7.01

Ausgrid's rate of return

Ausgrid

Estimation of certain aspects of the allowed rate of return

April 2018

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1 Introduction

1 Frontier Economics has been asked by Ausgrid to provide advice on the determination of the following aspects of the allowed rate of return for Ausgrid's 2019-24 regulatory control period:

   a. The equity beta;

   b. The low-beta bias problem;

   c. The market risk premium (MRP);

   d. Gamma; and

   e. The return on debt.

2 Our instructions are provided as an appendix to this report.

1.1 Structure of this report

3 This report is organised into five Chapters, reflecting each of the topics we have been asked to address:

   a. Chapter 1 addresses the questions we have been asked to answer in relation to estimation of the equity beta;

   b. Chapter 2 addresses the questions we have been asked to answer in relation to the low-beta bias problem;

   c. Chapter 3 addresses the questions we have been asked to answer in relation to estimation of the MRP;

   d. Chapter 4 addresses the questions we have been asked to answer in relation to gamma, within an regulatory context; and

   e. Chapter 5 addresses the question we have been asked to answer in relation to the estimation of the trailing average return on debt allowance.

1.2 Author of report

4 This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and corporate finance consultancy. I have Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. I teach graduate level courses with a focus on cost of capital issues, I have published widely in high-level academic journals, and I have more than 20 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. I have

published a number of papers that specifically address beta estimation issues. A copy of my curriculum vitae is attached as an appendix to this report.

5   My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above. I have been provided with a copy of the Federal Court's Expert Evidence Practice Note GPN-EXPT, which comprises the guidelines for expert witnesses in the Federal Court of Australia. I have read, understood and complied with the Practice Note and the Harmonised Expert Witness Code of Conduct that is attached to it and agree to be bound by them.

Introduction

Chapter 1: Equity beta

2   Introduction

2.1   Instructions

6   Frontier Economics has been asked by Ausgrid to provide an expert opinion on the approach to estimating the equity beta for use in the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM).

7   Specifically, we have been asked to:

      a.   Set out the AER's methodology—as specified in the AER's 2013 Rate of Return Guideline (Guideline)—for deriving estimates of the equity beta for Australian energy network businesses;

      b.   Update the statistical estimates of the equity beta using the AER's methodology using market data that has become available since the publication of the Guideline;

      c.   Consider the latest evidence on Australian energy network businesses published by the Economic Regulation Authority of Western Australia (ERA), noting that the Guideline had regard to similar evidence published by the ERA in 2013;

      d.   Consider any adjustments that the AER has made in the past to its statistical estimate of the equity beta to arrive at its final equity beta estimate; and

      e.   Provide an expert opinion on a reasonable, current estimate of the equity beta for Australian energy network businesses.

2.2   Primary conclusions

2.2.1   The AER's approach

8   In its Guideline, the AER adopted a "primary range" of 0.4 to 0.7 for the equity beta of the benchmark efficient entity (BEE).[1]   This primary range is based on a set of domestic comparators for a regulated energy distribution business. Only three of the nine domestic comparator companies considered by the AER at the time of the Guideline remain listed today: APA Group, AusNet Services and Spark Infrastructure.

9   In a series of decisions, the AER has explained that:

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[1] AER Rate of Return Guideline, p. 15.

    a.   It considers the "best empirical estimate" of beta to be 0.5;[2] and

    b.   The allowed beta is to be set to 0.7 due to three additional considerations:[3]

        i.   "international estimates" – the fact that the weight of evidence from international comparators supports a beta estimate materially above the AER's domestic starting point estimate of 0.5;

        ii.   "consideration of the theory of the Black CAPM" – the fact that the Black CAPM evidence is that the unadjusted SL-CAPM will systematically understate the required return on low-beta stocks; and

        iii.   "investor certainty" – the fact that instability in equity beta allowances may cause investors to increase their assessment of regulatory risk.

10   Thus, the AER's approach is to begin with its "best empirical estimate" of 0.5 from domestic comparators, and then select a final point estimate (i.e., 0.7) above this level on the basis of a number of other considerations.

11   Approximately four years have elapsed since the analysis that was performed at the time of the AER's Guideline, providing approximately 200 more recent weekly returns observations. This report demonstrates that the more recent evidence results in an increase in the statistical beta estimates.

2.2.2 Recent analysis by the ERA

12   The ERA has recently updated its equity beta estimates for the BEE and concluded that the latest available data supports a best statistical beta estimate of 0.7, as compared to the AER's 2013 best statistical estimate of 0.5.

13   That is, the ERA has concluded that equity beta estimates based on current data for domestic regulated network comparators are materially higher than the estimates at the time of the Guideline.

14   For its Final Decision for DBP, the ERA updated its beta estimates for domestic comparators and concluded that:

> …the Authority considers that a 95 per cent confidence interval range of equity beta using the most recent data is from 0.479 and 0.870 based on the portfolio results (see Appendix 4A, Table 21 and Table 22). The central estimate given by the average of

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[2] TransGrid Draft Decision, 2017, Attachment 3, p. 3-243.

[3] TransGrid Draft Decision, 2017, Attachment 3, p. 3-165

the portfolios is 0.699. The Authority notes that portfolio estimates have a narrower range than the individual assets.

Based on its own analysis and the other evidence before it, together with the recognition that estimates of equity beta from empirical studies exhibit a high level of imprecision, the Authority is of the view that the point estimate of equity beta of 0.7 (rounded) provides a conservative and appropriate central best estimate for beta for use in the SL-CAPM.[4]

15   Unlike the AER, the ERA does not reflect in its final point estimate the international evidence, low-beta bias or investor certainty. Rather, the ERA compiles what it considers to be the best statistical estimate and adopts that figure – which it currently considers to be 0.7. Any accounting by the AER for additional factors, such as those accounted for in the Guideline, would result in a higher estimate than is indicated by the statistical evidence alone.

2.2.3 Recent empirical evidence

16   In this report, we compile a range of equity beta estimates using the most recent data that is available on domestic network comparators. Our main findings are:

   a. Equity beta estimates for domestic regulated network comparators have increased since the 2013 Guideline. Using the same firms that the AER and ERA analyse and using the same estimation method, current estimates are higher than the "best statistical estimate" at the time of the Guideline; and

   b. Equity beta estimates for a broader sample of domestic unregulated infrastructure firms are also higher than the 0.5 "best statistical estimate" at the time of the Guideline.

17   Consequently, we conclude that application of the AER's Guideline approach (i.e., begin with a best empirical estimate and select a point estimate from the top the equity beta range to account for the additional considerations set out above) to the most recently available data would support an equity beta of at least 0.7. Indeed, recent empirical evidence supports a final beta allowance of at least 0.7, even if the AER adopts what is considers to be the best empirical estimate, rather than the Guideline approach of adopting the top of the range of empirical estimates, as its point estimate for the equity beta.

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[4] DBP Final Decision, Attachment 4, Paragraphs 473-474.

3   Background and context

3.1   The role of equity beta

18   The approach that the AER uses to determine the allowed return on equity is known as the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM).[5] Under the SL-CAPM, the return on equity that investors would require in the current market conditions, r_e, is given by:

$$r_e = r_f + \beta \times \left(r_m - r_f \right)$$

where:

a. r_f represents the **risk-free rate** of return. This is the return that is available to investors on an investment that is completely free of risk. Commonwealth government bonds are usually assumed to be such a risk-free investment;

b. r_m represents the **expected return on the market**, which is the expected return that investors require to invest in an asset of average risk;

c. $\left(r_m - r_f \right)$ represents the **market risk premium**, which is the amount of extra return (over and above the return on a risk-free asset) that investors would require for investing in an asset of average risk; and

d. β represents the **equity beta**, which indicates the extent to which the particular investment has more or less risk than average. For example, an equity beta of 1.2 indicates that the investment is 20% more risky than average, in which case it would require a risk premium (over and above the risk-free rate) that is 20% more than would be required for an investment of average risk.

3.2   The estimation of equity beta

19   In the SL-CAPM, the equity beta is defined to be:

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[5] This formula was independently derived by Sharpe (1964) and Lintner (1965). Sharpe, W., 1964, "Capital asset prices: A theory of market equilibrium under conditions of risk," *Journal of Finance,* 19, 425-442; and Lintner, J., 1965, "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets," *Review of Economics and Statistics,* 13-37.

$$\beta = \frac{Cov(r_i, r_m)}{Var(r_m)}$$

where:

a. $Cov(r_i, r_m)$ is the covariance between the returns of the asset in question and the returns on the market portfolio; and

b. $Var(r_m)$ is the variance of the returns on the market portfolio.

20   The slope coefficient from an ordinary least squares (OLS) regression of stock returns on market returns has the same definition as beta above, so it is standard to estimate betas using OLS regression analysis:

$$r_{i,t} = \alpha + \beta r_{m,t} + \varepsilon_t.$$

21   This OLS estimation technique was employed by Henry (2014) in a report commissioned by the AER.[6] Henry (pp. 8-9) notes that he was instructed to also report estimates from the Least Absolute Deviations (LAD) approach. Because the LAD estimate does not correspond with the SL-CAPM definition of beta in Paragraph 19 above, we focus on the OLS estimates in this report. In this regard, Henry (2014) states:

> The AER also requires the construction of estimates of β using the Least Absolute Deviations (LAD) approach…The use of LAD in addition to the (standard) OLS was intended to provide a robustness check on the underlying data with regard to data outliers. The consultant was not requested to provide expert advice or analysis on this design decision.[7]

3.3   Comparator firms and re-levered equity beta estimates

22   The equity beta estimates for individual firms generally have poor statistical properties. For example, the statistical noise in stock return data results in equity beta estimates for individual firms being unstable over time (sometimes doubling or halving over the course of two years). In addition, the R-squared statistics tend to be very low, indicating that there is a high degree of firm-specific noise which makes it difficult to reliably quantify the relationship between stock and market returns.

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[6] See Henry (2014), *Estimating β: An update*, April, Equation (4), p. 6. Henry (pp. 8-9) notes that he was instructed to also report estimates from the Least Absolute Deviations (LAD) approach

[7] Henry (2014), pp. 8-10.

23   For this reason, it is common to consider a set of comparator firms such that random statistical noise might tend to cancel out in a large enough sample of firms. There are two ways to distil the information from a set of comparator firms into a single beta estimate:

  a.   Estimate beta for each of the comparator firms and take the mean over this set of estimates; and

  b.   For each period, form the returns from each comparator firm into a portfolio return and use the portfolio returns in the OLS regression approach to produce a single estimate of beta.

24   In this report, we follow the standard approach of considering both of these techniques for reducing sampling error.[8]

25   When using a set of comparator firms, it is important to produce "re-levered" equity beta estimates. To explain this concept, we first note that beta is an estimate of the systematic risk of owning shares in the relevant company. There are two elements of this risk:

  a.   The asset beta – the inherent risk of the firm's operations; and

  b.   Leverage – the extent to which the firm has issued debt finance which ranks ahead of equity.

26   The asset beta reflects the extent to which some lines of business are inherently riskier than others. For example, high-end consumer products and financial services businesses tend to perform very well when the market is up and poorly when the market is down, whereas carton manufacturers and supermarkets tend to have more stable performance over market cycles.

27   Consider two firms with the same asset beta (because they operate in the same industry) but which have different leverage. The shareholders in the firm with higher leverage are subject to more risk. This is because the debt holders have a claim that ranks ahead of equity – they are entitled to be paid in full before the equity holders are entitled to any residual distribution.

28   Selecting comparator firms to match the relevant characteristics of the firm in question ensures that the sample firms all have similar operational risk (asset beta). However, the comparator firms may have different leverage. To correct for these differences in leverage, a procedure known as 're-levering' is used.

29   In the case at hand, the AER has determined that the benchmark efficient entity (BEE) has 60% debt finance. If a comparator firm has, for example, 50% leverage, its beta estimate must be re-levered to provide an estimate of what that beta estimate would have been if the firm had 60% debt commensurate with the BEE. The process of re-levering beta estimates to ensure that they are comparable is

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[8] For example, these two approaches were adopted by Henry (2014).

Background and context

standard academic and industry practice. All of the Henry (2014) beta estimates have been re-levered by multiplying the raw beta estimates by the following factor:

$$\omega = \frac{1 - \overline{G}}{1 - 0.60}$$

where $\overline{G}$ represents the average leverage of the comparator firm over the relevant data period. We follow the Henry (2014) approach to re-levering throughout this Chapter.

3.4   The AER approach to beta

30   The AER's approach to setting the allowed beta involves two steps:

   a.   The first step is to determine a range for beta from an analysis of domestic comparators; and

   b.   The second step is to use all other relevant evidence to guide the selection of a point estimate from within that range.

31   In its Guideline materials, the AER summarised its approach as follows:

…the AER proposes to estimate the range for the equity beta based on empirical analysis using a set of Australian energy utility firms the AER considers reasonably comparable to the benchmark efficient entity. This approach leads to a range for equity beta from 0.4 to 0.7.

The AER then proposes to use other information sources to inform the selection of a point estimate from within the empirical range of equity beta estimates. This additional information includes:

▪   empirical estimates of overseas energy networks.

▪   the theoretical principles underpinning the Black CAPM.

This approach leads to a point estimate of 0.7 for equity beta, chosen from within the range 0.4 to 0.7.[9]

32   The AER has maintained its 0.7 beta allowance in all of its decisions since the Guideline.

33   In relation to the first step of establishing a primary range based on a consideration of statistical estimates from domestic comparators only, the AER commissioned the Henry (2014) report. Henry advised the AER that:

[9] AER Rate of Return Guideline, p. 15.

> In the opinion of the consultant, the majority of the evidence presented in this report, across all estimators, firms and portfolios, and all sample periods considered, suggests that the point estimate for β lies in the range 0.3 to 0.8.[10]

34   The AER has not adopted the advice from Henry (2014) and has instead adopted a primary range of 0.4 to 0.7. The AER has explained its rationale as follows:

> …while Henry appears to base his range on all his estimates (including individual firm estimates), we consider the most useful empirical estimates in our regulatory context are averages of individual firm estimates and fixed weight portfolio estimates. We note, in any case, that a point estimate of 0.7 is consistent with, and at the higher level of, the range identified by Henry.[11]

35   Consequently, while we report individual firm estimates below, our primary focus is on the average and portfolio estimates of beta.

36   The second step of the AER's approach to beta is to select a point estimate from within its primary range. The AER begins this task by concluding that:

> We also consider Henry's 2014 results indicate a best empirical estimate of approximately 0.5 for the benchmark efficient entity. This is because most of the [average and portfolio] estimates are clustered around 0.5...[12]

37   However, the AER also notes that there are additional considerations that inform its determination of the equity beta point estimate from within the range. In its recent decisions, the AER has maintained its beta allowance at 0.7. The choice of the final point estimate of 0.7—which is at the top of the AER's estimated equity beta range, and above the AER's best empirical estimate of 0.5—is said to be based on three considerations:[13]

    a. "International estimates" – due to the fact that the weight of evidence from international comparators supports a beta estimate materially above the AER's domestic starting point estimate of 0.5;

    b. "Considerations of the Black CAPM" – due to the fact that the Black CAPM evidence is that the unadjusted SL-CAPM will systematically understate the required return on low-beta stocks; and

    c. "Investor certainty" – due to the fact that a larger movement from the AER's previous 0.8 allowance may cause investors to increase their assessment of regulatory risk.

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[10] Henry (2014), p. 63.

[11] TransGrid Draft Decision, 2017, Attachment 3, p. 3-274.

[12] TransGrid Draft Decision, 2017, Attachment 3, p. 3-243.

[13] TransGrid Draft Decision, 2017, Attachment 3, p. 3-165.

Background and context

38   Nowhere in its decisions does the AER quantify how much of the uplift from 0.5 to 0.7 is due to each of the three factors that it has documented. Moreover, the AER has not stated whether it considers any of the three factors to be more or less important than the others.

Background and context

4 The ERA's recent updated beta estimates

4.1 A current best statistical estimate of 0.7

39   In its recent (June 2016) Final Decision for DBP,[14] the ERA noted that it had adopted a range of 0.3 to 0.8, consistent with the advice from Henry (2014):

> The Authority noted in the Draft Decision it considered that the 95 per cent confidence interval for the beta estimate was 0.3 to 0.8. The Authority then determined a point estimate for beta at 0.7, allowing for some adjustment towards the top end of the range to account for the theory underpinning the Black CAPM.[15]

40   For its Final Decision, the ERA updated its beta estimates for domestic comparators and concluded that:

> …the Authority considers that a 95 per cent confidence interval range of equity beta using the most recent data is from 0.479 and 0.870 based on the portfolio results (see Appendix 4A, Table 21 and Table 22). The central estimate given by the average of the portfolios is 0.699. The Authority notes that portfolio estimates have a narrower range than the individual assets.

> Based on its own analysis and the other evidence before it, together with the recognition that estimates of equity beta from empirical studies exhibit a high level of imprecision, the Authority is of the view that the point estimate of equity beta of 0.7 (rounded) provides a conservative and appropriate central best estimate for beta for use in the SL-CAPM.[16]

41   That is, the ERA has concluded that the latest available data supports a best statistical beta estimate of 0.7, as compared to the AER's 2013 best statistical estimate of 0.5. Unlike the AER, the ERA does not reflect in its final point estimate the international evidence, low-beta bias or investor certainty. Rather, the ERA compiles what it considers to be the best statistical estimate and adopts that figure – which it currently considers to be 0.7. Any accounting for the factors identified by the AER in the Guideline as relevant to the selection of the final point estimate would result in a higher estimate.

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[14] ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, 30 June 2016.

[15] DBP Final Decision, Attachment 4, Paragraph 469.

[16] DBP Final Decision, Attachment 4, Paragraphs 473-474.

4.2   The ERA's estimation methodology

4.2.1 Currently existing comparators

42   The ERA's approach to estimating beta was to focus on the four domestic comparators that still remained listed at the time the ERA conducted its analysis: APA Group, AusNet Services, DUET and Spark Infrastructure.[17] The ERA does not estimate betas using firms that were once listed but that have subsequently been delisted. We agree with this approach and adopt it in our empirical analysis below. In our view, regression analysis applied to firms that have not existed for several years is unlikely to provide an estimate of beta that is commensurate with the prevailing conditions in the market for equity funds.

4.2.2 Portfolio estimates

43   The ERA draws its conclusions on the basis of portfolio estimates, considering both equally weighted and value weighted portfolios. Whereas the ERA also reports mean estimates over the four remaining comparators, it places less weight on them. This is primarily because the beta estimates for one of the four comparators, DUET, are materially below all of the other individual firm estimates and all of the portfolio estimates.[18] Our approach is to consider average and portfolio estimates.

4.2.3 Range of regression approaches

44   The ERA uses four variations of regression analysis – standard OLS analysis and three other methods. The beta estimates from OLS analysis are generally lower than the estimates from the other techniques.[19] However, it is only the estimate from OLS regression that corresponds to the CAPM definition of beta, so we focus on OLS estimates in our empirical analysis below.

4.2.4 Use of five years of data

45   The ERA focuses on estimates from the most recent five years of data. When estimating beta there is a trade-off between using a short data period to ensure that the estimate is commensurate with prevailing conditions, and using a longer period to improve statistical precision. Our view is that a five-year period is generally insufficient to provide sufficient statistical precision, so we also consider estimates from longer (10-year) periods.

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[17] DUET was de-listed in May 2017, leaving just three listed domestic energy network comparator firms.

[18] DBP Final Decision, Attachment 4, Paragraphs 470-471.

[19] DBP Final Decision, Attachment 4, Table 2, p. 102.

The ERA's recent updated beta estimates

5   Current equity beta estimates

46   This section sets out recent beta estimates for:

> a.   The four domestic regulated utility comparator firms that remained listed until May 2017: APA Group, AusNet Services, DUET and Spark Infrastructure;[20] and
>
> b.   A broader set of firms that have investments in long-lived infrastructure assets.

47   We report beta estimates for individual firms, mean estimates across firms, and portfolio estimates (equal and value-weighted portfolios).

5.1   Data Source

48   We have obtained weekly and monthly total returns for each stock and the broad market index[21] from Datastream for the most recently available 10-year period, 2006-09-01 to 2016-09-01. Our main results are based on the full 10-year period, but we also consider periods of different lengths as a robustness test.

5.2   Methodology

5.2.1   Regression analysis

49   All of the beta estimates reported below are estimated by OLS as set out in Section 3.2 above:

$$r_{i,t} = \alpha + \beta r_{m,t} + \varepsilon_t.$$

50   We have re-levered all estimates to be consistent with the 60% leverage assumption that the AER has adopted. We have used the same re-levering process that was adopted by Henry (2014) and which has been used consistently by the AER in every decision since its inception. Specifically, the re-levering is performed by multiplying the raw OLS beta estimates by the following factor:

$$\omega = \frac{1 - \overline{G}}{1 - 0.60}$$

where $\overline{G}$ represents the average leverage of the comparator firm over the relevant data period.

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[20] DUET was delisted in May 2017, leaving just three comparator firms in the AER's sample listed.

[21] ASX 200 Total Return Index.

5.2.2 Equally weighted portfolio construction

51   We construct equally-weighted portfolio estimates for two portfolios:

    a.   The set of four domestic regulated gas and electricity distribution businesses; and

    b.   The broader set of infrastructure firms.

52   In each case, the equally weighted portfolio is created by assigning the same weight to the returns of each firm for each period:

$$r_{p,t} = \frac{1}{N}\sum_{i=1}^{N} r_{i,t}\,.$$

53   For example, when computing a weekly estimate, we compute the portfolio return for each week as the simple mean of the returns of each of the firms in the portfolio. This produces a single time series of portfolio returns, which are regressed against the corresponding market returns to produce a raw beta estimate.

54   The raw beta estimate is then re-levered using the AER approach, as set out above. The average leverage is computed by constructing an equally-weighted average of the leverage of each component firm for each week or month, and then by averaging over all weeks or months:

$$\overline{G}_p = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{1}{N}\sum_{i=1}^{N} G_{i,t}\right).$$

5.2.3 Value weighted portfolio construction

55   The value weighted portfolio return for each week or month is constructed by applying a number of steps:

    a.   For each week or month, the "portfolio market value of equity" is created as the sum of the market value of equity for each constituent firm:

$$E_{p,t} = \sum_{i=1}^{N} E_{i,t}\,.$$

    b.   The weight applied to each constituent firm (for that period, t) is then constructed as the ratio of the firm's market value of equity to that of the portfolio:

$$w_{i,t} = \frac{E_{i,t}}{E_{p,t}}.$$

    c.   The portfolio return for each period, t, is then constructed as a weighted average of the returns of each constituent firm:

Current equity beta estimates

$$r_{p,t} = \sum_{i=1}^{N} w_i r_{i,t}$$

This produces a single time series of portfolio returns, which are regressed against the corresponding market returns to produce a raw beta estimate.

56   The raw beta estimate is then re-levered using the AER approach, as set out above. The average leverage is computed by constructing a value weighted average of the leverage of each component firm for each period, t, and then by averaging over all weeks or months:

$$\overline{G}_p = \frac{1}{T} \sum_{t=1}^{T} \left(\sum_{i=1}^{N} w_{i,t} G_{i,t} \right).$$

5.3   Current beta estimates for domestic utilities

57   We begin by reporting current beta estimates for the four firms in the AER's set of domestic comparators that remained listed until May 2017. In all cases, we report raw OLS beta estimates and re-levered estimates in a table structure that follows Henry (2014).

5.3.1   Beta estimates over the past five years

58   We begin by considering beta estimates over the most recent five-year period. Although our view is that a sample of five years and four comparator firms is too small to produce reliable estimates, we report these results:

   a.   To provide an indication of the direction of movement in equity beta estimates since the 2013 Guideline; and

   b.   To provide a point of comparison with the ERA's recent approach, which was to rely almost exclusively on estimates from the most recent five-year period for the four domestic utilities.

Table 1 shows that the re-levered equity beta estimates for three of the four firms are in the order of 0.7 to 0.9, with the DUET estimate appearing to be an outlier in the sense that it is materially below the other three estimates.

Current equity beta estimates

59   Figure 1 shows that the 95% confidence interval for DUET does not overlap the interval for any of the other estimates, indicating that the DUET estimate is significantly different from all other estimates.

60   As noted above, DUET is no longer listed, so is no longer available to the AER as a comparator contributing current information towards the estimate of the equity beta. The mean estimate over the four firms is 0.67, and if DUET is excluded the mean rises to 0.79.

61   The value and equally-weighted portfolio estimates are 0.71 and 0.83 respectively, which corresponds closely to the estimates for three of the four comparator firms. The mean of the two portfolio estimates is 0.77.

Table 1: Weekly beta estimates over the last 5 years

Statistic	APA	AST	DUE	SKI	Equally-Weighted Portfolio	Value-Weighted Portfolio
Average gearing	0.50	0.58	0.64	0.28	0.50	0.52
Adjustment factor	1.24	1.04	0.90	1.80	1.24	1.20
Raw beta	0.64	0.66	0.36	0.49	0.58	0.69
Re-levered beta	0.80	0.68	0.33	0.89	0.71	0.83
Standard error	0.09	0.08	0.09	0.12	0.07	0.09
Confidence interval upper bound	0.97	0.84	0.50	1.12	0.85	1.01
Confidence interval lower bound	0.62	0.52	0.15	0.66	0.58	0.65
R^2	0.20	0.21	0.05	0.11	0.25	0.21
Observations	260	260	260	260	260	260

Source: Datastream, Frontier Economics calculations. Five years to beginning of May 2017.

Current equity beta estimates

Figure 1: 95% confidence intervals for weekly beta estimates over the last 5 years
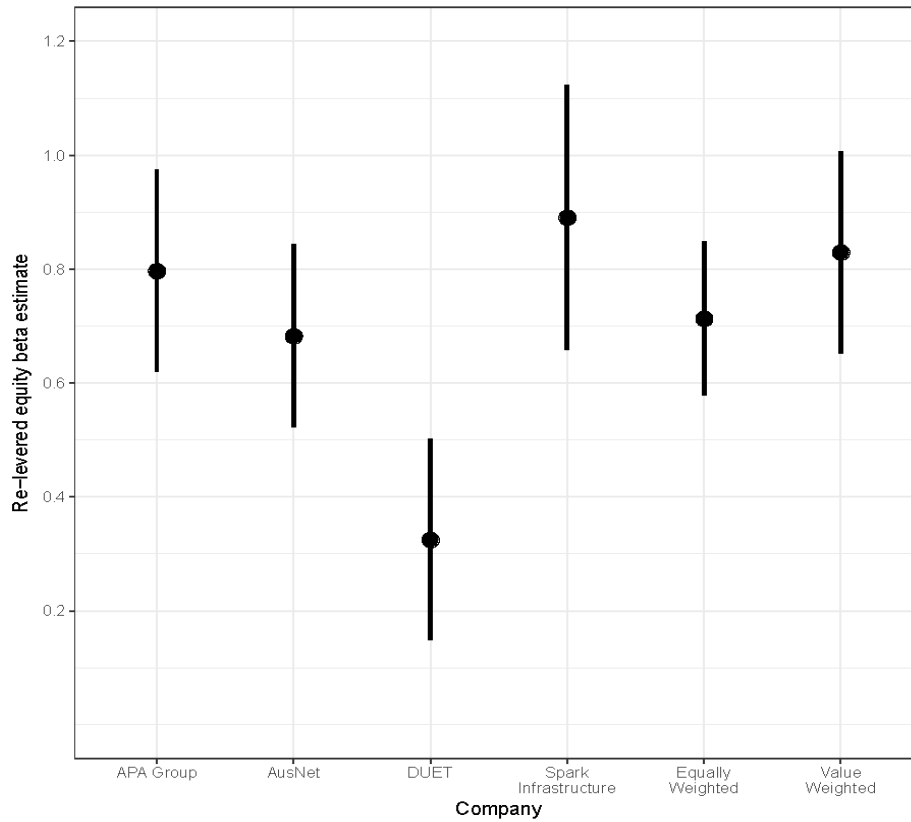
62   We have also compiled beta estimates using monthly data over the last five years. The key monthly point estimates are as follows:

      a.   The mean estimate over the four comparator firms is 0.82;

      b.   The equally-weighted portfolio estimate is 0.96;

      c.   The value-weighted portfolio estimate is 1.20;

      d.   The average of the two portfolio estimates is 1.08.

That is, the monthly estimates are generally higher than the weekly estimates.

63   It is clear that these recent re-levered equity beta estimates are materially higher than the best statistical estimate of 0.5 adopted by the AER in its decisions since the Rate of Return Guideline.

5.3.2 Beta estimates over the past ten years

As set out above, our view is that a sample of four firms and five years of data is insufficient to provide statistically reliable estimates of beta. In this section, we expand the sample period to ten years, examining a period from May 2007 to May 2017. The results are set out in Table 2.

Current equity beta estimates

Table 2: Weekly beta estimates over the last 10 years

Statistic	APA	AST	DUE	SKI	Equally-Weighted Portfolio	Value-Weighted Portfolio
Average gearing	0.56	0.61	0.71	0.37	0.57	0.57
Adjustment factor	1.09	0.97	0.73	1.57	1.08	1.07
Raw beta	0.62	0.38	0.48	0.42	0.51	0.56
Re-levered beta	0.68	0.37	0.35	0.65	0.55	0.59
Standard error	0.05	0.05	0.05	0.07	0.04	0.05
Confidence interval upper bound	0.79	0.47	0.46	0.80	0.63	0.69
Confidence interval lower bound	0.57	0.26	0.24	0.51	0.47	0.50
R^2	0.21	0.08	0.10	0.09	0.24	0.22
Observations	521	521	521	521	521	521

Source: Datastream, Frontier Economics calculations. Ten years to beginning of May 2017.

64   We have also compiled beta estimates using monthly data over the last ten years. The key monthly point estimates are as follows:

    a. The mean estimate over the four comparator firms is 0.83;

    b. The equally-weighted portfolio estimate is 0.68;

    c. The value-weighted portfolio estimate is 0.80;

    d. The average of the two portfolio estimates is 0.74.

65   The general pattern of results is that the 10-year estimates are lower than the 5-year estimates. This is consistent with the pattern of results reported by the ERA – the ERA's estimates from the most recent five-year period are materially higher than those that were relied upon in its Guideline estimate of beta. This suggests that the correlation between stock returns and market returns (for the four sample firms) has increased markedly over the last five years. Expanding the sample period to ten years includes data from prior to the Guideline and has the effect of reducing the equity beta estimates. This observation leads us to examine a series of rolling beta estimates in the following sub-section.

Current equity beta estimates

5.3.3 Rolling beta estimates

66   Figure 2, below shows rolling 5-year beta estimates for the two portfolio methods. We have estimated the re-levered portfolio betas for a number of five-year periods. There is an obvious increase in the portfolio beta estimates as data from 2014, 2015, 2016 and 2017 is introduced, replacing older data from 2007-2008. This is consistent with the notion that the relationship between the domestic comparator stock returns and market returns has become stronger in the years that have passed since the Guideline.

Figure 2: Rolling 5-year portfolio estimates of beta
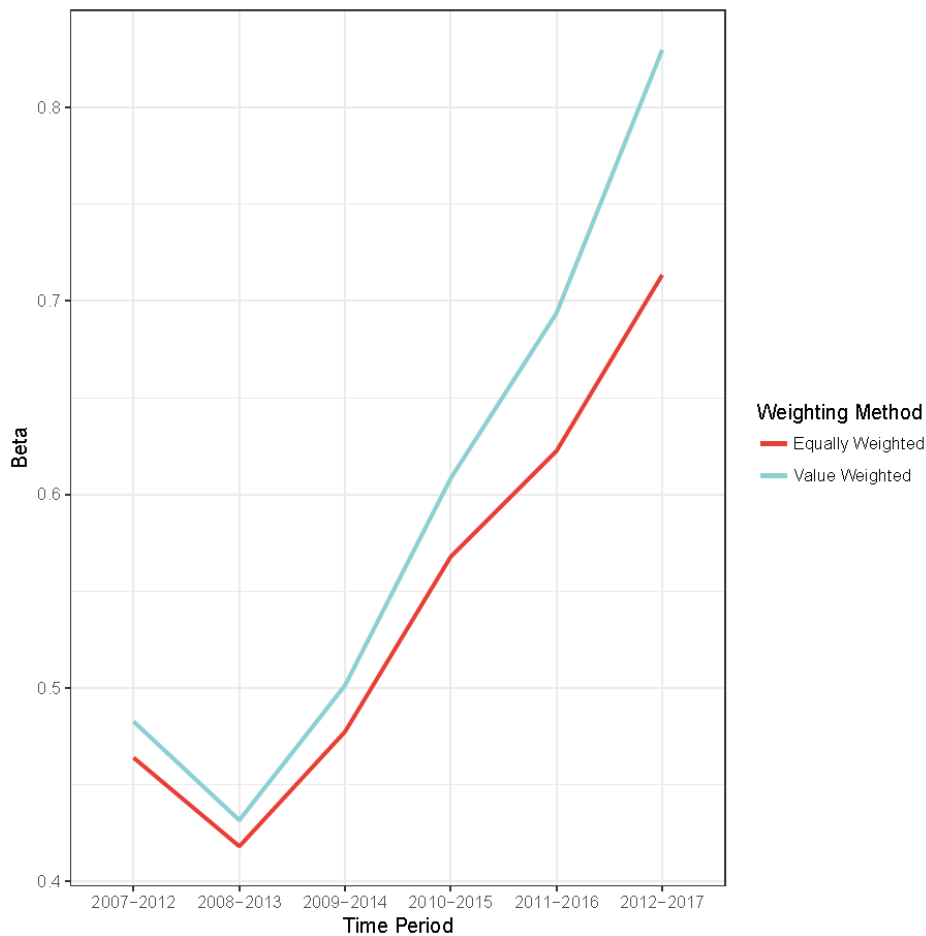
Source: Datastream, Frontier Economics calculations.

67   Figure 3 shows the 95% confidence interval around the rolling five-year weekly value-weighted portfolio estimates. This figure shows that the starting point estimate of 0.5 that the AER adopted from its Guideline analysis does not fall within the standard 95% confidence interval for the most recent estimate.

68   Moreover, there is little or no overlap between the bottom of the current confidence interval and the top of the interval around the time of the Guideline.

Current equity beta estimates

This suggests that the estimates have increased significantly since the time of the Guideline.

Figure 3: Rolling average of the value-weighted portfolio, showing 95% confidence intervals
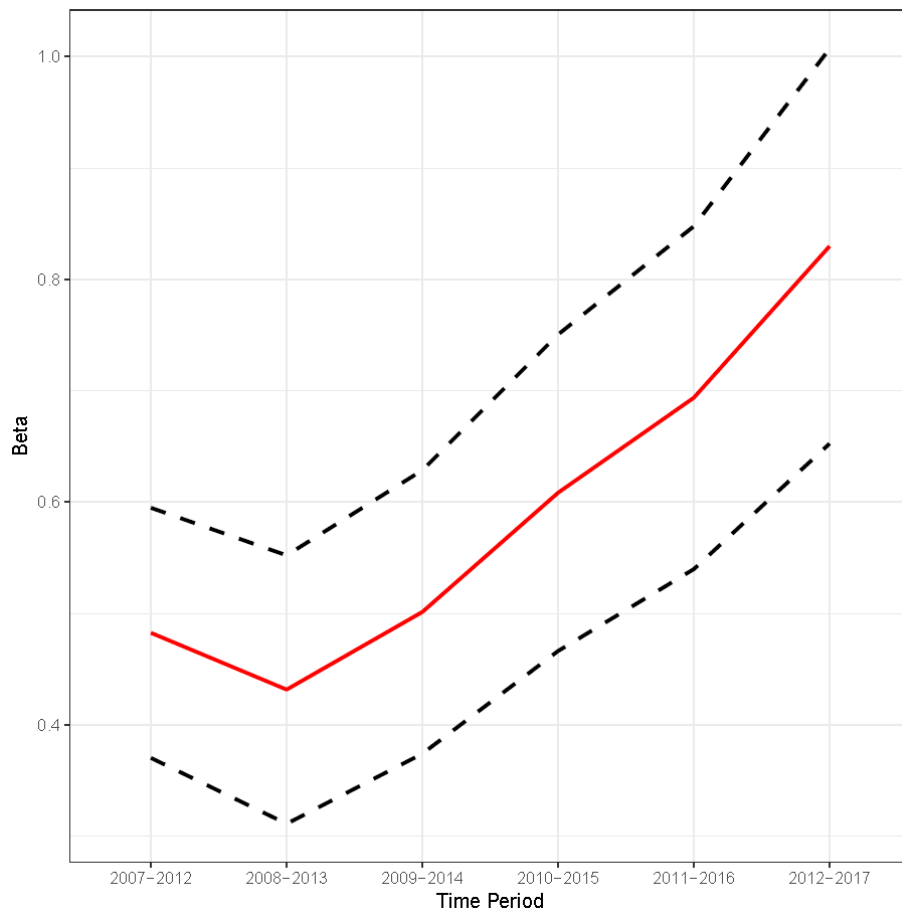
Source: Datastream, Frontier Economics calculations.

69   Figure 4 shows the re-levered portfolio equity beta estimates for different sample periods, all ending with the most recent data from May 2017. The estimates at the left-hand end of the figure are based on a longer sample period of ten years. Moving from left to right sees the length of the sample period decline, always ending with the 2017 data.

70   Again, the pattern in the estimates is obvious – including the older data has the effect of materially reducing the equity beta estimates. This evidence is consistent with the notion that the relationship between the domestic comparator stock returns and market returns has become stronger in the years since the Guideline.

Current equity beta estimates

Figure 4: Varying window beta estimates
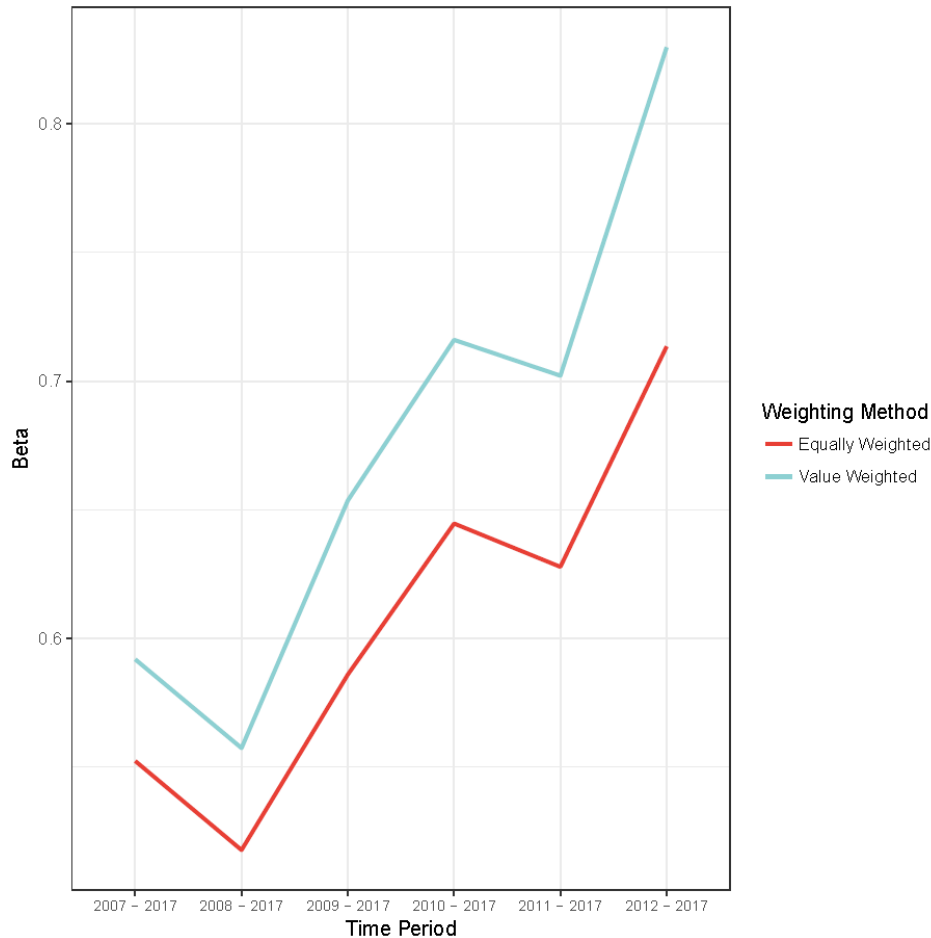
Source: Datastream, Frontier Economics calculations.

5.3.4 The AER's 2017 update of Henry's estimates

71   In its latest Decisions, the AER states that it has updated the empirical estimates of the equity beta using the methodology employed by Henry (2014) and data up to 28 April 2017.[22] The AER concludes that:[23]

   a.   the updated empirical estimates continue to support Henry's empirical range of 0.3 to 0.8; and

   b.   there is insufficient evidence to depart from the AER's estimated beta range of 0.4 to 0.7, or its point estimate of 0.7.

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[22] AER Staff Beta Analysis June 2017, published 7 February 2018.

[23] TransGrid Draft Decision, 2017, Attachment 3, p. 63-4.

Current equity beta estimates

72   Section 6 explains why we consider the AER has drawn incorrect conclusions from its updated analysis.

73   In essence, the AER's updated beta analysis continues to include five delisted comparators; at the time the AER completed its 2017 analysis, only four of the nine comparators used in the Henry (2014) study remained listed.

74   The problem with including delisted comparators in the sample is that the beta estimates of such firms at the time of delisting become determinative at whatever the estimate happened to be at that time. In other words, because no information on the returns of those comparators is available beyond the date of delisting, the beta estimate at the time of delisting becomes permanently 'frozen' in time. As such, delisted comparators provide no information about how beta estimates may have changed since the date of delisting. Yet, the AER continues to use estimates from firms that have in most cases been delisted for several years (more than a decade in two instances) to derive a *current* estimate of the beta of Australian energy networks.

75   We show in the Attachment that the beta estimates of all of the comparators that remained listed at the time the AER completed its updated beta study have increased since 2014. This supports the findings in this report that the beta of Australian energy networks has increased recently.

5.3.5 Conclusions in relation to domestic energy network comparators

76   The evidence set out above supports the conclusion that the equity beta estimates for the AER's preferred four domestic comparator firms have increased since the 2013 Rate of Return Guideline. Thus, the AER's starting point, or "best statistical estimate" of beta must now be at least what it was at the time of the Guideline.

5.3.6 Evidence from other domestic network utility firms

77   Currently, only three of the nine domestic energy network comparator firms considered by the AER remain listed, following DUET's delisting in May 2017. In our view, it is not possible to derive statistically-reliable beta estimates using just three comparator firms. Therefore, in order to obtain statistically-reliable beta estimates, it is necessary to expand the sample of comparators. A natural way to do this would be to include in the sample energy network comparator firms listed overseas. Whilst the AER has some regard to such firms when determining its final equity beta point estimate, the AER considers that such firms should not be used to estimate primary equity beta range or the best empirical estimate of beta. Therefore, the only remaining way to improve the statistical reliability of beta estimates is to consider empirical estimates from listed domestic non-energy networks.

Current equity beta estimates

78 Consequently, we examine the beta estimates of a set of firms that are comparable to an energy distribution business. Specifically, we consider a set of firms that demonstrate the characteristics of:

　　　　a.　Ownership of very long-lived, tangible, infrastructure assets;

　　　　b.　Capital intensive businesses;

　　　　c.　Provision of an access service to customers that provides a relatively stable series of cash flows;

　　　　d.　Being listed on the ASX.

79 This leads us to consider a set of transport-related infrastructure firms identified as such by the Thomson-Reuters classification scheme. A brief summary of the operations of each of the relevant firms is presented in section 7 of this report.

80 For the avoidance of doubt, we do not claim that these domestic transport infrastructure firms are perfect comparators to energy networks regulated by the AER. However, they share a number of important characteristics with energy networks (outlined above) that are likely to contribute towards the systematic risk of those firms. Therefore, in our view, they are useful in informing the estimate of the equity beta of Australian energy network businesses.

81 Table 3 documents the re-levered equity beta estimates for the set of transport infrastructure firms using weekly data over the last 10 years. For those firms that have not been listed on the ASX for the full 10-year period, estimates are based on the life of those firms.

82 Table 3 shows that the re-levered equity beta estimates range from 0.73 to 1.76, with a mean of 1.23.

83 We have also computed estimates based on different estimation periods and using monthly rather than weekly observations and summarise the results as follows:

　　　　a.　The mean estimate based on weekly data over the last 5 years is 1.15;

　　　　b.　The mean estimate based on monthly data over the last 5 years is 1.22; and

　　　　c.　The mean estimate based on monthly data over the last 10 years is 1.30.

84 In summary, however the estimates are computed for this set of unregulated infrastructure firms, the result is a mean point estimate materially above the AER's current equity beta allowance of 0.7.

Current equity beta estimates

Table 3: Weekly transport infrastructure beta estimates over the last 10 years: Individual firm estimates

Statistic	Auckland International Airport	Aurizon	Macquarie Atlas Roads	Qube Logistics	Sydney Airport	Transurban
Average gearing	0.27	0.20	0.32	0.19	0.51	0.38
Adjustment factor	1.84	2.00	1.71	2.02	1.23	1.55
Raw beta	0.40	0.73	0.93	0.87	0.84	0.51
Re-levered beta	0.73	1.45	1.58	1.76	1.03	0.80
Standard error	0.07	0.10	0.14	0.10	0.07	0.07
Confidence interval upper bound	0.86	1.66	1.85	1.96	1.17	0.93
Confidence interval lower bound	0.59	1.25	1.32	1.56	0.89	0.66
R^2	0.10	0.23	0.17	0.23	0.24	0.14
Observations	521	344	387	521	521	521

Source: Datastream, Frontier Economics calculations. Ten years to July 2017.

