpolated to daily estimates and a simple average of each year of daily observations in then made.

41. In this case, the DRP_t is estimated as shown below:

$$DRP_t = \frac{\sum_{D=1}^{Days\ in\ year} DRP_D}{Days\ in\ year} \qquad \text{equation 8}$$

where

DRP_D is the debt risk premium for day D in regulatory year t.

42. An example is discussed below.

- The average of daily debt risk premia for the period 1 July 2005 to 30 June 2006 provides the estimated annual debt risk premium for 2005-06, which gives the first term DRP_t, (DRP2005-06) in the trailing average debt risk premium estimate for 2014-15, TA DRP2014-15.

- The final term DRP2014-15 in the trailing average debt risk premium estimate for 2014-15, TA DRP2014-15, is given by the daily interpolated RBA estimates for the period 1 July 2014 to 30 March 2015, with daily estimates for the final period of the financial year for 1 April 2015 to 30 June 2015 given by the ERA's 2 April 2015 estimate of the debt risk premium. The resulting year of daily estimates is averaged to give the debt risk premium estimate for 2014-15 for inclusion in the trailing average estimate to apply for the six months July to December 2014.

- Similarly, the average of daily debt risk premia for the period 1 January 2006 to 31 December 2006 provides the estimated annual debt risk premium for 2006, which gives the first term DRP2006 in the trailing average debt risk premium estimated for 2015, TA DRP2015.

- Given the automatic formula for the trailing average, the term DRP2006 in the average trailing debt risk premium estimate for 2015 would drop out of the trailing average estimate for 2016, TA DRP2016 and be automatically replaced by the term DRP2016.

- The final term, DRP2015 in the trailing average debt risk premium estimate for 2015, TA DRP2015, is given by the daily interpolated RBA estimates for the period 1 January 2015 to 30 March 2015, with daily estimates for the final period of the financial year for 1 April 2015 to 31 December 2015 given by the ERA's 2 April 2015 estimate of the debt risk premium. The resulting year of daily estimates is averaged to give the debt risk premium estimate for 2015 for inclusion in the trailing average estimate to apply for calendar year 2015. This is shown in detail in the next section.

A8.5 Composition of the debt risk premium estimators for a regulatory period

43. As noted above, the annual update of the trailing average debt risk premium component of the rate of return in each year of an access arrangement period is to be calculated using the following automatic formula:

$$TA\ DRP_0 = \frac{\sum_{t=0}^{-9} DRP_t}{10} \qquad \text{equation 9}$$

where

$TA\ DRP_0$ is the equally weighted trailing average of the debt risk premium to apply in the following year as the annual update of the estimate used in the current year,

DRP_t is the debt risk premium estimated for each of the 10 regulatory years t = *0, -1, -2…. , -9*.