85   Table 4 summarises portfolio beta estimates using weekly data over the last 10 years. For each week of the 10-year sample period, we construct the portfolio return using the firms that were listed during that week and we record the average leverage of the firms that were listed in that week. That is, as new firms are listed on the ASX, they enter the portfolio. This produces a series of weekly portfolio returns and weekly leverage estimates. The re-levered beta estimates are then computed in the standard way, as set out above.

86   Table 4 shows that the re-levered equity beta estimates are 1.02 and 0.81 for the equally-weighted and value-weighted portfolios, respectively.

Current equity beta estimates

Table 4: Weekly transport infrastructure beta estimates over the last 10 years: Portfolio estimates

Statistic	Equally- Weighted	Value- Weighted
Average gearing	0.32	0.35
Adjustment factor	1.70	1.62
Raw beta	0.60	0.50
Re-levered beta	1.02	0.81
Standard error	0.05	0.06
Confidence interval upper bound	0.92	0.68
Confidence interval lower bound	1.13	0.94
R^2	0.31	0.16
Observations	521	521

Source: Datastream, Frontier Economics calculations. Ten years to July 2017.

87   We have repeated this exercise using monthly data and report similar re-levered equity beta estimates of 1.01 and 0.70, respectively.

88   The conclusion from this analysis of unregulated infrastructure firms is that the re-levered equity beta estimates are all materially above the AER's current starting-point "best statistical" equity beta estimate. Thus, if this evidence were to be afforded any weight, the result would be an increase in the equity beta allowance.

Current equity beta estimates

6   Appendix A: Comment on the AER's 2017 beta analysis

89   In the Guideline, the AER concludes on the basis of the Henry (2014) empirical analysis that an appropriate range for the equity beta is 0.4 to 0.7. That study used data for a set of Australian energy network comparators up to 28 June 2013.

90   In its latest Decisions, the AER states that it has updated the empirical estimates of the equity beta using the methodology employed by Henry (2014) and data up to 28 April 2017. The AER published this study in February 2018.[24] The AER concludes that:[25]

      a. the updated empirical estimates continue to support Henry's empirical range of 0.3 to 0.8; and

      b. there is insufficient evidence to depart from the AER's estimated beta range of 0.4 to 0.7, or its point estimate of 0.7.

91   In this section we comment on the AER's conclusion (which differs from our own) that there is insufficient evidence to suggest that the beta of Australian energy networks has increased since Henry (2014).

92   It appears to us that the main reason the AER concludes that there is insufficient evidence that the beta of Australian energy networks has increased is because in its 2017 beta study, the AER relies on several comparators that have been delisted many years. This can be seen in Table 5 below, which reports the full range of the time series (for each individual firm) used in the AER's 2017 beta study.

93   The Table shows that, at the time of completion of the AER's 2017 beta study:

      a. Only four (APA, DUE, SKI and AST) of the original nine comparators used in Henry (2014) remained listed;

      b. Two comparators (AGL and GAS) used in Henry (2014) had been delisted for over a decade; and

      c. Five comparators (AAN, AGL, ENV, GAS and HDF) used in Henry (2014) had been delisted for more than two years.

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[24] AER Staff Beta Analysis June 2017, published 7 February 2018.

[25] TransGrid Draft Decision, 2017, Attachment 3, p. 63-4.

Table 5: Availability of data used in AER's 2017 beta study

Comparator	Starting date	Ending date	Listed at the time of AER 2017 beta study?
Alinta (AAN)	20/10/2000	17/08/2007	No
Australian Gas Light (AGL)	29/05/1992	06/10/2006	No
APA Group (APA)	16/06/2000	28/04/2017	Yes
DUET Group (DUE)	13/08/2004	28/04/2017	Yes
Envestra (ENV)	29/08/1997	12/09/2014	No
GasNet Australia (GAS)	21/12/2001	10/11/2006	No
Hastings Diversified Fund (HDF)	17/12/2004	23/11/2012	No
Spark Infrastructure (SKI)	02/03/2007	28/04/2017	Yes
SP AusNet (AST)	16/12/2005	28/04/2017	Yes

Source: AER 2017 beta study, Table 3, p. 15.

94   The problem with including delisted comparators in the sample is that the beta estimates of such firms at the time of delisting become determinative at whatever the estimate happened to be at that time. In other words, because no information on the returns of those comparators is available beyond the date of delisting, the beta estimate at the time of delisting becomes permanently 'frozen' in time. As such, delisted comparators provide no information about how beta estimates may have changed since the date of delisting.

95   However, a comparison of the individual beta estimates for the four comparators that remain listed at the time of the AER's 2017 beta study with the beta estimates for the same firms in Henry (2014) shows that in every instance the beta estimates have increased. This can be seen in Figure 5 below, which plots the re-levered OLS and LAD estimates for APA, DUE, SKI and AST, as reported in the AER's 2017 beta study and in Henry (2014).

96   Figure 6 shows that the average beta estimate across the four surviving comparators has increased between Henry (2014) and the AER's 2017 beta study.

Appendix A: Comment on the AER's 2017 beta analysis

Figure 5: Comparison of 2014 and 2017 individual beta estimates (re-levered) for comparators that remain listed at the time of the AER's 2017 beta study

Ordinary Least Squares estimates

Least Absolute Deviations estimates

Source: Henry (2014), AER 2017 beta study

Appendix A: Comment on the AER's 2017 beta analysis
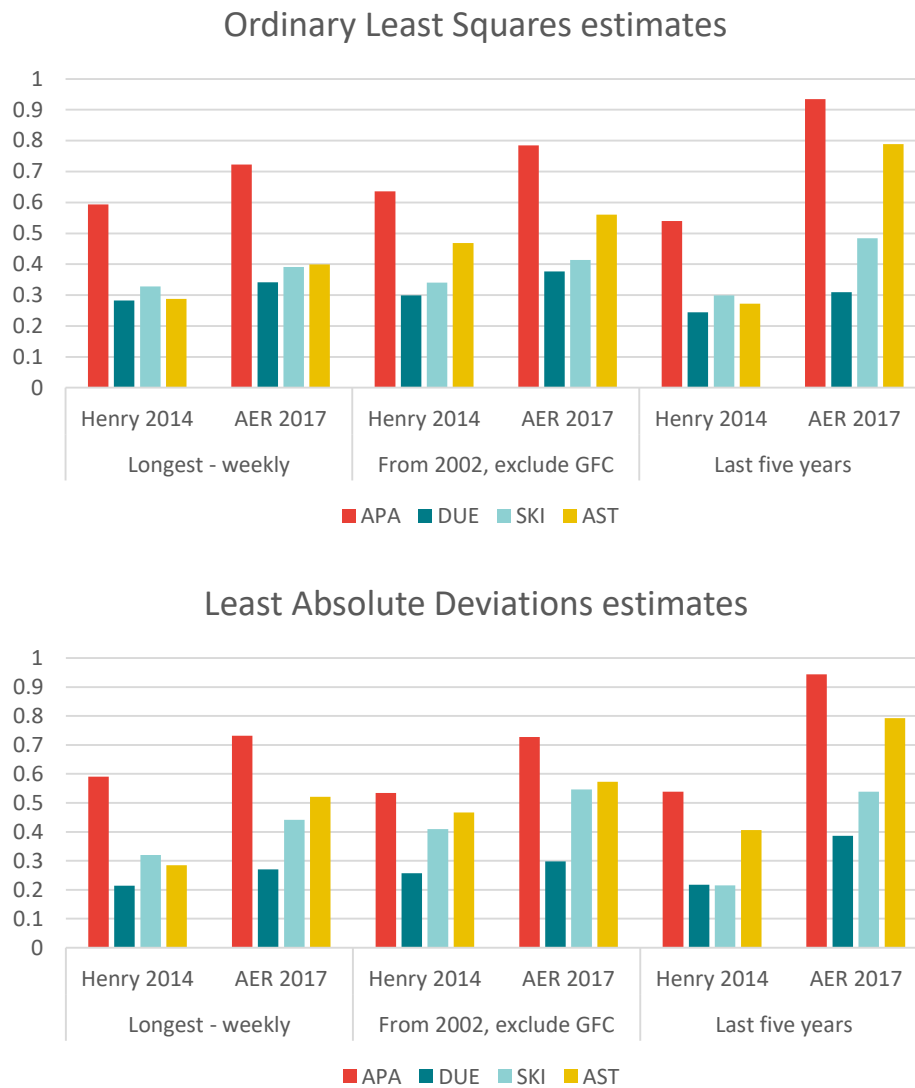
Figure 6: Comparison of 2014 and 2017 average beta estimates (re-levered) across comparators that remain listed at the time of the AER's 2017 beta study
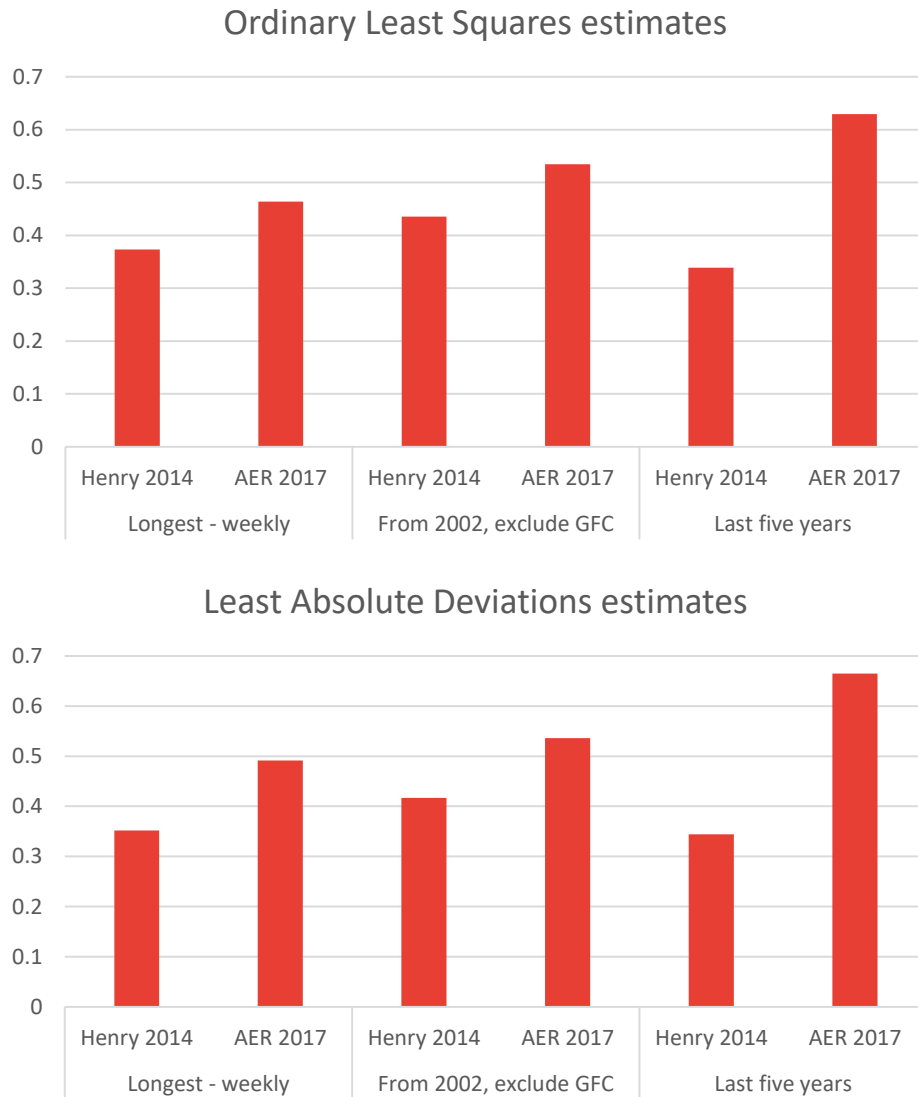
Source: Henry (2014), AER 2017 beta study

97   Finally, Figure 7 shows that the beta estimates for a portfolio constructed using only the four comparators that remained listed at the time of the AER's 2017 beta study (referred to by the AER as 'portfolio 6') have increased since 2014.[26]

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[26] Since Henry (2014) did not derive estimates for portfolio 6, we have derived the 2014 estimates reported in Figure 7 using data up to 28 June 2013 and the methodology described in the AER's 2017 beta study. We were unable to replicate the 2017 estimates derived by the AER (using Bloomberg data and the methodology described in the AER's 2017 beta study). However, our estimates and those reported in the AER's 2017 beta study differ only slightly. In order to ensure as much comparability as possible, the estimates presented in Figure 7 were derived by Frontier Economics using consistent methodology and the same dataset (albeit for different time periods). The measure of gearing for SKI used in the

Appendix A: Comment on the AER's 2017 beta analysis

Figure 7: Comparison of 2014 and 2017 portfolio estimates (OLS, re-levered) constructed using comparators that remain listed at the time of the AER's 2017 beta study

Source: Frontier analysis

98   The analysis above shows that the most recent estimates derived using only those firms that remain listed — and that therefore provide current information on how

AER's 2017 beta study made use of data obtained from annual reports. We have made no adjustments for data from annual reports; the data used in our analysis were obtained from Bloomberg. Finally, we note that whilst Henry (2014) adopted a net debt approach, the AER's 2017 beta study adopted a total debt approach. For comparability with the AER's results, we have adopted the AER's net debt approach.

Appendix A: Comment on the AER's 2017 beta analysis

the beta of Australian energy networks may have evolved since Henry (2014) — have increased.

99   The only way to conclude that the beta of Australian energy networks has not increased since Henry (2014) is by giving material weight to beta estimates derived using stocks that have been delisted for many years (in some cases more than a decade), and therefore have no ability to inform on how the beta of Australian energy networks may have changed recently.

100   For the avoidance of doubt, we are not arguing that statistically reliable beta estimates can be derived using a sample of only four listed comparators.

101   Our fundamental point is that:

           a.   The AER has some evidence that the beta of Australian energy networks has increased since 2014; but

           b.   This evidence is muted and masked by the inclusion in the AER's sample of delisted comparators that are capable of providing no information on how the beta of Australian energy networks has changed since 2014.

Appendix A: Comment on the AER's 2017
beta analysis

7   Appendix B: Transport comparator firms

102   In this appendix we provide a short explanation of what each of the firms in the transport utility portfolios does. These explanations are taken directly from Thompson Reuters.

7.1.1 Auckland International Airport Limited (AIA)

103   Auckland International Airport Limited provides airport facilities and supporting infrastructure in Auckland, New Zealand. Whilst AIA is a New Zealand firm, it is listed on the ASX. The Company operates in three segments: Aeronautical, Retail and Property. The aeronautical business provides services that facilitate the movement of aircraft, passengers and cargo, and provides utility services that support the airport. The aeronautical business also earns rental revenue from space leased in facilities, such as terminals. The retail business provides services to the retailers within the terminals and provides car parking facilities for airport staff, visitors and passengers. The property business earns rental revenue from space leased on airport land outside the terminals, including cargo buildings, hangars and standalone investment properties. Its subsidiaries include Auckland Airport Limited, Auckland Airport Holdings Limited and Auckland Airport Holdings (No. 2) Limited.

7.1.2 Aurizon Holdings Limited (AZJ)

104   Aurizon Holdings Limited is engaged in rail-based transport business. The Company acts as a heavy haul freight railway operator and rail transporter of coal from mine to port for export markets, and also engages in bulk general and containerized freight businesses and rail services activities. Its segments include Network, Commercial & Marketing, Operations and Other. The Network segment provides access to, operation and management of the Central Queensland Coal Rail Network. The Network segment is also engaged in the provision of overhaul and maintenance of rail network assets. The Commercial & Marketing segment is responsible for commercial negotiation of sales contracts and customer relationship management. The Operations segment is responsible for the national delivery of coal, iron ore, bulk and intermodal haulage services. It also includes yard operations, fleet maintenance, operations, engineering and technology, engineering program delivery and safety, health and environment.

7.1.3 Macquarie Atlas Roads Group (MQA)

105   Macquarie Atlas Roads Group is an Australia-based global infrastructure developer and operator. The Company comprises Macquarie Atlas Roads Limited and Macquarie Atlas Roads International Limited. Its portfolio assets have interests in five international toll roads, including Autoroutes Paris-Rhin-Rhone (APRR), which is a toll road network located in the east of France and covers over 2,320

kilometres of motorway network; Dulles Greenway, which is a toll road located in northern Virginia, the United States, and covers over 20 kilometres toll road which forms part of a commuter route into Washington District of Columbia; Warnow Tunnel, which is a toll tunnel located in Rostock, Germany, and covers over two kilometres toll road and tunnel under the Warnow River in the northern German city of Rostock, and M6 Toll, which is a toll road located in the West Midlands, United Kingdom, and covers over 43 approximately tolled motorway in the West Midlands of the United Kingdom.

7.1.4 Qube Holdings Limited (QUB)

106   Qube Holdings Limited is an Australia-based logistics and infrastructure company. The principal activities of the Company consist of logistics solutions across various aspects of the import-export supply chain, and the management and development of strategic properties into inland rail terminals, bulk terminals and related logistics facilities. Its segments include Logistics, which provides a range of services relating to the import and export of containerized cargo; Ports & Bulk, which consists of port and bulk logistics wherein port logistics activities are focused on the provision of an integrated logistics solution for the automotive industry, and bulk logistics activities are aimed at offering customers a logistics solution from mine-to-ship covering various activities, such as transport, stockpile management, ship loading facilities and stevedoring; Strategic Assets, which consists of the Company's interests in the Moorebank Industrial Property Trust, and Corporate and Other.

7.1.5 Sydney Airport (SYD)

107   Sydney Airport Holdings Limited the ownership of Sydney Airport. The Company's investment policy is to invest funds in accordance with the provisions of the governing documents of the individual entities within the Company. The Company is consists of Sydney Airport Limited (SAL) and Sydney Airport Trust 1 (SAT1).The Trust Company (Sydney Airport) Limited (TCSAL) is the responsible entity of SAT1.

7.1.6 Transurban Group (TCL)

108   Transurban Group is engaged in the development, financing, operation and maintenance of toll roads networks, as well as management of the associated customer and client relationships. The Company's segments include Victoria (VIC), New South Wales (NSW), Queensland (QLD) and the Greater Washington Area (GWA). Its VIC segment's operations include CityLink operations and development of CityLink Tulla Widening and Western Distributor. Its NSW segment's operations include GLIDe tolling system and the development of NorthConnex. Its QLD segment's operations include AirportlinkM7 and the development of Inner City Bypass (ICB), Gateway Upgrade North and Logan Enhancement Project. Its GWA segment's operations include 95 Express Lanes

Appendix B: Transport comparator firms

and the development of I-66, I-395 and Southern Extensions to 95 Express Lanes. The Company manages and develops urban toll road networks in Australia and the United States. Its subsidiaries include Transurban Holdings Limited and Transurban Holdings Trust.

Appendix B: Transport comparator firms

Chapter 2: Low-beta bias

8   Introduction

8.1   Instructions

109   Frontier Economics has been asked by Ausgrid to provide expert advice in relation to the issue of low-beta bias when estimating the equity beta as part of the implementation of the Sharpe-Lintner CAPM (SL-CAPM).

110   Specifically, we have been asked to:

   a. Explain the concept of low-beta bias in the context of the SL-CAPM;

   b. Examine the approaches for correcting for low-beta bias;

   c. Summarise the evidence about the quantum of low-beta bias; and

   d. Provide our opinion about the reasonableness of the AER's approach to correcting for low-beta bias.

8.2   Background and context

111   'Low-beta bias' is the term that is used to summarise one of the main results of empirical tests of asset pricing models – the SL-CAPM systematically under-states the returns on stocks with beta estimates less than one. That is, low-beta stocks systematically earn higher returns than the SL-CAPM would predict – the model does not fit the observable data.

112   Two methods of correcting for low-beta bias have recently been considered in the Australian regulatory setting:

   a. Use the Black CAPM (a modification of the SL-CAPM that was developed for the purpose of correcting for low-beta bias) to estimate the required return on equity; or

   b. Continue to use the SL-CAPM, but make an adjustment to the equity beta estimate to correct for low-beta bias.

113   In the recent *PIAC-Ausgrid* merits review case,[27] the Australian Competition Tribunal (Tribunal) determined that there is no error in:

   a. Recognising the existence of low-beta bias; or

   b. Accounting for low-beta bias by making an adjustment to the equity beta estimate in the SL-CAPM.

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[27] Applications by Public Interest Advisory Centre Ltd and Ausgrid [2016] ACompT 1.

8.3   Primary conclusions

114   In this Chapter, we explain the concept of low-beta bias and the theoretical rationale for it. We also summarise the evidence and note that low-beta bias is a standard result that is described in the standard finance textbooks. We examine the methods for correcting for low-beta bias and explain the AER's approach in some detail.

115   We also consider the evidence on the magnitude of low-beta bias and conclude that the majority of studies support an estimate of the zero-beta premium (the additional return, over and above the SL-CAPM forecast, for an asset with a beta of zero) between 2% and 4% and we consider that range to be a reasonable characterisation of the available data. We note that this range is slightly above the range of 1.5% to 3.0% that the AER adopted in its Rate of Return Guideline materials as a range that is "reasonable"[28] and "open to us."[29]

116   Finally, we note that the AER's approach has been to address the evidence of low-beta bias by making an adjustment to the equity beta estimate in the SL-CAPM. The AER's uplift from a best statistical estimate of 0.5 to an allowed beta of 0.7 reflects three considerations, one of which is low-beta bias. We show that even if the entire uplift is attributed to low-beta bias, that would only correct for a low-beta bias of 2.6%, which is at the lower end of the range of empirical estimates.[30] Consequently, we conclude that the AER's approach does not appear to fully correct for low-beta bias. A full correction for the observed low-beta bias would require a greater uplift to the statistical beta estimate than that which the AER has adopted in recent decisions.

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[28] AER Rate of Return Guideline, Explanatory Statement, Appendix C, p. 71.

[29] AER Rate of Return Guideline, Explanatory Statement, Appendix C, p. 71.

[30] We conclude in Section 13 of this report that the majority of the estimates set out above imply a zero-beta premium between 2% and 4% and we consider that range to be a reasonable characterisation of the available data.

9   What is low-beta bias?

9.1   Overview

117   Since the AER's 2013 Rate of Return Guideline process, there has been much discussion in the Australian regulatory process about the issue of 'low-beta bias.' This issue has been the subject of numerous submissions, it has been addressed by the AER in its Guideline and in several draft and final decisions, and it was one of the issues raised in the *PIAC-Ausgrid* merits review case.[31]

118   In this report, we explain the concept of low-beta bias and we summarise the empirical and theoretical support for the existence of a systematic low-beta bias. We also document the position that the AER has taken on this point and we summarise the views of the Tribunal.

9.2   The Capital Asset Pricing Model

119   The approach that the AER uses to determine the allowed return on equity is known as the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM).[32] Under the SL-CAPM, the return on equity that investors would require in the current market conditions, r_e, is given by:

$$r_e = r_f + \beta \times (r_m - r_f)$$

where:

- r_f represents the **risk-free rate** of return. This is the return that is available to investors on an investment that is completely free of risk. Commonwealth government bonds are usually assumed to be such a risk-free investment;

- r_m represents the **expected return on the market**, which is the expected return that investors require to invest in an asset of average risk; and

- $(r_m - r_f)$ represents the **market risk premium**, which is the amount of extra return (over and above the return on a risk-free asset) that investors would require for investing in an asset of average risk; and

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[31] Applications by Public Interest Advisory Centre Ltd and Ausgrid [2016] ACompT 1.

[32] This formula was independently derived by Sharpe (1964) and Lintner (1965). Sharpe, W., 1964, "Capital asset prices: A theory of market equilibrium under conditions of risk," *Journal of Finance,* 19, 425-442; and Lintner, J., 1965, "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets," *Review of Economics and Statistics,* 13-37.

- β represents the **equity beta**, which indicates the extent to which the particular investment has more or less risk than average. For example, an equity beta of 1.2 indicates that the investment is 20% more risky than average, in which case it would require a risk premium (over and above the risk-free rate) that is 20% more than would be required for an investment of average risk.

120   The SL-CAPM formula is often displayed in graphical form as in Figure 8 below. This figure shows that firms with higher beta risk require higher expected returns.

Figure 8: Sharpe-Lintner Capital Asset Pricing Model
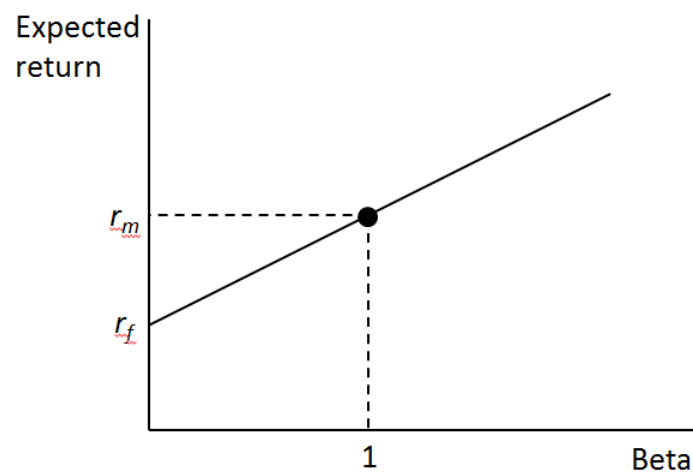
121   Like all economic models of this type, the SL-CAPM formula was derived by starting with a set of simplifying assumptions and applying a series of mathematical steps to solve for an equilibrium. In the SL-CAPM, the equilibrium pricing formula above is derived by assuming that every investor will trade to maximise their utility (i.e., to obtain the risk/return trade-off that is optimal for them), and by then aggregating over all investors in the market. That is, the SL-CAPM is a theoretical mathematical/economic model that was derived without regard to any market data. Consequently, there is no guarantee that actual market data will be consistent with the predictions of the model.

9.3   The empirical performance of the SL-CAPM[33]

122   Soon after the publication of the Sharpe-Lintner CAPM, researchers began testing whether the predictions (or, more precisely, the empirical implications) of the model were supported in real-world data. The conclusion from this evidence is

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[33] Much of the material in this section is drawn from SFG, 2014, "Cost of equity in the Black Capital Asset Pricing Model," 22 March.

What is low-beta bias?

that the empirical implementation of the SL-CAPM provides a poor fit to the observed data. That is, when the SL-CAPM parameters are empirically estimated and inserted into the SL-CAPM formula, the resulting estimate of the required return on equity bears little resemblance to observed stock returns. The feasible implementation of the SL-CAPM does not fit the observed data. The remainder of this sub-section summarises some of the relevant evidence.

9.3.1 Black, Jensen and Scholes (1972)[34]

123   A number of empirical tests are based on the following rearranged version of the SL-CAPM equation:

$$r_e - r_f = \left(r_m - r_f\right)\beta_e.$$

124   For example, Black, Jensen and Scholes (1972) construct tests of the model in the form of the following regression specification:[35]

$$r_{e,j} - r_{f,j} = \gamma_0 + \gamma_1\beta_{e,j} + u_j.$$

125   The SL-CAPM implies that $\gamma_0 = 0$ and $\gamma_1 = r_m - r_f$. However, a series of studies including Black, Jensen and Scholes (1972) report that the intercept of this regression model is higher than the SL-CAPM would suggest $(\gamma_0 > 0)$ and the slope is flatter than the SL-CAPM would suggest $\left(\gamma_1 < r_m - r_f\right)$. For example, Black Jensen and Scholes (1972) state that:

> The tests indicate that the expected excess returns on high beta assets are lower than (1) [the Sharpe-Lintner CAPM equation] suggests and that the expected excess returns on low-beta assets are higher than (1) suggests.[36]

126   The main result of Black, Jensen and Scholes (1972) is summarised in Figure 9 below. In that figure, the dashed line represents the security market line[37] that is implied by the SL-CAPM and the solid line represents the best fit to the empirical data. The data suggest that the intercept is too high and the slope is too flat to be consistent with the SL-CAPM.

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[34] Black, F., M.C. Jensen, and M. Scholes, 1972, "The Capital Asset Pricing Model: Some empirical tests," in *Studies in the Theory of Capital Markets,* Michael C. Jensen, ed., New York: Praeger, 79–121.

[35] See, for example, Black, Jensen and Scholes (1972), p. 3.

[36] Black, Jensen and Scholes (1972), p. 4.

[37] The term "security market line" refers to the linear relationship between beta and expected returns for individual assets or portfolios of assets. In empirical analysis this is typically measured as the line of best fit between beta estimates and realised returns for individual assets or portfolios of assets.

What is low-beta bias?

Figure 9: Results of Black, Jensen and Scholes (1972)
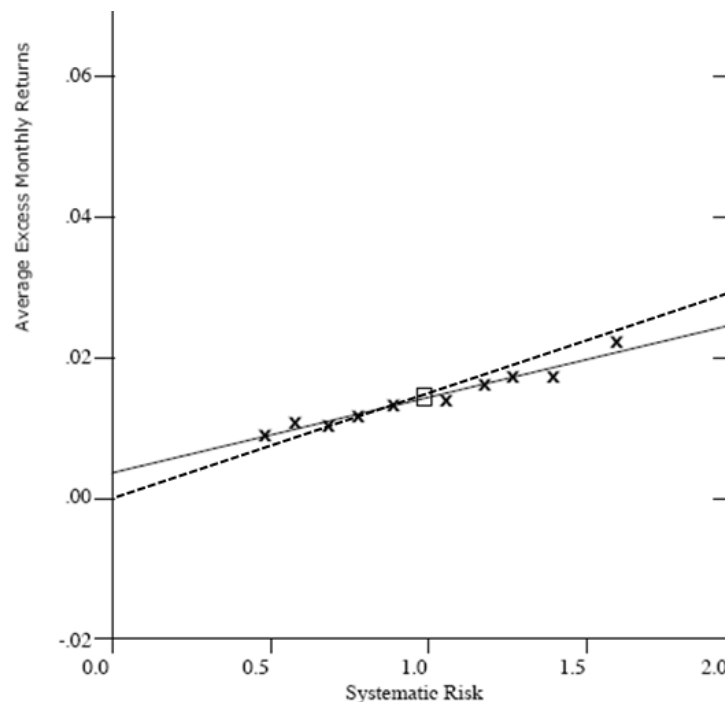
Source: Black, Jensen and Scholes (1972), Figure 1, p. 21. Dashed line for Sharpe-Linter CAPM has been added.

127   Black, Jensen and Scholes (1972) go on to define the intercept of the empirical regression line to be R_z, a quantity that has since become known as the "zero beta premium."[38] They report that the zero beta premium over their sample period of 1931 to 1965 was approximately 4% per year.[39] They go on to conclude that:

> These results seem to us to be strong evidence favoring rejection of the traditional form of the asset pricing model which says that Rz should be insignificantly different from zero.[40]

and that:

> These results indicate that the usual form of the asset pricing model as given by (1) [the SL-CAPM] does not provide an accurate description of the structure of security returns.[41]

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[38] We have not yet described the Black CAPM, but the term "zero beta premium" refers to the difference between the expected return on an asset with zero systematic risk (a zero beta) and the estimate of the risk-free rate (typically estimated as the yield on a government security).

[39] Table 5, p. 38 reports a monthly zero beta premium of 0.338% per month, which is approximately equivalent to 4% per year.

[40] Black, Jensen and Scholes (1972), p. 39.

[41] Black, Jensen and Scholes (1972), pp. 3–4.

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128   The empirical relationship and the implications of the SL-CAPM are contrasted in Figure 10 below, which shows the SL-CAPM in its usual form. (Note that in Figure 9 Black, Jensen and Scholes (1972) show *excess* returns, after subtracting the risk-free rate.)

Figure 10: Sharpe-Lintner CAPM vs. empirical relationship.
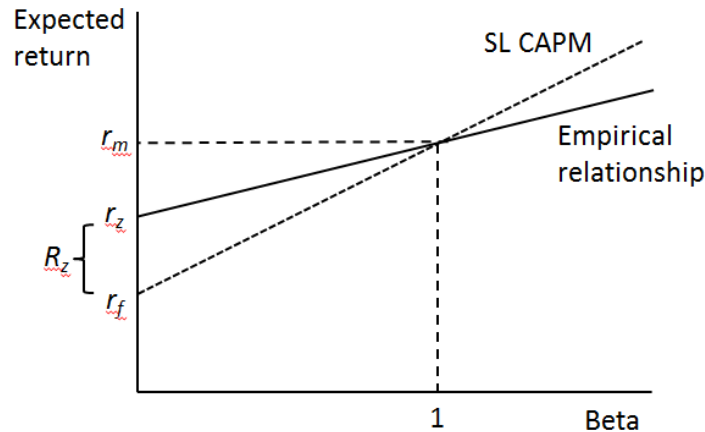
9.3.2 Friend and Blume (1970)[42]

129   Friend and Blume (1970) define the abnormal return (the Greek letter "eta" or η) to be the observed excess return of a stock (or portfolio) less the expected return from the SL-CAPM:[43]

$$\eta_i = \left(r_e - r_f\right) - \left(r_m - r_f\right)\beta_e.$$

130   Under the SL-CAPM, η_i should be zero on average and it should be independent of beta.   However, Friend and Blume (1970) report a systematic relationship between the abnormal return and beta – *low-beta* stocks generate *higher* returns than the SL-CAPM would suggest and *high-beta* stocks tend to generate *lower* returns than the SL-CAPM would suggest.   This relationship is shown clearly in Figure 11 below.   Friend and Blume note that:

> The absolute values of the performance measures are in excess of market expectations for funds with Beta coefficients below one and below expectations for higher coefficients. [44]

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[42] Friend, I., and M. Blume, 1970, "Measurement of portfolio performance under uncertainty," *American Economic Review*, 60, 561–75.

[43] Friend and Blume (1970), p. 563.

[44] Friend and Blume (1970), p. 569.

What is low-beta bias?

Figure 11: The relationship between abnormal returns and beta
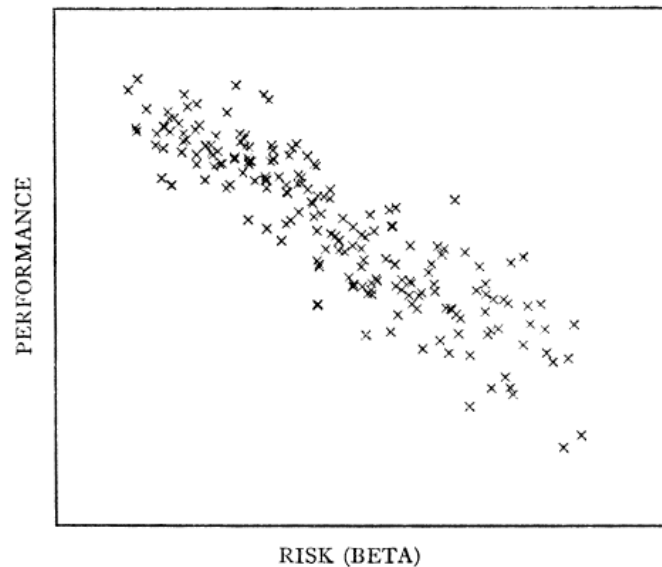
Source: Friend and Blume (1970), p. 567.

131   Friend and Blume (1970) go on to consider what it is about the SL-CAPM that
       results in it providing such a poor fit to the observed data. They conclude that the
       most likely source of the problem is the SL-CAPM assumption that all investors
       can borrow or lend as much as they like at the risk-free rate:

> Of the key assumptions underlying the market theory leading to one-parameter
> measures of performance, the one which most clearly introduces a bias against risky
> portfolios is the assumption that the borrowing and lending rates are equal and the
> same for all investors. Since the borrowing rate for an investor is typically higher than
> the lending rate, the assumption of equality might be expected to bias the one-
> parameter measures of performance against risky portfolios because, for such
> portfolios, investors do not have the same option of increasing their return for given
> risk by moving from an all stock portfolio to an investment with additional stock
> financed with borrowings at the lending rate.[45]

9.3.3 Fama and MacBeth (1973)[46]

132   Fama and MacBeth (1973) use the following regression specification:[47]

$$r_{e,j} = \gamma_0 + \gamma_1 \beta_{e,j} + u_j.$$

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[45] Friend and Blume (1970), p. 569.

[46] Fama, E.F., and J.D. MacBeth, 1973, "Risk, return, and equilibrium: Empirical tests," *Journal of Political Economy*, 81, 607–636.

[47] See Fama and MacBeth (1973), p. 611.

What is low-beta bias?

133   Under this specification, the SL-CAPM implies that $\gamma_0 = r_f$ and $\gamma_1 = r_m - r_f$. Fama and Macbeth (1973) note that previous empirical work has demonstrated violations of both of these implications of the SL-CAPM:

> The work of Friend and Blume (1970) and Black, Jensen, and Scholes (1972) suggests that the S-L hypothesis is not upheld by the data. At least in the post-World War II period, estimates of $E[\tilde{\gamma}_{0t}]$ seem to be significantly greater than R_{ft}.[48]

134   Fama and Macbeth (1973) then test the hypothesis that $\gamma_0 - r_f = 0$ on average. They reject that hypothesis in their data and conclude that:

> Thus, the results in panel A, table 3, support the negative conclusions of Friend and Blume (1970) and Black, Jensen, and Scholes (1972) with respect to the S-L hypothesis.[49]

9.3.4 Fama and French (2004)[50]

135   The consistent results in the studies reviewed above are not unique to the data from the periods examined in those studies. Rather, the results have proven to be consistent through time – low-beta stocks generate higher returns than the SL-CAPM would imply and high-beta stocks earn lower returns than the SL-CAPM would imply. With respect to the early tests of the SL-CAPM, Fama and French (2004) summarise the state of play as:

> The early tests firmly reject the Sharpe-Lintner version of the CAPM. There is a positive relation between beta and average return, but it is too "flat."

136   Fama and French (2004) then provide an updated example of the evidence using monthly returns on U.S.-listed stocks over 76 years from 1928 to 2003. This analysis is summarised in Figure 12 below. Consistent with the early evidence, realised returns on low-beta stocks are higher than predicted by the SL-CAPM, and realised returns on high-beta stocks are lower than predicted by the SL-CAPM. Stocks with the lowest beta estimates (approximately 0.6) had average returns of 11.1% per year, whereas the SL-CAPM estimate of the expected return was only 8.3% per year. Stocks with the highest beta estimates (approximately 1.8) had average returns of 13.7% per year, whereas the SL-CAPM estimate of the expected return was 16.8% per year.

---

[48] Fama and MacBeth (1973), p. 630.

[49] Fama and MacBeth (1973), p. 632.

[50] Fama, E.F., and K. French, 2004, "The Capital Asset Pricing Model: Theory and evidence," *Journal of Economic Perspectives*, 18, 25–46.

What is low-beta bias?

Figure 12. Average returns versus beta over an extended time period

Figure 2
Average Annualized Monthly Return versus Beta for Value Weight Portfolios Formed on Prior Beta, 1928–2003
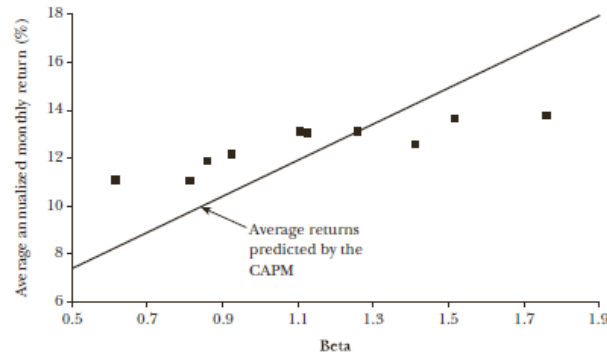
Source: Fama and French (2004), p. 33.

9.3.5 Brealey, Myers and Allen (2011)[51]

137   The evidence of low-beta bias has been so consistent and well-accepted that it is now discussed in standard finance courses and textbooks. For example, Brealey, Myers and Allen (2011), one of the leading finance textbooks, extend the previous analysis another four years to the end of 2008, and provide a similar chart to that presented by Fama and French (2004), but with excess returns on the vertical axis. This chart is presented below in Figure 13. The line represents the relationship between beta and excess return that is implied by the SL-CAPM and each dot represents the observed return for a particular portfolio. Consistent with all of the evidence set out above, the low-beta portfolios still earn higher returns than the SL-CAPM would imply.

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[51] Brealey, R.A., S.C. Myers, and F. Allen, 2011, *Principles of Corporate Finance,* 10th ed., McGraw-Hill Irwin.

What is low-beta bias?

Figure 13: The relationship between excess returns and beta
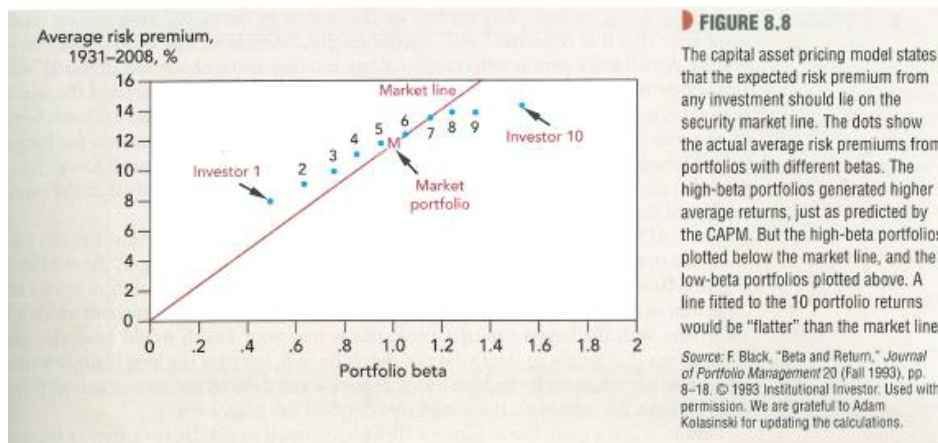
Source: Brealey, Myers, and Allen (2011), p. 197.

9.3.6 Berk and DeMarzo (2014)[52]

138   Another leading corporate finance textbook is Berk and DeMarzo (2014). They too consider violations of the SL-CAPM and also the explanations for those violations. They specifically note that if investors are unable to borrow unlimited amounts at the risk-free rate, the empirical relationship that has been documented in the data would be expected to occur. They also note that the result is a relationship between beta and expected returns that has a higher intercept (at r^*) and a flatter slope than the SL-CAPM would imply. They conclude that:

> Because our determination of the security market line depends only on the market portfolio being tangent for some interest rate, the SML still holds in the following form:

$$E[R_i] = r^* + \beta_i \left(E[R_{Mkt}] - r^* \right)$$

> That is, the SML holds with some rate r^* in place of r_f .[53]

9.3.7 Summary of the empirical evidence

139   The analysis documented above, compiled over four decades of research and using 80 years of stock returns, all reaches the same conclusion. The researchers uniformly reject the SL-CAPM on the basis that, in the observable data, the relationship between estimated betas and observed stock returns:

> a. Has an intercept that is economically and statistically significantly greater than the intercept that is implied by the SL-CAPM; and

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[52] Berk, J. and P. DeMarzo, 2014, *Corporate Finance,* 3rd global ed., Pearson.

[53] Berk and DeMarzo (2014), p. 399.

What is low-beta bias?

b. Has a slope that is economically and statistically significantly less than the slope that is implied by the SL-CAPM.

9.4   Systematic low-beta bias

140   The evidence set out above suggests that the actual relationship between beta and stock returns has a flatter slope than the SL-CAPM predicts. The result of this is that:

a. The SL-CAPM systematically underestimates the required return on low-beta stocks (i.e., those with a beta estimate less than 1); and

b. The SL-CAPM systematically overestimates the required return on high-beta stocks (i.e., those with a beta estimate more than 1); and

c. The magnitude of the bias is greater when the beta estimate is further away from 1.

141   In the regulatory setting, the focus has been on stocks with a beta less than 1, because regulators tend to consider the infrastructure firms that they regulate to have lower than average systematic risk. Figure 14 below shows that for stocks with a beta less than 1, the SL-CAPM consistently underestimates actual stock returns. This empirical result is known as the 'low-beta bias.'

Figure 14: Sharpe-Lintner CAPM vs. empirical relationship.
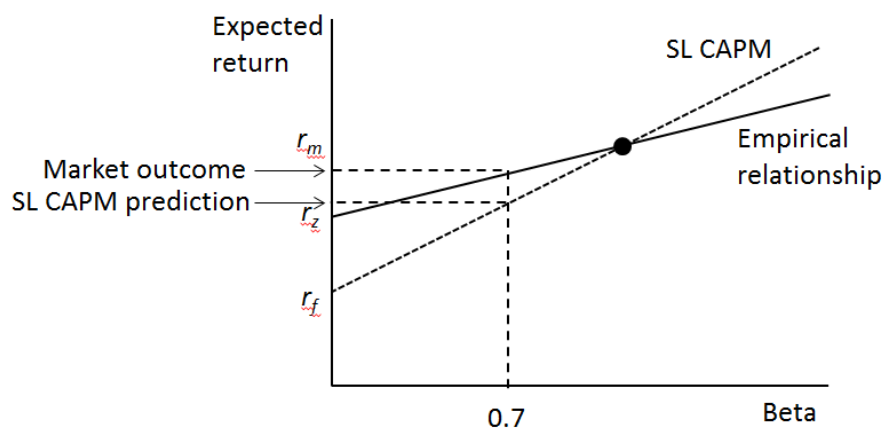
What is low-beta bias?

10   The theoretical rationale for low-beta bias

142   As set out above, the empirical tests of the SL-CAPM have consistently indicated that the relationship between equity beta and stock returns tends to be flatter than the SL-CAPM would suggest.[54] Black (1972)[55] summarises some of this literature as follows:

> …several recent studies have suggested that the returns on securities do not behave as the simple capital asset pricing model described above predicts they should. Pratt analyzes the relation between risk and return in common stocks in the 1926-60 period and concludes that high-risk stocks do not give the extra returns that the theory predicts they should give.
>
> Friend and Blume use a cross-sectional regression between risk-adjusted performance and risk for the 1960-68 period and observe that high-risk portfolios seem to have poor performance, while low-risk portfolios have good performance.
>
> …Black, Jensen, and Scholes analyze the returns on portfolios of stocks at different levels of β_i in the 1926-66 period. They find that the average returns on these portfolios are not consistent with equation (1) [the Sharpe-Lintner CAPM], especially in the postwar period 1946-66. Their estimates of the expected returns on portfolios of stocks at low levels of β_i are consistently higher than predicted by equation (1), and their estimates of the expected returns on portfolios of stocks at high levels of β_i are consistently lower than predicted by equation (1).[56]

143   In trying to develop a conceptual rationale for this observed and consistent empirical finding, Black (1972) focuses on one of the assumptions that underpins the derivation of the SL-CAPM – that all investors can borrow or lend as much as they like at the risk-free rate. He states that:

> One possible explanation for these empirical results is that assumption (d) of the capital asset pricing model does not hold. What we will show below is that the relaxation of assumption (d) [all investors can borrow or lend as much as they like at the risk-free rate] can give models that are consistent with the empirical results obtained by Pratt, Friend and Blume, Miller and Scholes, and Black, Jensen and Scholes.[57]

144   That is, Black (1972):

   a.   Notes that there is consistent evidence about the empirical failings of the SL-CAPM; and

   b.   Augments the SL-CAPM to produce a model that does not suffer from those empirical failings; and then

---

[54] See, for example, Friend and Blume (1970), Fama and Macbeth (1973) and Black, Jensen and Scholes (1972).

[55] Black, F., 1972, "Capital market equilibrium with restricted borrowing," *Journal of Business*, 45, 3, 444-455.

[56] Black (1972), p. 445.

[57] Black (1972), p. 445.

c. Sets out the conceptual rationale for his augmentation to the SL-CAPM.

145 Specifically, Black relaxes the SL-CAPM assumption that all investors can borrow or lend unlimited amounts at the risk-free rate, and derives a modified version of the CAPM that has become known as the 'Black CAPM.' The specification of the Black CAPM is as follows:

$$r_e = r_z + \beta(r_m - r_z)$$

where r_z is the new intercept term, which is above the risk-free rate by an amount R_z, which is known as the 'zero-beta premium.' This model is contrasted against the SL-CAPM in Figure 15 below. The figure shows that the Black CAPM, which is a theoretically-derived model based on a modified set of assumptions, produces predictions that conform more closely to the observed empirical evidence.

Figure 15: The Black CAPM
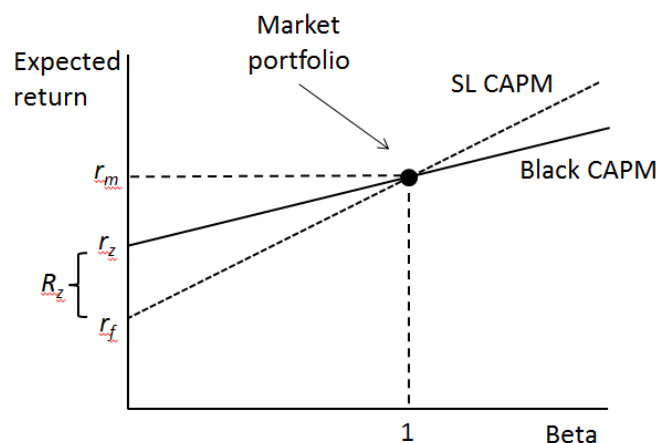
146 That is, there are two models that have been theoretically derived from different sets of assumptions. One has predictions and empirical implications that are consistent with the observed data and the other does not.

The theoretical rationale for low-beta bias

11   How to correct for low-beta bias

147   Two methods of correcting for low-beta bias have recently been considered in the Australian regulatory setting:

> a.   Use the Black CAPM to estimate the required return on equity since that model does not suffer from low-beta bias (indeed the documentation of low-beta bias was the original motivation for its derivation); or
>
> b.   Continue to use the SL-CAPM, but make an adjustment to the equity beta estimate to correct for low-beta bias.

148   We illustrate these two approaches via a simple numerical example that is based on the following parameters:

> a.   Equity beta of 0.4;[58]
>
> b.   Market risk premium of 6% (in which case the required return on the market is 10%);
>
> c.   Risk-free rate of 4%; and
>
> d.   Zero-beta premium of 3% (in which case the intercept term for the Black CAPM is 7%).

149   For this example, the SL-CAPM suggests that the required return on equity is given by:

$$r_e = r_f + \beta\left(r_m - r_f\right)$$
$$= 4\% + 0.4\left(10\% - 4\%\right) = 6.4\%,$$

and the Black CAPM suggests that the required return on equity is given by:

$$r_e = r_z + \beta\left(r_m - r_z\right)$$
$$= 7\% + 0.4\left(10\% - 7\%\right) = 8.2\%.$$

150   The SL-CAPM estimate suffers from low-beta bias, but the Black CAPM estimate does not. This is illustrated in Figure 16 below. Thus, one way to avoid low-beta bias is to use the Black CAPM rather than the SL-CAPM.

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[58] These parameters are drawn from the AER's Rate of Return Guideline, Explanatory Statement, Appendix C, Table C.11, p. 71.

Figure 16: Comparison of SL-CAPM and Black CAPM estimates
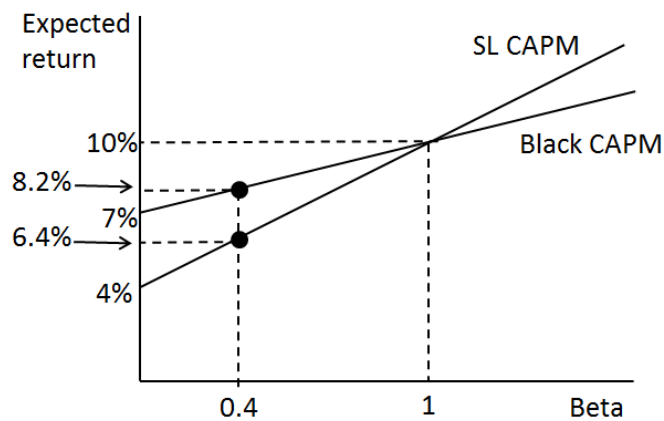
Source: Frontier Economics calculations.

151 The alternative approach is to pose the question: What beta, when inserted into the SL-CAPM, would produce an estimate of required return of 8.2% so as to be consistent with the evidence from the Black CAPM? Figure 17 below shows that the relevant modified beta estimate is 0.7. That is, the beta estimate would be revised upwards from 0.4 to 0.7 in order to produce an estimate of the required return on equity that is consistent with the Black CAPM evidence.

152 The logic behind these calculations can be summarised as follows:

   a. Beta is estimated to be 0.4;

   b. It is recognised that the theoretical and empirical evidence establishes that if this beta estimate is inserted into the SL-CAPM, the resulting estimate of the required return on equity (6.4%) will be understated;

   c. Inserting the beta estimate of 0.4 into the Black CAPM equation would produce an estimate of the required return on equity of 8.2%; and

   d. Rather than insert the estimated beta of 0.4 into the Black CAPM, the beta used in the SL-CAPM is adjusted from 0.4 to 0.7. In the SL-CAPM, this also produces an estimate of the required return on equity of 8.2%.

How to correct for low-beta bias

Figure 17: Modifying the SL-CAPM to correct for low-beta bias
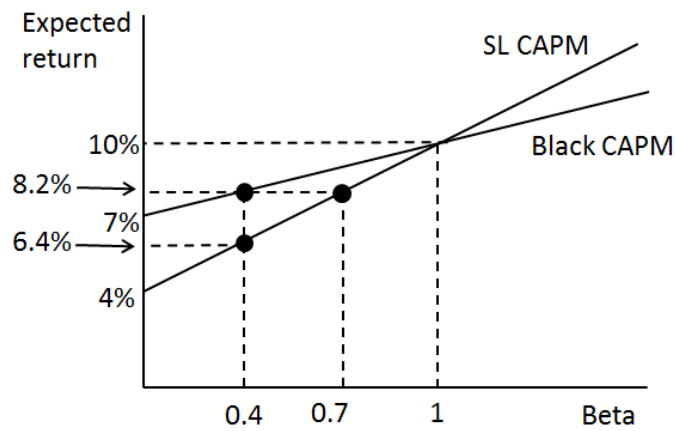
153   In summary, there are two ways to correct for the low beta bias in this case:

    a.   Estimate the parameters of the Black CAPM and insert those parameters into the Black CAPM formula; or

    b.   Continue to use the SL-CAPM formula, but use an increased beta estimate that is calibrated to offset the bias that arises from applying the SL-CAPM to low-beta stocks.

154   If the adjustment to the beta estimate under the second approach is consistent with the estimate of the zero-beta premium that is required for the first approach, the estimates of the required return on equity will be the same under both approaches.

How to correct for low-beta bias

12   The AER's approach to low-beta bias

12.1   The AER's 2013 Rate of Return Guideline

155   In its 2013 Rate of Return Guideline materials, the AER stated that it will account for the evidence of low-beta bias in the context of the Black CAPM.[59]   In this regard, the Guideline materials explain that:

> We account for the Black CAPM because we recognise there is merit to its theoretical basis, particularly when viewed alongside the standard Sharpe–Lintner CAPM.[60]

156   The Guideline materials further explain that the Black CAPM has the theoretical merit of relaxing one of the strongest and most unrealistic assumptions of the SL-CAPM – the assumption that all investors can borrow or lend as much as they like at the risk-free rate:

> The Sharpe–Lintner CAPM assumes there is unlimited risk free borrowing and lending, a simplification that does not hold in practice. The Black CAPM relaxes this assumption and acknowledges that investors may not be able [to] undertake unlimited borrowing or lending at the risk free rate.[61]

157   The AER also states that:

> A key outworking of the Black CAPM is that the Sharpe–Lintner CAPM may underestimate the return on equity for firms with equity betas less than one.[62]

158   The AER goes on to state that it will not estimate the Black CAPM, but rather that it will have regard to the evidence of low-beta bias and the Black CAPM when selecting a beta estimate to insert into its SL-CAPM formula:

> …using the Black CAPM theory to inform our equity beta estimate may mitigate possible low beta bias…we consider this represents a pragmatic approach.[63]

159   That is, the AER recognises the existence of low-beta bias and states that it will adopt the second of the two approaches set out above to correct for it.

160   The AER then goes on to demonstrate how the equity beta can be adjusted to correct for low beta bias. To do this, the AER sets out six worked numerical examples in its Guideline materials.[64] The first of the AER's examples uses the figures that are the basis of the numerical example in the previous section of this

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[59] AER, 2013, Rate of Return Guideline, p. 13.

[60] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 85.

[61] AER,2013, Rate of Return Guideline, Explanatory Statement, Appendix A, p. 17.

[62] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix A, p. 18.

[63] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix A, p. 12.

[64] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix C, Table C.11, p. 71.

report. The AER shows that, for a zero-beta premium of 3%, an equity beta of 0.4 would have to be adjusted to 0.7 to account for low-beta bias – as in the example above.

12.2 The AER's recent final decisions

161   In its recent final decisions,[65] the AER has maintained the position set out in its Guideline insofar as it recognises the Black CAPM/low-beta bias evidence and makes an adjustment in relation to this evidence to the equity beta that is used in the SL-CAPM:

> The theoretical principles underpinning the Black CAPM demonstrate that market imperfections could cause the true (unobservable) expected return on equity to vary from the Sharpe-Lintner CAPM estimate. This is a result of slightly different starting assumptions between the models. The resulting variation in expected return on equity is (in the theoretical principles) larger for businesses with equity betas further from one. We have also considered the empirical evidence that the Sharpe-Lintner CAPM tends to underestimate returns on low beta stocks when examined using ex-post data.
>
> Our empirical and conceptual analysis of equity beta for businesses with a similar degree of risk as JEN (in the provision of regulated services) indicates an equity beta less than one, and within the range of 0.4 to 0.7. In this case, where initial considerations indicate an equity beta materially below one, the theory of the Black CAPM may be relevant. As the importance of the theory of the Black CAPM is relative to considerations of the business' equity beta estimate, we consider it is appropriate for the theory of the Black CAPM to inform our equity beta estimate.[66]

162   In its recent Final Decisions, the AER states that its "best empirical estimate" of beta is 0.5:

> We consider the evidence in Henry's 2014 report suggests a best empirical estimate for the equity beta of approximately 0.5.[67]

Thus, the AER has stated that its 'starting point' beta estimate is 0.5.

163   The AER goes on to state that its final allowed beta is 0.7.[68] The uplift from 0.5 to 0.7 is said to be based on three considerations:

    a. "International estimates" [69] – due to the fact that the weight of evidence from international comparators supports a beta estimate materially above the AER's domestic starting point estimate;

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[65] AER, 2016, Final Decision: Jemena distribution determination 2016 to 2020, May.

[66] JEN Final Decision, 2016, Attachment 3, p. 191.

[67] JEN Final Decision, 2016, Attachment 3, p. 64.

[68] JEN Final Decision, 2016, Attachment 3, p. 64.

[69] JEN Final Decision, 2016, Attachment 3, p. 64.

b. "Considerations of the Black CAPM"[70] – due to the fact that the Black CAPM evidence is that the unadjusted SL-CAPM will systematically understate the required return on low-beta stocks; and

c. "Investor certainty"[71] – due to the fact that a larger movement from the AER's previous 0.8 allowance may cause investors to increase their assessment of regulatory risk.

164   Nowhere in its decisions does the AER quantify how much of the uplift from 0.5 to 0.7 is due to each of the three factors that it has documented. Moreover, the AER has not stated whether it considers any of the three factors to be more or less important than the others.

165   In our view, because there is no way of knowing what uplift was applied in relation to each of the three factors, there is no way of knowing whether or not the uplift that was applied in relation to a factor, if any, was reasonable.

12.3 The Tribunal's considerations of low-beta bias

166   The Tribunal has recently considered the issue of low-beta bias, and the adjustments that may be made to correct for it, in the *PIAC-Ausgrid* case.[72] In those proceedings, the Public Interest Advisory Centre (PIAC) submitted that the AER had erred in making any uplift at all to its starting point equity beta estimate of 0.5. However, the Tribunal concluded that there was no error in concluding that there was evidence of low-beta bias and that there was no error in making an uplift to the equity beta in relation to that evidence.

167   In response to PIAC's submission that there was no evidence of low-beta bias that would justify the AER departing from its starting point beta of 0.5, the Tribunal concluded that:

> Upon reviewing the whole of the material before the AER, the Tribunal however is not satisfied that that material does not support a conclusion that the SL CAPM provided a low equity beta bias.[73]

168   In relation to the evidence of low-beta bias, the Tribunal concluded as follows:

> It is, as the AER noted, correct that the three parameters for the SL CAPM – equity beta, risk free rate, and MRP – are recorded as giving a low beta bias for businesses with a beta (that is, the risk of the asset relative to the average asset) of less than 1.0, and that the Network Applicants are all within that group. There was also evidence

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[70] JEN Final Decision, 2016, Attachment 3, p. 64.

[71] JEN Final Decision, 2016, Attachment 3, p. 64.

[72] Applications by Public Interest Advisory Centre Ltd and Ausgrid [2016] ACompT 1.

[73] *PIAC-Ausgrid*, 2016, Paragraph 779.

that the low beta bias is exacerbated when it is combined with conditions of low government bond rates and a high MRP. Those conditions were applicable at the time of the AER Final Decisions.[74]

169   That is, the Tribunal accepted the existence of low-beta bias – that the SL-CAPM systematically understates the returns of low-beta stocks.

170   The Tribunal summarised the detail of the PIAC submission as follows:

> PIAC criticises the AER's view that the Black CAPM would be expected to warrant an upward adjustment (of some unspecified magnitude) to the best empirical estimates derived in accordance with the SL CAPM. That, it says, is found in the Final Decisions and in the RoR 2013 Guideline.
>
> PIAC says the analysis of the AER to justify that approach is an exercise in econometric reverse-engineering; and was to assess whether the AER might be able to justify making an adjustment from any point within the 0.4-0.7 range to the upper bound of that range.[75]

171   The Tribunal then determined that there is no error in:

 a.   Recognising the existence of low-beta bias; or

 b.   Accounting for low-beta bias by making an adjustment to the equity beta estimate in the SL-CAPM.

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[74] *PIAC-Ausgrid*, 2016, Paragraph 731.

[75] *PIAC-Ausgrid*, 2016, Paragraphs 774-775.

The AER's approach to low-beta bias

13 Evidence of the magnitude of low-beta bias

Grundy (2010)

172　In the Australian regulatory setting, the first evidence of the magnitude of low beta bias was provided by Grundy (2010).[76] His summary of the relevant evidence is reproduced as Table 6 below.

173　The relevant evidence from Table 6 is the estimates of $\dfrac{R_m - R_0}{R_m - R_f}$, which can be interpreted as the ratio of the slope of the empirical relationship between beta and returns and the slope of the SL-CAPM. An estimate below 1 indicates that the actual data exhibits a flatter slope than the SL-CAPM implies – consistent with low-beta bias.

174　This estimate of the ratio of the slopes can be converted into an estimate of the zero-beta premium (i.e., the extent to which the actual empirical intercept is above the risk-free rate as in Figure 15 above) as follows:

$$R_z = \left(1 - \frac{R_m - R_0}{R_m - R_f}\right) \times MRP.$$

175　Thus, for an MRP of 6.5%, the mean slope ratio estimate of 0.511 would imply a zero-beta premium of:

$$R_z = (1 - 0.511) \times 6.5\% = 3.2\% \ .$$

176　That is, the empirical estimate of the intercept in the relationship between beta and stock returns is 3.2% above the risk-free rate.

177　The more recent estimates in Table 6 imply higher zero-beta premiums:

　　a.　Kothari, Shanken and Sloan (1995)[77] implies a zero-beta premium of 3.8%; and

　　b.　Da, Guo and Jagannathan (2009)[78] implies a zero-beta premium of 5.0%.

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[76] Grundy, B., 2010, "The calculation of the cost of capital: A report for Envestra," 30 September.

[77] Kothari, S. P., j. Shanken and R. Sloan, 1995, "Another look at the cross section of expected stock returns, *Journal of Finance*, 50, 1, 185-224.

[78] Da, Z., R. Guo and R. Jagannathan, 2009, "CAPM for estimating the cost of equity capital: Interpreting the empirical evidence, NBER Working Paper 14889.

Table 6: Summary of evidence from Grundy (2010)

Paper	Sample period		(Rm-R0)/ (Rm-Rf)
Empirical papers cited by the AER			
Schrimpf, Schroder and Stehle (2007)	1969-2002	Estimate of Rm-R0=0.2% per month. Note that an annual MRP of 6.5% implies a monthly MRP of 0.54% per month	N/A
Ang and Chen (2007)	1926-1963:06	Cannot reject the Sharpe CAPM	N/A
	1963:07-2001	Likelihood the Sharpe CAPM is true is <1%	N/A
Gruaer and Janmaat (2010)	1963-2005	For 7 of the 14 methods for grouping stocks to form portfolios that are examined in the paper, the likelihood of the Sharpe CAPM being true is <5%	N/A
Gregory and Michou (2009)	1975-2005	Examines 35 industries. For only 3 industries would one reject the Sharpe CAPM at the 5% level. For the Gas, Water and Multi-utility industry, returns are statistically significantly higher at the 5% level than predicted by the Sharpe CAPM	N/A
Black (1993)	1926-1965	Likelihood Sharpe CAPM true <1%	N/A
Schwert (2003)	1926-1965	Likelihood Sharpe CAPM true <0.0001%	N/A
Morana (2009	1965-2001	Likelihood Sharpe CAPM true <1%	N/A
Daniel, Titman and Wei (2001)	1975-1997	Likelihood Sharpe CAPM true <0.34%	N/A
Da, Guo and Jagannathan (2009)	1932-2007	Likelihood Sharpe CAPM true <0.002%	0.232
Kothari, Shanken and Sloan (1995)	1927-1990	Likelihood Sharpe CAPM true <0.058%	0.415
Classic tests of the Sharpe CAPM			
Fama and Macbeth (1973)	1935-1968	Likelihood Sharpe CAPM true <0.55%	0.639
Black, Jensen and scholes (1972)	1931-1965	Likelihood Sharpe CAPM true <0.0001%	0.761
Average			**0.511**

Source: Grundy (2010), Table 1, p. 13.

Davis (2011)

178   In a report for the AER, Davis (2011)[79] considers the results of Kothari, Shanken and Sloan (1995) in more detail. Specifically, he makes an adjustment to the way Grundy (2010) had estimated the relative slope,[80] and he considers the full range

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[79] Davis, K., 2011, Cost of equity issues: A further report for the AER, May 13.

[80] By dividing the reported annual risk-free rate by 12 to make it consistent with the monthly units of other parameters.

Evidence of the magnitude of low-beta bias

of data sorts rather than just the main sort that had been considered by Grundy.[81] Davis concludes that the estimate of the zero-beta premium varies depending on how the various portfolios are constructed and according to which time period is used.

179   We summarise the estimates for all portfolio formation methods and for both of the data periods considered by Kothari, Shanken and Sloan (1995) in Table 7 below. The table shows that the zero-beta premium ranges from about 2% to over 4%, except for one portfolio sort for one time period where the zero-beta premium was immaterial.

Table 7: Zero-beta premium estimates from Kothari, Shanken and Sloan (1995)

Method	Zero-beta premium
1927-1990	
Ranked on beta	3.0%
Ranked on size	0.0%
Ranked on beta and size independently	2.2%
Ranked on beta then size	1.8%
Ranked on size then beta	1.8%
1941-1990	
Ranked on beta	4.7%
Ranked on size	2.7%
Ranked on beta and size independently	4.4%
Ranked on beta then size	4.1%
Ranked on size then beta	4.0%

Source: Kothari, Shanken and Sloan (1995), Table I, pp. 196-197; Frontier Economics calculations.

180   Davis (2011) also considers the estimates for various 5-year sub-periods in the earlier Fama and Macbeth (1973)[82] study, and notes that the estimates vary across periods. However, such variation is entirely expected since a 5-year period is

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[81] The approach of these studies is to form a set of portfolios and then plot the relationship between beta and returns for the set of portfolios. The portfolios can be formed on the basis of beta estimates from a prior period, or size, of industry, or some combination of these characteristics.

[82] Fama, E., and J. Macbeth, "Risk, return, and equilibrium: Empirical tests," *Journal of Political Economy*, 81 (3), 1973, pp. 607-636.

Evidence of the magnitude of low-beta bias

extremely short when seeking to estimate the slope of the security market line. Indeed, the slope of the line for the SL-CAPM is the MRP. It is not at all surprising that the results are unstable when estimates are based on only 5 years of data.

NERA (2013)

181   NERA (2013)[83] demonstrates that, for the Australian data between 1974 and 2012, there is no relationship at all between beta estimates and stock returns. Their results are reproduced in Figure 18 below. NERA forms 10 portfolios by ranking stocks based on their beta estimates. Thus the 10% of firms with the lowest beta estimates are assigned to the first portfolio and so on. The portfolio beta is then graphed against the subsequent annual returns of the portfolio. The Figure below shows that the portfolios with the lowest betas produce returns that are among the highest of all portfolios.

Figure 18: NERA (2013) results

Figure 5.1
Annualised premium over bill against beta estimate for 10 portfolios formed on past beta estimates
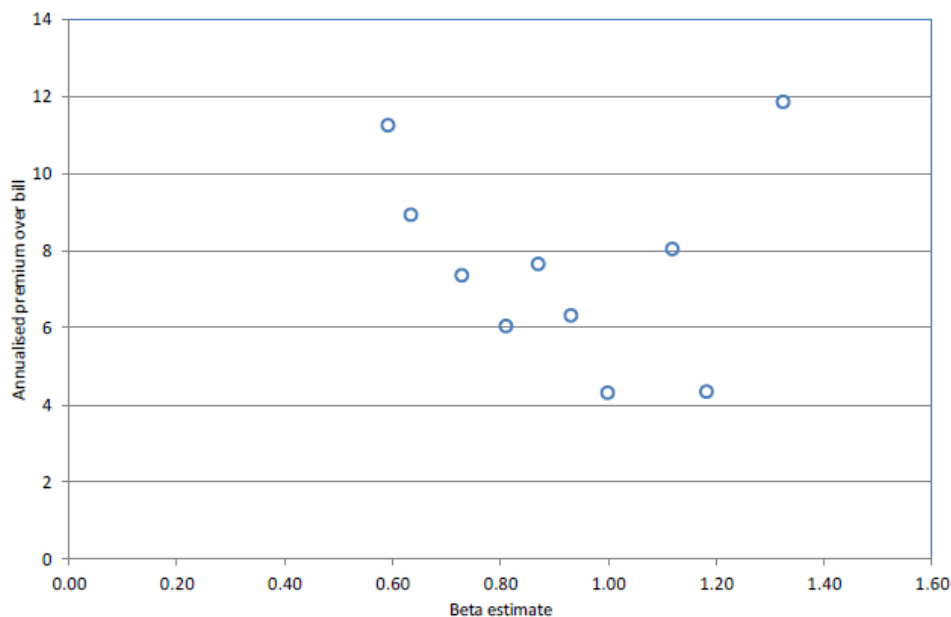
Notes: Data are from SIRCA's SPPR database. Annualised premium is in per cent and is the monthly premium multiplied by 12. Estimates are computed using data from 1974 to 2012.

Source: NERA (2013), Figure 5.1, p. 15.

182   The fact that there is no discernible relationship between beta estimates and stock returns means that the empirical security market line is not significantly different

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[83] NERA, 2013, Estimates of the zero-beta premium, June.

Evidence of the magnitude of low-beta bias

from a horizontal line. That is, beta estimates cannot be used to determine whether a stock is likely to generate above-average or below-average returns. NERA (2013) concludes:

> The fact that estimates of the zero-beta premium do not differ significantly from the values that the AER has chosen in the recent past for the *MRP* is consistent with the evidence that Figure 5.1 provides that there is little relation across stocks between risk, measured by an estimate of beta, and return.[84]

183   This implies that the required return for any stock would be set equal to the estimate of the required return on the market – the sum of the risk-free rate and the MRP.

SFG (2014)

184   The most recent Australian estimate of the zero-beta premium is that of SFG (2014).[85] SFG (2014) recognise that the non-relationship between beta estimates and stock returns in the Australian market is driven by two things:

a.   In the Australian market, value stocks (those with a high book-to-market ratio) tend to have low beta estimates and these stocks are well-known to have generated returns in excess of the SL-CAPM predictions; and

b.   After controlling for the out-performance of value stocks, there remains a low-beta bias.

185   SFG (2014) notes that any bias associated with the book-to-market ratio would be accommodated by the Fama-French model (FFM), whereas the low-beta bias would be accommodated by the Black CAPM. That is, any outperformance of the SL-CAPM prediction that is due to the fact that the stock has a high book-to-market ratio would be accommodated via the FFM, so there is a need to estimate the degree of outperformance that occurs simply because the stock has a low beta. Thus, the SFG approach is to control for any book-to-market effect so as to isolate the effect that arises simply because a stock has a low beta.

186   The econometric approach used by SFG (2014) is set out in detail in their report. Their conclusion is that the best available point estimate of the zero-beta premium is 3.34%.

187   In its recent final decisions, the AER has stated that:

> We consider SFG's latest estimate of the zero beta premium appears more plausible, as it is not negative and is below the market risk premium.[86]

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[84] NERA (2013), p. 16.

[85] SFG, 2014, Cost of equity in the Black Capital Asset Pricing Model, May.

[86] JEN Final Decision, Attachment 3, p. 185.

Evidence of the magnitude of low-beta bias

Summary and conclusion

188   The majority of the estimates set out above imply a zero-beta premium between 2% and 4% and we consider that range to be a reasonable characterisation of the available data.

189   We note that this range is slightly above the range of 1.5% to 3.0% that the AER adopted in its Rate of Return Guideline materials. In its Guideline, the AER stated that:

> …the size of the zero beta premium is between 150 basis points and 300 basis points (under a variety of scenarios for the risk free rate and market risk premium). This does not seem implausible, since zero beta premiums of this magnitude are below the market risk premium as required by the definition of the Black CAPM. Further, although the borrowing rates for the representative investor are not readily discernible, these magnitudes appear reasonable,[87]

and:

> this magnitude of adjustment appears open to us.[88]

190   Figure 19 below demonstrates that a beta uplift from 0.5 to 0.7 would be consistent with a zero-beta premium of 2.6%. That is, if the AER's entire uplift was due to low-beta bias, it would correct a zero-beta premium of 2.6%, which is at the lower end of the reasonable range.

Figure 19: AER parameter estimates in the context of the Black CAPM
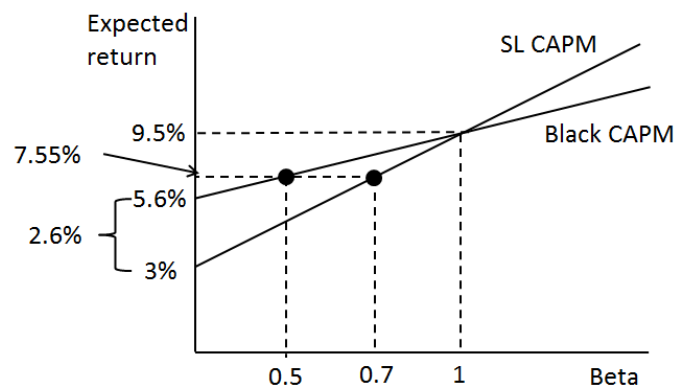
Source: Parameters from JEN Final Decision, 2016, Attachment 3, p. 12; Frontier Economics calculations.

For the reasons set out above, we conclude that the AER's approach does not appear to fully correct for low-beta bias. A full correction for the observed low-beta bias would require a greater uplift to the statistical beta estimate than that which the AER has adopted.

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[87] AER Rate of Return Guideline, Explanatory Statement, Appendix C, p. 71.

[88] AER Rate of Return Guideline, Explanatory Statement, Appendix C, p. 71.

Evidence of the magnitude of low-beta bias

Chapter 3: Market Risk Premium

14   Introduction

191   Frontier Economics has been asked by Ausgrid to provide our views on the approach to estimating the market risk premium (MRP) for use in the Capital Asset Pricing Model (CAPM).

192   Specifically, we have been asked to:

   a. explain where the estimation of the MRP fits within the AER's regulatory framework;

   b. explain the approach to estimating the MRP that the AER set out in its 2013 Rate of Return Guideline (Guideline) and contrast that approach in the Explanatory Statement with the AER's approach to the MRP in recent decisions;

   c. summarise the evolution of the relevant evidence and empirical estimates since 2013;

   d. explain the implications of applying a constant, or substantially constant, MRP to contemporaneous estimates of the risk-free rate; and

   e. provide a reasonable, current estimate of the MRP.

Introduction

15 Primary conclusions

15.1 Application of the 2013 Guideline to the prevailing evidence

193   In this report, we draw three main conclusions:

      a.   The preponderance of evidence indicates that the MRP has increased since the AER's Guideline; and

      b.   In our view, the prevailing market evidence indicates that a reasonable estimate of the MRP is at least 7%.

194   We note that this recommendation of an MRP of at least 7% is lower than the recommendation of at least 7.5% in a report on the MRP that we prepared in January 2017.[89] This reflects the evolution of the evidence since that time. Our estimation approach assigns most weight to the historical returns estimate (which remains effectively constant over time) and to the DGM estimate (which has declined to partially offset the increase in government bond yields that has occurred over the course of this year).

15.2 Change in MRP estimates since the 2013 Guideline

195   The changes in the AER's estimates of the MRP since the Guideline are summarised in Table 8 below. The preponderance of recent evidence indicates an increase in the MRP since the Guideline.

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[89] Frontier Economics, January 2017, The market risk premium, Report for TransGrid.

Table 8: Change in MRP estimates since Guideline

Estimation method	AER 2013 Guideline estimate (%)	Current estimate (%)	Source for current evidence
Historical excess returns	Point estimate: 6.0	6.0 to 6.5	Range from five historical periods used by AER, updated to end 2016.
Dividend growth model	6.1 to 7.5	7.1 to 8.2	Updated estimates using AER DGM approach.
Surveys	Supportive of 6.0	7.3 to 7.6 7.8	Fernandez (2017) mean and median estimates. MRP consistent with KPMG survey and use of prevailing risk-free rate.
Conditioning variables	Qualitative consideration	Qualitative consideration	AER concludes all approaches currently near mean levels whereas one approach suggested a lower MRP at time of Guideline.
Regulatory determinations	Supportive of 6.5	7.2 to 7.7	Decsions made by other Australian regulators within the last six months. Over last year, no estimates below 6.5%, nearly all estimates above 7%.
Independent expert valuation reports (directional evidence on return on equity)	Not inconsistent with estimate of 6.5	6.9 to 8.7	Recent independent expert reports.
Wright approach ("cross-check" only)	5.8 to 8.7	7.3 to 9.9	Range from five historical periods used by AER, updated to end 2016.

Source: AER 2013 Rate of Return Guideline Materials, AER TransGrid Draft Decision

15.3 Comparison of current AER approach with the 2013 Guideline approach

15.3.1 The regulatory task when estimating the MRP

196   Within the CAPM, the MRP is a parameter that reflects the additional return, over and above the risk-free return, that investors would require from an investment of average risk.

Primary conclusions

197   The AER's Guideline materials[90] explain that "the MRP likely varies over time."[91] The AER has stated in recent Decisions that it seeks to estimate the "prevailing market risk premium",[92] which is a "forward-looking estimate of the market risk premium."[93]

198   The regulatory task is to estimate, for an asset of average risk, the forward-looking required return on equity that is commensurate with the prevailing conditions in the market for equity funds.

15.3.2 2013 Guideline approach

199   The approach to MRP that was set out in the Guideline materials was as follows:

    a.   Determine a range from the historical excess returns evidence;

    b.   Determine a range from the DGM evidence;

    c.   Form a combined range from (a) and (b);

    d.   Select a point estimate from within the combined range by weighting the relevant evidence as follows:

        i.   "greatest" consideration to historical excess returns;

        ii.   "significant" consideration to DGM estimates;

        iii.   "some" consideration to survey evidence; and

        iv.   "limited" consideration to other evidence (including conditioning variables and other regulators' estimates of the MRP).

200   In the Guideline materials:

    a.   The historical excess returns range was set to 5.0% to 6.5%;

    b.   The DGM range was set to 6.1% to 7.5%;

    c.   The combined range was set to 5.0% to 7.5%; and

    d.   A point estimate of 6.5% was adopted from within the combined range.

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[90] By "Guideline materials", we mean the Rate of Return Guideline, the Rate of Return Guideline Explanatory Statement (Explanatory Statement), and the associated Appendices. As we explain below, the description of the Guideline approach to the MRP was very brief, comprising three short paragraphs. The Explanatory Statement and Appendices are relevant as they explain how the AER intended, at the time it was developing the Guideline, to implement in practice the Guideline approach to the MRP.

[91] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

[92] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

[93] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

201   The AER stated that its selection of a 6.5% estimate, from within the area of overlap between the historical and DGM estimates, reflected its consideration of the strengths and limitations of each source of evidence:

> We consider an MRP estimate of 6.5 per cent provides an appropriate balance between the various sources of evidence. This point estimate lies between the historical average range and the range of estimates produced by the DGM. This reflects our consideration of the strengths and limitations of each source of evidence.[94]

202   The AER also stated that:

> …we give greatest consideration to historical averages followed by estimates of the MRP from DGMs and then surveys.[95]

203   In relation to the other evidence, including conditioning variables which received "limited" weight, the AER stated:

> We also give some consideration to conditioning variables and other regulators' MRP estimates. These sources of evidence are subject to various limitations and should be used with caution.[96]

and:

> We also give limited consideration to conditioning variables which give mixed results at the time of this decision. Credit spreads and dividend yields are stable, while implied volatility suggests the MRP may be below the historical average.[97]

15.3.3 The AER's approach in recent Decisions

204   The approach to MRP that is adopted in the AER's latest Decisions, such as the September 2017 Draft Decision for TransGrid, is the following:

   a.   The AER first determines a "baseline estimate" of the MRP using historical excess returns.[98] We note that the concept of a "baseline" MRP is not mentioned anywhere in the Guideline materials.

   b.   The AER then uses its DGM estimates as *directional* evidence only to decide whether it should select a point estimate above the baseline estimate.[99] Whereas the Guideline affords "significant" weight to the DGM estimates, and uses them to create the range whereby the final point estimate is selected from the region of overlap between the historical and DGM estimates, the AER's

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[94] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[95] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 95.

[96] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[97] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[98] TransGrid Draft Decision, Attachment 3, p. 76.

[99] TransGrid Draft Decision, Attachment 3, p. 76.

Primary conclusions

most recent Decisions apply "less reliance" on the DGM estimates.[100] The DGM evidence now seems to be applied in a binary manner – having no role other than to indicate whether the final point estimate should be *directionally* above or below the "baseline" of 6%. The DGM evidence appears to have no role in determining the *amount* by which the prevailing MRP exceeds the baseline.

c. The AER then uses conditioning variables to support the contention that the MRP has been relatively stable:

the conditioning variables indicate there has not been a material change in market conditions to warrant adjusting the market risk premium. [101]

and:

Overall, the conditioning variables appear fairly stable and close to their long term averages.[102]

This contrasts with the Guideline approach in which conditioning variables receive "limited" weight because they are "subject to various limitations and should be used with caution."

This conclusion is also inconsistent with the fact that, at the time of the Guideline, the AER concluded that the evidence from conditioning variables was mixed, with some supporting an average and some supporting a low MRP, whereas none of the current evidence supports a low MRP.[103]

d. The AER then considers surveys and other regulatory determinations and concludes that evidence is not inconsistent with a MRP estimate of 6.5%.[104]

15.4 Derivation of a reasonable, current estimate of the MRP

205   We have been asked to provide a reasonable, current estimate of the MRP. In order to do this, we have used our best endeavours to apply the approach to estimating the MRP described in the Guideline materials to the latest data available.

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[100] TransGrid Draft Decision, Attachment 3, p. 76.

[101] TransGrid Draft Decision, Attachment 3, p. 76.

[102] TransGrid Draft Decision, Attachment 3, p. 90.

[103] TransGrid Draft Decision, Attachment 3, p. 90.

[104] TransGrid Draft Decision, Attachment 3, p. 76.

206   Specifically, our approach is to:

    a.   Update the historical excess returns range;

    b.   Update the DGM range based on the AER's specification and parameter estimates;

    c.   Construct the combined range using the historical excess returns and DGM evidence; and

    d.   Select a point estimate that we consider to be reasonable from within the combined range.

15.4.1 Historical excess returns approach

207   We begin by updating the AER's historical excess returns estimates to the end of 2016. In computing these estimates, we adopt a theta of 0.6, which is consistent with a gamma of 0.4. We do not make the NERA correction for dividend yields – again to maintain consistency with the approach set out in the AER's Guideline.

208   We form the MRP range derived using historical excess returns by considering arithmetic averages only. The relevant estimates are set out in Table 9 below.

Table 9: Updated estimates of the MRP from the historical excess returns approach

Sampling period	Average (% p.a.)
1883 - 2016	6.3
1937 – 2016	6.0
1958 – 2016	6.5
1980 – 2016	6.5
1988 - 2016	6.0

Source: AER Historical excess returns estimates, updated to end 2016 by Frontier Economics.

209   In our view, these estimates support a range of 6.0% to 6.5%.[105] The lower bound of this range is derived using the lowest estimate in Table 9, and the upper bound is derived using the highest estimate in Table 9.

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[105] This range differs from the range published by the AER in its latest Decisions (e.g., the TransGrid Draft Decision) of 5.1% to 6.4%. One reason our estimated range differs from the AER's is because our estimates are based on arithmetic averages only, whereas the AER appears to have formed the lower bound of its range (5.1%) by adding 20 basis points to the highest geometric average (4.9%, for the averaging period 1883-2016). The reasons for any remaining differences between our estimates and the AER's are unclear. The historical data we use in our estimation covers the period 1883-2016. Table 3-19 in the TransGrid Draft Decision suggests that the AER also uses data over the same period. However, the text immediately preceding the AER's Table 3-19 (section C.1, p. 202) suggests that the

Primary conclusions

210   We note that, by definition, this approach produces an estimate of the MRP that is commensurate with the average market conditions that existed over the historical sampling period. By contrast, the DGM approach (below) is designed to produce an estimate of the MRP that is commensurate with the prevailing conditions in the market.

15.4.2 DGM approach

211   We have applied the DGM approach, as set out in the Guideline, using data from June and July 2017.[106] The relevant estimates are set out in Table 10 below.

Table 10: Contemporaneous estimates of the MRP from the AER's DGM approach

Growth rate (% p.a.)	Two-stage DGM (% p.a.)	Three-stage DGM (% p.a.)
4.0	7.14	7.25
4.6	7.70	7.72
5.1	8.18	8.11

Source: AER dividend growth model, estimates over June-July 2017 computed by Frontier Economics.

212   This supports a DGM MRP range of 7.14% (the lowest estimate in Table 10) to 8.18% (the highest estimate in Table 10).

15.4.3 The combined range

213   The combined range, based on updated data as at July 2017, is presented in Figure 20s below. The lower bound of the combined range is the 6.0% lower bound of the historical excess returns range and the upper bound of the combined range is the 8.2% upper bound from the AER's DGM approach.

AER has used data "up until the 2015 calendar year end." As noted above, like the AER, we assume a theta estimate of 0.6 and we make no NERA adjustments to the historical data.

[106] This is consistent with the AER's approach of using two months of data when applying the DGM.

Primary conclusions

Figure 20: Current MRP range – AER Guideline approach
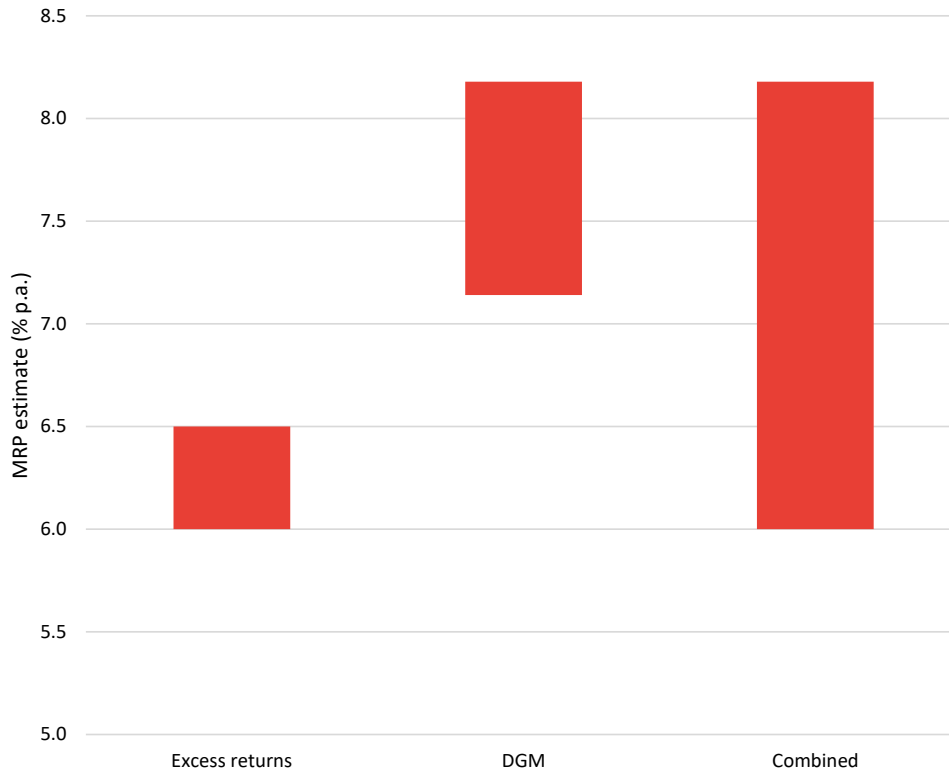
Source: Frontier Economics calculations based on estimates set out in Table 9 and Table 10 above.

15.4.4 Selection of a point estimate from within the range

214   Next we select a point estimate from within the combined range. In this regard, we note that the Guideline approach is to select a point estimate that "lies between the historical average range and the range of estimates produced by the DGM."[107]

215   In the Guideline materials, the AER adopted a point estimate MRP of 6.5%. The Guideline materials do not say precisely how this point estimate was chosen from within the combined range. However, the following factors appear to be relevant to the selection of that figure:

   a. The AER's historical excess returns mid-point estimate is 6.0%[108] and its mid-point three-stage DGM estimate is 7.1%.[109] The mid-point of these two estimates is 6.55%;

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[107] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[108] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 93.

[109] The AER has subsequently stated its preference for the three-stage specification of the DGM. See, for example, JGN Draft Decision, 2014, Attachment 3, Appendix C, p. 222.

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b. The AER adopted an upper bound of 6.5% from its historical excess returns approach and a lower bound of 6.7% from its three-stage DGM approach. The mid-point of this gap between the two ranges is 6.6%;

c. The AER's historical excess returns range and two-stage DGM range overlapped in the region of 6.1% to 6.5%. The mid-point of this region of overlap is 6.3%;

d. The combined range adopted by the AER was 5.0% (the lower bound of the excess returns range) and 7.5% (the upper bound of the DGM range). The mid-point of the combined range is 6.3%; and

e. If the historical excess returns range is based on arithmetic means, consistent with the AER's subsequent decisions, the combined range is 5.7%[110] to 7.5%, with a mid-point of 6.6%.

216   In summary, the approach to the MRP that is set out in the Guideline is to rely primarily on the historical excess returns method and the DGM method to specify a range for the MRP and to select a point estimate from within that range. Other evidence is considered to be "less informative"[111] and is given only "some"[112] or "limited"[113] consideration.

217   In relation to the current estimates set out above, we note that:

a. The mid-point of the combined range is 7.1%; and

b. The upper bound of the AER's historical excess returns approach is 6.5% and the lower bound from the AER's DGM approach is 7.2%. The mid-point of this gap between the two ranges is 6.9%.

218   We also note that, since the Guideline, the AER's excess returns estimates have increased somewhat and its DGM estimates have increased substantially. Figure 23 below shows the increase in the estimates from each of the two main approaches set out in the Guideline. Clearly, the mid-points of the ranges for both methods have increased since the Guideline and the same applies to the combined range. All of this evidence is consistent with an increase in the MRP since the Guideline.

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[110] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 93.

[111] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[112] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[113] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Primary conclusions

Figure 21: Comparison of AER estimates: 2013 Guideline vs. current

Source: AER 2013 Rate of Return Guideline, Explanatory Statement, Appendix D; Frontier Economics calculations based on estimates set out in Table 9 and Table 10 above.

219   In our view, the latest evidence no longer supports an estimate of 6.5%. Rather, the evidence above suggests that a reasonable, current estimate of the MRP is at least 7.0%.

15.4.5 Other relevant evidence

220   In the Guideline materials, the AER indicated that it considered other evidence to be "less informative"[114] and that it would be given only "some"[115] or "limited"[116] consideration. In this section, we consider how that other evidence has moved since the Guideline.

221   We find that the evidence from other relevant regulators in Australia and recent surveys support a MRP estimate well above 7.0%.

222   Further, we also investigate cross-check evidence in the form of recent reports from valuation experts, and estimates derived using the Wright approach, and find that these also provide strong directional evidence that the MRP in prevailing market conditions is materially higher than 7.0%.

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[114] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[115] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[116] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Primary conclusions

Relevant estimates from other Australian regulators

223 The AER has stated recently that it gives no weight to MRP estimates used in overseas regulatory decisions.[117] Therefore, we restrict our focus to MRP decisions by regulators in Australia.

224 The AER also notes that:

> …other regulators adopt different approaches, have different regulatory tasks (and regimes) and regulate different businesses.[118]

225 We agree with this observation. In our view, to the extent the AER gives any weight to the MRP decisions of other Australian regulators — even as cross-checks — it should give most weight to the estimates derived by regulators with similar regulatory objectives and tasks.

226 We note that those regulators who seek to obtain an estimate of the MRP that is commensurate with the prevailing conditions in the market, as the AER must do under the Rules, have over the past 12 months adopted estimates above 7.0%. This is borne out by the AER's own evidence, as summarised in Figure 22 below, and discussed in some detail in Appendix C of this report.

Figure 22: Market risk premium estimates from other Australian regulators' decisions
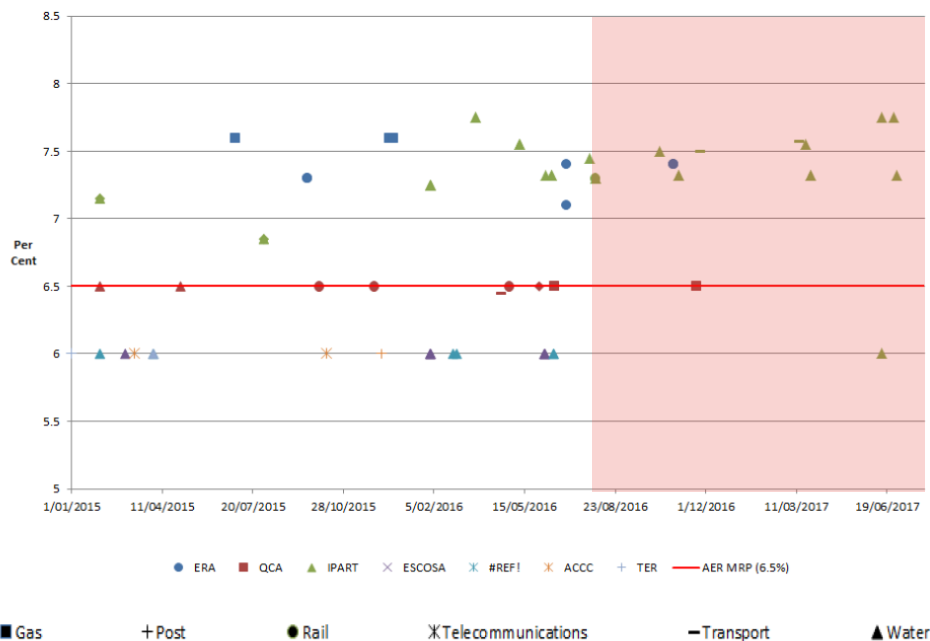
Source: TransGrid Draft Decision, 2017, Attachment 3, Figure 3-15, p. 236.

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[117] TransGrid Draft Decision, 2017, Attachment 3, p. 291.

[118] TransGrid Draft Decision, 2017, Attachment 3, p. 291.

Primary conclusions

227   As we note in Appendix C, in addition to the regulatory decisions reflected in Figure 22, IPART, the ERA and QCA have each published further estimates of the MRP:

   a.   IPART's August 2017 Biannual WACC update determined a MRP estimate of 7.7%;[119]

   b.   The ERA's October 2017 WACC Final Decision for WA rail networks determined a MRP estimate of 7.2%;[120] and

   c.   The QCA's November 2017 Draft Decision on bulk water charges for Seqwater concluded that the best empirical estimate of the MRP at the present time is 7.0%.[121]

228   This evidence indicates that other regulators in Australia are currently estimating the MRP, reflecting prevailing market conditions, to be at least 7.0%, with nearly all decisions within the last 12 months adopting estimates materially above 7.0%.

229   The AER notes that the ERA has stated in its 2016 Goldfields Gas Pipeline Decision[122] that its estimate of the MRP (7.4%) is comparable to the AER's estimate of 6.5% "once differences in parameter estimates and judgment are accounted for."[123] The ERA explains in its Goldfields Gas Decision that it uses a risk-free rate with a 5-year term, whereas the AER uses a risk-free rate with a 10-year term. At the time of that decision, the 5-year risk-free rate was approximately 40 basis points below the 10-year rate. Thus, the ERA's MRP was 7% relative to the 10-year government bond yield, which is materially different from the AER's 6.5% allowance.

230   Moreover, we note that in the ERA's latest Decisions, in relation to WA rail networks, the ERA adopted a 10-year risk-free rate, and still arrived at a MRP estimate of 7.2%.[124]

231   Further, the ERA is subject to the same Rules as the AER and therefore must, like the AER, ensure its estimate of the MRP satisfies the ARORO.

232   Hence, it is incorrect that the ERA's most recent estimates of the MRP are consistent with the AER's estimate of 6.5%.

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[119] IPART, WACC Biannual update, August 2017, p. 2.

[120] ERA, Determination on the 2017 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways, 6 October 2017, p. 4.

[121] QCA, Seqwater Bulk Water Price Review 2018–21, November 2017, p. 54.

[122] ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Goldfields Gas Pipeline, June 2016, p. 240.

[123] TransGrid Draft Decision, 2017, Attachment 3, p. 291.

[124] ERA, Determination on the 2017 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways, 6 October 2017, p. 4.

Primary conclusions

Survey evidence

233   In its Guideline materials, the AER noted that:

> McKenzie and Partington place significant weight on survey evidence[125]

and that:

> Lally also supported the use of survey evidence and suggested the recent Fernandez survey is the most relevant survey evidence. [126]

234   The AER then cited five versions of the Fernandez surveys in its Table D.5.[127]

235   An updated Fernandez survey was released in April 2017.[128] This new survey is clearly the most timely of the available surveys.

236   The Fernandez (2017) survey reports that:

       a. **The median MRP for Australia has increased to 7.6%** and the mean is 7.3%;[129]

       b. **The mean reported MRP increased between 2015 and 2017 for the vast majority of countries represented in the survey.** Out of the 41 countries in Table 6, the mean MRP estimate increased for 31 and decreased for 10.[130] Of the 10 countries for which the MRP estimate decreased, 9 are developing markets. This indicates that an increase in the reported MRP for Australia is in line with the results for other markets and particularly other developed markets;

       c. **The standard approach of survey respondents is to pair the MRP estimate with a risk-free rate above the prevailing government bond yield.** The authors take the 10-year government bond yield as a standard benchmark and show that respondents are pairing their MRP estimates with a risk-free rate above the benchmark rate.[131] Since the AER's approach is to estimate the risk-free rate as the 10-year government bond yield
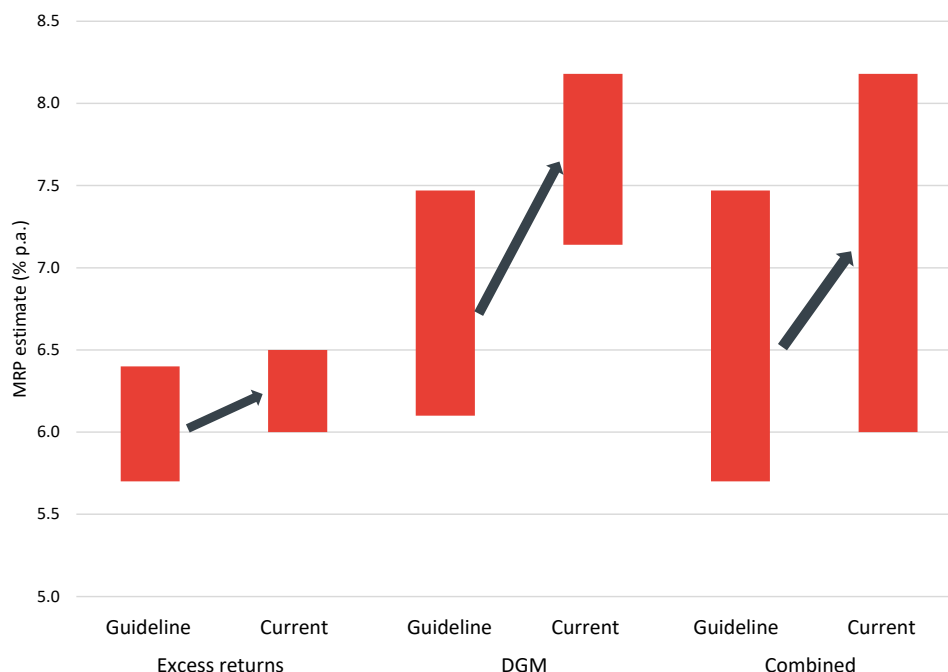
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[125] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix D, p. 89.

[126] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix D, p. 89.

[127] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendix D, p. 92.

[128] Fernandez, P., V. Pershin and I.F. Acin, Discount rate (risk-free rate and market risk premium) used for 41 countries in 2017: A survey, April 17, ssrn.com/abstract=2954142.

[129] Fernandez et al (2017), Table 2, p. 3.

[130] Fernandez et al (2017), Table 6, p. 7.

[131] Fernandez et al (2017), Table 8, p. 9. The median return on the market is not reported.

without adjustment, the implied MRP is even higher than the raw figures set out above.

d. **As with prior surveys, the estimates would have to be adjusted to reflect the value of dividend imputation tax credits that is assumed by the AER.** It is, in our view, unreasonable to suggest (as the AER does) that survey respondents had already adjusted their MRP estimates to reflect a gamma of precisely 0.4 so as to be consistent with the AER's other MRP estimates. However, even if no such adjustment were made, the 'raw' survey evidence would still support a MRP estimate well in excess of 7.0%.

237   We note that the Fernandez survey on which the AER placed primary regard in the Guideline, produced materially lower estimates of the MRP than does the current Fernandez survey. That is, this survey evidence supports the notion that the MRP has risen materially since the Guideline, as shown in Figure 23 below.

Figure 23: Comparison of survey estimates of the MRP: 2013 Guideline vs. current
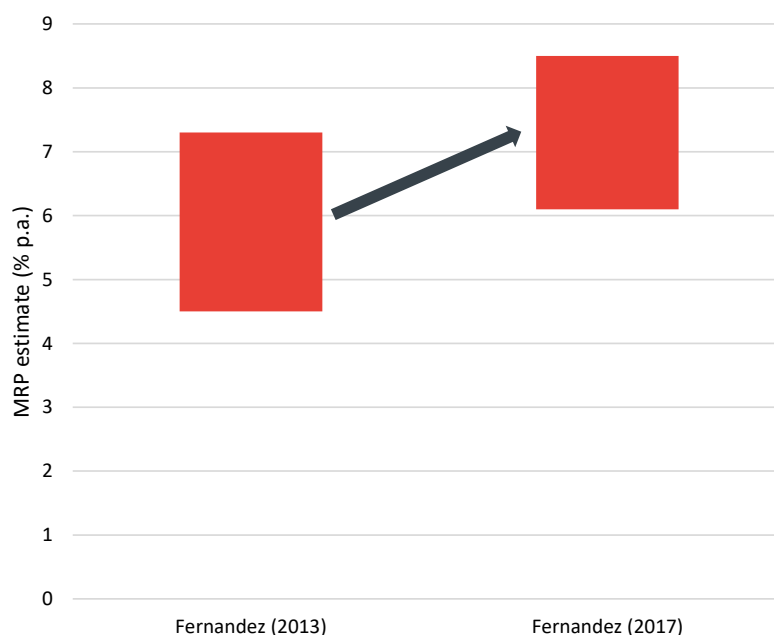
Source: Fernandez, P., J. Aguirreamalloa and L. Corres, 2013, Market risk premium used in 82 countries in 2012: a suvey with 7,192 answers, May 15; Fernandez, P., V. Pershin and I.F. Acin, 2017, Discount rate (risk-free rate and market risk premium) used for 41 countries in 2017, April 17. For each survey, we have set out a range that consists of the mean estimate plus and minus one standard deviation.

238   In its most recent Decisions, the AER presents results from a number of other surveys, but nearly all of these are more than 12 months out of date and so have little relevance to estimation of the current MRP reflecting prevailing market conditions.

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Cross-checks: Wright estimates

239   The AER states in recent Decisions that it uses the Wright evidence as a cross-check on its overall return on equity, but does not use the Wright approach to estimate the MRP because the Wright approach:[132]

      a.   is "not theoretically justified";

      b.   does "not take into account changing market conditions";

      c.   assumes a clear inverse relationship between the risk-free rate and the MRP, and there is "no compelling empirical evidence" for such a relationship; and

      d.   is not generally accepted by market practitioners, academics or regulators.

240   Whilst we disagree with a number of the AER's reasons cited above,[133] we make a more fundamental observation. The AER uses the Wright approach as a cross-check of the overall return on equity estimate and, in doing so it presents its estimates of:[134]

      a.   What it refers to as the "Wright CAPM return on equity";

      b.   the prevailing risk-free rate; and

      c.   equity beta.

241   Using these inputs, the Wright estimate of the MRP can be calculated mechanistically using the following formula:

$$MRP_W = \frac{r_W - r_f}{\beta}$$

where MRP_W denotes the Wright estimate of the MRP, r_W denotes the AER's Wright CAPM return on equity, r_f denotes the AER's estimate of the prevailing risk-free rate and β denotes the AER's estimate of the equity beta.

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[132] TransGrid Draft Decision, 2017, Attachment 3, p. 199.

[133] For example, it is incorrect to say that the Wright approach does not take into account changing market conditions. The AER seems to argue that because the Wright approach uses long-run averages of the overall return on the market, it is incapable of reflecting changing market conditions. We note that the Wright estimates of the MRP move in a very similar manner to the AER's DGM estimates, which the AER acknowledges reflects prevailing market conditions well. Further, we note that whilst direct empirical evidence of an inverse relationship between the risk-free rate and MRP is impossible to adduce (since the MRP cannot be observed directly; it can only be estimated), there is ample indirect evidence (which we cite below in this report) that the returns required by equity investors have remained fairly stable over time as the risk-free rate has fluctuated significantly. This is entirely consistent with the Wright approach.

[134] For example: TransGrid Draft Decision, 2017, Attachment 3, Table 3-21, p. 199.

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242 Note that all of the estimates on the right-hand-side of this relationship are the AER's own estimates. Further, the Wright CAPM return on equity is accepted by the AER as a cross-check on the overall return on equity estimate. Given these facts, it would seem logical for the AER to use its Wright estimate of the MRP as a cross-check on its other estimates of the MRP. The AER's Wright estimate of the MRP is implicit within its own estimate of the Wright CAPM return on equity. It can be computed mechanistically using two other parameter estimates (the risk-free rate and equity beta) which the AER presumably regards as uncontroversial as they are its own estimates.

243 That is the approach that we have followed in this report: The AER's own estimates of the risk-free rate, equity beta, and the Wright CAPM return on equity imply a unique estimate of the MRP. We use this unique estimate of the MRP as a cross-check of the AER's allowed MRP.

244 Table 11 below presents estimates of the MRP derived using the Wright CAPM.

Table 11: Contemporaneous estimates of the MRP from the Wright approach

Sampling period	Average (% p.a.)
1883 - 2016	8.6
1937 – 2016	7.3
1958 – 2016	8.9
1980 – 2016	9.9
1988 - 2016	9.3

Source: AER Wright approach estimates, updated to end 2016 by Frontier Economics.

245 Figure 24 below shows that the Wright estimates of the MRP have also materially increased since the AER's 2013 Guideline.

Primary conclusions

Figure 24: Comparison of Wright estimates of the MRP: 2013 Guideline vs. current
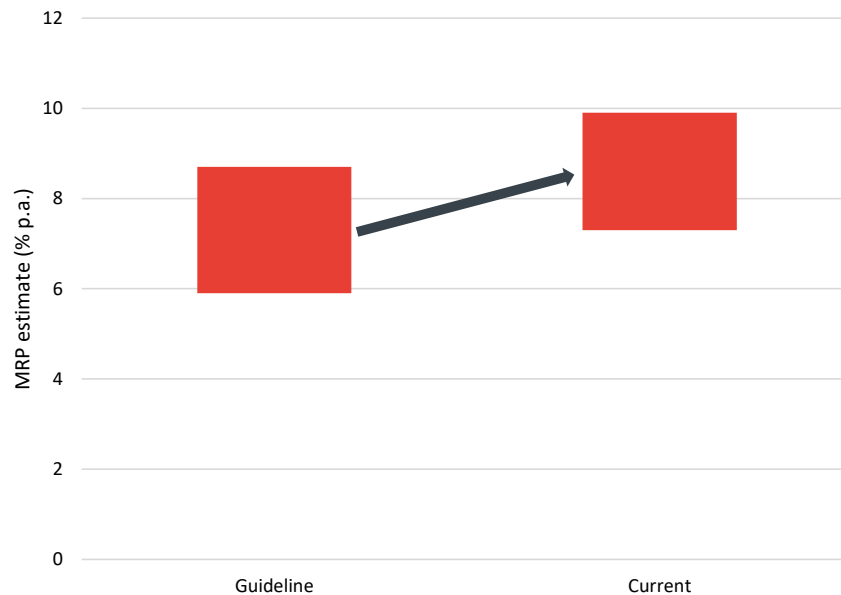
Source: AER Wright estimates, updated to end 2016 by Frontier Economics.

Cross-checks: Updated independent expert report evidence

246   The AER also stated in its Guideline materials that independent expert valuation reports "should play a role in our estimation of the expected return on equity,"[135] cautioning that they must be contemporaneous:

> Expert reports are credible, verifiable, and clearly sourced. Against this, expert reports are not released at regular intervals. Consequently, some estimates may be out of date.[136]

247   The Guideline materials acknowledge that independent valuation experts have regard to changing market conditions and new information, when estimating the return on equity:

> Expert reports have regard to changing market conditions and new information. Firms undertaking valuations will generally have an agreed policy or framework that is applied consistently at a point in time. Within this they may adjust their assumptions and point estimates having regard to current market conditions.[137]

248   The AER went on to explain in the Guideline materials that different valuation experts take account of changing market conditions and new information in different ways: some adjust the risk-free rate, some the MRP and others still the overall return on equity; therefore, in order to make fair comparisons across

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[135] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

[136] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

[137] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

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different valuation experts' reports, it is necessary to examine the valuation experts' estimates of the overall return on equity:

> However, the adjustments can be arbitrary and may be made to the risk free rate, the market risk premium and/or the expected return on equity. Hence, the results are most comparable at the overall return on equity level.[138]

249   We agree entirely with the AER on this point. It would be quite misleading to examine only the MRP estimates presented by valuation experts, ignoring any adjustments to account for changing market conditions that these experts may have applied to their estimates of the risk-free rate or the overall return on equity.

250   However, in recent Decisions the AER makes precisely the error that is warned against in the Guideline materials, when assessing some valuation experts' reports that we had brought to the AER's attention in previous submissions. Specifically, the AER has stated that:[139]

   a.   Three of the four valuation reports we cited "specify a market risk premium of 6 per cent";

   b.   These same three valuation reports apply an uplift to the prevailing risk-free rate. "This does not change the market risk premium itself and so should not be compared as such. The AER does not apply any uplift to its risk-free rate."

251   Our point in drawing the AER's attention to these valuation reports (and the AER's point in the Guideline materials) is that whilst these valuation experts were using a MRP estimate of 6%, they had made upward adjustments to the risk-free rate (or elsewhere) to account for prevailing market conditions, so as to obtain a more realistic estimate of the overall return on equity.

252   Independent valuation experts use a range of approaches to estimate the required return on equity that they consider to be commensurate with the prevailing market conditions. However, the AER has adopted an approach where the only parameter that can be varied is the MRP. Consequently, the relevant task is to determine what MRP would have to be inserted into the AER's valuation formula to obtain an estimate of the required return on equity that is consistent with that adopted by the independent expert. This is the *effective* MRP that is implicit in the independent expert reports.

253   For example, suppose the prevailing risk-free rate is 3% and an independent expert report adopts an adjusted risk-free rate of 5% and a MRP of 6%. In this case, the expert has determined that the required return on market equity is 11% (5%+6%). This implies an effective MRP of 8% (11%-3%). Thus, if the effective MRP of

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[138] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

[139] TransGrid Draft Decision, 2017, Attachment 3, p. 294.

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8% is used in the AER's valuation formula, where the risk-free rate is set to 3%, the resulting estimate of the required return on market equity is 11% (3%+8%), which is consistent with the expert's view.

254   It would, in our view, be unreasonable to conclude that the expert report supported the approach of inserting a 6% MRP into a valuation formula with a risk-free rate of 3%, as that would produce a return on equity estimate of only 9%, which is clearly inconsistent with the expert's view. We note that, for each independent expert report, there is a unique MRP that, when inserted into the AER's valuation formula, produces a return on equity estimate that is consistent with the expert's return on equity estimate.

255   The AER gives the following reasons in recent Decisions for rejecting the use of valuation expert reports to cross-check its estimates of the MRP:

a.   The AER argues that the uplifts applied by valuation experts to initial estimates (i.e., of the risk-free rate, MRP or the overall required return on equity) may be inconsistent with the ARORO. As a result the AER prefers to have regard to unadjusted estimates.[140] Further, the adjustments made by valuation experts "seem too ad hoc to be a regulatory tool."[141] We note that the adjustments applied by valuation experts affect the overall estimate of the required return on equity *and* the effective MRP implicit within those estimates. It is inconsistent for the AER to reject estimates of the effective MRP in valuation experts' reports as a cross-check, due to concerns over the adjustments applied, but then accept the same valuation experts' overall return on equity estimates (affected by the same adjustments) as a cross-check on its overall return on equity estimate – as per the Guideline. Further, the AER provides no evidence that the adjustments being made by valuation experts *actually* reflect any of these factors; it merely speculates that the adjustments *may* reflect some of these factors and, based on this speculation alone, rejects valuation expert reports as evidence relevant to the MRP.

b.   The AER notes that the ARORO states that data must be "informed by sound empirical analysis and robust data", and argues that many valuation reports do not state the source of their information or decisions.[142] This reasoning appears to be an

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[140] TransGrid Draft Decision, 2017, Attachment 3, Table 3-6, pp. 93-4.

[141] TransGrid Draft Decision, 2017, p. 293.

[142] TransGrid Draft Decision, 2017, p. 293.

Primary conclusions

unexplained departure from the Guideline, which concludes that "Expert reports are credible, verifiable, and clearly sourced."

256   Given that the AER accepts valuation expert reports as a cross-check on the overall return on equity, we consider it reasonable to use this same evidence (accounting for the various ways in which different experts may make adjustments for changing market conditions and new information) as a cross-check on MRP estimates.

257   In our January 2017 report, we presented estimates of the effective MRP contained in valuation reports by Lonergan Edwards, Grant Samuel, Deloitte and KPMG.[143]

258   We calculate the effective MRP used in these valuation reports by first summing together the risk-free rate and MRP estimates reported in each of those reports. We then subtract the contemporaneous government bond yield to obtain an estimate of the effective MRP. These calculations are set out in Table 12 below.[144]

Table 12: The effective MRP used in recent independent expert valuation reports

Independent expert	Required market return	Contemporaneous government bond yield	Effective MRP
Lonergan Edwards	10.0%	3.1%	6.9%
Grant Samuel	11.2%	2.5%	8.7%
Deloitte	9.6%	1.8%	7.8%
KPMG	10.4%	2.4%	8.0%

Source: Connect 4.

259   The evidence in Table 12 is that independent experts are using estimates of the required return on equity that are materially higher than those being allowed by the AER's approach of adding a fixed 6.5% premium to the prevailing government bond yield.

260   As we noted in our January 2017 report, the MRP figures set out in Table 12 are ex-imputation estimates. For example, Lonergan Edwards specifically states that its WACC parameter estimates have been derived:

…without adjustment for imputation.[145]

and Grant Samuel conclude that:

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[143] Frontier Economics (2017), Section 4.5.

[144] Grant Samuel applies an upward adjustment at the WACC level. To find the required return on the market, we simply strip out the return on debt component for the case where beta is set to 1.

[145] Lonergan Edwards, 2016, p. 45.

Primary conclusions

> While acquirers are undoubtedly attracted by franking credits there is no clear evidence that they will actually pay extra for them or build it into values based on long term cash flows. Accordingly, it is Grant Samuel's opinion that it is not appropriate to make any adjustment.[146]

261   Consequently, before the estimates of the effective MRP reported in Table 12 can be compared to the AER's 6.5% allowance, they must be grossed-up to reflect the AER's assumed value of imputation credits.

262   For the avoidance of doubt, we do not argue that these valuation reports should be used as evidence on the precise point estimate of the MRP. However, this is relevant directional evidence that finance practitioners are *not* coupling the prevailing risk-free rate with a MRP commensurate only with the historical excess returns evidence—as the AER's Decisions in effect do.

263   Our preferred approach is to use estimates of the risk-free rate and MRP that are commensurate with the prevailing conditions in equity markets. In our view, the MRP that is commensurate with the prevailing conditions is materially higher than the AER's 6.5% allowance, in which case the required return on equity is materially higher than the AER's allowance.

264   Although some independent experts take a different path, they all reach the same conclusion – in the prevailing conditions in the market for equity funds, the required return on equity is materially higher than the AER's allowance.

15.4.6 Conclusions in relation to MRP

265   In our view, the evidence set out above supports the notion that the MRP has increased materially since the Guideline, published in December 2013. In the Guideline materials, the AER set out the sort of evidence that it would consider when estimating the MRP. As explained above, the preponderance of that evidence supports the conclusion that the MRP has risen materially since the Guideline.

266   In selecting a current, forward-looking point estimate, we have adopted an approach that we consider is reasonable and consistent with the Guideline. This involves:

a.   Estimating a range of historical excess returns estimates;

b.   Estimating a range of DGM estimates;

c.   Constructing a combined range; and

d.   Selecting a point estimate that lies between the historical average range and the range of estimates produced by the DGM.

267   As set out above, this produces a current estimate of at least 7.0%.

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[146] Grant Samuel, 2016, p. 11.

Primary conclusions

268   The fact that our proposed estimate of at least 7.0% is higher than the 6.5% estimate that the AER adopted when applying its approach to the evidence in 2013 is conservative in that:

    a. The AER's historical excess returns estimates have increased since 2013;

    b. The AER's DGM estimates have increased since 2013, and are currently above 7.0%;

    c. A number of other regulators are currently adopting MRP estimates above 7.0%;

    d. The most recent survey evidence suggests that the MRP has increased since 2013, and is currently above 7.0%;

    e. The AER's Wright estimates have increased since 2013 and are currently above 7.0%; and

    f. The effective MRP estimates being used by independent valuation experts are currently above 7.0%.

269   We note that had the AER adopted this estimate in its latest Decisions, the return on equity allowance would have still been materially lower (by about 107 basis points) than the return on equity allowance implied by the AER's parameter estimates set out in the Guideline materials—as shown in Table 13 below.

Table 13: Change in return on equity estimates over time

Parameter	December 2013	September 2017
Risk-free rate	4.10%	2.68%
Beta	0.7	0.7
MRP	6.50%	7.00%
Return on equity	8.65%	7.58%
Change in return on equity estimates	-107 basis points	

Source: Frontier calculations

270   Therefore, we do not claim that the overall return on equity has remained perfectly constant over time. We simply argue that the return on equity has not fallen as materially as claimed by the AER in its most recent Decisions.

15.5 Summary of appendices to this Chapter

271   The remainder of this Chapter fleshes out the above analysis and conclusions in a series of Appendices, each of which is summarised below.

Primary conclusions

15.5.1 Appendix A: The AER's Guideline approach

272   Appendix A to this Chapter contains a summary of the approach to estimating the MRP that was set out in the Guideline materials. In this report, we have sought to apply the approach described in the Guideline materials as best we can to the prevailing evidence to obtain a reasonable, current estimate of the MRP.

15.5.2 Appendix B: The AER's recent presentation of the Guideline approach

273   Appendix B to this Chapter contains a summary of the approach to estimating the MRP that was set out in the AER's most recent Decisions. That Appendix documents the similarities and differences between the approach described in the Guideline materials and the approach used by the AER in its most recent Decisions. We concluded that the fact that a material change in the evidence has not produced any change in the MRP allowance makes the current approach difficult to reconcile with the Guideline approach.

274   The main differences between the two approaches are:

    a.   The introduction of a "baseline" historical estimate that was not mentioned in the Guideline materials;

    b.   The downgrading of the DGM evidence from receiving "significant" weight to now being afforded "less reliance" and providing only "directional" information; and

    c.   The additional weight that seems to now be afforded to conditioning variables in justifying the maintenance of the same 6.5% allowance.

275   The AER does not offer any reasons for these (and other) departures from the Guideline approach in its most recent Decisions. Indeed, the AER argues that it has not departed from the Guideline approach when making its most recent Decisions.

15.5.3 Appendix C: Issues relating to the AER's interpretation of the prevailing evidence

276   Appendix C to this Chapter raises a number of issues in relation to the AER's current interpretation of the prevailing evidence.

The interpretation of the historical excess returns evidence

277   The AER concludes in its most recent Decisions that the historical excess returns data supports an MRP range between 5.1% and 6.4%.[147]

278   The lower bound of 5.1% comes from the geometric mean of historical excess returns. The AER concludes that "there may be a bias in the geometric averages."[148]

279   The upper bound of 6.4% comes from the arithmetic mean of historical excess returns, which is the correct method for taking the average in this setting. The AER's latest Decisions report arithmetic mean estimates between 5.8% and 6.4% for the five historical periods that are examined.[149]

280   The latest Decisions then adopt an historical excess returns estimate of 5.5% to 6.0%.[150] That range does not even include the majority of the arithmetic estimates, even though the AER has acknowledged that the arithmetic mean is the appropriate method for taking the average in this setting. Moreover, the mid-point of the final range is below *all* of the AER's arithmetic mean estimates. The range adopted by the AER in its latest Decisions does not seem to reconcile with the evidence presented.

281   Moreover, our estimates of the arithmetic mean for the same five historical periods range between 6.0% and 6.5%. We have been unable to reconcile the AER's slightly lower estimates.

Conclusions about whether current government bond yields are "low"

282   One important point made in submissions to the AER was that the historical data can, by definition, only provide an estimate of the MRP for the average market conditions over the historical period that was used. It then follows that, if the prevailing market conditions differ in some respect relative to the historical average conditions, the historical average MRP may not reflect the prevailing conditions as it is required to do. The AER received submissions to the effect that one important difference is that the prevailing government bond yields are lower than at any time in history. The AER's most recent Decisions reject that submission[151] on the basis that "the low rates we are currently experiencing are not so unusual."[152]

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[147] TransGrid Draft Decision, Attachment 3, p. 76.

[148] TransGrid Draft Decision, Attachment 3, p. 76.

[149] TransGrid Draft Decision, Attachment 3, p. 202.

[150] TransGrid Draft Decision, Attachment 3, p. 76.

[151] TransGrid Draft Decision, 2017, Attachment 3, p. 285.

[152] Partington and Satchell (2016), p. 23.

Primary conclusions

283 In Figure 25 below, we plot the 10-year government bond yields that form the basis of the AER's historical estimate of the MRP. Taking data back to 1883, the three lowest yields are those that have occurred since the Guideline. This would appear to settle the issue of whether the prevailing government bond yields are low.

284 The fact that the three years since the Guideline have produced the three lowest government bond yields in history:

      a. raises questions about the weight that should be applied to an historical MRP that is computed using data from a period of uniformly higher yields; and

      b. makes it imperative that material weight be given to DGM estimates, since the DGM reflects prevailing market conditions more than other estimation approaches considered by the AER. In our view, the DGM should not be relegated to providing only directional evidence.

Figure 25: Frequency distribution of government bond yields from 1883 to 2016
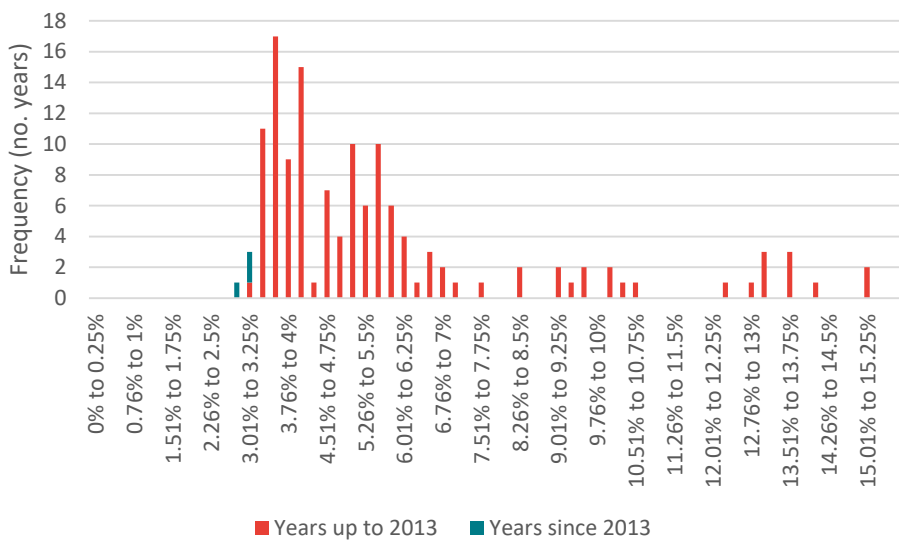
Source: Frontier Economics analysis.

Conclusions about survey evidence

285 The AER's recent Decisions conclude that:

    Survey evidence generally supported a market risk premium around 6.0 per cent or less.[153]

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[153] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

Primary conclusions

286   However, the evidence does not support that conclusion. The AER considers two surveys from 2017, which should receive predominant weight given that the Guideline materials identify "timeliness" as a potential weakness of survey evidence.[154]

287   Fernandez et al (2017) report mean and median MRP estimates of 7.3% and 7.6% respectively.

288   KPMG (2017) report a median MRP of 6.0% but specifically note that:

    a.   Australia's current low-interest environment has resulted in some valuers adjusting the market risk premium upwards by either 0.5% or 1.0%;[155] and

    b.   The vast majority of respondents are currently using risk-free rates that are well above the prevailing 10-year government bond yield.[156] In fact, KPMG indicate that the most commonly used risk-free rate was 4.5%.[157]

289   If the most commonly used risk-free rate is 4.5%, and the most commonly used MRP is 6.0%, the total required return on equity for an average firm is 10.5%. If that expected market return is paired with a prevailing risk-free rate of 2.7% (as is the case in the AER's latest Decisions) the implied MRP is 7.8%.

290   It would be unreasonable to interpret this evidence as supporting the approach of inserting a 6.0% MRP into the CAPM formula with the prevailing risk-free rate of 2.7%, as that would produce a return on equity figure that is materially lower than that actually adopted by the respondents. Such an approach would imply that respondents considered the required return on equity to be 8.7%, which is materially different from the 10.5% that they are actually using.

Conclusions about the practice of other regulators

291   The AER's latest Decisions conclude that:

> Regulatory decisions over the past 12 months indicate a market risk premium of 6.5 is reasonable.[158]

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[154] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 90.

[155] KPMG, 2017 Valuation Practices Survey, p. 11.

[156] KPMG, 2017 Valuation Practices Survey, p. 10.

[157] https://home.kpmg.com/au/en/home/insights/2017/07/valuation-practices-survey-2017.html (accessed 15 December 2017).

[158] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

Primary conclusions

292   The latest Decisions contain a Figure that summarises regulatory MRP estimates since the beginning of 2015.[159] This Figure shows that:

      a.   The majority of regulatory estimates are materially higher than 6.5% (mostly above 7%);

      b.   Some regulatory estimates are equal to 6.5%; and

      c.   Some regulatory estimates are equal to 6.0%.

293   The AER's latest Decisions note that the AER's focus is on regulatory decisions over the 12 month period between August 2016 and July 2017.[160] The MRP estimates determined by other Australian regulators during this period were almost exclusively above 7.0%. Only two data points lie on or below the AER's preferred MRP estimate of 6.5%:

      a.   One was a decision by the QCA in relation to DBCT's draft access undertaking in October 2016, which used a MRP estimate of 6.5%; and

      b.   The other is a June 2016 determination by IPART for WaterNSW in relation to bulk water services supplied in the Murray-Darling Basin (MDB) valleys, which used a MRP estimate of 6.0%.

294   However, we note that:

      a.   the October 2016 QCA decision has been superseded by a November 2017 QCA decision in relation to Seqwater's bulk water charges. In its more recent decision, the QCA concluded that the best empirical estimate of the MRP at the present time is 7.0%.[161]

      b.   the June 2016 estimate of 6.0% should be disregarded because IPART was constrained by legislation to use a 6.0% MRP for WaterNSW's charges in relation to the MDB valleys.[162] Indeed, in the same determination, IPART adopted a 7.75% MRP for charges that were not subject to that legislative constraint.[163]

295   The suggestion that 12 estimates above 7% and one legislatively mandated figure below 6.5% supports an MRP of 6.5% is a clear misinterpretation of the evidence.

296   Moreover, we note that the two additional recent decisions from other Australian regulators, which were not considered in the AER's most recent Decisions, are:

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[159] TransGrid Draft Decision, 2017, Attachment 3, Figure 3-15, p. 236.

[160] TransGrid Draft Decision, 2017, Attachment 3, Figure 3-15, p. 235.

[161] QCA, Seqwater Bulk Water Price Review 2018–21, November 2017, p. 54.

[162] IPART, Review of prices for rural bulk water services from 1 July 2017 to 30 June 2021, June 2017, p. 72.

[163] IPART, Review of prices for rural bulk water services from 1 July 2017 to 30 June 2021, June 2017, p. 75.

Primary conclusions

a. IPART's August 2017 Biannual WACC update determined a MRP estimate of 7.7%;[164] and

b. The ERA's October 2017 WACC Final Decision for WA rail networks determined a MRP estimate of 7.2%.[165]

297   These estimates also point to a current MRP estimate of at least 7.0%.

15.5.4 Appendix D: The implications of a "nearly constant" approach to the MRP

298   Whilst the AER acknowledges that "the MRP likely varies over time,"[166] the AER has allowed an MRP of 6.5% in every one of its Draft and Final Decisions since the Guideline was published in December 2013, irrespective of how the market evidence has changed. The AER also adopted an MRP of 6.5% in its previous review of WACC parameters in 2009.

299   Appendix D to this Chapter explains that the consequence of applying a fixed MRP to the prevailing risk-free rate (as in the AER's approach) is that the return on equity allowance varies one-for-one with changes in government bond yields.

300   This can lead to implausible outcomes. For example, during the global financial crisis (GFC) in late 2008, government bond yields fell sharply as demand for safe government bonds increased dramatically. The AER's approach of applying a fixed MRP to the prevailing risk-free rate would have implied that the return required by investors fell in line with government bond yields during the GFC. An approach that leads to such implausible outcomes is an unreasonable one.

15.5.5 Appendix E: Evidence on the total required return on equity

301   Appendix E to this Chapter addresses a number of points the AER has raised in relation to evidence of stability in the required return on equity. In a number of previous submissions (including our January 2017 report for TransGrid), we presented evidence indicating that the overall required return on equity had remained relatively stable since the Guideline. This implies that the MRP has increased to largely offset the material decline in government bond yields that has occurred since 2013. The AER's most recent Decisions argue that we have not engaged sufficiently with some of its assessment of that evidence.

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[164] IPART, WACC Biannual update, August 2017, p. 2.

[165] ERA, Determination on the 2017 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways, 6 October 2017, p. 4.

[166] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

Primary conclusions

302   Appendix D presents a response to the AER's analysis and concludes that there is material evidence from central banks, other regulators, corporate advisory firms and independent experts that the required return on equity has remained relatively stable over recent years and has *not* declined one-for-one with the dramatic fall in government bond yields, as the AER's regulatory allowances would suggest.

15.5.6 Appendix F: Issues relating to DGM estimates of the MRP

303   Appendix F to this Chapter documents the change in the way the AER uses its DGM estimates when estimating the MRP. Although the AER's most recent Decisions state that the AER has not changed the weight it applies to its DGM evidence,[167] that statement is difficult to reconcile with the fact that the MRP allowance has remained fixed even as the AER's DGM estimates have increased materially.

304   The AER's most recent Decisions set out a number of issues that *may* affect DGM estimates, without providing any evidence that these issues *have* in fact affected the AER's estimates. We address each of those issues in Appendix F to this Chapter. We note that all of these potential issues were known at the time the Guideline was written, so could not be the basis for reducing the weight applied to the (now materially higher) DGM estimates. Moreover, some of the issues were specifically considered by the AER when it was developing the Guideline and were set aside as being unimportant. For example, the possibility of a term structure of equity returns was specifically rejected in the Guideline[168] and the possibility that the long-run growth rate may be affected by the issuance of new shares is already accommodated by a specific downward adjustment within the AER's approach to implementing the DGM.

305   Also, as noted above, recent Decisions state clearly that the AER has *not* reduced the weight that it applies to its DGM estimates, which is difficult to reconcile with the fixed 6.5% MRP allowance that has been maintained even as the AER's DGM estimates have increased materially.

306   In recent Decisions, the AER appears to have accepted advice from Partington and Satchell (2017) to the effect that a study by Duarte and Rosa (2015) of the New York Federal Reserve concludes that historical excess returns are more closely related to the MRP than are DGM estimates.[169] However, we show that Partington and Satchell appear to have misinterpreted that study, drawing precisely the wrong conclusion from it. Indeed, Duarte and Rosa (2015) conclude that the

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[167] TransGrid Draft Decision, Attachment 3, p. 215.

[168] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 115.

[169] Partington and Satchell (2017), April, p. 25.

DGM produces high estimates when the true MRP is high and low estimates when the true MRP is low and that the reverse holds for the historical mean estimate.[170]

307   Also relevant is the fact that the study in question concludes that the required return on equity has remained stable even as government bond yields have fallen, leading to an increase in the MRP.[171] This finding lends support to the AER's own DGM evidence.

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[170] Duarte and Rosa (2015), p. 46.

[171] Duarte and Rosa (2015), p. 54.

Primary conclusions

16 Appendix A: The AER's Guideline approach

16.1 Recap on the regulatory task

308 In a January 2017 report to TransGrid,[172] which TransGrid submitted along with its 2017 Initial Proposal to the AER, we explained that:

    a. The AER's Guideline materials explain that "the MRP likely varies over time";[173] and, as a consequence

    b. The AER has stated in recent Decisions that it seeks to estimate the "prevailing market risk premium",[174] which is a "forward-looking estimate of the market risk premium." [175]

16.2 Methods considered by the AER when estimating the MRP

309 In its Guideline, and in subsequent decisions, the AER has regard to a number of methods for estimating the MRP. In this section, we begin with an overview of those methods and then consider the process by which the AER distils that evidence into an estimate of the forward-looking MRP that is consistent with the prevailing conditions in the market for equity funds.

16.2.1 Historical excess returns

310 Prior to the 2013 Guideline, the AER set the allowed MRP on the basis of the mean of historical excess returns. This approach involves estimating the excess market return for each year of a long historical period by taking the return on a broad stock market index over the year and subtracting the return that could have been earned on government bonds over that year. The mean excess return over the historical period is then used as an estimate of the average MRP over that period.

311 The mean historical excess return ranges between approximately 6.0% and 6.5% depending on which historical period is considered.

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[172] Frontier Economics, *The market risk premium*, January 2017 ('Frontier Economics (2017)').

[173] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

[174] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

[175] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

16.2.2 Dividend growth model (DGM)

312   The DGM involves forecasting future dividends on the market portfolio and then solving for the discount rate that equates the present value of those dividends with current stock prices. This approach provides a direct estimate of the required return on the market portfolio. Subtracting the current risk-free rate then produces an estimate of the MRP.

313   In its Guideline materials, the AER stated that the main change to its approach to estimating the MRP was that it intended to apply more weight to DGM estimates of the MRP. In endorsing the use of DGM estimates, the AER stated that: [176]

   a. DGM estimates "may reflect current market conditions more closely";

   b. "DGMs are recognised financial models that are commonly used in practice;" and

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

314   In the Guideline materials, the AER set out its preferred DGM specification, concluding that:

   …we have greater confidence in the symmetry of this information through time and give these estimates greater consideration than we have in the past. [177]

16.2.3 Surveys

315   The AER indicates that it has some limited regard to surveys, although the AER states that it considers this evidence to be "less informative than historical averages and DGM estimates."[178]

16.2.4 Other evidence

316   The AER also states that it gives "limited consideration" to conditioning variables and other regulators' estimates.[179]

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[176] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[177] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[178] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[179] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix A: The AER's Guideline approach

16.3 Distilling the evidence into a single MRP allowance

317   At the time the AER was developing the Guideline, many stakeholders requested that the AER provide clear guidance on the approach it intended to apply when deriving a point estimate of the MRP using the various methodologies and sources of evidence identified in the Guideline. The AER responded by setting out in its final Guideline materials a worked example to show how it would apply the evidence available in December 2013 to derive a point estimate for the MRP.[180] The AER concluded that the evidence available in December 2013 supported a MRP estimate of 6.5%.

Weight given by the AER to different sources of evidence

318   In the worked example in its Guideline materials, the AER stated that, when setting the allowed MRP, it will rely primarily on its historical excess returns and DGM estimates:

> …we give greatest consideration to historical averages followed by estimates of the MRP from DGMs and then surveys. We also give some consideration to conditioning variables and other regulators' estimates of the MRP. [181]

319   The AER further stated that it gives:

> …significant consideration to DGM estimates of the MRP,[182]

and described its development of a preferred approach for implementing the DGM as:

> …the most significant development in this area.[183]

320   The AER also notes that it gives "some"[184] consideration to surveys and "limited"[185] consideration to other evidence. In this regard, the AER states that:

> We also give consideration to survey estimates of the MRP but consider this evidence less informative than historical averages and DGM estimates,[186]

and:

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[180] AER, 2103, Rate of Return Guideline, Explanatory Statement, p. 89.

[181] AER, 2103, Rate of Return Guideline, Explanatory Statement, p. 95.

[182] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[183] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 89.

[184] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[185] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[186] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

> We also give some consideration to conditioning variables and other regulators' MRP estimates. These sources of evidence are subject to various limitations and should be used with caution. At the same time, we consider them relevant and worthy of limited consideration.[187]

321   Thus, when setting the allowed MRP, the AER relies primarily on its historical excess returns and DGM estimates.

The worked example in the Guideline

322   The AER begins by setting a range for the MRP:

> The AER proposes to estimate a range for the MRP, and then select a point estimate from within that range.[188]

323   The AER's Guideline materials make clear that its range for the MRP would be derived by the aggregation of ranges from the historical excess returns and DGM methods. Specifically, the AER explained in its worked example that, given the evidence available in December 2013:

> We consider a range for the MRP of 5.0 to 7.5 per cent is reasonable based on the evidence before us. The range we determine in this decision reflects the span of the evidence before us.[189]

324   In its Guideline materials, the AER concluded that, based on information available in December 2013:

    a.   The historical excess returns method supported a range of 5.0% to 6.5%;[190] and

    b.   The DGM method supported a range of 6.1% to 7.5%.[191]

325   The AER then combines these two ranges into a single combined range of 5.0% to 7.5%, whereby:[192]

    a.   the lower bound was derived from the lower bound of the historical excess returns range; and

    b.   the upper bound was derived using the highest available estimate from the AER's specification of the DGM.

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[187] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[188] AER, 2013, Rate of Return Guideline, p. 16.

[189] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 93.

[190] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 95.

[191] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[192] AER, 2103, Rate of Return Guideline, Explanatory Statement, p. 93.

Appendix A: The AER's Guideline approach

326   The AER noted that this estimated range would not be fixed in stone, but rather, the range may change over time as the available evidence changes:

> The upper and lower bound estimates reflect the evidence before us. These estimates may change over time and likewise the upper and lower bounds may change.[193]

327   We summarise the AER's Guideline approach to setting the MRP in Figure 26 below. The AER computes DGM estimates using a two-stage specification and a three-stage specification, but has concluded that:

> …a three stage DGM is conceptually better than a two stage DGM[194]

and that:

> We use a three stage model because we consider the three stage model more plausible. This is because we expect it to take some time for the short term growth in dividends to transition to the long term growth.
>
> In addition to the three stage model, we also consider a two stage model…given the way the short term growth rate is calculated, the two stage model should be used as a cross check.[195]

328   Consequently, we show the full range of the AER's DGM estimates as well as the range from the three-stage specification.

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[193] AER, 2103, Rate of Return Guideline, Explanatory Statement, p. 93.

[194] JGN Draft Decision, 2014, Attachment 3, Appendix C, p. 222.

[195] JGN Draft Decision, 2014, Attachment 3, Appendix C, p. 222.

Appendix A: The AER's Guideline approach

Figure 26: AER Guideline MRP ranges
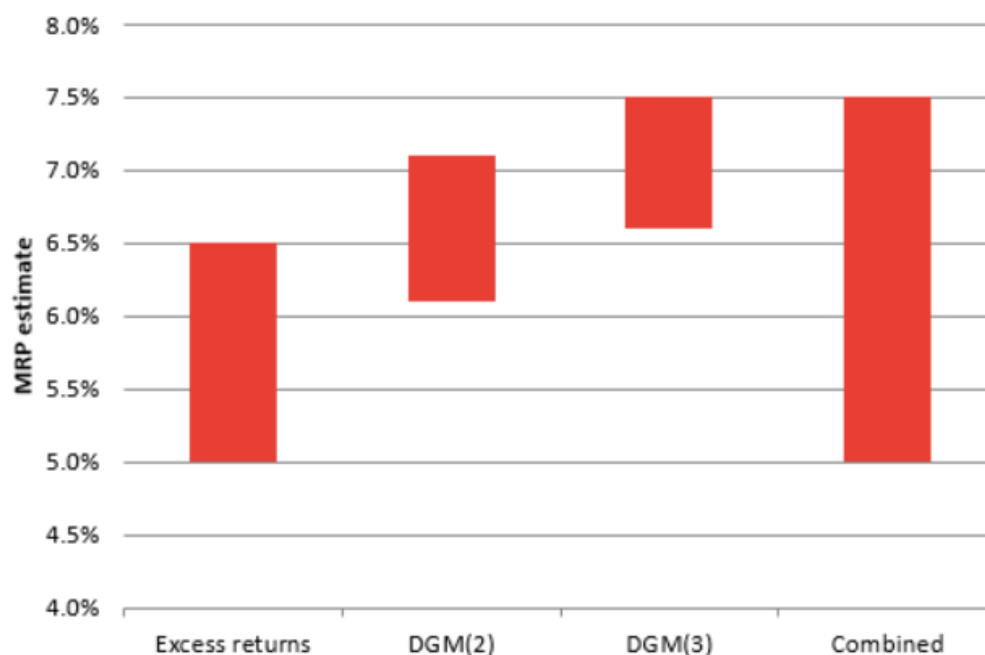
Source: AER Rate of Return Guideline Explanatory Statement – Appendices, December 2013, Table E.1.

329   In its Guideline materials, the AER set the allowed MRP to 6.5%. In selecting this estimate, the AER noted that there was some overlap between the historical excess returns and DGM ranges at 6.5%:

> We consider an MRP estimate of 6.5 per cent provides an appropriate balance between the various sources of evidence. This point estimate lies between the historical average range and the range of estimates produced by the DGM. This reflects our consideration of the strengths and limitations of each source of evidence.[196]

330   Moreover, the AER stated that its preferred historical excess returns estimate is 6.0%[197] and has since stated that its preferred approach to the DGM is the three-stage specification,[198] which has a mid-point estimate of 7.1%. The final MRP allowance of 6.5% is approximately the mid-point between these two point estimates.

331   In summary, the approach to the MRP that is set out in the Guideline materials is to rely primarily on the historical excess returns method and the DGM method (particularly the three-stage method) to specify a range for the MRP and to select

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[196] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[197] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[198] JGN Draft Decision, 2014, Attachment 3, Appendix C, p. 222.

Appendix A: The AER's Guideline approach

a point estimate from within that range. Other evidence is considered to be "less informative"[199] and is given "some"[200] or "limited"[201] consideration.

332   In the worked example that the AER provides in the Guidelines materials, to demonstrate how it will apply the MRP methodology, the range from within which the AER selected its MRP point estimate was constructed by aggregating together the ranges derived using historical excess returns and DGM evidence. Specifically:

    a.   the lower bound of the range from within which the AER selected the Guideline point estimate of 6.5% was derived using the lower bound of the excess returns range; and

    b.   the upper bound was derived using the upper bound of the DGM evidence.

333   The AER then selected a point estimate of 6.5%, which was approximately the mid-point between the point estimate implied by excess returns evidence (6.0%) and the mid-point of the DGM evidence (7.1%).

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[199] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[200] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[201] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix A: The AER's Guideline approach

17   Appendix B: The AER's recent presentation of the Guideline approach

334   In its 2017 TransGrid Draft Decision, the AER has criticised us and a number of network service providers for having "mischaracterised the Guideline approach for estimating the market risk premium." [202]

335   Specifically, the AER argues that:

> We did not and do not average estimates across historical excess returns and dividend growth model estimates. We have regard to a range of relevant evidence. [203]

336   In its latest Decisions, the AER describes the Guideline approach to the MRP as follows:

> We place most reliance on historical excess returns. Therefore, we use this information to determine a baseline estimate of the market risk premium. We consider 6.0 per cent (from a range of 5.1–6.4 per cent) is, at this time, a reasonable point estimate based on this source of evidence.
>
> We place less reliance on our dividend growth model estimates of the market risk premium. This information indicates whether we should select a market risk premium point estimate above or below the baseline estimate.
>
> We place some reliance on the other information (survey evidence and conditioning variables). This information, in conjunction with dividend growth model evidence, helps to indicate how far above or below the baseline estimate the market risk premium point estimate should be. We use other Australian regulators' market risk premium estimates as a cross check on how we consider information.[204]

337   To summarise, the AER now says that, under the Guideline approach:

   a.   The first step to estimating the MRP is to determine a "baseline estimate" of the MRP using historical excess returns, and that it considers that a reasonable baseline estimate (from a range of 5.1% to 6.4%) is 6.0%.

   b.   The second step is to use DGM evidence to decide whether it should select a point estimate above the baseline estimate. However, this evidence is to provide directional assistance only, and must not be used to determine the level of the final point estimate.

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[202] TransGrid Draft Decision, 2017, Attachment 3, p. 82.

[203] TransGrid Draft Decision, 2017, Attachment 3, p. 82.

[204] TransGrid Draft Decision, 2017, Attachment 3, p. 78.

c. Other information (surveys and conditioning variables) are to be used to decide how far above or below the baseline the final MRP point estimate should be.

338 This represents a material reinterpretation of the original Guideline. Nowhere in the Guideline materials is the process outlined above described. Indeed, the Guideline materials contain no reference to a "baseline" estimate of the MRP. Rather, the AER's new approach to the MRP appears to be departure (without reasons) from the original Guideline approach.

339 In summary, the Guideline states that:

> The AER proposes to estimate a range for the MRP, and then select a point estimate from within that range.[205]

340 In the TransGrid Draft Decision, the AER says that the relevant material available to it suggests a range for the MRP with a lower bound of 5.1% (which is derived from what the AER considers to be the lower bound of historical excess returns MRP range) and an upper bound of 8.17% (which is derived from the upper bound of the DGM evidence).[206] The AER then says it has selected a point estimate of 6.5% from within this range.[207]

341 However, in arriving at this point estimate, the AER applies a number of steps and considerations, which are not set out in the Guideline materials. For example, the AER presents in the TransGrid Draft Decision a "baseline estimate" of the MRP derived from the historical excess returns evidence.[208] However, there is no reference to any "baseline estimate" of the MRP anywhere in the Guideline, Explanatory Statement or Appendices.

342 The AER now suggests that the *only* role of the DGM evidence within the Guideline approach is to identify "directionally" whether the final point estimate of the MRP should be above or below the AER's baseline estimate of the MRP. For instance, the AER states in the TransGrid Draft Decision that:

> The guideline designated the dividend growth model to inform on whether the market risk premium may be above or below the historical estimates.[209]

and:

> We assessed the dividend growth model in detail in section B.4 and consider that there are a range of limitations with the dividend growth model which makes its results unreliable and unsuitable for directly estimating the market risk premium. We still

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[205] AER, 2013, Rate of Return Guideline, p. 16.

[206] TransGrid Draft Decision, 2017, Attachment 3, pp. 74-5.

[207] TransGrid Draft Decision, 2017, Attachment 3, pp. 74-5.

[208] TransGrid Draft Decision, 2017, Attachment 3, p. 76 and p. 78.

[209] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

Appendix B: The AER's recent presentation of the Guideline approach

> believe it is useful for indicating, directionally, where the market risk premium should
> lie in relation to the historical excess returns as indicated in the Guideline.[210]

343   In support of its claim that the only role of the DGM is to provide directional evidence, the AER cites the following paragraph in the Guideline materials:

> In estimating the MRP, we place most emphasis on historical estimates (which gives an MRP estimate of approximately 6 per cent) and dividend growth model estimates (which give changing MRP estimates over time, particularly in response to changing interest rates). Our approach to the MRP is symmetrical. This means we may adopt a value above 6 per cent when dividend growth model estimates are above the historical estimates (as they are at December 2013), and a value lower than 6 per cent when dividend growth model estimates are below the historical estimates. At December 2013, our MRP point estimate is 6.5 per cent, chosen from within a range of 5 to 7.5 per cent.[211]

344   The passage above does indicate that if the DGM estimates are above the historical excess returns estimate, the AER would select a MRP point estimate above the historical excess returns estimate, and vice versa.

345   However, under the Guideline approach where the AER constructs a combined range using historical excess returns and DGM evidence, and then selects a point estimate close to the mid-point of that range (as the worked example in the Guideline materials did) this result would follow because:

     a.   If the estimated DGM range were *above* the historical excess returns range, the mid-point of the combined range would naturally lie above the historical excess returns evidence; and

     b.   If the estimated DGM range were *below* the historical excess returns range, the mid-point of the combined range would also lie *below* the historical excess returns evidence.

346   In other words, the only excerpt from the Guideline materials that the AER has adduced in support of its current description of the Guideline approach is entirely consistent with our interpretation of the Guideline approach. However, nothing in the passage that the AER cites from the Guideline materials designates the DGM as mere directional evidence. That is a new interpretation of the Guideline, which is inconsistent with the worked example in the Guideline materials designed to help stakeholders understand how the AER intends to apply the Guideline MRP approach.

347   Additionally, we note that the AER now says that the role of survey and conditioning variable evidence is to determine how far above or below its baseline estimate the final point estimate should be set. However, there is nothing in the

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[210] TransGrid Draft Decision, 2017, Attachment 3, pp. 97-8.

[211] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 11.

Appendix B: The AER's recent presentation of the Guideline approach

Guideline materials that attributes that role to the survey and conditioning variable evidence.

348   For example, in the worked example provided by the AER in the Guideline, the AER concluded that, as at December 2013:

        a.   The survey evidence supported a MRP estimate of 6.0%; and

        b.   The conditioning variables produced mixed results, but some variables indicated an estimate close to 5.6%.

349   All of these pieces of evidence indicated, at the time of the Guideline, an estimate at or below 6.0% (the estimate implied by the historical excess returns evidence). It is therefore unclear how this additional evidence "helps to indicate how far above or below the baseline estimate the market risk premium point estimate should be."

350   Finally, we note that the AER now seems to be giving more weight to conditioning variables than that set out in the Guideline materials. In the TransGrid Draft Decision, the AER states that the conditioning variables indicate that market conditions have not changed materially and, therefore a change in its estimate of the MRP from 6.5%, the estimate adopted in every decision since the Guideline, would not be warranted:

> …the conditioning variables indicate there has not been a material change in market conditions to warrant adjusting the market risk premium.[212]

351   As noted above, the Guideline indicated that the AER would give only "limited consideration" to conditioning variables (which the AER concludes have not changed materially) but "significant consideration" to DGM evidence (where the AER's estimates have increased materially).

352   Further, the Guideline materials made explicit that the AER would give greater consideration to DGM estimates than conditioning variables:

> …in this decision, we give DGM estimates greater consideration than other forward looking estimates of the MRP, such as dividend yields, implied volatility and credit spreads. This reflects our assessment of the relative strengths and limitations of these sources of evidence.[213]

353   However, contrary to those statements, the AER now explains that it is conditioning variables (and not the DGM evidence) that will determine "how far above or below the baseline estimate the market risk premium point estimate should be."

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[212] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

[213] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix B: The AER's recent presentation of the Guideline approach

354   Since the Guideline, the DGM evidence has changed materially (as shown in Figure 31). However, the AER argues that because the conditioning variables do not indicate a material change in market conditions, an increase in the MRP estimate (to reflect the changing DGM evidence) is not warranted. In other words, the AER appears to be saying that the conditioning variables evidence now trumps the DGM evidence. In allowing the conditioning variables evidence to effectively overrule the DGM evidence, the AER appears to be giving greater weight to the former than the latter. This would seem to be another unexplained departure by the AER from the original Guideline.

Appendix B: The AER's recent presentation of the Guideline approach

18 Appendix C: The AER's interpretation of the MRP evidence

18.1 A forward-looking estimate that is commensurate with the prevailing conditions

355 As explained in Section 16.1 above, the regulatory task is to estimate a forward-looking MRP that is commensurate with the prevailing conditions in the market for equity funds. In this section, we consider how the historical excess returns and DGM methods are able to contribute to this regulatory task.

356 We begin by noting that there is broad agreement that the DGM method does produce a forward-looking MRP that is commensurate with the prevailing conditions in the market for equity funds. In this regard, the AER states that:

> The DGM method is a theoretically sound estimation method for the MRP. As DGM estimates incorporate prevailing market prices, they are more likely to reflect prevailing market conditions. DGM estimates are also clearly forward looking as they estimate expectations of future cash flows and equate them with current market prices through the discount rate.[214]

and:

> …we consider DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches.[215]

357 The historical excess returns approach estimates the MRP by taking the mean excess return over a long historical period. Self-evidently, this estimate must reflect the average market conditions over the historical period that was used. Logically, this approach can only produce a forward-looking estimate that is commensurate with the prevailing conditions in the market in two circumstances:

    a. Investors always require the same MRP in all market conditions; or

    b. The current market conditions are the same as the average market conditions over the historical period.

358 In relation to the conjecture that investors always require the same MRP in all market conditions, the AER notes that:

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[214] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 84.

[215] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

> Although the [historical excess returns] estimate changes slowly over time, we consider it is likely to reflect prevailing market conditions if investor expectations are guided by historical excess returns.[216]

359   However, the prospect that investors always require the same risk premium in all market conditions is inconsistent with the generally accepted view that risk premiums are higher during recessions and financial crises and lower during economic expansions. It is also inconsistent with the AER's own view that the MRP likely varies over time[217] and with the following advice from the AER's consultant:

> …the AER believes that the historic average of excess returns may be used by investors to estimate the future MRP and therefore would be a forward-looking methodology if investors acted in this way. Whether investors act in this way is debatable.[218]

360   The alternative motivation for the use of mean historical excess returns is that the current market conditions are the same as the average market conditions over the historical period. However, the prevailing market conditions are very different from the average historical conditions in that the yield on government bonds is lower than at any time in history. The yield on 10-year government bonds at the time of the AER's most recent draft decision was 2.68%[219] whereas the average yields over the various historical periods that the AER considers are several times greater than this, as set out in Table 14 below.

Table 14: Mean historical excess return estimates

Historical period	Mean excess return	Mean government bond yield
1883-2016	6.3%	5.5%
1937-2016	6.0%	6.5%
1958-2016	6.5%	7.4%
1980-2016	6.5%	8.0%
1988-2016	6.0%	4.8%

Source: Frontier calculations.

361   Of course, there are many dimensions to "market conditions" and many variables can be used to provide an indication of whether the prevailing conditions differ

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[216] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 78.

[217] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

[218] Lally, M., 2013, Review of the AER's Methodology, March, p. 6.

[219] TransGrid Draft Decision, 2017, Attachment 3, p. 12.

Appendix C: The AER's interpretation of the MRP evidence

from the historical average market conditions. We consider that the 10-year government bond yield is the most directly relevant and important indicator because it is the figure that is added to the MRP estimate to produce the allowed return on equity.

362   Thus, the approach of adding the (effectively constant) mean historical excess return estimate to the prevailing government bond yield currently produces an historically low allowed return on equity – due to the historically low government bond yield. This would only be appropriate if the cost of equity capital really was at historical lows. The evidence that we report in the remainder of this Chapter, as well as the AER's own DGM evidence, is inconsistent with the notion that the cost of equity capital is currently at historical lows. Rather, the evidence suggests that the cost of equity capital has been quite stable over recent years, even as government bond yields have fallen materially.

363   Because:

        a.   investors do *not* always require the same MRP in all market conditions; and

        b.   the current market conditions are *not* the same as the average market conditions over the historical period,

there is no reason to conclude that the historical excess returns approach would, in the current circumstances, produce a forward-looking MRP that is commensurate with the prevailing conditions in the market for equity funds.

364   Indeed, the AER itself distinguishes between its historical MRP estimates on the one hand and its forward-looking DGM estimates on the other:

        Rather, we used results from both forward looking methods and historical averaging of excess returns for estimating the MRP and the results from forward looking methods unambiguously constitute estimates of the prevailing rather than the long-term average value for the MRP.[220]

365   The AER went on to conclude in the Guideline that the only reason that there is any need to rely on mean historical excess return estimates is due to concerns about relying exclusively on the forward-looking DGM estimate:

        If a perfectly reliable estimate of the MRP could be generated from market prices it would be reasonable to use this estimate. However, no such estimate exists.[221]

366   In recent Decisions, however, the AER has argued that the present market conditions are not uncommon for Australia, and that current level interest rates

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[220] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 103.

[221] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 110.

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Appendix C: The AER's interpretation of the MRP evidence

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are not so dissimilar to levels that have prevailed in the past as to invalidated mean historical excess returns from informing an estimate of the current MRP:

> …it is important to note the current market situation is not uncommon for Australia. We note the magnitude of current interest rates is not so dissimilar to the past as to invalidate the historic market risk premium informing an estimate of the current market risk premium.[222]

367   In support of these contentions, the AER refers to Partington and Satchell (2016), who argue that:

> We begin by making a comment about the supposed abnormality of the current conditions. We agree that interest rates in the USA and UK are abnormally low. However, in Australia, while current interest rates may seem very low to those whose memory of interest rates only extends back for forty-five years, the low interest rates we are currently experiencing are not so unusual. Indeed over the majority of the history for which the MRP has been calculated relatively low interest rates have prevailed.[223]

368   In order to justify this claim, Partington and Satchell (2016) refer to data on historical bond yields represented in a chart in Brailsford et al (2012),[224] which we reproduce below in Figure 27.

Figure 27: Historical bill and bond returns
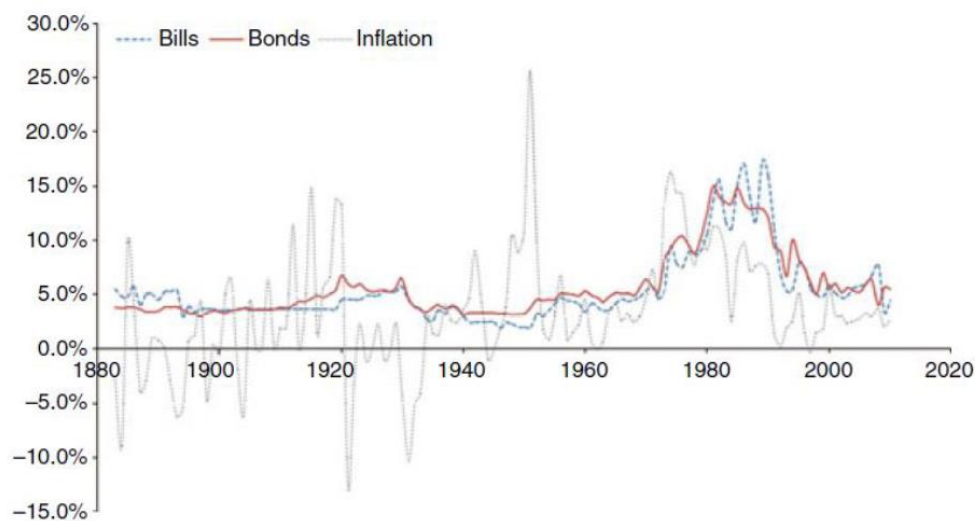
Source: Brailsford et al (2012) reproduced in Partington and Satchell (2016), p. 24

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[222] TransGrid Draft Decision, 2017, Attachment 3, p. 285.

[223] Partington and Satchell (2016), p. 23.

[224] Brailsford, T., J. C. Handley and K. Maheswaran, 2012, The historical equity risk premium in Australia: Post-GFC and 128 years of data, Accounting and Finance, 52 (1), 237-247

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369   Based on data in this chart, Partington and Satchell argue that:

> Clearly high yields were only a feature of the post 1970 era and thus it is lower interest rates that have been most common in computing the long run market risk premium. It is also clear that there have been extended periods of low interest rates. For 30 years prior to 1913 interest rates were below 4% and reached a low point of 3%. While for 18 of the 19 years from1933 to 1951 interest rates were again below 4% and for 11 years of that period stayed in the range 3.1% to 3.3%.[225]

370   Partington and Satchell repeat similar claims in their April 2017 report to the AER.[226]

371   Unfortunately, the chart from Brailsford et al (2012), which Partington and Satchell rely upon, presents data only to 2010 (which Partington and Satchell themselves recognise). Therefore, it does not show how government bond yields have changed since the publication of the Guideline in December 2013, or how post-2013 government bond yields in Australia compare to historical levels. Furthermore, simple visual inspection of the chart above is insufficient to draw meaningful conclusions about how similar or dissimilar prevailing bond yields are to historical levels.

372   Figure 28 below presents a frequency distribution of the 10-year government bond yields that the AER uses in its calculation of mean historical excess returns. This distribution covers bond yields from 1883 to 2016, and therefore extends the Brailsford et al (2012) data series by six years. Importantly, it *includes* years since the publication of the 2013 Guideline.

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[225] Partington and Satchell, 2016, p. 23.

[226] Partington and Satchell, 2017, April, pp. 23-4.

Appendix C: The AER's interpretation of the MRP evidence

Figure 28: Frequency distribution of government bond yields from 1883 to 2016
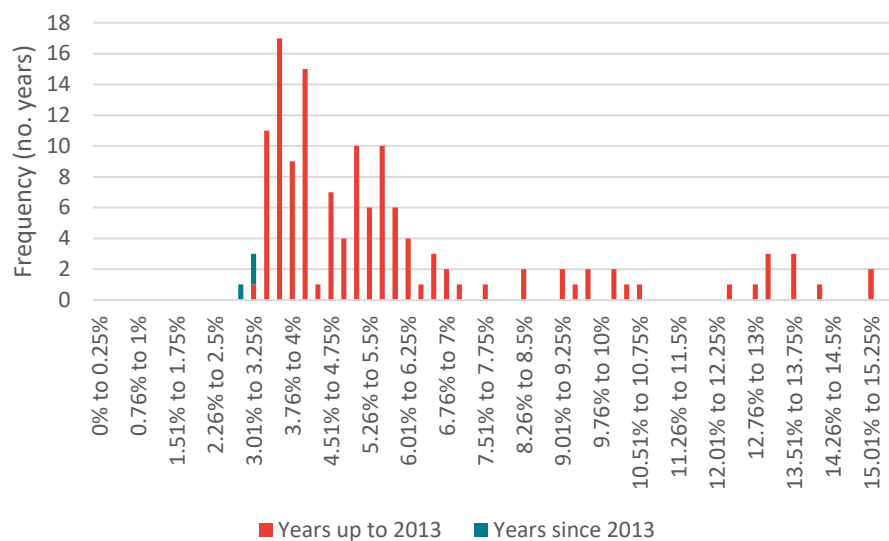
Source: Frontier analysis.

373   Figure 28 shows that:

a. There have been only four years in this series spanning 134 years during which the average government bond yield was 3.0% or lower: 1897 and every year since the publication of the Guideline – 2014, 2015 and 2016.

b. Every year since the publication of the Guideline (denoted by the blue bars) lies in the extreme left tail of the distribution.

c. The average yield in the very latest year in the dataset, 2016, was 2.74%. This is happens to be minimum yield in the entire dataset. The average yield in 2016 is also 280 basis points lower than the mean of the distribution (i.e., 5.55%) and 196 basis points lower than the median of the distribution (i.e., 4.70%).

374   It is evident from these data that prevailing government bond yields *are* abnormally low by historical standards, and have been so since 2013. In our view, this demonstrates conclusively that Partington's and Satchell's claim that government bond yields are "not so dramatically dissimilar to the past," apparently based on casual empiricism, simply does not withstand objective scrutiny.

375   Another claim that Partington and Satchell (2016) make is that government bond yields in other countries, such as the US and the UK, are currently abnormally low, whereas government bond yields in Australia are not.[227] Partington and Satchell

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[227] Partington and Satchell (2016), p. 23.

Appendix C: The AER's interpretation of the MRP evidence

(2017) attribute this to the fact that the US, UK and a few other jurisdictions pursued quantitative easing (QE), whereas Australia has not to date pursued QE.[228] These are very misleading claims.

376   Figure 29 plots the yields on 10-year Australian Commonwealth Government Securities, UK Gilts and US Treasury bonds from 2 January 2013 to 2 October 2017.

Figure 29: Yields on 10-year government bonds in Australia, UK and US since 2012
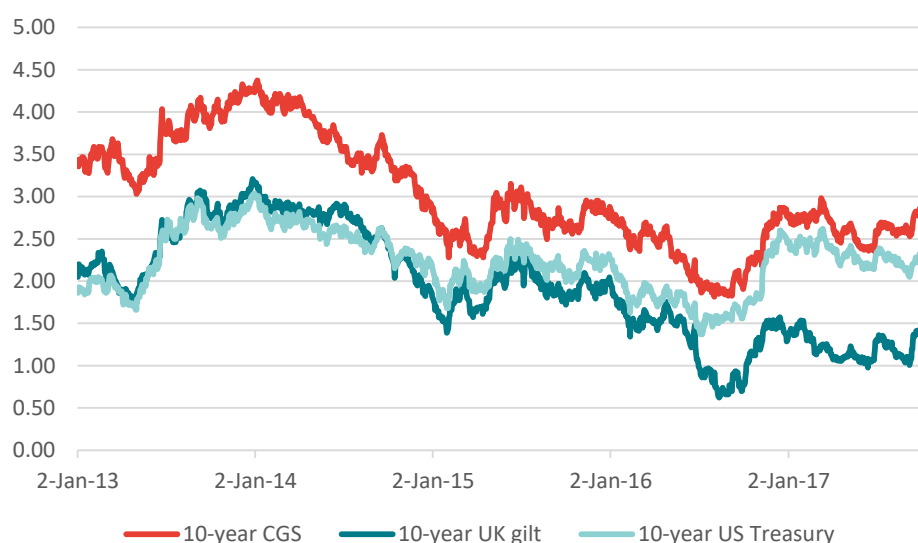
Source: RBA, Bank of England, US Federal Reserve.

377   The Figure shows that whilst government bond yields in the US and the UK have since 2013 been lower than government bond yields in Australia, since late 2016, the gap between yields in the US and Australia has closed considerably. Over the 12 months to 2 October 2017, the average difference between the yields on 10-year CGS and 10-year US Treasury yields was just 34 basis points. Hence, if Partington and Satchell regard government bond yields in the US to be abnormally low (which they do), the same should be said of government bond yields in Australia.

378   Table 15 computes the percentage change in government bond yields between 2 January 2013 and 2 October 2017 in Australia, the UK and the US. The Table shows that whilst bond yields in the UK have fallen by approximately 33%, Australian government bond yields have also declined very materially, by over 15%. By contrast, over the same period, US government bond yields have increased by nearly 26%.

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[228] Partington and Satchell (2017), April, p. 23.

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Appendix C: The AER's interpretation of the MRP evidence

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Table 15: Change in Australian, US and UK government bond yields since 2012

	10-year CGS	10-year UK Gilt	10-year US Treasury
2-Jan-13	3.40%	2.05%	1.86%
2-Oct-17	2.87%	1.37%	2.34%
% change	-15.6%	-33.2%	25.8%

Source: RBA, Bank of England, US Federal Reserve, Frontier analysis

379   Table 16 below computes the ratio between the prevailing nominal bond yield (computed as the 20-day average to 2 October 2017) and the historical average nominal bond yield (over the period 1900-2016).[229] The Table shows that CGS yields in Australia are presently as low by historical standards as are US Treasury yields. Hence, if government bond yields in the US are currently abnormally low, it must be the case that the same is true for Australia.

Table 16: Comparison of prevailing and historical average bond yields

	Historical mean real bond yield	Historical mean inflation rate	Historical mean nominal bond yield	Prevailing bond yield	Ratio between current and historical yield
Australia	2.50%	3.90%	6.5%	2.7%	0.42
UK	2.70%	3.90%	6.7%	1.3%	0.19
US	2.50%	3.00%	5.6%	2.2%	0.40

Source: 2017 Credit Suisse Investment Returns Yearbook, RBA, Bank of England, US Federal Reserve, Frontier analysis

380   In our view, market conditions today *are* very different from those that prevailed at the time the Guideline was published, and the AER's MRP estimates ought to reflect this.

18.2 The evolution of the AER's range of estimates

381   In this section, we show that the evidence on which the AER relies has changed materially since the publication of the Guideline in 2013. However, the AER has maintained the same MRP allowance of 6.5% in every decision since the Guideline.

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[229] We calculate the mean nominal bond yields in this Table using data on historical average real bond yields and historical average rates of inflation (over the period 1900-2016) reported in the 2017 Credit Suisse Investment Returns Yearbook.

Appendix C: The AER's interpretation of the MRP evidence

382   As set out in Section 16 above, the AER's Guideline approach to the MRP is to form a range based on the combined range of its historical excess returns and DGM estimates. The resulting ranges from the evidence at the time of the Guideline and the current evidence are set out in Figure 30 below.

Figure 30: AER MRP ranges
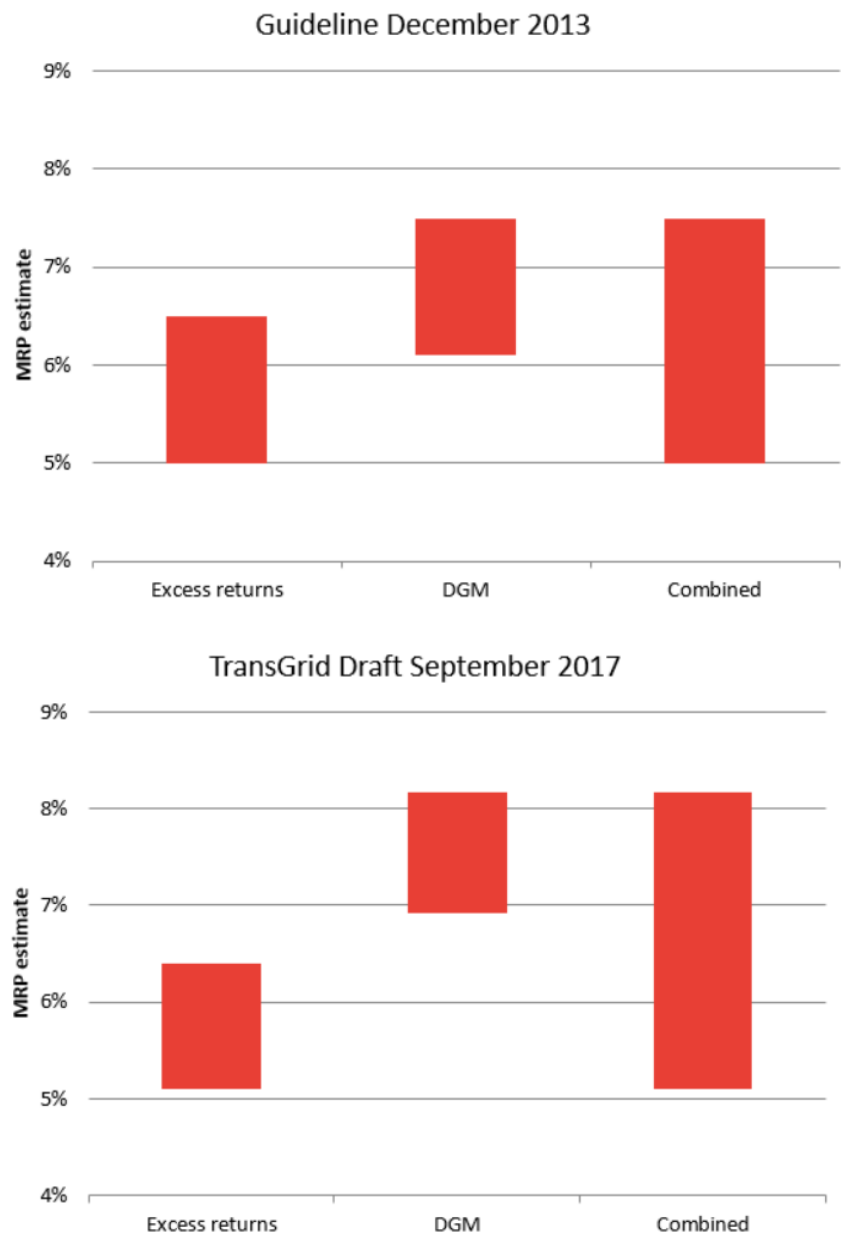
Source: AER Rate of Return Guideline, December 2013; TransGrid Draft Decision, September 2017.

383   The historical average excess returns evidence has not changed materially – as one would expect. In the Guideline, the AER specified a range of 5.0% to 6.5% for the historical excess returns estimates. In its most recent Decisions, the AER

determined a range between 5.1% and 6.4%, depending on which historical period is considered.[230] This is the range that we have displayed in Figure 30.

384   By contrast, the MRP estimates from the AER's forward-looking DGM specifications have increased substantially, so the top end of the combined range is now materially higher than at the time of the Guideline.

385   We summarise the evolution of the AER's MRP estimates derived using historical excess returns and the AER's preferred three-stage DGM specification, and the AER's MRP allowance in Figure 31 below.

Figure 31: The AER's primary MRP estimates
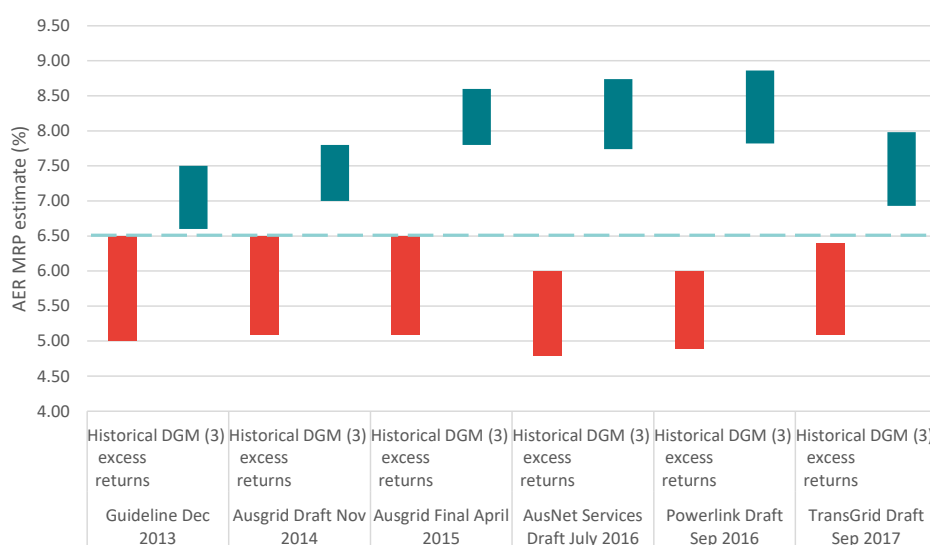
Source: Rate of Return Guideline December 2013; Ausgrid Draft Decision November 2014; Ausgrid Final Decision April 2015; AusNet Services Draft Decision July 2016; Powerlink Draft Decision September 2016; TransGrid Draft Decision September 2017.

386   Figure 31 shows that:

a.   The AER's historical excess returns estimate range (denoted by the red bars in the Figure) has narrowed slightly since the Guideline, but the upper bound of this range has not changed materially. The AER has consistently interpreted the appropriate point estimate of this evidence to be 6.0% since the publication of the Guideline in 2013;[231]

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[230] TransGrid Draft Decision, 2017, Attachment 3, Table 3-19, p. 202.

[231] We consider this source of evidence in more detail in Section 18.3 below.

Appendix C: The AER's interpretation of the MRP evidence

b. The AER's DGM estimates of the MRP (denoted by the dark blue bars in the Figure) have increased materially since the Guideline; and

c. The AER's allowed MRP (the light blue line in the Figure) has remained constant at 6.5% since the Guideline, despite the changing DGM evidence.

387   That is, Figure 31 shows that even though the AER's DGM estimates have increased materially since the Guideline, this has had no impact on the AER's MRP allowance.

388   We note that, in its recent final decisions, the AER has stated that it has applied the Guideline approach to the MRP since the publication of the Guideline in 2013,[232] and that:

> We have not changed the weight we apply to the dividend growth model.[233]

389   That is, the AER contends that its approach to processing the relevant evidence and the weight that it applies to the DGM evidence has not changed since the Guideline. This can only be reconciled with the evidence in Figure 31 above if the DGM evidence plays only a very minor role in determining the allowed MRP, with the vast majority of weight being applied to historical excess returns.[234] Although the AER's own DGM estimates have diverged materially since the Guideline, its MRP allowance remains anchored to the historical excess returns estimate.

390   However, this would be at odds with the Guidelines materials, which states that the AER gives "significant consideration to DGM estimates of the MRP."[235]

391   In summary, in the face of the material change in the AER's own DGM evidence since the Guideline, there appears to be no way of reconciling the AER's contentions that it:

a. has applied the Guideline approach to the MRP consistently since December 2013;

b. has not changed the weight it applies to the DGM evidence; and

c. gives "significant" consideration to the DGM evidence.

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[232] TransGrid Draft Decision, 2017, Attachment 3, p. 73.

[233] TransGrid Draft Decision, 2017, Attachment 3, p. 215.

[234] We have previously submitted that the AER appears to use the DGM for no purpose other than selecting a point estimate at the top of its primary range based on historical excess returns. However, the AER has stated that it does not use its DGM evidence in this way. See, for example, Ausgrid Final Decision, 2015, Attachment 3, pp. 368-369.

[235] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix C: The AER's interpretation of the MRP evidence

392   It appears that the AER's MRP allowance appears to be based almost exclusively on the historical excess returns estimate – which, by its nature, is guaranteed to remain very stable over time and is independent of the prevailing market conditions. If material weight is assigned only to methods that produce essentially constant estimates over time, it is impossible for there to be any result other than a constant allowed MRP.

393   This contrasts with the regulatory task of estimating a forward-looking MRP that is commensurate with the prevailing conditions in the market for equity funds. The AER's DGM estimates suggest that the forward-looking MRP that is commensurate with the prevailing conditions has increased materially since the Guideline, but the AER's MRP allowance has remained fixed.

394   In the remainder of this section, we summarise the evolution of the MRP estimates from each of the methods that the AER set out in its Guideline. We report that:

   a. The AER's estimate of average historical excess returns has remained stable (in part because these averages are computed over long historical periods, and in part because of the AER has varied the way in which it has interpreted the historical excess returns evidence); and

   b. The other evidence suggests that since the Guideline, the overall required return on equity has remained quite stable even as government bond yields have fallen – implying that the MRP has increased.

18.3 The AER's historical excess returns estimates

395   In the Guideline, the AER set out estimates of the arithmetic and geometric mean of excess returns over various historical periods.[236] The AER concluded that the mean historical excess returns supported an MRP range of 5.0% to 6.5%.[237]

396   The top of that range was set slightly above the highest arithmetic mean estimate, presumably in recognition of the fact that no mean estimate is perfectly precise, but has a statistical confidence interval around it.[238]

397   The bottom of that range was set to 20 basis points above the highest geometric mean estimate due to concerns about the geometric estimate:

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[236] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, Table D.2, p. 83.

[237] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, Table D.2, p. 97.

[238] This is not to say that the 6.5% figure is based formally on any confidence interval. Given the high volatility in annual excess returns, the standard error of the mean estimates is large and statistical confidence intervals are very wide.

Appendix C: The AER's interpretation of the MRP evidence

> …there are concerns with using the geometric mean as a forward looking estimate. Therefore, we consider a reasonable estimate of the lower bound will be above the geometric average. However, we give some weight to geometric mean estimates. Therefore, we consider a lower bound estimate of 5.0 per cent appropriate. [239]

398   Figure 32 plots how the AER's estimates of MRP using the geometric (red bars) and arithmetic (dark blue bars) mean of excess returns has evolved in a series of Decisions since the publication of the Guideline, and the AER's conclusions on the final range (light blue bars) for the MRP derived using historical returns, based on that evidence.

Figure 32: Evolution of the AER's historical excess returns MRP estimates
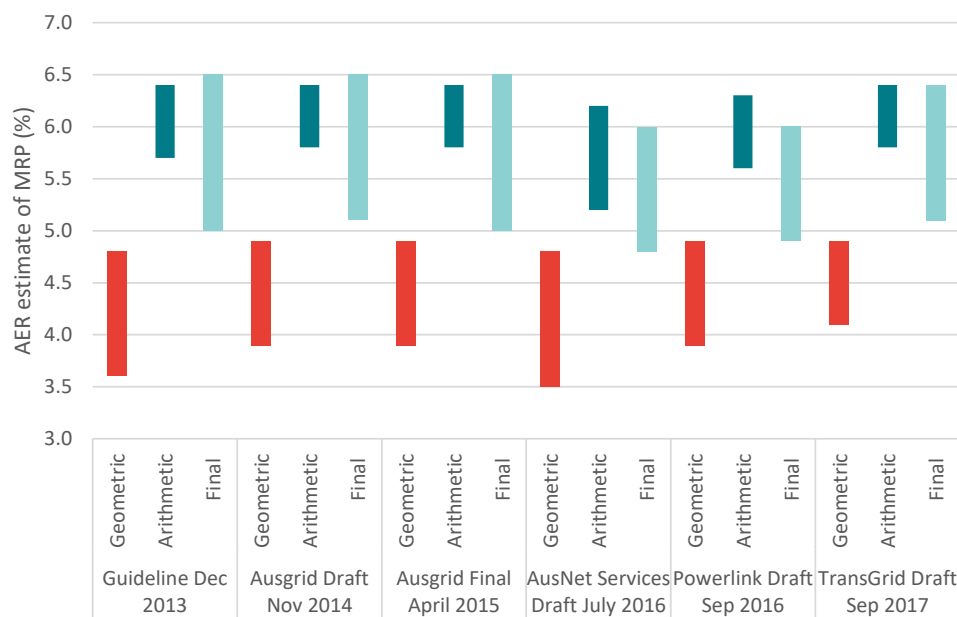
Source: Rate of Return Guideline December 2013; Ausgrid Final Decision April 2015; SA Power Networks Final Decision April 2015; AusNet Distribution Final Decision May 2016; Powerlink Draft Decision September 2016; TransGrid Draft Decision September 2017.

399   A striking feature of these plots is that there seems to be no consistency over time in the way the AER interprets the available evidence when determining its final historical excess returns MRP range.

400   For example, in its April 2015 Final Decisions, the AER followed the Guideline in setting the top of the range to 6.5% and the bottom of the range to 20 basis points above the highest geometric mean:

> Consistent with the approach in the Guideline, we set the bottom of the range as 20 basis points above the highest estimate from the range of geometric averages.[240]

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[239] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 93.

[240] Ausgrid Draft Decision, 2014, Attachment 3, p. 193; Ausgrid Final Decision, 2015, Attachment 3, p. 115.

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401   However, in the October 2015 Decisions, the AER set the lower bound of the range (5.0%) only 10 basis points above the highest geometric mean (4.9%).[241] No explanation was given by the AER for this change. The upper bound of the range remained at 6.5% in those Decisions.

402   Then, in the May 2016 and September 2016 Decisions, the AER set the lower bound of the range *equal* to the highest geometric mean estimate, and the upper bound of the range (6.0%) materially lower than the highest arithmetic mean estimate (6.2% and 6.3%, respectively). Once again, no explanation was provided in the AER's Decisions for these changes of approach.

403   Rather confusingly, in its May 2016 Final Decisions, the AER claimed that it had based its historical returns MRP range on arithmetic averages because it had concerns that the geometric averages suffered from bias:

> Historical excess returns provide our baseline estimate and indicates a market risk premium of approximately 5.5 to 6.0 per cent from a range of 4.8 per cent to 6.0 per cent. We consider both geometric and arithmetic averages of historical returns. However, we consider there may be evidence of bias in the geometric averages. Therefore, our range for historical returns is based on arithmetic averages.[242]

404   But this was manifestly not so. The bottom of the range was influenced by the geometric mean estimates, and the upper bound was significantly lower than indicated by the upper end of the arithmetic mean range.

405   In the AER's most recent Decisions, it appears to have reverted back to setting the lower bound of the range 20 basis points above the highest geometric mean estimate (consistent with the Guideline), but the upper bound of the range was set equal to, rather than slightly above, the upper end of the arithmetic mean range. Once again, no explanation was provided for this particular approach.

406   In all of its Decisions since the Guideline, the AER has concluded that a reasonable point estimate for the MRP based on historical excess returns is 6.0% – despite the underlying arithmetic and geometric mean estimates varying over time, and despite the AER's interpretation of the historical evidence changing in an unexplained way from one decision to another. The AER offers no explanation for why 6.0% was a reasonable estimate in all past instances in which the underlying evidence differed.

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[241] SA Power Networks Final Decision, 2015, Attachment 3, p. 36.

[242] AusNet Draft Decision, 2016, Attachment 3, p. 59.

Appendix C: The AER's interpretation of the MRP evidence

18.4 The AER's DGM estimates

407   The evolution of the AER's DGM estimates of the MRP is summarised in Figure 33 above. It is clear that these estimates have increased materially since the Guideline.

408   The reason for the increase in these estimates of the MRP is that the overall required return on equity has remained stable, while the government bond yield has fallen materially. Figure 33 below shows that the AER's own DGM estimates of the required return on equity have remained fairly constant since the publication of the Guideline – they have certainly not fallen in line with the marked decline in government bond yields.

Figure 33: AER three-stage DGM estimates of the required return on the market
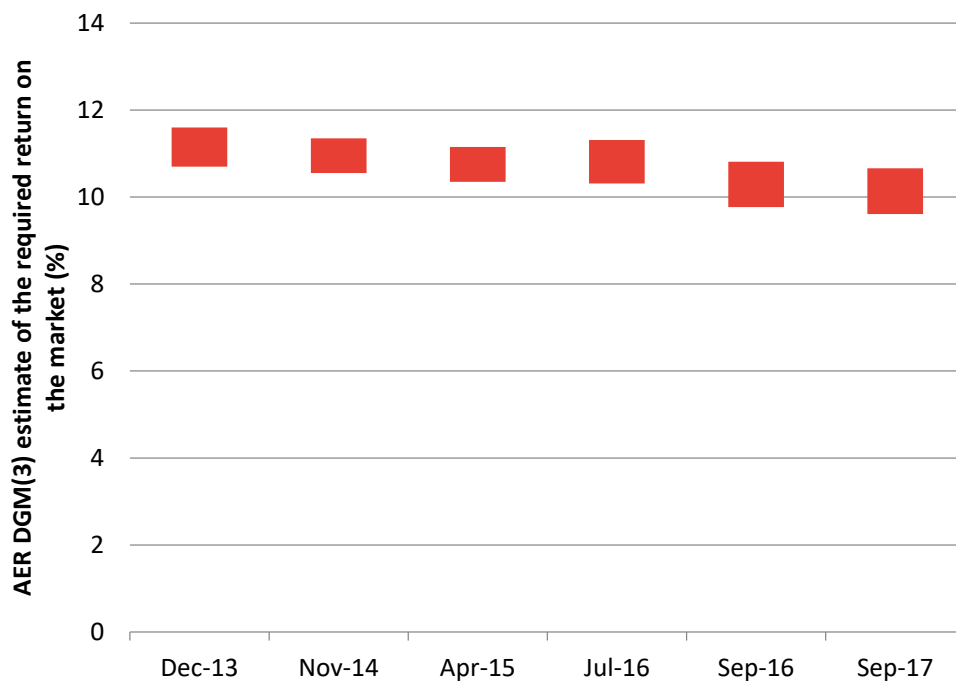
Source: AER Rate of Return Guideline December 2013; AER Ausgrid Draft Decision November 2014; AER Ausgrid Final Decision April 2015; AER AusNet Services Draft Decision July 2016; Powerlink Draft Decision September 2016; AER TransGrid Draft Decision September 2017.

409   The reasons for the stable return on equity estimates obtained from the AER's three-stage DGM are apparent from examination of the inputs to the model, which are presented graphically in Figure 34 below.

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Figure 34: Evolution of inputs to AER's three-stage DGM
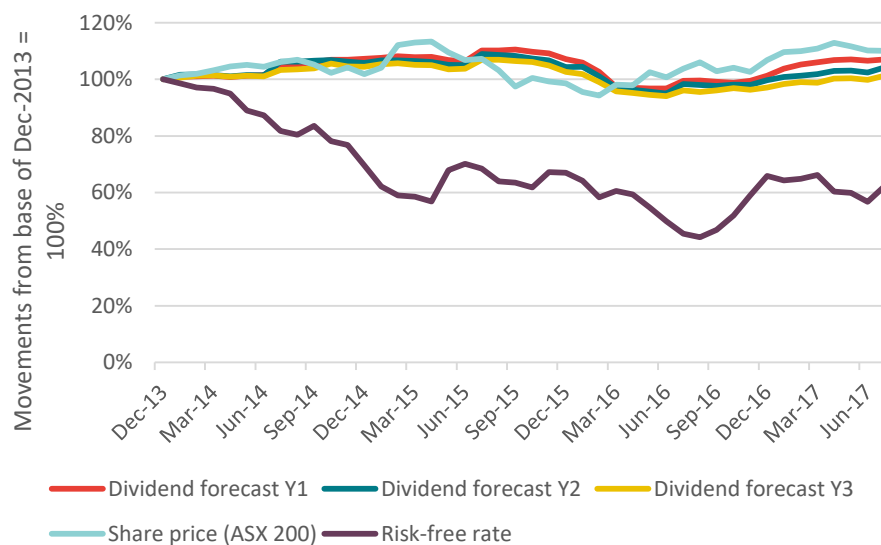
Source: Bloomberg and RBA data, Frontier analysis.

410   Figure 34 shows that nothing has changed materially other than the fall in the risk-free rate. The forecast dividends have remained fairly stable, share prices have remained fairly stable, and the AER has maintained the same long-run growth rates. As we have shown above, this produces a stable estimate of the required return on equity. The only thing that has changed is that the yield on government bonds that the AER deducts from the estimate of the required return on the market.

411   Since an ever-decreasing government bond yield is being subtracted from a stable estimate of the required return on equity, the result is an increasing estimate of the MRP.

18.5 Other considerations

412   The AER has regard to a number of other considerations—surveys, conditioning variables and the recent decisions of other Australian regulators—when setting its MRP allowance. Notwithstanding that much of this evidence indicates an increase in the MRP, the AER has chosen to make no adjustment to its preliminary estimate that is based primarily on historical excess returns.

413   In this section, we show that the AER has in recent Decisions interpreted the evidence on surveys, conditioning variables and other regulatory decisions selectively, to argue in favour of no departure from its favoured estimate of 6.5%. This interpretation of the recent evidence has resulted in a constant MRP allowance.

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MRP evidence

18.5.1 Surveys

414   The AER's most recent Decisions present the survey evidence summarised in Table 17 below.

415   The AER concludes from this evidence that:

> Survey evidence generally supported a market risk premium around 6.0 per cent or less.[243]

416   In our view, the only way the AER could arrive at this conclusion is if it were to continue to give surveys that are several years out of date material weight, and to give the most recent surveys little weight.

Table 17: Survey evidence considered by the AER in its most recent Decisions

Survey	Numbers of responses	Mean (%)	Median (%)	Mode (%)
Fernandez et al (2013)	73	5.9	6.0	N/A
KPMG (2013)[a]	19	N/A	6.0	6.0
Fernandez et al (2013)	17	6.8	5.8	N/A
Asher and Hickling (2013)	46	4.8	5.0	6.0
Fernandez et al (2014)[b]	93	5.9	6.0	N/A
Asher and Hickling (2014)[c]	27	4.4	4.6	6.0
Fernandez et al (2015)	40	6.0	5.1	N/A
KPMG (2015)[d]	~27	N/A	6.0	6.0
Asher and Carruther (2015)	29	4.9	N/A	N/A
Fernandez et al (2016)	87	6.0	6.0	N/A
Carruther (2016)	24	5.3	N/A	N/A
Fernandez et al (2017)	26	7.3	7.6	N/A
KPMG (2017)	45	N/A	6.0	6.0

Source: TransGrid Draft Decision, 2017, Attachment 3, Table 3-24, p. 228.

417   Table 17 presents survey evidence as old as 2013 (four years out of date) alongside the two most recent surveys, by Fernandez and KPMG, published in 2017. The AER acknowledges that surveys measure investors' expectations about the MRP:

> Survey estimates explore investor expectations about the market risk premium. They achieve this by directly asking investors and market practitioners what their expectations are and/or what they apply in practice.[244]

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243 TransGrid Draft Decision, 2017, Attachment 3, p. 76.

244 TransGrid Draft Decision, 2017, Attachment 3, p. 228.

Appendix C: The AER's interpretation of the MRP evidence

418   In the Guideline materials, the AER stated that it considered that the strength of survey evidence is the:

> ...direct theoretical link between expected excess returns and stated expectations[245]

419   Since survey evidence aims to capture market participants' expectations of the MRP, if survey evidence is to be relied upon the most recent surveys should be used as they are most likely to provide the best indication of the *prevailing* MRP. For instance, Table 17 above presents six survey studies by Fernandez, and each of these asks respondents to report the MRP they are using *in that year*. For example, the 2017 Fernandez survey asks respondents to report the "Market Risk Premium that I am using in 2017".[246] This suggests that older surveys reflect out-of-date expectations of the MRP, and are therefore less relevant to estimating a return on equity that reflects the prevailing conditions in the market for equity funds. Conversely, more recent surveys are more likely to provide useful evidence on the prevailing MRP, and therefore should supersede older surveys.

420   We note that in the Guideline materials, the AER itself noted "timeliness" as a potential weakness of survey evidence.[247] Further, in recent Decisions, the AER acknowledges that it must have regard to the timing of surveys when evaluating the usefulness of survey evidence, but then proceeds to consider survey evidence as old as 2013 without providing any explanation as to why the use of such old surveys is appropriate.

421   We have expressed many reservations about the reliability of survey evidence in the past.[248] However, our view is that if the AER is minded to give some consideration to survey evidence, it should give most weight to the most recent and timely survey evidence, and least weight to older less timely evidence.

422   Therefore, of the survey evidence cited by the AER, we consider that the most useful evidence are those surveys that pertain to 2017:

    a.   The 2017 Fernandez survey; and

    b.   The 2017 KPMG Valuation Practices Survey.

423   The first of these surveys, the Fernandez survey, suggests that prevailing MRP in Australia is now materially higher than 6.0%. That survey finds that the median estimate of the MRP is 7.6%.

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[245] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 90.

[246] Fernandez, Linares, Acín, 2017, Discount Rate (Risk-Free Rate and Market Risk Premium) used for 41 Countries in 2017: a survey, April, p.13.

[247] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 90.

[248] See, for example: Frontier Economics, The market risk premium: A report prepared for TransGrid, September 2016.

Appendix C: The AER's interpretation of the MRP evidence

424   The 2017 KPMG Valuation Practices Survey does indeed find that the median estimate of the MRP used by valuation experts is 6.0%. However, KPMG notes that:

> a. Australia's current low-interest environment has resulted in some valuers adjusting the market risk premium upwards by either 0.5% or 1.0%;[249] and
>
> b. The vast majority of respondents are currently using risk-free rates that are well above the prevailing 10-year government bond yield.[250] In fact, the KPMG website indicates that, in relation to the 2017 Valuation Practices Survey, the most commonly used risk-free rate was 4.5%.[251]

425   If the most commonly used risk-free rate is 4.5%, and the most commonly used MRP is 6.0%, the total required return on equity, assuming the AER's equity beta of 0.7, would be 8.7%.[252] This implies that had most valuers used the risk-free rate adopted by the AER its latest Decisions, 2.68%, and adjusted the MRP rather than the risk-free rate, those valuers would have had to use a MRP estimate of approximately 8.6% to arrive at the same total required return on equity estimate of 8.7%.[253] In other words, implicit within the 2017 KPMG Valuation Practices Survey is a MRP of 8.6% rather than 6.0%. It would, in our view, be unreasonable to interpret this evidence as supporting the approach of inserting a 6% MRP into the CAPM formula with the prevailing risk-free rate, as that would produce a return on equity figure that is materially lower than that actually adopted by the respondents.

426   The Guideline materials themselves note that survey respondents may make adjustments either the risk-free rate or to the overall return on equity, rather than the MRP reported, in order to reflect prevailing market conditions:

> Furthermore practitioners may make adjustments to other parameters (for example, the risk free-rate) or to the return on equity or overall returns to reflect prevailing market conditions and this may not be picked up in the survey.[254]

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[249] KPMG, 2017 Valuation Practices Survey, p. 11.

[250] KPMG, 2017 Valuation Practices Survey, p. 10.

[251] https://home.kpmg.com/au/en/home/insights/2017/07/valuation-practices-survey-2017.html (accessed 15 December 2017).

[252] $4.5\% + 0.7 \times 6.0\% = 8.70\%$.

[253] $(8.70\% - 2.68\%) \div 0.7 = 8.60\%$.

[254] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix C: The AER's interpretation of the MRP evidence

427   To the extent that evidence of this is available in the results of the survey (as it is in the 2017 KPMG Valuation Practices Survey), then this should be accounted for. However, the AER has not done so in its latest Decisions.

428   In summary, we consider that that:

> a. Of the survey evidence presented by the AER in its latest Decisions, the most timely evidence – i.e., surveys pertaining to 2017 – should be given most weight because these are most likely to reflect market participants' prevailing expectations of the MRP and, therefore, are most suitable for the purposes of estimating a return on equity that that reflects the prevailing conditions in the market for equity funds.
>
> b. The two surveys cited by the AER that relate to 2017, by Fernandez and KPMG, both indicate that the prevailing MRP is considerably higher than the estimate of 6.5% adopted by the AER in its most recent Decisions.

429   In sharp contrast, the AER maintains that the survey evidence supports a MRP estimate of 6.0%. This estimate can only be supported by the evidence if material consideration is given to out-of-date evidence and/or the AER is exercising its judgment in a way that is not explained in its decisions, and therefore cannot be replicated by any stakeholder.

18.5.2 Conditioning variables

430   In its most recent Decisions, the AER has regard to a number of conditioning variables and concludes, based on the most recent values for those conditioning variables, that there is no satisfactory evidence for a departure from the AER's standard MRP estimate of 6.5%:

> Having considered all the relevant material before us we do not consider there is satisfactory evidence to warrant departure from the Guideline approach and our 6.5 per cent point estimate. For example, the conditioning variables indicate there has not been a material change in market conditions to warrant adjusting the market risk premium.[255]

431   The view that we have expressed in previous submissions to the AER is that in the absence of a formal econometric mapping of these conditioning variables to a point estimate of the MRP, it is difficult to know how this evidence should be interpreted.[256] We note that the AER's advisers, Partington and Satchell, agree with us in this regard:

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[255] TransGrid Draft Decision, 2017, Attachment 3, p. 74.

[256] See, for example: Frontier Economics, The market risk premium: A report prepared for TransGrid, September 2016.

Appendix C: The AER's interpretation of the MRP evidence

> We agree with the former statement that it is difficult to draw conclusions from conditioning variables in the absence of formal econometric mapping to a point estimate of the MRP. This the substance of a well-regarded paper by Goyal and Welch(2008) who demonstrate that over a long period of time there seems to be no stable relationship between forecasts of MRP and actual market excess returns in the US. We would expect similar results elsewhere.[257]

432   Notwithstanding agreement between us and the AER's advisers, the AER continues to use evidence on various conditioning variables to reach conclusions about the *level* of the prevailing MRP.

433   Having reiterated this overarching concern, we raise three further concerns about the way in which the AER has used conditioning variables.

434   First, the AER has used conditioning variables to assess whether "there is satisfactory evidence to warrant departure from" the AER's Guideline estimate of 6.5%. In other words, the AER has introduced into its decision-making process for determining a MRP allowance a persuasive evidence test. Such a test was expressly rejected by the AEMC in 2012 when it developed the Rule Change that led to the requirement for the AER to prepare the Guideline.

435   In its Final Rule Determination, the AEMC noted that some stakeholders had submitted that some form of persuasive evidence test, or 'inertia principle' should be included in the Rules, such that when making a rate of return determination, the AER would by default estimates for certain parameters that applied in previous determinations unless there was persuasive evidence that warranted the application of different estimates:

> The Commission also gave consideration to a suggestion from NSPs that if a rate of return framework based on the NGR determination by determination approach were to be adopted, then there should be an "inertia principle" included in the rules. This would require the parameter values of previous regulatory determinations to be binding until variation is sought that passes some form of persuasive evidence test. It was suggested that some parameters by their nature are subject to significant ongoing discussion and that two experts could look at the same material and come up with multiple answers. It was suggested that use of this type of "evidence" would reduce certainty, stability and transparency in the regulatory framework.[258]

436   Having considered these representations, the AEMC rejected resoundingly the proposal that a persuasive evidence test, or inertia principle, be included within the Rules. The AEMC stated the following:

> The rate of return guidelines are not intended to explicitly lock-in any parameters or methodologies from which departure would not be permitted. In order for the guidelines to have some purpose and value at the time of the regulatory determination or access arrangement process, they must have some weight to narrow the debate. However, there should not be any "inertia principle" or "persuasive evidence test" applying to the

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[257] Partington and Satchell (2017), April, p. 28.

[258] AEMC, Rule Change Final Determination, 2012, pp. 45-6.

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Appendix C: The AER's interpretation of the MRP evidence

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> application of the guidelines. Requirements on the regulator (and service providers) of this nature to justify departures from the guidelines would undermine the purpose of them.[259]

437   In this statement, the AEMC is explicit that in the application of the Guideline in the context of making a particular Decision:

  a.   there should be no presumption that a parameter estimate from a previous Decision should apply unless satisfactory or persuasive evidence is adduced that justifies the use of a different estimate; and

  b.   network service providers and the AER are free from the burden of a persuasive evidence test.

438   By using the conditioning variables to assess whether there is satisfactory evidence to depart from a previous estimate of the MRP, the AER appears to have applied a persuasive evidence test.

439   In our view, a correct application of the conditioning variables evidence would involve the AER using that evidence to estimate the MRP in prevailing market conditions. However, as we have explained previously, it is very difficult to use the conditioning variables in that way in the absence of a formal econometric mapping of these conditioning variables to a point estimate of the MRP.

440   Our second concern in respect of the AER's application of conditioning variables is that it argues that these variables indicate that market conditions have not changed materially since the Guideline. However, the AER's allowed return on equity has declined by over 16% between the publication of its December 2013 Guideline (8.7%) and its September 2017 Decisions (7.2%). If market conditions have not changed materially since the Guideline (when the AER derived its MRP estimate of 6.5%), why has the AER's estimate of the return required by equity investors fallen so materially?

441   Finally, we note that the AER appears to be giving conditioning variables greater weight than indicated in the Guideline. As explained in section 15.3.2, in the Guideline the AER:

  a.   said that it would give only "limited consideration" to conditioning variables but "significant consideration" to DGM evidence; and

  b.   made explicit that it would give more weight to DGM evidence than it would to conditioning variables.

442   According to the AER's own analysis, the DGM evidence suggests that the MRP has increased materially since the publication of the Guideline. However, in recent Decisions the AER has used conditioning variables (which the AER has said

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[259] AEMC, Rule Change Final Determination, 2012, p. 58.

Appendix C: The AER's interpretation of the MRP evidence

should be given less weight than DGM evidence) to overrule the DGM evidence and argue for no change to its Guideline estimate of the MRP, 6.5%. This appears to be a material and unexplained departure from the Guideline.

18.5.3 Regulatory determinations

443   The Guideline approach is for the AER to give some limited consideration to MRP estimates by other Australian regulators.[260] In its most recent Decisions, the AER contends that:

> Regulatory decisions over the past 12 months indicate a market risk premium of 6.5 is reasonable. The most recent regulatory decisions in 2017 have largely used an MRP value from 2016.[261]

444   However, the empirical evidence actually presented by the AER does not support this contention. Most recent decisions by other Australian regulators are well above 6.5%, as indicated by the AER's own chart, which is reproduced below in Figure 35.

Figure 35: Market risk premium estimates from other Australian regulators' decisions
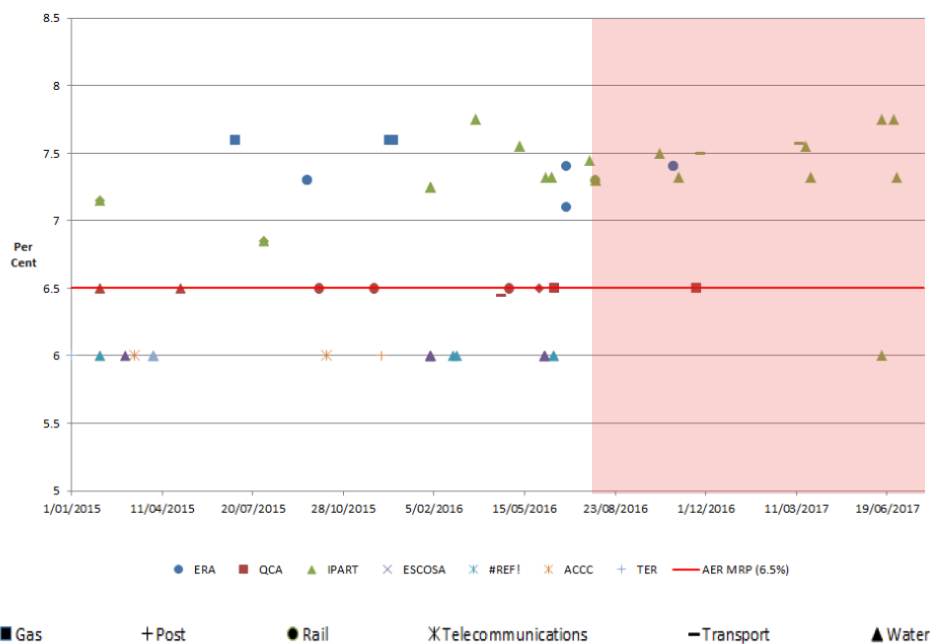
Source: TransGrid Draft Decision, 2017, Attachment 3, Figure 3-15, p. 236.

445   The AER makes clear that its focus is on regulatory decisions over the 12 month period between August 2016 and July 2017 (which we have shaded in the Figure

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[260] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[261] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

Appendix C: The AER's interpretation of the MRP evidence

above).[262] The AER's own data show that the MRP estimates determined by other Australian regulators during this period were almost exclusively above 7.0%. Only two data points lie on or below the AER's preferred MRP estimate of 6.5%:

a. One was a decision by the QCA in relation to DBCT's draft access undertaking in October 2016, which used a MRP estimate of 6.5%; and

b. The other is a June 2016 determination by IPART for WaterNSW in relation to bulk water services supplied in the Murray-Darling Basin (MDB) valleys, which used a MRP estimate of 6.0%.

446   It is important to recognise that the MRP estimate used in the June 2016 IPART determination does not represent IPART's view of the MRP prevailing at that time. This is evident for two reasons:

a. First, IPART states explicitly in that determination that it is required to use the ACCC Water Charge Infrastructure Rules (WCIR) when setting WaterNSW's charges in relation to the MDB valleys, and the WCIR methodology stipulates the use of a MRP of 6.0%.[263] Hence, IPART is compelled to use the ACCC-mandated MRP estimate of 6.0%; and

b. Second, in the same determination, IPART also set WaterNSW's charges in relation to bulk water services provided to the Coastal valleys. When setting those charges, IPART used a MRP estimate (derived using its standard methodology) of 7.75%.[264] This estimate, which may be interpreted as IPART's view of the prevailing MRP since it is based on its own methodology and not the requirements of the WCIR, is shown in Figure 35.

447   If the IPART bulk water determination in relation to the MDB valleys is discarded, as it does not represent IPART's view of the prevailing MRP, then in the 12 month period that the AER considers relevant, only a single determination by another Australian regulator, the QCA, sits below 7.0%.

448   Based on this evidence, we see no reasonable way in which the AER could conclude that "Regulatory decisions over the past 12 months indicate a market risk premium of 6.5 is reasonable." Such a conclusion is a misinterpretation of the evidence.

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[262] TransGrid Draft Decision, 2017, Attachment 3, Figure 3-15, p. 235.

[263] IPART, Review of prices for rural bulk water services from 1 July 2017 to 30 June 2021, June 2017, p. 72.

[264] IPART, Review of prices for rural bulk water services from 1 July 2017 to 30 June 2021, June 2017, p. 75.

Appendix C: The AER's interpretation of the MRP evidence

449   In addition, we note that since the AER released its 2017 TransGrid Draft Decision, from which Figure 35 is an excerpt, IPART, the ERA and the QCA have each published further estimates of the MRP:

   a.   IPART's August 2017 Biannual WACC update determined a MRP estimate of 7.7%;[265]

   b.   The ERA's October 2017 WACC Final Decision for WA rail networks determined a MRP estimate of 7.2%;[266] and

   c.   The QCA's November 2017 Draft Decision on bulk water charges for Seqwater concluded that the best empirical estimate of the MRP at the present time is 7.0%.[267]

450   All three of these recent MRP decisions are materially greater than the AER's estimate of 6.5%. It is particularly noteworthy that the QCA (who was the only regulator in the AER's chart to have determined the same MRP of 6.5% as the AER within the past 12 months) now considers that "the best empirical estimate of the MRP is 7.0 per cent at this time."

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[265] IPART, WACC Biannual update, August 2017, p. 2.

[266] ERA, Determination on the 2017 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways, 6 October 2017, p. 4.

[267] QCA, Seqwater Bulk Water Price Review 2018–21, November 2017, p. 54.

Appendix C: The AER's interpretation of the MRP evidence

19   Appendix D: The implications of a "nearly constant" approach to the MRP

19.1   The AER's approach is to set a nearly constant MRP allowance

451   Since the Guideline, the AER has allowed an MRP of 6.5% in every one of its Draft and Final Decisions. The AER also adopted an MRP of 6.5% in its previous review of WACC parameters in 2009. In every Decision since its inception, the AER has allowed an MRP of either 6.0% or 6.5%.

452   Although the AER's position is that "the MRP likely varies over time,"[268] the AER's consultants now recognise that the AER's approach is to set an effectively constant MRP allowance:

> The AER decisions hold the risk premium nearly constant (although upward adjustments of 0.5% have been made). As (sic) result the regulated return tends to fall 1 for 1 with falls in the risk free rate.[269]

19.2   The allowed return on equity falls one-for one with falls in government bond yields

453   As Partington and Satchell (2016) note above, the inevitable consequence of setting a nearly constant MRP is that the allowed return on equity falls one-for-one with falls in government bond yields. The AER adds its constant risk premium to the contemporaneous government bond yield and the sum is adopted as the allowed return on equity. Since government bond yields have fallen sharply since the Guideline, the AER's allowed return on equity has also fallen correspondingly. This occurs in spite of the evidence set out above – including the AER's own DGM estimates – that the required return on equity has remained remarkably stable since the Guideline. The distinction between the AER's estimates and its regulatory allowance is summarised in Figure 36 below.

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[268] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

[269] Partington and Satchell (2016), p. 17.

Figure 36: The required return on the market – AER estimates and allowances
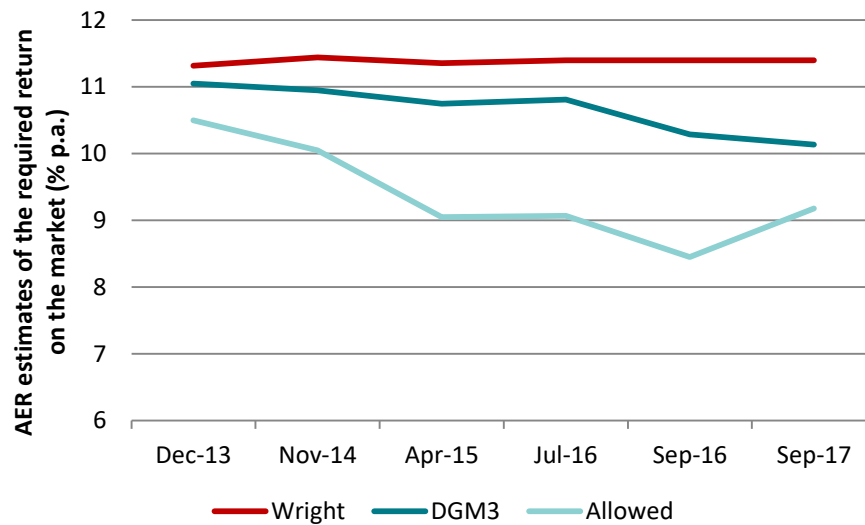
454   Since its Guideline in December 2013, the yield on 10-year government bonds has fallen from 4.1% to 2.68%.[270] The AER has maintained the same 6.5% MRP in every one of its decisions since December 2013. Thus, the AER considers that the required return on equity for the average firm[271] has fallen from 10.6%[272] in December 2013 to 9.2%[273] now. This represents a decline of more than 13% since 2013, as illustrated in Figure 37 below.

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[270] TransGrid Draft Decision, September 2017.

[271] Which, under the CAPM, is equal to the sum of the risk-free rate and the MRP.

[272] 4.1% + 6.5%.

[273] 2.68% + 6.5%.

Appendix D: The implications of a "nearly constant" approach to the MRP

Figure 37: AER estimate of the required return on equity for an average firm
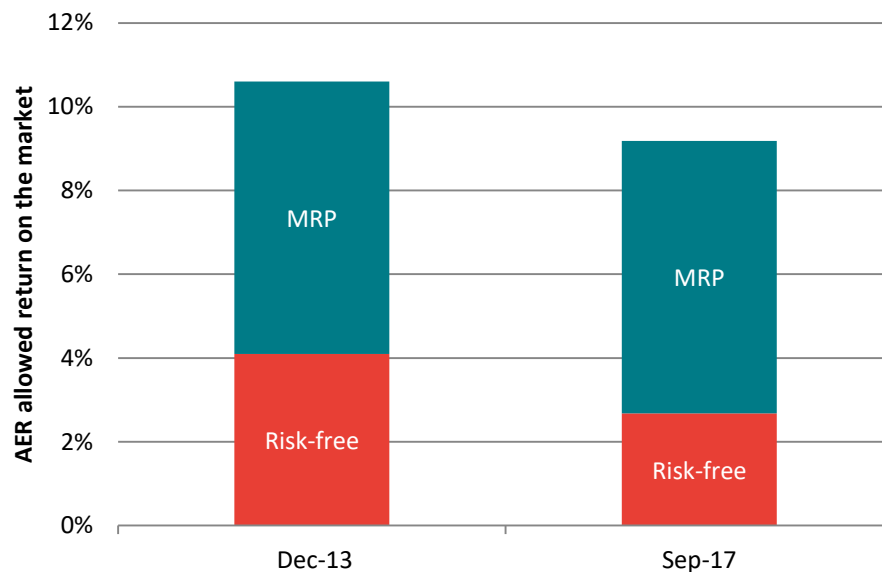
455   By contrast, as set out above, there is a substantial body of evidence to support the propositions that:

a.   Real-world investors do **not** determine the return that they require by simply adding a constant figure to the contemporaneous government bond yield; and

b.   The required return on equity has **not** fallen by over 13% since the end of 2013.

456   The broader effect of the AER's approach to distilling the MRP evidence into a single regulatory allowance is illustrated in Figure 38. That figure contrasts the AER's allowance for the required return on the market with mid-point estimates from the AER's three-stage DGM.[274]

457   The most obvious point of departure is during the global financial crisis (GFC) in late 2008.[275] The approach of applying a fixed premium to the contemporaneous government bond yield implies that the required return on equity *fell* dramatically during the peak of the GFC – as investors moved funds into government bonds, lowering yields. Such an outcome is implausible – the required return on equity capital does *not* fall materially during financial crises. But that is precisely what the 'fixed premium' approach to setting the MRP suggests. By contrast, the AER's

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[274] That is, estimates based on the AER's specification and implementation of the DGM with a long-run growth rate of 4.6%.

[275] The first shaded region in the figure below.

Appendix D: The implications of a "nearly constant" approach to the MRP

own forward-looking DGM method suggests that the required return on equity increased during the GFC.

Figure 38: The required return on the market – AER mid-point DGM estimates and regulatory allowances
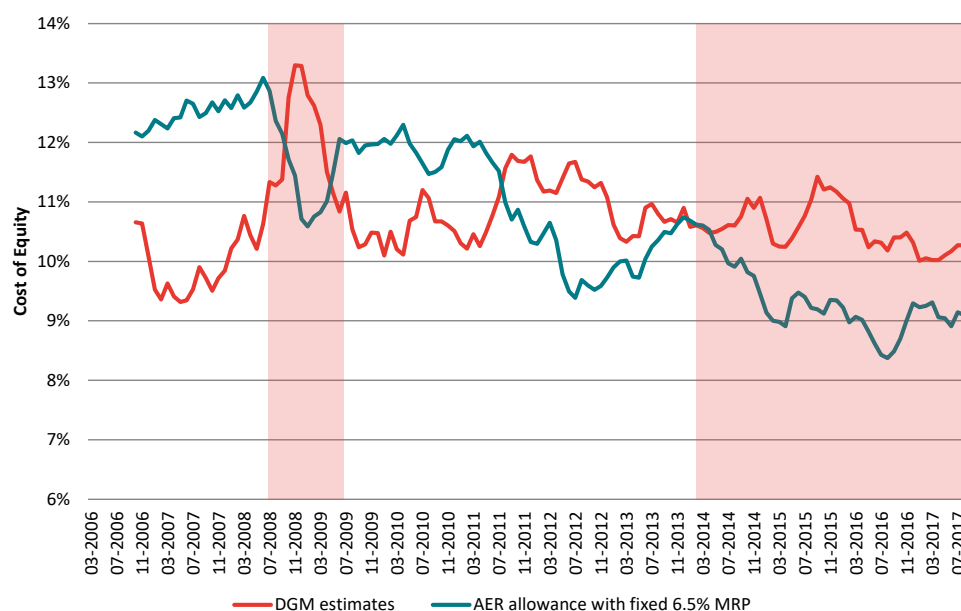
458   Figure 38 also shows that the divergence between the two methods is not confined to the peak of the GFC. For example, throughout 2007 when equity prices were very high and it is widely accepted that equity capital was relatively cheap, the AER-style fixed premium approach suggests that the cost of equity capital was very high.

459   During average market conditions, when government bond yields are closer to their long-run mean, both approaches produce similar estimates of the required return on equity. This is the case through 2002 to 2005.

460   Importantly, the two approaches currently suggest very different required returns. Whereas the DGM method suggests that the required return on equity has remained quite stable since 2013[276] (hovering between 10% and 11%), the AER allowance suggests a material decline in the cost of equity.

19.3 The source of the problem

461   We have shown above that the AER's approach to setting the MRP allowance produces implausible outcomes in some market conditions, including the current market conditions. These implausible outcomes arise because the AER's

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[276] The second shaded region in the figure above.

Appendix D: The implications of a "nearly constant" approach to the MRP

estimation approach produces a nearly constant estimate of the MRP. This results in an allowed return on equity that is volatile – it rises and falls one-for-one with every change in government bond yields.

462   In some market conditions, the true required return on equity may well fall when government bond yields fall. However, in other market conditions the required return on equity may stay constant, or even rise, as government bond yields fall. It depends on the reasons why the government bond yield has fallen.

463   The problem with the AER approach is that it assumes that the required return on equity **always** falls one-for one with **every** decline in government bond yields. This unwavering assumption leads to implausible estimates in some market conditions, including the current market conditions.

464   In this regard, Partington and Satchell (2016) have recently advised the AER that:

> We begin by stating our position that it seems likely that the risk premium changes over time. It is also entirely possible that the risk premium sometimes changes at the same time as interest rates change, but that change may either be in the same direction as the interest rates, or in the opposite direction. At any point in time, there are three possibilities for the market risk premium, it may remain unchanged, it may go down, or it may increase. There is no compelling reason for an interest rate decrease to automatically be associated with an increase in the market risk premium.[277]

465   We agree with everything that Partington and Satchell have said in the above paragraph. However, just as there is "no compelling reason for an interest rate decrease to automatically be associated with an increase in the market risk premium," there is equally no compelling reason for an interest rate decrease to *never* be associated with an increase in the MRP.

466   This is the crux of the problem with the AER's nearly constant MRP. Even though government bond yields have fallen markedly since the Guideline, and even though there is strong evidence that the real-world required return from equity holders has not fallen one-for-one with those yields, the AER has maintained the same MRP allowance.

467   We do not suggest that the AER should *always* increase the MRP allowance *whenever* the government bond yield falls or that any increase should completely offset the fall in yields. We simply suggest that the AER should *sometimes* increase the MRP allowance to *partially* offset the fall in yields – when objective evidence supports that course of action. The problem is that the historical experience has been that the AER's approach has not permitted *any* increase in the MRP to offset *any* of the material decline in government bond yields that has occurred since the Guideline. In our view, the prevailing market conditions support an increase in the MRP to partially offset the recent material decline in government bond yields.

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[277] Partington and Satchell (2016), p. 17.

Appendix D: The implications of a "nearly constant" approach to the MRP

468   In their most recent report, Partington and Satchell (2017) state that they agree in principle with the contentions we make above:

> There is a high level of agreement here, as we agree with everything that Frontier have said in the above paragraph. Thus both we and Frontier agree that just because there has been a large fall in government bond yields does not necessarily mean that an increase in the MRP will offset reduced required returns to stocks. Nor is there anything necessarily unnatural about the required stock return falling one for one with falls in the government interest rate. Ceteris paribus that is to be expected. Nonetheless, we agree with Frontier and accept that on occasion it is entirely possible that the MRP may increase as interest rates fall. However, we remain unconvinced by the evidence that Frontier subsequently present for a current increase in the market risk premium.[278]

469   Hence, it appears that the only difference between our views and that of the AER's advisers is that Partington and Satchell are unconvinced by our arguments that the MRP has increased recently. In Appendix F, we address a number of their key objections to the evidence that we present, particularly in relation to the DGM.

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[278] Partington and Satchell (2017), April, p. 15.

Appendix D: The implications of a "nearly constant" approach to the MRP

20   Appendix E: Evidence on the total required return on equity

20.1 Overview of evidence

470   In a number of recent reports,[279] we have set out evidence from a range of respected market participants that is consistent with the weight of evidence set out above – that the required return on equity has remained relatively stable even as government bond yields have fallen. This position is supported by:

>   a.   Central banks such as the Reserve Bank of Australia and the Federal Reserve Bank of New York;
>
>   b.   Other regulators such as Ofgem, FERC, the ERA, and IPART;
>
>   c.   Corporate advisory firms such as McKinsey and NERA-US; and
>
>   d.   Independent expert firms such as EY, KPMG, Deloitte, and Lonergan Edwards.

471   This evidence indicates that the required return on equity has remained relatively stable even as government bond yields have fallen – which implies an increase in the MRP to partially offset the fall in government bond yields. All of this is consistent with the AER's own DGM evidence set out above.

472   While we remain of the view that this represents relevant evidence that should inform the estimation of the MRP, we do not restate that evidence here. Rather, we respond to a small number of specific points that the AER and its advisers have raised in relation to it.

20.2 Purpose of evidence of stability in required returns

473   The AER's own DGM evidence indicates that the required return on equity has remained quite stable since the Guideline even though government bond yields have fallen materially. This indicates that an increase in the MRP has at least partially offset the fall in government bond yields.

474   The purpose of our summary of the analyses performed by central banks, other regulators, corporate advisory firms and independent expert firms is to show that there is a weight of opinion and analysis that is entirely consistent with the evidence of relative stability in the required return on equity. We do not suggest that any

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[279] See, for example, Frontier Economics, 2017, The market risk premium, Report prepared for TransGrid, January, Section 5.

single piece of evidence or analysis is individually compelling or should be used to supplant other evidence as a point estimate of the MRP. Rather, we simply note that there is a preponderance of evidence from a range of credible market participants (central banks, other regulators, advisory firms and independent valuation experts) that also conclude that the required return on equity has remained stable in recent years – consistent with the AER's own DGM estimates.

475   The AER's analysis of this evidence in its recent decisions focuses on a small number of specific issues relating to some individual pieces of evidence, which we address below. The AER does not suggest that *all* of the evidence from central banks, other regulators, advisory firms and independent valuation experts is flawed or unreliable, so we maintain the point that there is a preponderance of evidence from credible market participants supporting the conclusion that the required return on equity has remained relatively stable in recent years.

20.3 Evidence from FERC

476   We have previously noted that FERC has recently concluded that:

> The Commission's practice traditionally has been to adjust the ROE using a 1:1 correspondence between the ROE and the change in U.S. Treasury bond yields—i.e., for every basis point change in the U.S. Treasury bond yield the Commission would adjust the ROE by one basis point.[280]

and that:

> The capital market conditions since the 2008 market collapse and the record in this proceeding have shown that there is not a direct correlation between changes in U.S. Treasury bond yields and changes in ROE. [281]

and further that:

> The current low treasury bond rate environment creates a need to adjust the CAPM results, consistent with the financial theory that the equity risk premium exceeds the long-term average when long-term US Treasury bond rates are lower than average, and vice-versa.[282]

477   FERC then allowed a return on equity of 12.5%[283]

478   We submitted this as evidence that is inconsistent with the AER's practice of adding the same fixed risk premium even as government bond yields have varied

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[280] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 159.

[281] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 158.

[282] FERC Docket ER14-500-000, January 2014, pp. 35-36.

[283] FERC Docket ER14-500-000, January 2014, pp. 35-36.

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materially – as that approach produces a 1:1 correspondence between the return on equity and the change in government bond yields.

479   In its TransGrid Draft Decision, the AER dismisses this evidence on the basis that FERC's:

> …concern seems to be in using solely historic excess returns with a simple CAPM. However, we use information from a range of relevant material, including forward looking material, to determine the forward looking return on equity.[284]

480   That is, the AER appears to accept that it would be wrong to use only historic excess returns to estimate the MRP in a "simple" CAPM; that approach leading to the return on equity varying 1:1 with changes in the government bond yield. The AER then suggests that it is immune from such criticism since it does not use only historical excess returns, but also uses "forward-looking material."   However, whatever the AER says about its approach, the fact is that in every decision since the Guideline it *has* set the MRP to the same fixed 6.5% such that the allowed return on equity *has* varied 1:1 with changes in government bond yields. Thus, the AER's practice is certainly *not* immune from the FERC criticism and conclusion.

20.4 Evidence from the Federal Reserve Bank

481   In a recent paper for the Federal Reserve Bank of New York, Duarte and Rosa (2015)[285] estimate 20 models of the MRP (which they call "ERP" for equity risk premium). They conclude that the ERP is currently at elevated levels – even above the levels reached during the GFC:

> In this article, we estimate the ERP by combining information from twenty prominent models used by practitioners and featured in the academic literature. Our main finding is that the ERP has reached heightened levels. The first principal component of all models –a linear combination that explains as much of the variance of the underlying data as possible– places the one-year-ahead ERP in June 2012 at 12.2 percent, above the 10.5 percent that was reached during the financial crisis in 2009.[286]

482   They conclude that the reason for the elevated ERP is that the required return on equity remains at normal levels even as government bond yields have fallen to exceptionally low levels:

> Our analysis provides evidence that the current level of the ERP is consistent with a bond-driven ERP: expected excess stock returns are elevated not because stocks are expected to have high returns, but because bond yields are exceptionally low. The

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[284] TransGrid Draft Decision, Attachment 3, p. 3-97.

[285] Duarte, F. and C. Rosa, 2015, "The Equity Risk Premium: A Review of Models," Federal Reserve Bank of New York Economic Policy Review, December.

[286] Duarte and Rosa (2015), p. 39-40.

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models we consider suggest that expected stock returns, on their own, are close to average levels.[287]

483   We have drawn the evidence presented in the Federal Reserve Paper by Rosa and Duarte to the AER's attention in previous reports.[288] In its 2017 TransGrid Draft Decision, the AER addresses this study and concludes that the Duarte and Rosa paper uses US data and it is not clear that the Australian market would follow a similar experience.[289]

484   We consider this paper to be relevant because of its focus on precisely the issue that arises in the AER's own estimates of the MRP – the required return on equity appears to have remained stable over recent years even as government bond yields have fallen to historical lows:

> …unlike the ERP, expected stock returns are close to their long-run mean and nowhere near their highest levels, achieved in 1980. The discrepancies between the two lines [depicting the estimated ERP and expected stock returns] are the result of exceptionally low bond yields since the end of the financial crisis.[290]

485   We also note that the AER's advisers, Partington and Satchell, have placed weight on this paper in another context, as we discuss in Section 21 below.

20.5 Evidence from McKinsey Inc.

486   In a recent McKinsey publication, Dobbs, Koller, Lund, Ramaswamy, Harris, Krishnan and Kauffman (2016)[291] examine the practice of investors, companies, bankers and management teams and conclude that the cost of equity capital has not declined with the recent declines in government bond yields:

> …our analysis shows that over the past 50 years the real cost of equity has usually stayed within a narrow band of 6 to 8 percent, averaging about 7 percent. This has remained the case even with ultra-low interest rates. This indicates that even if investors believe the risk-free rate has fallen because of a decline in government bond yields, they have offset this with a higher equity risk premium. Alternately, it may be that investors do not view the government bond rate as the appropriate proxy for the risk-free rate, particularly in today's environment. In either case, the total cost of equity for the average company does not appear to have benefited from ultra-low interest rates. If it had, we would expect to see PE ratios and stock prices substantially above today's levels. This is consistent with the discount rates we observe companies and bankers using to evaluate and price acquisitions. It is also consistent with our

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[287] Duarte and Rosa (2015), p. 54.

[288] Frontier Economics, The market risk premium, January 2017.

[289] TransGrid Draft Decision, Attachment 3, p. 3-98.

[290] Duarte and Rosa, 2015, p. 53.

[291] Dobbs, R., T. Koller, S. Lund, S. Ramaswamy, J. Harris, M. Krishnan, D. Kauffman, 2016, "Diminishing Returns," McKinsey Global Institute, May.

> observation that most management teams and corporate boards have not reduced their investment hurdle rates or minimum returns for projects.[292]

487   Dobbs, Koller and Lund (2014)[293] seek to explain the stability of the required return on equity with reference to price earnings ratios. For example, if dividends are generally expected to grow at a constant rate, the price earnings ratio will be a function of dividend payout (D/E), the return on equity and expected growth:

$$P/E = \frac{D/E}{r_e - g}.$$

Dobbs, Koller and Lund make the point that a reduction in the required return on equity would, other things being equal, lead to an increase in the price/earnings ratio. Partington and Satchell (2017) make the point that other things may not be equal – dividend payout ratios and/or the expected growth rate may also change. We agree that this is possible, although no evidence is presented that those things *have* changed. However, Dobbs, Koller and Lund are simply seeking to reconcile the broader evidence of recent stability in the required return on equity by considering the relationship with price/earnings ratios. Even if that reconciliation is rejected, there remains a preponderance of evidence, using a whole range of different approaches, indicating recent stability in the required return on equity.

20.6 IPART

488   IPART applies a default 50% weight to forward-looking estimates of the MRP – primarily a number of DGM specifications.[294] In its most recent update, IPART adopts a contemporaneous MRP of 7.8%.[295]

489   IPART is presently consulting on various aspects of its rate of return methodology. In a recent consultation paper, which discussed proposals for possible improvement to its methodology, IPART stated clearly its view that there exists an inverse relationship between the risk-free rate and the MRP:

> ...there is a negative correlation between the risk-free rate and the MRP - when one of these parameters changes, the other changes in the opposite direction. This is because in times of economic uncertainty, investors would move away from riskier assets in preference for safer assets like government bonds. This would push up the price of these bonds and decrease the yield – a phenomenon known as a 'flight to quality'.[296]

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[292] Dobbs, Koller, Lund, Ramaswamy, Harris, Krishnan and Kauffman, 2016, p. 12.

[293] Dobbs, R., T. Coller and S. Lund, 2014, "What effect has quantitative easing had on your share price?" McKinsey on Finance, 49, Winter 2014.

[294] IPART, Review of WACC Methodology, December 2013.

[295] IPART, WACC Biannual update, August 2017.

[296] IPART, Review of our WACC method, Issues Paper, July 2017, p. 16.

Appendix E: Evidence on the total required return on equity

490   IPART went on to present evidence that supported its view on the inverse relationship between the risk-free rate and the MRP:

> Figure 3.1 shows this inverse relationship between the risk-free rate and the MRP estimated using the Damodaran model. Very similar correlations are also found for the other MRP methods, including the two Bank of England models and the SFG analyst implied method. In particular, the figure shows if the risk-free rate increases by 1%, the MRP decreases by approximately 1% - substantially offsetting the effect on the WACC of the increase in the risk-free rate.[297]

491   We reproduce below in Figure 39 the chart that IPART referred to in the excerpt above.

492   The corollary of IPART's analysis is that the overall return on equity is fairly stable over time, such that a reduction in the risk-free rate is accompanied by an increase in the MRP, and vice versa. IPART's view about the stability of the overall return on equity is borne out by the stability of the WACC estimates produced by its current rate of return methodology – as shown in Figure 40 below.

493   This contrasts with the AER's WACC allowances, which have declined materially since 2013 as government bond yields have fallen.

Figure 39: Correlation between IPART's DGM estimate of the MRP and the prevailing risk-free rate
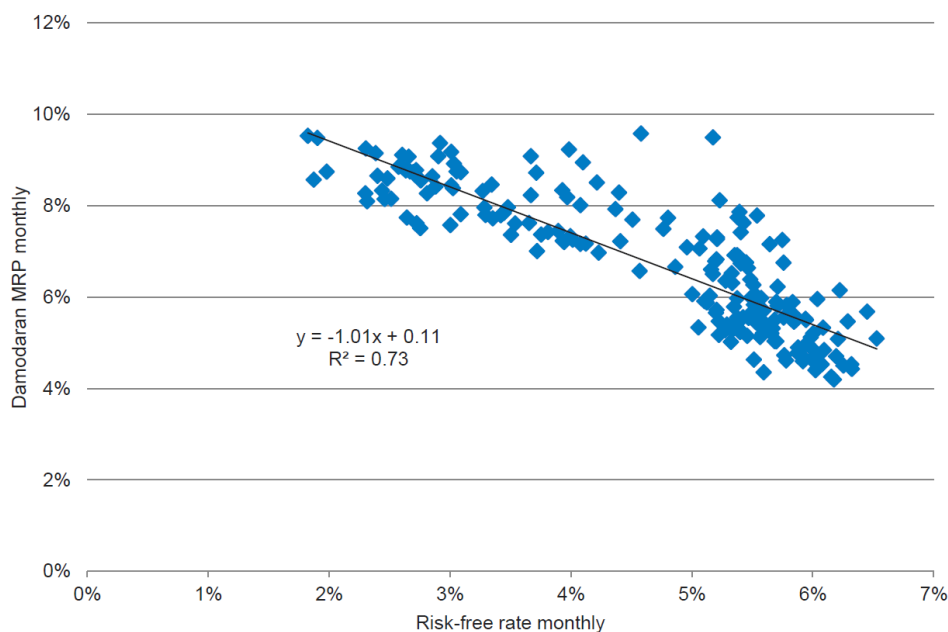
Source: IPART, Review of our WACC method, Issues Paper, July 2017, Figure 3.1, p. 17.

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[297] IPART, Review of our WACC method, Issues Paper, July 2017, pp. 16-7.

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Figure 40: IPART WACC estimate of real vanilla WACC (equity beta = 1, gearing = 60%)
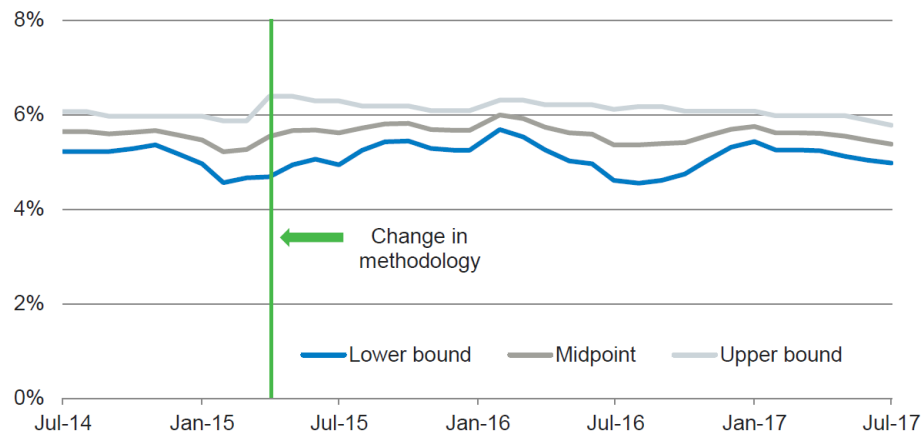
Source: IPART, WACC Biannual update, August 2017, p.1.

Appendix E: Evidence on the total required return on equity

21 Appendix F: The reliability of DGM estimates of the MRP

21.1 The AER's views on the DGM in the Guideline

494 Because the long-run mean of historical excess returns is effectively constant over time, if the MRP is set predominantly on the basis of that evidence the allowed MRP will be nearly constant over time – reflecting the long-run average of historical outcomes.

495 To obtain an estimate of the MRP that is forward-looking and commensurate with the prevailing conditions in the market, some material weight would have to be applied to forward-looking estimates that are based on prevailing market prices.

496 In this regard, the AER has stated that, but for some concerns about DGM estimates not being perfectly reliable, it would adopt the DGM estimate as the allowed MRP:

> If a perfectly reliable estimate of the MRP could be generated from market prices it would be reasonable to use this estimate. However, no such estimate exists.[298]

497 The AER did, in the Guideline materials, express some reservations about the DGM. The AER's primary concern was the sensitivity of the DGM estimates of the MRP to estimates of the long-run growth rate, and the time assumed to transition to the long-run growth rate:

> Our primary concern with using DGM estimates is the sensitivity of the estimates to assumptions about the long term growth rate and the time it takes to reach the long run growth rate…[299]

498 The AER went on to say that despite those concerns, it considered that theoretical basis for the DGM was sound, and that estimates from the DGM are more likely to reflect prevailing market conditions than other approaches:

> Notwithstanding our concerns about the reliability of input assumptions, we consider DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches.[300]

499 In the Guideline, the AER was concerned that because DGM estimates can be sensitive to model specification, inconsistent application of models through time could result in cherry-picking of estimates. Therefore, the AER considered that in

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[298] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 110.

[299] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

[300] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

order for the DGM to be useful in a regulatory context, it would be necessary to settle on a formulation of the DGM that could be applied consistently over time:

> There are many possible formulations of DGMs and the results from the different variants tend fluctuate through time. For DGMs to be given greater consideration in the regulatory process, we consider that it is necessary to settle on a variant that can be consistently applied through time. A consistent approach through time will moderate some of the causes of variation.[301]

500   Through the Guideline process, a number of stakeholders proposed various formulations of the DGM. The AER rejected all of these and settled on two specifications of its own design—a two-stage model and a three-stage model—drawing on advice received from its own experts.[302]

501   After investigating different DGM specifications and settling on a preferred construction, the AER stated in the Guideline materials that:

> We consider our preferred construction provides a reasonable indication of the range of MRP estimates implied by the DGM.[303]

502   The AER describes its proposal of a preferred construction of the DGM as:

> …the most significant development in this area[304]

503   The AER stated that its preferred formulation would allow a symmetric and consistent assessment of MRP evidence over time. This, said the AER, gave it more confidence in this evidence, which meant that it would give DGM evidence more consideration than it had done in the past:

> We have considered the available evidence on the DGM and proposed our preferred construction of the model. We have consulted with stakeholders on our preferred construction and engaged consultants to review our proposal. As a result, in this explanatory statement we propose our preferred DGM estimates. Consequently, we have greater confidence in the symmetry of this information through time and give these estimates greater consideration than we have in the past.[305]

504   The AER also noted that consistent construction and application of the DGM helps address its primary concern about sensitivity of DGM estimates to the assumed long-term growth rate assumption, and transition to the long-term growth rate:

> … the outcomes [of DGMs] are sensitive to the model assumptions, especially the assumed long term growth in dividends and the transition from current dividends to

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[301] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

[302] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, pp. 85-6.

[303] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 87.

[304] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 89.

[305] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

Appendix F: The reliability of DGM estimates of the MRP

the long term growth path. There are a range of plausible assumptions that one could make on these parameters. We note, however, consistent applications of the various models appear to show similar trends over time.[306]

505 Further, whilst the AER did express some concerns in the Guideline about the sensitivity of DGM estimates to model inputs, the AER noted that it had access to "robust data" with which to estimate the inputs to its preferred specification of the DGM, and that, consequently, it places "emphasis on DGMs for estimating the MRP":

> The determination of robust and transparent DGM estimates, however, is predicated on the reliability and breadth of the available input data. As outlined previously, the estimation of DGMs requires assumptions about dividend yields, as well as the expected growth rate of dividends. For estimates of dividend yields in the Australian market, a sufficiently robust data series exists. Additionally, methods for estimating the growth rate of dividends in the Australian market have been developed. This is why we place emphasis on DGMs for estimating the MRP. [307]

506 The AER gave the strong impression throughout the Guideline materials that whilst it did have some reservations about the DGM, these would be ameliorated by consistent application of its preferred formulation of the DGM, and that it had data and means to derive reliable inputs to its specification of the DGM.

507 The AER concluded in the Guideline materials that when estimating the MRP, it would give:

> …significant consideration to DGM estimates of the MRP.[308]

508 In summary, when developing the Guideline, the AER:

   a. Stated that the DGM approach has the attractive features of being a forward-looking estimate that is more likely to reflect the prevailing market conditions than other approaches;

   b. Expressed some concerns about the reliability of input parameters—particularly the long-run growth rate—but concluded that these concerns are mitigated by a consistent implementation of its preferred DGM, and that it had "robust data" with which it could derive those inputs; and

   c. Stated that it would give "significant" consideration to its DGM evidence when determining the MRP allowance, and that it placed "emphasis on DGMs for estimating the MRP."

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[306] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[307] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 15.

[308] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

Appendix F: The reliability of DGM estimates of the MRP

21.2 Recent AER views on the DGM

509   The AER has stated in its most recent Decisions that it has not changed its views about the DGM since the Guideline:

> The AER has not changed its view on the DGM and how useful the information it provides is in forming a point estimate of the MRP.[309]

510   The AER has also said that it has not altered the weight that it gives to the DGM:

> We have not changed the weight we apply to the dividend growth model.[310]

511   As we set out in Section 18, since the publication of the Guideline, the AER's DGMs, implemented consistently, have indicated that the MRP has increased materially. As this has occurred, the AER appears to have placed less weight on its DGM estimates. For example, unlike the "significant consideration" that was given to the DGM in the Guideline materials, the AER now says that "limited reliance" should be placed on DGM estimates:

> Consistent with the rate of return guideline (Guideline), we use dividend growth models to inform our estimate of the market risk premium. However, we consider that limited reliance should be placed on estimates from dividend growth models.[311]

512   The AER says in its latest decisions that the DGM now fails to provide a "true" estimate of the MRP:

> We consider our dividend growth model is theoretically sound but that there are many limitations in practically implementing the model. As previously stated in our assessment of the dividend growth model, it may capture current conditions to a certain extent but fails to adequately provide a 'true' estimate of the forward looking MRP.[312]

513   This recent statement by the AER, that the DGM captures current market conditions only "to a certain extent" seems to retreat from the Guideline, which stated that DGM estimates are more likely to reflect prevailing market conditions than other approaches:

> DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches.[313]

and that:

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[309] TransGrid Draft Decision, 2017, Attachment 3, p. 81.

[310] TransGrid Draft Decision, 2017, Attachment 3, p. 215.

[311] TransGrid Draft Decision, 2017, Attachment 3, p. 209.

[312] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

[313] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 85.

Appendix F: The reliability of DGM estimates of the MRP

> The DGM method is a theoretically sound estimation method for the MRP. As DGM estimates incorporate prevailing market prices, they are more likely to reflect prevailing market conditions. DGM estimates are also clearly forward looking as they estimate expectations of future cash flows and equate them with current market prices through the discount rate.[314]

514   The AER also now says that the DGM is likely to produce "upward biased estimates in the current market" and "may not accurately track changes in the return on equity for the market." [315] The reasons for this conclusion are discussed below. As we explain, none of these reasons are new – they were all considered when the AER developed its Guideline. The only thing that has changed since the Guideline is that the AER's DGM estimates are now higher.

515   The AER has also stated in recent Decisions that:

> The guideline designated the dividend growth model to inform on whether the market risk premium may be above or below the historical estimates.[316]

516   As we have explained in section 17, nowhere in the Guideline is the DGM designated merely as a method to determine whether the final point estimate of the MRP should be set above or below the historical excess returns estimate, or as providing directional evidence only. The AER's description of the DGM as providing only directional evidence represents an after-the-event recasting of the role of the DGM in the Guideline approach to the MRP.

21.3 AER concerns

517   In this sub-section, we consider each of the concerns that the AER has documented in relation to the DGM estimates of the MRP since the publication of the Guideline.

518   Importantly, *all* of these concerns were known at the time of the Guideline and *none* of them were raised as a reason for placing "limited reliance" on DGM estimates. Importantly, none of these concerns are based on any new evidence since the Guideline, other than the fact that the AER's DGM estimates are now higher.

21.3.1 Slow-changing dividends

519   The AER points out correctly that corporate dividends are more stable over time than corporate earnings. The AER then conjectures that if the market's expectation is that earnings are falling, stock prices would fall. However, if dividends remain

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[314] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 84.

[315] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

[316] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

sticky, then the dividend yield would remain high and the resulting estimate of the return on equity would be overstated:

> If investors revise downwards their earnings expectations for a firm, the share price may drop significantly with the 'sticky' dividend unchanging. Together, this will cause a higher dividend yield, giving an upwardly-biased estimate of the return on equity. The reverse occurs if expectations are for profits and free cash flow to equity to rise.[317]

520   We note that the AER simply asserts that this *could* be a problem in present market conditions, but presents no convincing evidence that the market's expectations of earnings is in fact falling at the present time. (We explain below that the only evidence presented by the AER appears to have been misinterpreted.)

521   We acknowledge that it is possible that a firm may seek to maintain its dividend through a period of weaker earnings. However, this is only possible for a short period of time. If earnings are persistently weak, maintaining a high level of dividends becomes unsustainable. Thus, if a firm is anticipating weaker earnings for a prolonged period, it is highly unlikely that it would *increase* its dividend.

522   We have previously pointed out that the AER's concerns about sticky dividends leading to upward-biased DGM estimates of the MRP are unlikely to be material in current market conditions because analysts are currently forecasting growing dividends and earnings.[318] Forecasts of this kind are inconsistent with the notion that dividends are currently being sustained in the face of what is expected to be weak earnings in the future.

523   The AER acknowledges our submission but states that it finds this evidence unpersuasive because the analyst forecasts we presented related only to the short-term (i.e., until 2017).[319] The AER argues that analysts' forecasts are only short term forecasts, whereas market prices are likely to reflect earnings expectations in the more distant future.[320] The AER asserts that is uncertain that investors expect positive growth in dividends per share beyond the short term (i.e., post-2017):

> It is not apparent that there is or will be strong earnings growth.[321]

524   The AER presents no actual evidence that, although the market is expecting corporate earnings growth over the next two years, it may be expecting earnings to decline thereafter.

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[317] TransGrid Draft Decision, 2017, Attachment 3, p. 214.

[318] Frontier Economics, The relationship between government bond yields and the market risk premium, January 2016, p. 39.

[319] TransGrid Draft Decision, 2017, Attachment 3, p. 215.

[320] TransGrid Draft Decision, 2017, Attachment 3, p. 214.

[321] TransGrid Draft Decision, 2017, Attachment 3, p. 214.

Appendix F: The reliability of DGM estimates of the MRP

525   The only empirical evidence that the AER cites in support of its concerns is the RBA's January 2017 Chart Pack:

> …RBA data suggests that forecast growth in earnings per share will likely slow over the 2016-17 financial year.[322]

526   We reproduce below in Figure 41 the earnings growth forecasts in the most recent (October 2017) version of the RBA Chart Pack.

Figure 41: Forecast earnings per share
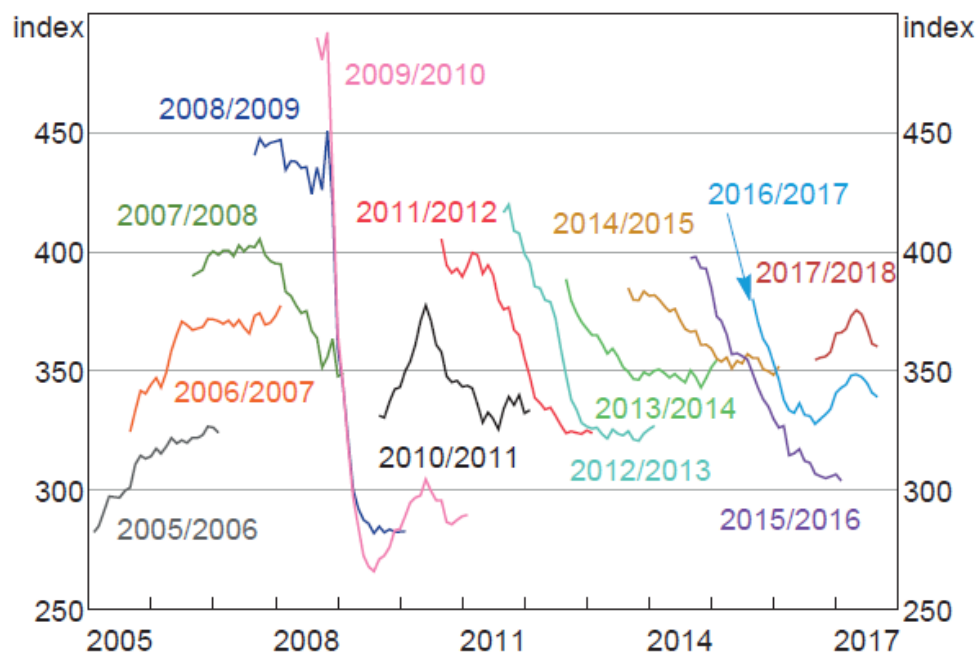
Source: RBA, The Australian Economy and Financial Markets, Chart Pack, October 2017, p. 24

527   We make two observations about the RBA earnings forecasts:

a.   First, the latest RBA Chart Pack presents earnings forecast data to 2017-18. The data clearly suggests that earnings forecasts for 2016-17 were above earnings forecasts for 2015-16 (a point that the AER has acknowledged[323]), and earnings forecasts for 2017-18 are higher again. In other words, the RBA data cited by the AER suggests that analysts are forecasting earnings to increase over the next two years.

b.   Second, at the start of 2016, earnings were expected to fall over that year and then increase again over 2017. At the start of 2017,

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[322] TransGrid Draft Decision, 2017, Attachment 3, p. 287.

[323] TransGrid Draft Decision, 2017, Attachment 3, p. 100.

Appendix F: The reliability of DGM estimates of the MRP

the continuing expectation was for earnings to rise over the year. However, the level of forecast earnings was revised upwards relative to the forecast from the previous year. This suggests that expected earnings growth has increased with new information.

528   In our view, nothing in the RBA data supports the AER's contention of weak future earnings growth. The 'sticky dividends' issue would only be material if future earnings were likely to fall so materially as to make the current dividend unsustainable, and there is no evidence to support that conjecture.

529   Finally, we note that there is no reason to suggest that this issue is any more or less important than at the time of the Guideline.

21.3.2 Bias in analyst forecasts

530   In a number of recent Decisions, the AER notes that any upward bias in analyst forecasts will result in a higher estimate of the required return on the market. The AER does not present any actual evidence that the analysts' forecasts used in its DGMs are biased. This proposition is simply asserted as a general truth:

> Analyst forecasts are well understood to be upwardly biased.[324]

531   We have submitted previously that any such bias is irrelevant – if analyst forecasts are taken to be an estimate of the market's expectation of future dividends and the current price is taken be an estimate of the market's expectation of the current value, it follows mechanically that the implied discount rate must be an estimate of the market's required return on equity.

532   The AER's response to this point is that:

> If analysts' dividend and price forecasts are biased, it is also plausible that the analysts' implied return on equity is biased.[325]

533   This response misses the point. The AER seems to suggest that the market (proxied by analysts) should have forecasted lower dividends but maintained the same stock price, thus producing a lower implied return. But what we are seeking to estimate is the implied return that equates the dividend forecast that the market actually uses to the actual stock price – not the dividend forecast that the AER thinks the market should have used.

534   Our previous submissions have noted that the issue was known to the AER at the time of the Guideline when the AER applied "significant consideration" to its DGM estimates.

535   The AER has recently stated that:

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[324] TransGrid Draft Decision, 2017, Attachment 3, p. 228.

[325] TransGrid Draft Decision, 2017, Attachment 3, p. 216..

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Frontier has not provided any evidence that bias has not increased.[326]

536   To examine the very recent extent of any analyst forecast bias in Australia, we collected data on 'earnings surprises' for the 2015-16 financial year for the stocks in the ASX 20 index.[327]

537   The earnings surprise is actual earnings per share less forecast earnings per share, expressed as a percentage. Half of the firms had positive surprises and half had negative surprises and the mean surprise was 2.37%, meaning that actual earnings were slightly *above* the forecast. This high-level evidence is inconsistent with the proposition that forecast earnings are becoming more optimistic over time.

538   In response to this evidence, the AER says that it has:

> …reservations about a survey from only 20 firms. [328]

539   The AER also notes that:

> Partington and Satchell advised that they would "place little weight on a non-random sample of twenty firms and one year's observations" when assessing the reliability of analyst's forecasts.[329]

540   We note that the ASX 20 represents roughly half of the capitalisation of the Australian share market, so whilst we have focussed on 20 firms, these firms represent a very substantial portion of the Australian stock market.[330] Further, we analysed the latest year of data available at the time of our submission since the AER's challenge to us was that we had not provided evidence of a recent increase in analyst forecast bias.

541   In response to the AER's concerns, we have provided some data and evidence relevant to the present market conditions. By contrast, the AER and its advisers offer *no data or evidence* relevant to the present market conditions, nor do they set out the standard of evidence that they *would* find persuasive.

542   A related point that Partington and Satchell make is that the supposed problems arising from bias in analysts' forecasts are exacerbated by the fact that the AER is seeking to estimate the MRP over a relatively long (i.e., 10-year) horizon:

> We certainly agree that DGM-based estimates of the MRP are forward looking and that this is an attractive property. The usefulness of this approach rather depends upon the accuracy of the forecast and the horizon that it is evaluated over. It is unfortunately the case that forecasts of future earnings and dividends tend to be fairly inaccurate over more than 2 years. Indeed, even over a one or two year horizon the evidence is

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[326] TransGrid Draft Decision, 2017, Attachment 3, p. 215..

[327] Source: CommSec.

[328] TransGrid Draft Decision, 2017, Attachment 3, p. 229.

[329] TransGrid Draft Decision, 2017, Attachment 3, p. 229.

[330] https://www.asx20list.com/ (accessed 9 October 2017).

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> that analyst's forecasts are upward biased. Thus, a 10 year horizon, which seems implicit in many of the calculations here, is probably going to lead to poor forward looking estimates of the risk premium.

543   Partington and Satchell imply that if analysts' forecasts over a relatively short, two-year horizon are biased, then forecasts over a 10-year horizon must be much worse, such that any DGM estimates that rely on such long-range forecasts should be distrusted.

544   It is worth noting, however, that analysts' forecasts are used in the AER's two-stage and three-stage DGMs only in the first two years.[331] From year three, the growth rate either switches immediately to the AER's estimate of the long-run growth rate (in the case of the two-stage model), or transitions to the long-run growth rate by year 10 (in the case of the three-stage model). Hence, the AER's DGMs *do not* rely on analyst forecasts relating to a 10-year horizon. By implying that the AER's DGM estimates are derived using very uncertain long-range analyst forecasts, Partington and Satchell exaggerate greatly the limitations of those estimates.

545   The AER also notes that its experts, McKenzie and Partington, have advised that analysts' forecasts are slow to adjust to changing market information, which can create problems with time matching analyst dividend forecasts with prices. This, in turn, may result in DGM estimates not tracking changes in the return on equity accurately:

> McKenzie and Partington also considered that analysts' forecasts are slow to adjust to changing information. This creates problems with time matching analyst dividend forecasts with prices. It also implies that dividend growth models may not track changes in the return on equity accurately.[332]

546   We agree that this is a potential limitation of the DGM. This was also recognised by SFG during the Guideline process. During that process, SFG proposed a version of the DGM that matched the timing of price inputs and analyst forecast inputs, in order to address this limitation. The AER acknowledged this as a feature of the SFG version of the DGM in the Guideline materials.[333]

547   The AER considered this feature of the SFG model, performed its own investigation of the issue, and concluded that the problem was not of a sufficient magnitude to incorporate the feature of matching analyst forecasts inputs to price inputs:

> Given that the forecast data is somewhat 'stale', SFG suggests this stale forecast data may partly explain the volatility observed in the return on equity of the energy infrastructure businesses. However SFG does not provide evidence of the magnitude

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[331] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, pp. 115-7.

[332] TransGrid Draft Decision, 2017, Attachment 3, p. 216.

[333] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 123.

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of this effect, or indeed, whether the effect on the volatility of the return on equity is material. We did some sensitivity analysis, examining the effect on our estimates of the MRP of adjusting for sluggish analyst forecasts. We decided that, given the moderate magnitude of the adjustments, and also the given uncertainties surrounding the calculation of the adjustment, that we would not incorporate the adjustment into our estimates of the MRP.[334]

548   Having concluded in the Guideline that this problem was not sufficiently material to address in its own DGMs, the AER now cites exactly the same problem as a reason why its DGM estimates "may not track changes in the return on equity accurately."

21.3.3 Dividends as a proxy for free cash flow on equity

549   In its Decisions, the AER cites a submission from McKenzie and Partington (2014)[335] in relation to the effect of the financing of dividends.[336] McKenzie and Partington posit that if a firm routinely issues new shares,[337] that could affect the long-run dividend growth rate. However, this is already accounted for – the AER already makes a downward adjustment to the long-run growth rate for this effect.

550   Moreover, McKenzie and Partington (2014, p.29) conclude on this point that "it may be less of a problem at the level of the market" which is relevant when the DGM is being used to estimate the MRP.

551   We also note that there is no reason to suggest that this issue is any more or less important than at the time of the Guideline.

21.3.4 Term structure for required return on equity

552   In Decisions, the AER considers the question of a term structure in the required return on equity.[338] The idea is that rather than estimating a single required return on equity, one could assume that investors require a relatively higher return beyond Year 10 and a relatively lower required return before Year 10. The AER cites McKenzie and Partington (2014) on this point:

> we do recommend that it be borne in mind that the existence of a term structure could materially change cost of equity estimates from the DGM.[339]

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[334] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, pp. 124-5.

[335] McKenzie, M. and G. Partington, 2014, *Report to the AER, Part A: Return on equity*, October.

[336] TransGrid Draft Decision, 2017, Attachment 3, p. 216..

[337] McKenzie and Partington (2014) provide a numerical example where a firm does this via a dividend reinvestment plan.

[338] TransGrid Draft Decision, 2017, Attachment 3, p. 194.

[339] TransGrid Draft Decision, 2017, Attachment 3, p. 217.

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553   Also relevant is what McKenzie and Partington (2014) said in the passage immediately before the quote selected by the AER:

> Furthermore, even if we knew that there was a term structure, we would have the problem of estimating the cost of equity that was to apply to the more distant cash flows. It is a difficult enough problem estimating one cost of equity, without complicating that problem by requiring estimation of another cost of equity to apply at the end of the growth transition period. We therefore agree with SFG (2014d, p. 20) that if a term structure of equity was applied then:
>
> *There is the risk that the regulated rate of return varies by substantial amounts over time because of estimation error, associated with whether a term structure exists and the assumption about the long term cost of equity.*
>
> Consequently we do not recommend that an estimation technique involving an equity term structure be adopted.[340]

554   In its Guideline materials, the AER explained that:

> …we do not incorporate a term structure into our model because it is non-standard.[341]

555   Consequently this notion of a return on equity term structure would seem to be irrelevant unless the AER intends to depart from the Guideline.

21.3.5 Evidence on the forecast accuracy of DGM estimates

556   In recent Decisions, the AER criticises a number of network service providers for giving too much weight to DGM evidence, and argues that the DGM should be used only to inform whether the final MRP point estimate should lie above or below the MRP estimate derived using historical excess returns.[342]

557   In support of this conclusion, the AER refers to advice provided by Partington and Satchell:

> Partington and Satchell have previously advised that we should not assign more weight to dividend growth model estimates because of inaccuracy, upward bias of the estimates and sensitivity of the model to inputs and assumptions. They concluded that it is 'very unlikely that the DGM will produce a forward looking MRP commensurate with the prevailing conditions in the market for funds'. They also noted that 'DGM-based estimates of the MRP in a 10 year horizon context are probably better down-weighted than given more weight'.
>
> Partington and Satchell advised that 'the DGM…is more useful as a conceptual tool than a forecasting model'. This is consistent with our Guideline approach of using dividend growth model estimates to inform if a point estimate may be above or below the historical excess estimate.

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[340] McKenzie and Partington (2014), pp. 36-37.

[341] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 115.

[342] See, for example, TransGrid Draft Decision, 2017, Attachment 3, p. 81.

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558   A major piece of evidence that Partington and Satchell cite in support of this view is evidence from a study by Duarte and Rosa (2015).[343] We have previously cited the conclusions of the same study in submissions to the AER:

> …expected excess stock returns [MRP] are elevated not because stocks are expected to have high returns, but because bond yields are exceptionally low. The models we consider suggest that expected stock returns, on their own, are close to average levels.[344]

559   The AER has dismissed the evidence from that study as unpersuasive because it uses US data and because the MRP estimates derived by Duarte and Rosa are not 10-year MRP estimates. However, the AER adopts the conclusions of Partington and Satchell, arrived at by reference to the same Duarte and Rosa paper.

560   In any event, we explain below that Partington and Satchell draw precisely the wrong conclusions from the findings of the Duarte and Rosa study.

561   First, we note that the main finding of the Duarte and Rosa paper is that the MRP has increased since the end of the GFC, and that the main cause of this has been a material decline in the risk-free rate. Partington and Satchell attempt to downplay this key finding by noting that Duarte and Rosa acknowledge that there is "considerable uncertainty" around their MRP estimates. But this does not detract from their central finding—that the MRP has increased since the GFC because government bond yields have fallen dramatically—which is repeated several times in the paper.

562   Second, Partington and Satchell focus on a minor finding in the paper to argue that the DGM is a poor estimator of the MRP. However, it appears that Partington and Satchell misunderstand Duarte and Rosa and, consequently, draw precisely the wrong conclusion. Partington and Satchell argue that Duarte and Rosa show that mean historical excess returns are "positively correlated" with the MRP estimated in the study—using a technique known as principal components analysis (PCA)—whereas "the DGM is not".[345]

563   By way of background, Duarte and Rosa use PCA to derive an estimate of the MRP by drawing on information from 20 different models, including two models that calculate the historical mean of excess returns, and eight differently-specified DGMs. PCA works by identifying successive linear combinations of the 20 models, where each linear combination explains progressively less of the variation in the data. The first of these linear combinations, known as the first principal component (FPC), is the combination that captures as much of the variation in the data as possible. By construction, the second linear combination explains less of

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[343] Duarte, F. and C. Rosa, 2015, "The Equity Risk Premium: A Review of Models," Federal Reserve Bank of New York Economic Policy Review, December.

[344] Duarte and Rosa (2015), p. 54.

[345] Partington and Satchell (2017), April, p. 25.

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the variation than the FPC, and is uncorrelated with (orthogonal to) the FPC, and so on. Duarte and Rosa find that the FPC explains approximately 76% of the variation of the underlying models, suggesting that relatively little would be gained by examining the remaining principal components. Therefore, Duarte and Rosa use the FPC to derive their estimate of the MRP. The FPC might be thought of as a conglomeration of the most useful information on the true (but unobservable) MRP available from the 20 underlying models.

564   Partington's and Satchell's confusion appears to arise from the following sentence in Duarte and Rosa:

> The first principal component puts positive weight on models based on the historical mean, cross-sectional regressions, and the survey of CFOs. It weights DDMs … mostly negatively.[346]

565   It appears that Partington and Satchell interpret this sentence to that mean historical excess returns do a better job of predicting the MRP estimated by Duarte and Rosa than does the DGM.[347] However, this conclusion is incorrect.

566   Duarte and Rosa present data (reproduced in Table 18 below) that show that there is a high degree of correlation between several models considered in the study. In such circumstances, examining the principal component weights attached to *individual* models, as Partington and Satchell do, is meaningless. This is because when a number of models are contributing similar information, the individual impact of each cannot be isolated. By analogy, if a multiple regression on a number of correlated independent variables, the coefficient on each cannot be reliably interpreted (the so-called multicollinearity problem) even though their collective effect is statistically valid. So too, the weight ascribed to each model in the principal components analysis is irrelevant.

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[346] Duarte and Rosa (2015), p. 48.

[347] It is interesting to note from column three in Table 7 in Duarte and Rosa (2015) that surveys and Fama-French estimates, like mean historical excess returns, receive large positive weights from the FPC. The AER gives only "some consideration" to surveys and gives no weight at all to Fama-French estimates. If the AER accepts Partington's and Satchell's advice on how to interpret the Duarte and Rosa study, then presumably the AER should give material weight to surveys and Fama-French estimates, alongside mean historical excess returns.

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Table 18: Correlation of MRP models considered in Duarte and Rosa (2015)

	Long-run mean	Mean past five years	E/P-ten year	1/CAPE-ten year	E/P-real ten year	Exp E/P-real ten year	Exp E/P-ten year	Two-stage DDM	Six-stage DDM	Free cash flow	Fama and French	Carhart	Duarte	Adrian, Crump, and Moench	D/P	Goyal and Welch	Campbell and Thompson	Fama and French	Sentiment	CFO survey
Long-run mean	100																			
Mean past five years	32	100																		
E/P-ten year	8	15	100																	
1/CAPE-ten year	-9	0	78	100																
E/P-real ten year	-11	25	98	23	100															
Exp E/P-real ten year	-58	42	70	84	60	100														
Exp E/P-ten year	-83	-61	84	95	46	98	100													
Two-stage DDM	17	27	88	54	89	66	79	100												
Six-stage DDM	3	-38	26	39	-30	32	52	-31	100											
Free cash flow	-43	-55	59	70	35	80	94	27	62	100										
Fama and French	69	29	-8	-36	-21	-69	-91	9	-29	-77	100									
Carhart	71	30	-5	-31	-24	-71	-91	10	-25	-75	99	100								
Duarte	71	30	-3	-29	-22	-70	-91	11	-28	-74	99	100	100							
Adrian, Crump, and Moench	-1	-52	36	62	6	54	63	27	23	33	-28	-28	-25	100						
D/P	49	12	27	12	27	42	54	24	74	42	44	54	55	21	100					
Goyal and Welch	25	12	25	21	-7	-36	-60	20	29	-9	7	13	14	-24	61	100				
Campbell and Thompson	27	31	14	-7	81	49	-60	28	-51	-40	60	57	58	-33	54	50	100			
Fama and French	1	-30	-24	-29	37	-27	-37	-18	22	38	36	38	37	-9	40	23	43	100		
Sentiment	-10	33	-4	-20	68	-23	-29	27	-38	-20	18	17	18	-12	-38	-8	21	6	100	
CFO survey	-43	-33	12	30	1	1	13	16	5	-3	-36	-37	-39	60	14	-21	-32	-3	-36	100

Source: Duarte and Rosa (2015), Table 8, p. 49.

567 What is meaningful is the extent to which estimates from different models move in line with the MRP estimated by the PCA. In this regard, Duarte and Rosa find the following:

> …the first principal component covaries negatively with historical mean models but positively with DDMs…

568 In other words, Duarte and Rosa find that the DGMs they considered tended to produce high MRP estimates when the FPC (i.e., their estimate of the true MRP) was high, and vice versa. However, importantly, they found that mean excess returns tended to be *low* when their estimate of the true MRP was *high*, and vice versa. In other words, the mean excess returns moved in precisely the opposite direction to their estimate of the MRP.

569 This result can be seen graphically in the two charts below in Figure 42, reproduced from the Duarte and Rosa paper.

Appendix F: The reliability of DGM estimates of the MRP

Figure 42: Performance of mean excess returns and DGM as estimators of the MRP
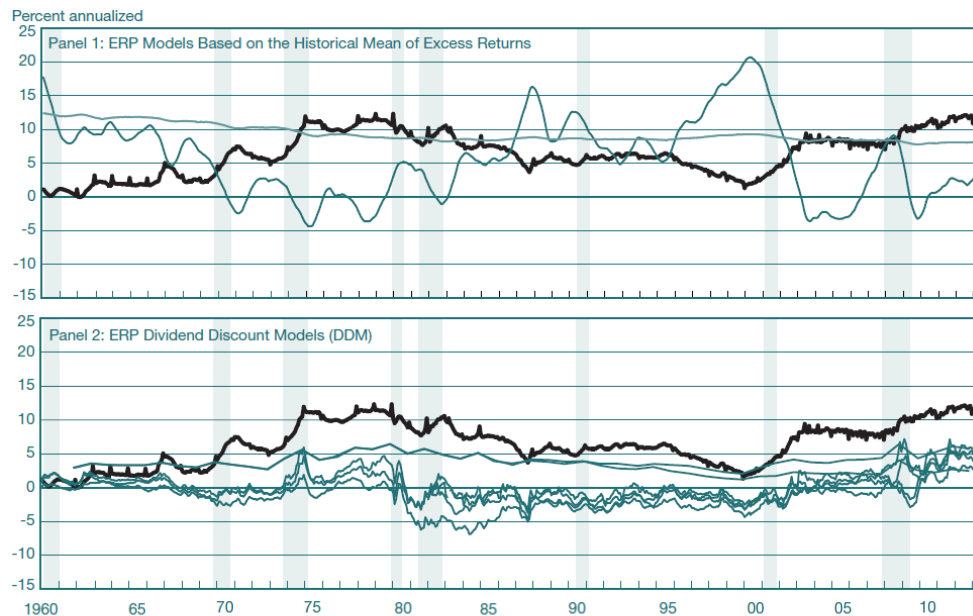
Source: Duarte and Rosa (2015), Chart 1, p. 47.

570   The green curves in the top chart plot the results of the two mean historical excess returns models considered by Duarte and Rosa, while the green curves in the bottom chart present the results from the eight DGM estimates considered in the study. The black curve in both charts plots Duarte's and Rosa's estimate of the MRP. The light green vertical bands identify periods of recession. A number of features should be noted about the charts above:

a.   First, the PCA estimate of the MRP tends to be rising or peaking during periods of recession, and falling at other times. This is what we would normally expect. A notable exception to this pattern is post-2009, during which time Treasury yields in the US fell significantly, just as CGS yields have fallen in Australia. During this period, Duarte and Rosa find that the MRP rose significantly.

b.   Second, the DGM estimates in the bottom chart follow a fairly similar pattern to the PCA estimate of the MRP: typically rising or peaking during periods of recession, and falling during other times — except post-GFC, when DGM estimates tend to rise.

c.   Finally, mean historical excess returns in the top chart tend not to move in line with the PCA estimate of the MRP. Specifically, the long-run mean excess return remains relatively flat through as the PCA estimate of the MRP rises and falls. The five-year rolling mean (depicted by the more volatile green curve) tends to be high when the PCA estimate of the MRP is low, and vice versa. The mean

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historical excess returns have a tendency to fall during periods of recession, most likely due to declining asset prices.

571   Hence, contrary to the advice provided by Partington and Satchell, the Duarte and Rosa study actually suggests that DGMs perform *better* than mean historical excess returns as estimators of the prevailing MRP.

21.4 Summary and conclusions

572   As set out above, we consider that the various concerns that the AER and its advisers have raised in relation to the reliability of DGM estimates of the MRP are overstated. To the extent that there are concerns about these points, those concerns would have to be weighed up against the strengths and weaknesses of other approaches. For example, the historical excess returns approach:

a.   Is an estimate that reflects the average conditions over the historical period, which may differ from the prevailing market conditions;

b.   Provides different estimates for different historical periods (especially the shorter periods that the AER considers);[348]

c.   Produces imprecise estimates with wide confidence intervals (especially the shorter periods that the AER considers).[349]

573   Our view is that the various approaches should be compared against each other in terms of their relative strengths and weaknesses. In our view, the historical excess returns approach and the DGM approach have different strengths and weaknesses, but they both have something to contribute and both should be afforded material weight. That was our interpretation (and the interpretation of other stakeholders) of the Guideline approach to the MRP.

574   Importantly, none of the issues that the AER has raised in relation to the DGM have changed or intensified since the Guideline, so none of them provide a reason to now "down-weight" DGM estimates. These points had already been brought to the AER's attention at the time of the Guideline by its advisers,[350] but the AER did not express these as material concerns in the Guideline materials, and did not

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[348] For example, the shortest period that the AER considers in its recent Decisions begins in 1988 and produces an estimate that is materially different from all other estimates. See TransGrid Draft Decision, 2017, Attachment 3, Table 3-19, p. 202.

[349] For example, our estimate of the historical mean excess return since 1988 is 5.6% within a standard 95% confidence interval of 1.2% to 10.0%.

[350] When discussing a number of the issues above, in Attachment 3 to the AusNet Draft Decision (2016) at Footnote 852, the AER cites Lally, M., 2013, *The Dividend Growth Model*, and McKenzie, M. and G. Partington, 2013, *The Dividend Growth Model*.

say in the Guideline that the DGM should be used only as directional evidence due to these potential limitations. Rather, the AER's view in the Guideline was that:

> The DGM method is a theoretically sound estimation method for the MRP. As DGM estimates incorporate prevailing market prices, they are more likely to reflect prevailing market conditions. DGM estimates are also clearly forward looking as they estimate expectations of future cash flows and equate them with current market prices through the discount rate.[351]

and:

> …we consider DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches.[352]

575   The AER went on to say that, regardless of the issues raised by Lally (2013)[353] and McKenzie and Partington (2013),[354] it had decided to give:

> …significant consideration to DGM estimates of the MRP,[355]

and described its development of a preferred approach for implementing the DGM as:

> …the most significant development in this area.[356]

576   We note that in its recent Decisions, the AER states that:

> We consider our dividend growth model is theoretically sound but that there are many limitations in practically implementing the model. As previously stated in our assessment of the dividend growth model, it may capture current conditions to a certain extent but fails to adequately provide a 'true' estimate of the forward looking MRP.[357]

577   However, none of the issues that the AER raises relation to the DGM are new or different since the Guideline. Since the Guideline, the only thing that has changed in relation to the AER's DGM estimates is that they have become more and more inconsistent with the AER's allowed MRP of 6.5%.

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[351] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 84.

[352] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 85.

[353] Lally, M., 2013, *The Dividend Growth Model*, March.

[354] McKenzie, M. and G. Partington, 2013, *The Dividend Growth Model*, December.

[355] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[356] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 89.

[357] TransGrid Draft Decision, 2017, Attachment 3, p. 76.

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Chapter 4: Gamma

22   Introduction

22.1   Instructions

578   Frontier Economics has been asked by Ausgrid to provide expert advice in relation to the estimation of the value of dividend imputation tax credits, gamma (γ).

579   We note that we have previously provided a report on this topic in the context of these proceedings dated January 2017 and titled "Estimating gamma for regulatory purposes."

580   We have now been asked to provide our views on:

    a.   The findings of the Federal Court in the *PIAC-Ausgrid* appeal proceedings; and

    b.   The AER's new rationale for its utilisation estimate of theta, as developed in the Tribunal hearings in relation to the Victorian distribution businesses and in the AER's submissions to the Federal Court in relation to the *SAPN* appeal proceedings.

22.2   Primary conclusions

581   Our primary conclusions are set out below.

22.2.1 The competing approaches for interpreting and estimating gamma

582   Two methods for interpreting and estimating gamma have been proposed:

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

    b.   The *redemption* or *utilisation* approach posits that gamma should be estimated as the proportion of credits that are available for investors to redeem. This approach considers the extent to which investors value the credits they redeem less than the dividends or capital gains they receive to be irrelevant.

22.2.2 Gamma must be interpreted and estimated in a way that is consistent with its role in the regulatory framework

583 The Federal Court has held that the approach that is used to interpret and estimate gamma must be consistent with the role of gamma in the regulatory framework. We agree with that conclusion and understand that this is the very reason for the AEMC revising the NER from defining gamma in terms of utilisation to defining gamma to be the value of imputation credits.

22.2.3 The role of gamma in the regulatory framework

584 The regulatory framework operates in two steps:

a. In the first step, the AER estimates the total required return on equity. This is an estimate of the amount of dividends and capital gains that would be required by investors in a benchmark efficient firm if there were no imputation credits. This estimate reflects personal taxes and personal costs that relate to dividends and capital gains. In this report, we use a simple example where the regulated firm has equity of $1,000 and investors require a return on equity of 7%, of which 2% is compensation for personal taxes and personal costs. That is, investors require $70, of which $20 is to compensate them for the personal taxes and costs that relate to dividends and capital gains.

b. In the second step, the AER deducts "the value of imputation credits" and sets the allowed revenues so that the firm is able to pay the difference to investors in the form of dividends and capital gains. For example, if the AER estimates that the value of imputation credits is $5, it will allow the firm to charge prices sufficient to provide dividends and capital gains of $65.

585 That is, gamma plays the role of determining the amount by which the allowed dividends and capital gains will be reduced to reflect the imputation credits that investors will receive. It is an exchange rate – the rate at which investors would exchange dividends and capital gains for imputation credits. Thus gamma must reflect the value of credits *relative to* dividends and capital gains.

586 There are a number of reasons why imputation credits are less valuable to investors than dividends or capital gains, including:

a. Some credits are distributed to non-residents who cannot redeem them and therefore do not value them at all;

b. Some credits are distributed to resident investors who are prevented from redeeming them by the 45-day rule;

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    c. Some credits are distributed to residents who simply fail to redeem them;

    d. Investors have to wait longer to receive any benefit from the credits – whereas dividends are available to investors immediately, the investor only receives a benefit from credits when their personal tax return is finalised after the end of the tax year;

    e. There is a compliance and administration cost involved in tracking and redeeming credits;

    f. Resident investors will rationally adjust their portfolios until the last dollar of credits they receive just offsets the cost they bear by concentrating their portfolio into franked dividend paying stocks and away from what would otherwise be optimal. Thus, the *net* benefit of the redeemed credits would, on average, be approximately half of the face amount.

587   Anything that equally affects imputation credits, dividends and capital gains will have no effect on the relative value between them, and therefore no effect on gamma. For example, investors pay personal tax on imputation credits at the same rate as on dividends and capital gains.[358] If this were the only factor to consider, the exchange rate would be 1 and investors would value a dollar of imputation credits equal to a dollar of dividends or capital gains because the same tax cost would be imposed on both. It is for this reason that the personal taxes that investors pay on the credits they receive does not appear in the above list.

588   The personal taxes and personal costs that apply to dividends and capital gains are already taken into account in the first step of the regulatory process above. Thus, the second step requires an estimate of gamma that reflects only those personal taxes and costs that apply only to imputation credits, making them less valuable relative to dividends and capital gains.

22.2.4 The recent Federal Court decision

589   In our view:

    a. The Court has correctly identified that gamma must be interpreted and estimated in a way that is consistent with the regulatory framework in which it operates; and

    b. The Court has also correctly identified that the personal costs and personal taxes that relate to dividends and capital gains are taken into account in the first step of the regulatory process. Thus, the $70 in the example above is an estimate of the pre-personal tax and

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[358] The personal tax rate on short term capital gains is the same as on dividends, and the AER's implementation of the CAPM assumes that investors view dividends and capital gains as being interchangeable.

Introduction

pre-personal costs dividends and capital gains that investors would require.

590   However, having correctly identified that it would be wrong for gamma to reflect any personal taxes or costs that *equally* affect credits and dividends and capital gains,[359] it then ruled that gamma should reflect *no* personal costs or taxes at all – even those that apply only to credits and not to dividends or capital gains.

591   This results in investors receiving no compensation at all in relation to any personal taxes and costs that apply only to imputation credits (making them less valuable to investors than dividends and capital gains). Whereas investors are properly compensated for the personal taxes and costs that apply to dividends and capital gains, they receive no compensation at all for the additional personal costs that apply to imputation credits. The result is an internally inconsistent implementation of the regulatory model whereby investors are properly compensated for all personal taxes and costs that apply to dividends and capital gains, but not compensated at all for the additional personal costs that apply to imputation credits. In our view, this outcome fails the Court's requirement of consistency.

22.2.5 The AER has provided two rationales for its "utilisation" approach to gamma

592   The AER has provided two mutually exclusive rationales for its approach of providing investors with no compensation for the additional personal costs that apply to imputation credits:

a.   The AER's first rationale is that the first step of the regulatory framework estimates the before-personal-tax and before-personal-costs dividends and capital gains that investors would require in the absence of any imputation credits, so the second step of the process must subtract the before-personal tax and before-personal-costs value of imputation credits. Thus, any additional personal costs that apply only to imputation credits (making them relatively less valuable than dividends and capital gains) are not considered. This is the line of argument run before the *PIAC-Ausgrid* Tribunal.

b.   The AER's second rationale is that the additional personal costs that apply only to imputation credits *are* relevant, but they have already been taken into account in the return on equity, so to also take them into account when estimating the value of imputation credits would amount to double counting. This is the line of argument run before the Victorian Distribution Businesses (*Vic*

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[359] And which have therefore already been considered in the first step of the regulatory process.

DB) Tribunal in November 2016 and in the appeal of the *SAPN* proceedings to the Federal Court in June 2017.

593   Clearly, these two rationales are mutually exclusive. The additional personal costs that affect the market value of credits (relative to dividends and capital gains) cannot be simultaneously irrelevant and already taken into account.

594   In our view, the AER's first rationale is wrong for the reasons set out above – it inconsistently sets the allowed return on equity to be sufficient to cover the personal taxes and costs that apply to dividends and capital gains, but not those additional costs that apply only to imputation credits.

595   In our view, the AER's second rationale is also wrong. The basis of that argument is that investors will reduce their requirement for dividends and capital gains by their assessment of the relative market value of imputation credits. Thus, if there are additional personal costs that relate only to imputation credits, investors will assign a relatively lower value to the credits, and apply a lower reduction in dividends and capital gains. Suppose, for example, that investors require a total return of 7% and are provided with credits with a face amount of 1%, which they value at 35% of the value of dividends and capital gains.[360] In this case, investors will reduce the return that they require from dividends and capital gains to 6.65% (the 7% total return that they require, minus the 0.35% return that they receive from imputation credits).

596   Thus, when the AER analyses the market data it will observe that investors require a return from dividends and capital gains of 6.65%, which properly reflects the market value of credits. The regulatory process then requires the AER to add back the estimated value of credits to produce an estimate of the total (with-imputation) required return.

597   However, the AER's second rationale is that because the (0.35%) reduction in the market's required return from dividends and capital gains reflects the market value of credits, using the same market value of credits in the grossing-up step of the regulatory process would amount to double counting. In our view, this is exactly wrong. It is precisely *because* the reduction in the market's required return from dividends and capital gains reflects the market value of credits that the same market value of credits *must* be used in the grossing-up step of the regulatory process. To arrive at a correct estimate of the total required return on equity, the AER must add back the same quantity that the market has deducted.

598   In any event, in any determination the AER should be clear about which rational it proposes for its adoption of the "utilisation" approach to estimating gamma.

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[360] For example, of the 65% discount relative to dividends and capital gains, 45% may be due to credits being distributed to non-residents who do not value them and the other 20% may be due to personal costs that apply to credits, but not to dividends or capital gains.

Introduction

22.2.6 Estimation approaches

599   In Paragraph 586 above, we set out a number of reasons why investors in aggregate would value imputation credits less than dividends and capital gains. In relation to those reasons:

    a. The equity ownership approach provides a noisy estimate of the effect of (a) only – the fact that some credits are distributed to non-residents who obtain no value from them;

    b. ATO tax statistics provide an estimate of the effects of (a)-(c) – that approach produces a direct estimate of the proportion of credits that are *actually* redeemed from the Tax Office; and

    c. The dividend drop-off approach provides a direct estimate of the extent to which investors value imputation credits relative to dividends and capital gains. This estimate includes all of the effects set out in Paragraph 586, and any other reasons why investors would value credits less than dividends and capital gains.

600   Consequently:

    a. If one accepts that theta does properly represent the exchange rate at which investors would exchange dividends and capital gains for imputation credits, dividend drop-off analysis would provide a direct estimate, ATO tax statistics would provide an upper bound, and the equity ownership estimate would be of little relevance because the ATO estimate provides a tighter upper bound.

    b. If one concludes that theta should be interpreted as the proportion of credits that are redeemed, the ATO approach would provide a direct estimate and the equity ownership approach would provide an upper bound (because it does not consider the effects of the 45-day rule or indeed *any* reason why investors would not redeem credits other than their ineligibility as foreign investors).

23   Market value or utilisation rate?

23.1   Two parameters to be estimated

601   In our previous report on gamma[361] we noted that there is broad agreement that gamma (γ) should be estimated as the product of two parameters: $\gamma = F \times \theta$. The first parameter (F) is the distribution rate – the proportion of created imputation credits that are attached to dividends and distributed to shareholders. The second parameter (θ) is variously defined as "the value of distributed imputation credits" or as "the utilisation rate." While there is dispute about how each component of gamma should be interpreted and estimated, there is broad agreement that gamma is to be estimated as the product of these two components.[362]

23.2   Interpretation of theta

602   Our previous report also noted[363] that there is broad agreement that two different interpretations of the second parameter, theta, have been proposed:

      a.   a *market value* interpretation; and

      b.   a *redemption proportion* interpretation.

603   There is broad agreement that:

      a.   If the *market value* interpretation is adopted, we should use estimation methods that are designed to estimate the market value of credits relative to the value of dividends and capital gains; and

      b.   If the *redemption proportion* interpretation is adopted, we should use estimation methods that are designed to estimate the proportion of credits that are (or are likely to be) redeemed.[364]

604   There is broad agreement that estimates of the market value of credits are materially lower than estimates of the proportion of credits that might be redeemed. (Of course, if the two approaches produced similar estimates, there would be no reason for any debate.)

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[361] Frontier Economics, 2017, *Estimating gamma for regulatory purposes*, January, p. 7.

[362] See, for example, the AER's CitiPower Final Decision, May 2016, Attachment 4, p. 8. Throughout this report we use references to the CitiPower Final Decision as an example of the AER's current approach to gamma. The CitiPower decision is among the batch of the AER's most recent final decisions. The AER's approach to, and estimate of, gamma has remained the same for more than two years.

[363] Frontier Economics, 2017, *Estimating gamma for regulatory purposes*, January, p. 7.

[364] CitiPower Final Decision, Attachment 4, pp. 32-39.

23.3 A simple illustration to help interpret years of litigation

605   In recent years there has been extensive litigation involving the interpretation of gamma across a number of overlapping cases. To create a simple framework for analysing the key issue of what gamma actually means, we begin with the following analogy.

606   Consider a lawyer with a charge-out rate of $50/hr who performs a task that takes exactly one hour, but which also incurs $20 of costs for photocopying which are passed on to the client at cost. The lawyer would invoice the client for $70, which would cover the $20 of costs and leave a $50 net benefit. Now suppose that the client proposes to pay part of the bill in the form of 30 units of Malaysian currency. In this case, the lawyer would note that each unit of Malaysian currency can be converted into 35 cents (after all relevant fees and charges), so the 30 units of Malaysian currency are equivalent in value to $10.50. Thus, the lawyer would reduce the required payment of Australian dollars to $59.50. That is, the lawyer would be indifferent between receiving $70 or $59.50 plus 30 units of Malaysian currency.

607   Now consider the regulatory setting where a business has $1,000 of equity capital. Suppose that investors require a return on equity of 7%, of which 2% is to cover the effects of personal taxes and personal costs. In this case, the business would be allowed to charge prices so that it was able to provide $70 of dividends and capital gains to its shareholders, $20 of which would cover shareholder level taxes and costs, leaving $50 of net benefit.

608   Now suppose that the firm's shareholders will also be provided with $30 (face amount) of imputation credits. Under the regulatory framework, the allowed revenues will be reduced by the "value" of those credits. This means that the dividends and capital gains provided to the shareholders will be reduced by the estimated value of the credits. Thus, what is required is an estimate of the "exchange rate" between imputation credits on the one hand and dividends and capital gains on the other. For example, if investors in aggregate value the receipt of a dollar of credits equal to the receipt of 35 cents of dividends and capital gains, the exchange rate is 0.35 and investors would be left whole if their dividends and capital gains were reduced by $10.50 in relation to the $30 of credits that they will receive.

609   In the regulatory setting, theta represents this exchange rate. It encapsulates all of the reasons why imputation credits are less valuable to investors than dividends and capital gains. Importantly, theta does not encapsulate any factors that are in common. For example, investors pay personal tax on imputation credits at the

same rate as on dividends and capital gains.[365]   If this were the only factor to consider, the exchange rate would be 1 and investors would value a dollar of imputation credits equal to a dollar of dividends or capital gains because the same tax cost would be imposed on both.

610   However, there are a number of reasons why imputation credits are less valuable to investors than dividends or capital gains, including:

    a. Some credits are distributed to non-residents who cannot redeem them and therefore do not value them at all;

    b. Some credits are distributed to resident investors who are prevented from redeeming them by the 45-day rule;

    c. Some credits are distributed to residents who simply fail to redeem them;

    d. Investors have to wait longer to receive any benefit from the credits – whereas dividends are available to investors immediately, the investor only receives a benefit from credits when their personal tax return is finalised after the end of the tax year;

    e. There is a compliance and administration cost involved in tracking and redeeming credits;

    f. Resident investors will rationally adjust their portfolios until the last dollar of credits they receive just offsets the cost they bear by concentrating their portfolio into franked dividend paying stocks and away from what would otherwise be optimal. Thus, the *net* benefit of the redeemed credits would, on average, be approximately half of the face amount.

611   For all of these reasons, and possibly others, the value to investors of imputation credits is lower than the value of dividends and capital gains. Theta represents the extent of this difference – the exchange rate that equates the value of the credits that investors receive with the value of dividends and capital gains that they must give up under the regulatory model. That is, theta reflects the additional personal costs that apply only to imputation credits and not to dividends and capital gains.

612   In our view, theta should be estimated in a way that captures *all* of the reasons why credits are less valuable than dividends and capital gains, and we show below that the market value approach does exactly that. By contrast, the AER's redemption rate approach reflects the fact that some credits are distributed to non-residents (item (a) in the list above) but none of the other reasons why credits are less valuable to investors.

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[365] The personal tax rate on short term capital gains is the same as on dividends, and the AER's implementation of the CAPM assumes that investors view dividends and capital gains as being interchangeable.

Market value or utilisation rate?

613   With this framework in mind, we now consider a number of recent Court and Tribunal decisions. We explain that some Courts and Tribunals have been led into very complex-sounding worlds of marginal versus average investors and of discussions about whether cash flows should be considered to be pre or post personal taxes and personal costs. But that complexity is entirely unnecessary and is only likely to lead into confusion and error. As set out above, all that has to be estimated is the relative value of credits on the one hand to dividends and capital gains on the other. This is because the regulatory framework first estimates the amount of dividends and capital gains that are due to shareholders and then reduces that for the estimated value of imputation credits.

614   To extend the legal fees analogy from above, all that is required is an estimate of the exchange rate between Malaysian and Australian currency. It does not matter whether we define revenue as gross revenue ($70) or net revenue ($50) or whether or not we consider the complexity of how much personal tax the lawyer might have to pay. All that is required is an estimate of the value of receiving a unit of Malaysian currency relative to the value of receiving a unit of Australian currency. So it is with imputation credits – all that is required is an estimate of the value of receiving a dollar of credits relative to the value of receiving a dollar of dividends or capital gains.

23.3.1 The February 2016 *PIAC-Ausgrid* decision of the Australian Competition Tribunal

615   In our previous report,[366] we noted that the specific issue of whether theta should be interpreted as the *value* that distributed credits have to investors (relative to the value of dividends capital gains) or as the *proportion* of credits that are available for redemption was the subject of a merits review appeal brought by several NSW electricity networks. Essentially, the network businesses submitted that theta should be estimated in a way that captures *all* of the reasons why credits are less valuable than dividends and capital gains,[367] whereas the AER submitted that theta should be estimated in a way that reflects only the fact that some credits are distributed to non-residents who obtain no value from them.[368]

616   In the *PIAC-Ausgrid* case,[369] the Tribunal held that gamma must be interpreted as the value of credits (i.e., reflecting *all* of the reasons why credits are less valuable

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[366] Frontier Economics, 2017, *Estimating gamma for regulatory purposes*, January, pp. 11-13.

[367] That is, all of the reasons set out in Paragraph 610 above.

[368] That is, only reason (a) in Paragraph 610 above.

[369] Applications by Public Interest Advocacy Service Ltd and Ausgrid Distribution [2016] ACompT 1 (26 February 2016).

than dividends and capital gains) to investors and not simply as the proportion of credits that might be available for redemption:

> We consider that, by placing most reliance on the equity ownership approach and effectively defining the utilisation rate as the proportion of distributed imputation credits available for redemption, the AER has adopted a conceptual approach to gamma that redefines it as the value of imputation credits that are available for redemption. This is inconsistent with the concept of gamma in the Officer Framework for the WACC.[370]

> …the Tribunal does not accept the AER's approach that imputation credits are valued at their claimable amount or face value (as it said in the Final Decisions: the measure is what can be claimed). The value is not what can be claimed or utilised.[371]

617   Thus, the Tribunal decided that the AER had estimated the wrong thing – a redemption proportion instead of a relative value – and directed the AER to re-make its decision with a gamma of 0.25 instead of the 0.4 figure that the AER had used.

618   In all of its decisions since 2013 the AER has relied primarily on the "equity ownership" approach to estimate the proportion of credits that might be redeemed. This involves simply estimating the proportion of Australian equity that is owned by resident investors, and reflects only item (a) in the list of reasons why investors value credits less than dividends and capital gains.[372] This equity ownership approach was singled out for special criticism by the Tribunal:

> The AER's equity ownership and tax statistics approaches consequently make no attempt to assess the value of imputation credits to shareholders…The Tribunal considers these approaches to be inconsistent with a proper interpretation of the Officer Framework.[373]

> The Tribunal considers that the equity ownership approach overstates the redemption rate. We agree with the Network Applicants' submission that "even on the AER's own definition of theta (focussing on potential utilisation by eligible investors), equity ownership rates are above the true maximum possible figure for theta".[374]

619   The *PIAC-Ausgrid* Tribunal also noted that the AER's approach to estimating theta was inconsistent with the approach to estimating all other WACC parameters. All other parameters are estimated as market values using the prices of traded securities:

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[370] *PIAC-Ausgrid*, Paragraph 1100.

[371] *PIAC-Ausgrid*, Paragraph 1081.

[372] See Paragraph 610 above.

[373] *PIAC-Ausgrid*, Paragraph 1095.

[374] *PIAC-Ausgrid*, Paragraph 1093.

Market value or utilisation rate?

> Moreover, the AER's reasoning ignores the fact that other parameters in the WACC calculations are market values.[375]

> …the Tribunal considers the use of market studies to estimate the value of imputation credits is consistent with the methods used to calculate other parameters of the costs of debt and equity from market data.[376]

> Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[377]

620   The Tribunal's conclusion was very clear on this point:

> …the AER has adopted a conceptual approach to gamma that redefines it as the value of imputation credits that are available for redemption. This is inconsistent with the concept of gamma in the Officer Framework for the WACC.[378]

621   The Tribunal was also very clear about the fact that it is not enough to simply look at the *number* of credits that might be redeemed – it is also necessary to determine the *value* to investors of any credits that they redeem:

> …it is necessary to consider both the eligibility of investors to redeem imputation credits and the extent to which investors determine the worth of imputation credits to them.[379]

23.3.2 The May 2017 decision of the Federal Court of Australia

622   The AER appealed the Tribunal's decision in the *PIAC-Ausgrid* case to the Federal Court, which held that the AER's Ground 17, in relation to gamma, was made out.[380] The Court held that the Tribunal had erred in its interpretation of r 6.5.3 of the NER, which states that "gamma is the value of imputation credits." The court stated that the word "value" should not be interpreted in isolation and that gamma must be interpreted and estimated in a way that is consistent with the regulatory framework in which it operates:

> In our opinion, the expression "the value of imputation credits" is to be construed as a whole, in its context and having regard to the subject matter of the exercise. It would be an error to limit attention to the word "value" and give it a meaning in isolation. In essence, we think this is what the Tribunal did. The Tribunal thereby misunderstood

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[375] *PIAC-Ausgrid*, Paragraph 1073.

[376] *PIAC-Ausgrid*, Paragraph 1097.

[377] *PIAC-Ausgrid*, Paragraph 1098.

[378] *PIAC-Ausgrid*, Paragraph 1100.

[379] *PIAC-Ausgrid*, Paragraph 1061.

[380] Australian Energy Regulator v Australian Competition Tribunal (No2) [2017] FCAFC 79, Paragraph 757.

the function of imputation credits under the Rules in relation to the return on capital and the tax building block.[381]

623   The Court went on to accept the AER's submission that the relevant regulatory framework is a post-company tax and pre-personal tax and personal costs framework:

> We accept the AER's submission that the context is the determination of a regulated return using a post-tax revenue model based on a nominal vanilla WACC. We accept the AER's submission that the Rules require consistency in the way the relevant building blocks interact, that is, a post-company tax and pre-personal tax and personal costs basis. We also note that the nature of gamma is an estimate to be used in a model.[382]

624   In the context of the example above, the $70 allowed return on equity is on "a post-company tax and pre-personal tax and personal cost basis." The regulated business generates a profit, pays corporate tax, and then pays a $70 return to shareholders, who must then fund their own personal tax and personal cost payments out of it.

625   We agree that consistency requires that imputation credits must also be treated on the same basis. Suppose, for example that the only factor to consider is personal taxes at the rate of 25%. That is, 25% of any receipt of dividends, capital gains, or credits would have to be paid as personal tax. It would be wrong to submit that, since 25% of each credit is lost to personal tax, theta should be set to 0.75 such that every dollar of credits received would reduce dividends or capital gains by 75 cents. This would involve a comparison of the post-personal tax credit with the pre-personal tax dividend or capital gain and would be quite wrong. Since the same tax effect applies to credits and dividends and capital gains, the exchange rate between them would be 1.

626   It is for this reason that theta must reflect only (and all) of those reasons why credits would be valued less than dividends and capital gains. We note that the list set out in Paragraph 610 above are things that apply to credits only, and will therefore affect the value of credits *relative to* dividends and capital gains. This is what should be reflected in the estimate of theta.

627   In our view, the Court has fallen into error on this point. Having correctly identified that it would be wrong for theta to reflect any personal taxes or costs that *equally* affect credits and dividends and capital gains, it then ruled that theta should reflect *no* personal costs or taxes at all – even those that apply only to credits and not to dividends or capital gains.

628   The regulatory framework requires theta must reflect only the reasons, and all of the reasons, why credits are less valuable than dividends and capital gains. This is

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[381] AER v ACT, 2017, Paragraph 751.

[382] AER v ACT, 2017, Paragraph 752.

Market value or utilisation rate?

because the regulatory framework first estimates the amount of dividends and capital gains that would be appropriate and then makes a reduction in relation to the imputation credits that are received. In our view, a finding of fact that the regulatory framework requires theta to be estimated in any other way is simply wrong.

629　The *PIAC-Ausgrid* Tribunal carefully considered this very question and concluded that estimating gamma on the basis of the full face amount of credits available for redemption (ignoring all other reasons why credits might be less valuable than dividends or capital gains) was inconsistent with the regulatory framework:

> …the AER has adopted a conceptual approach to gamma that redefines it as the value of imputation credits that are available for redemption. This is inconsistent with the concept of gamma in the Officer Framework for the WACC[383]

and observed that, within the regulatory framework, all other WACC parameters are estimated as market values using the prices of traded securities:

> Moreover, the AER's reasoning ignores the fact that other parameters in the WACC calculations are market values.[384]

> …the Tribunal considers the use of market studies to estimate the value of imputation credits is consistent with the methods used to calculate other parameters of the costs of debt and equity from market data.[385]

> Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[386]

630　That is, the *PIAC-Ausgrid* Tribunal considered the question of which interpretation of gamma was consistent with the regulatory framework and decided in favour of the market value interpretation that reflects all of the reasons why investors value credits less than dividends and capital gains. However, the Court held that the Tribunal had erred in reaching this conclusion:

> …we accept the AER's submission the Tribunal's approach to gamma was underpinned by a misunderstanding on its part about how return to investors was conceptualised in a WACC framework. In our opinion the Tribunal assumed that other parameters in the WACC calculations were market values that already incorporated investors' tax positions and transaction costs but that misconstrued the "post-tax" framework.[387]

631　This statement from the Court gives rise to two questions of fact:

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[383] *PIAC-Ausgrid*, Paragraph 1100.

[384] *PIAC-Ausgrid*, Paragraph 1073.

[385] *PIAC-Ausgrid*, Paragraph 1097.

[386] *PIAC-Ausgrid*, Paragraph 1098.

[387] AER v ACT, 2017, Paragraph 755.

Market value or utilisation rate?

a. Whether other WACC parameters are estimated using market values that already incorporate investors' tax positions and transaction costs; and

b. Whether consistency with the regulatory WACC framework requires an estimate of gamma that reflects all of the reasons why investors would value credits less than dividends and capital gains, or only the extent to which non-residents are unable to redeem credits.

632   On these questions, the *PIAC-Ausgrid* Tribunal decided in favour of a market value estimate that reflects all of the reasons why investors value credits less than dividends and capital gains, but the Court has held that it is open to the AER to disregard everything other than the extent to which non-residents are unable to redeem credits. We consider these two questions in more detail in the following sections.

23.4 Are other WACC parameters market value estimates?

633   In this section, we consider the Court's finding that:

> In our opinion the Tribunal assumed that other parameters in the WACC calculations were market values that already incorporated investors' tax positions and transaction costs but that misconstrued the "post-tax" framework.[388]

634   We explain that other WACC parameters *are* market value estimates that *do* reflect the effects of personal taxes, personal costs, and every other consideration that investors make when determining how much they would be prepared to pay for stocks or bonds.

Risk-free rate

635   The first WACC parameter we consider is the risk-free rate, which is estimated as the yield on government bonds. The yield is computed as the discount rate that equates the present value of the cash flows to be received by the bond holder with the prevailing market price of the bond.

636   The market price of the bond will obviously reflect all of the considerations that investors make when determining the value of the bond to them, including the expected impact of any personal taxes associated with investing in the bond, and any expected personal or transactions costs incurred by the bond holder when investing in the bond.

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[388] AER v ACT, 2017, Paragraph 755.

Market value or utilisation rate?

637   Thus, the risk-free rate that is derived, and used in the WACC calculation, will include compensation that investors require in relation to personal taxes and personal costs – and every other consideration that investors make when considering how much they would be prepared to pay for a government bond.

Return on debt

638   The return on debt is computed in the same way as the risk-free rate, except that corporate bonds are used instead of government bonds.

639   Again, the market price of the bond will obviously reflect all of the considerations that investors make when determining the value of the bond to them, including the impact of any personal taxes and any personal or transactions costs.

640   Thus, the return on debt that is derived, and used in the WACC calculation, will include compensation that investors require in relation to personal taxes and personal costs – and every other consideration that investors make when considering how much they would be prepared to pay for a corporate bond.

Market risk premium – dividend growth model estimate

641   One set of evidence that the AER considers when estimating the market risk premium (MRP) is dividend growth model estimates. Just as for the bond yields above, the implied return on the market portfolio is computed as the discount rate that equates the present value of the cash flows (in this case, dividends) to be received with the prevailing market price of the portfolio of shares.

642   The market price of shares will obviously reflect all of the considerations that investors make when determining the value of the shares to them, including the impact of any personal taxes and any personal or transactions costs.

643   Thus, the MRP that is derived will include compensation that investors require in relation to personal taxes and personal costs – and every other consideration that investors make when considering how much they would be prepared to pay for shares.

Market risk premium – historical excess returns

644   When estimating the MRP, the AER also considers evidence from historical excess returns. This evidence is based on the annual returns of a broad portfolio of shares, calculated from the observed market prices of those shares. The idea behind this method is that the price that investors would be prepared to pay to buy shares today is the present value of the expected dividend over the next year and the expected sale price at the end of the year:

$$S_t = \frac{E[DIV_{t+1}] + E[S_{t+1}]}{1 + r_{m,t}}.$$

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645   This is precisely the same as for the parameters above – the implied return on the market portfolio is computed as the discount rate that equates the present value of the cash flows to be received (in this case, from dividends and the sale of the share a year later) with the prevailing market price of the portfolio of shares.

646   As above, the current share price will reflect all of the considerations that investors make when determining the value of the shares to them, including the impact of any personal taxes and any personal or transactions costs.

647   Thus, the market return that is derived will include compensation that investors require in relation to personal taxes and personal costs – and every other consideration that investors make when considering how much they would be prepared to pay for shares.

Equity beta

648   The AER estimates equity beta from a regression analysis of stock returns (for domestic comparator firms) on returns from a broad market index. As explained above, the returns, which are derived from observed market prices, will reflect all of the considerations that investors make when determining the value of the shares to them, including the impact of any personal taxes and any personal or transactions costs.

649   Thus, the equity beta will also reflect any compensation that investors require in relation to personal taxes and personal costs – and every other consideration that investors make when considering how much they would be prepared to pay for shares.

Conclusion

650   In our view, the evidence set out above clearly supports the contention that other WACC parameters *are* market value estimates that *do* reflect the effects of personal taxes, personal costs, and every other consideration that investors make when determining how much they would be prepared to pay for stocks or bonds. This is because they are all derived from the observed prices of traded securities. It then follows that the estimates of the required return on equity and debt are estimates that include the compensation that investors require in relation to personal taxes and personal costs.

651   We note that the *PIAC-Ausgrid* Tribunal made precisely this point:

> The Tribunal accepts the Network Applicants' submission that the return on equity is derived from the market prices of government bonds (the risk-free rate) and from the market prices of shares (beta and MRP). The cost of debt is calculated by reference to bond yields. Bond yields are derived directly from the traded market prices of bonds. Further, we accept the Network Applicants' submission that these market prices reflect every consideration that investors make in determining the worth of shares to them and that the bond prices, and the yields that are derived from them, reflect every consideration that investors make in determining the worth of the asset to them,

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including "personal costs".[389] Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[390]

652   The passage above makes clear that the *PIAC-Ausgrid* Tribunal's conclusion that other parameters in the AER's WACC calculations are based on market values was not an assumption but, rather, a finding of fact based on a proper understanding of the WACC framework within the NER.

23.5 Are market value or "utilisation" estimates consistent with the regulatory framework?

Analysis

653   In this section, we consider the question of whether consistency with the regulatory WACC framework requires:

 a. a market value estimate of gamma that reflects all of the reasons why investors value credits less than dividends and capital gains; or

 b. a utilisation estimate of gamma that reflects only the extent to which non-residents are unable to redeem credits.

654   In our view, the best way to consider this question is in the context of Dr Lally's 2013 report for the AER. Our earlier report[391] noted that Lally (2013 AER) Equation (3) shows that what is relevant is the extent to which imputation credits are capitalised into the stock price:

$$S_0 = \frac{DIV_1 + \theta \times IC_1 + S_1}{1 + R_e}.$$

655   This equation shows that the price of a stock at the beginning of the year is equal to the present value of:

 a. Dividends paid during the year;

 b. Theta times the face amount of imputation credits distributed during the year; and

 c. The stock price at the end of the year.

656   As set out above, the discount rate (R_e) includes the compensation that investors require in relation to personal taxes and personal costs on dividends and capital

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[389] The AER had used the term "personal costs" to summarise the various reasons why investors would not value credits that they redeemed at the full face amount.

[390] *PIAC-Ausgrid*, Paragraph 1098.

[391] Frontier Economics, 2017, *Estimating gamma for regulatory purposes*, January, pp. 9-10, 16.

gains (from share sales). The framework adopted by the AER assumes that investors are indifferent between dividends and capital gains, so the same discount rate is applied to both components in the formula above and both components are treated as equally valuable to investors when estimating other WACC parameters. In summary, R_e is the discount rate that capitalises the face amount of dividends and capital gains into the current stock price. In the example above, R_e is the 7% required return that includes the 2% compensation that investors require in relation to any personal taxes and personal costs that apply to dividends and capital gains.

657   Of course, we cannot simply capitalise the face amount of imputation credits using the same discount rate because credits are clearly less valuable to aggregate investors than dividends or capital gains. This is where theta comes in – it reflects the extent to which imputation credits are less valuable to investors than dividends or capital gains.

658   A list of reasons why investors value credits less than dividends and capital gains is set out in Paragraph 610 above. One of those reasons is the fact that some credits are distributed to non-residents who do not value them at all, but there are many other reasons. We note that the list does not include the fact that credits are subject to personal tax. That is because dividends and capital gains are similarly subject to personal tax, so the effect of personal taxes will already be taken into account in the 7% discount rate that is used. In summary, theta is a relative valuation term – it will reflect only those reasons that cause credits to be less valuable relative to dividends and capital gains.

659   In our view, theta should be estimated in a way that captures *all* of the reasons why credits are less valuable than dividends and capital gains, and we show below that the market value estimation approach does exactly that. By contrast, the AER's redemption rate approach reflects only the fact that some credits are distributed to non-residents but none of the other reasons why credits are less valuable to investors.

Consistency with dividend drop-off analysis

660   To show that dividend drop-off analysis properly estimates theta as the value of credits relative to dividends and capital gains, we note that Dr Lally's formula can be rearranged slightly as follows:

$$S_0(1+R_e) - S_1 = DIV_1 + \theta \times IC_1 .$$

661   Dividing all terms by the current stock price gives:

$$\frac{S_0(1+R_e) - S_1}{S_0} = \frac{DIV_1}{S_0} + \theta \frac{IC_1}{S_0} .$$

662   This expression is entirely consistent with dividend drop-off regression analysis, which is performed as follows:

Market value or utilisation rate?

$$\frac{S_0(1+R_e)-S_1}{S_0} = \delta\frac{DIV_1}{S_0} + \theta\frac{IC_1}{S_0} + \varepsilon.$$

663   That is, in a dividend drop-off analysis, theta estimates the value of credits relative to the value of dividends and capital gains – exactly as required.

Numerical example

664   Suppose that:

    a. The proportion of credits that are distributed to resident investors is 0.55, so theta would be set to 0.55 if this was the only reason that was contemplated for why credits are less valuable to aggregate investors than dividends and capital gains; and

    b. Investors in aggregate actually value credits at 35% of dividends or capital gains. This figure reflects *all* of the reasons why investors value credits less than dividends and capital gains.

665   Now suppose that a regulator uses the 0.55 figure for theta. Under the regulatory framework and post-tax revenue model (PTRM), this would result in the regulator reducing the allowed dividends and capital gains by 55 cents for every dollar of imputation credits that are distributed to investors. But in this example, investors value a dollar of credits as equivalent to only 35 cents of dividends or capital gains. Thus, investors would be under-compensated by 20 cents in relation to every dollar of credits that is distributed – the additional personal costs that apply only to credits would be left uncompensated.

Conclusion

666   In the regulatory WACC framework, and within the PTRM, the return on equity (R_e) includes the compensation that investors require to cover the personal taxes and personal costs that relate to dividends and capital gains. It does not cover the additional reasons why imputation credits are less valuable to investors than dividends or capital gains. That is the role of theta (which recognises the extent to which distributed credits are less valuable than dividends or capital gains) and ultimately gamma (which also recognises that some of the credits that are created will not be distributed to investors).

667   The regulatory framework and PTRM serve to reduce the allowance of dividends and capital gains for the assumed value of imputation credits. For investors to end up with appropriate compensation, it is essential than an appropriate "exchange rate" is used. What is required is an estimate of the ratio of the extent to which investors value imputation credits relative to the extent to which they value dividends and capital gains. This provides the proper indication of the amount of dividends or capital gains investors would give up in order to obtain an imputation credit. This ratio is precisely what is estimated by dividend drop-off analysis.

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668   As noted above, the Court appears to have fallen into error on this point. Having correctly identified that it would be wrong for theta to reflect any personal taxes or costs that *equally* affect credits and dividends and capital gains, it then ruled that theta should reflect *no* personal costs or taxes at all – even those that apply only to credits and not to dividends or capital gains.

23.6 The October 2016 *SAPN* Tribunal decision

669   We note that the *SAPN* Tribunal has also held that it is open to the AER to adopt the redemption rate interpretation for theta.[392] The reason for this finding was based around that Tribunal's independent development of a distinction between "average investor" and "marginal investor" theoretical frameworks, which appears to be quite orthogonal to the issue at hand. In particular, neither the AER nor SAPN had made submissions on that point, and the AER's decision was not based on a distinction between average and marginal investors.

670   On this point, in the hearing before the Victorian Distribution Businesses (*Vic DB*) Tribunal, Counsel for the AER agreed with the proposition that:

> …the discussion in SAPN about the distinctions between marginal and average investors is not of much assistance to us [393]

and also agreed with the proposition that:

> …you seem to be relying rather a lot on the conclusions in SAPN, and not too much on the reasoning that gets them [394]

and concluded that:

> …the primary reasoning of the AER is not dependent upon that analysis, and I don't make any submissions about that analysis.[395]

671   Moreover, in its recent decisions the AER does not rely on the average vs. marginal investor distinction that was developed by the *SAPN* Tribunal. Consequently, it seems that the approach of the *SAPN* Tribunal is now redundant, so we do not consider it further in this report. Rather, it seems that there is now broad agreement (including by us) that the key issue is not around the theoretical excursion that was embarked upon by the *SAPN* Tribunal, but around the question of which estimate of theta is properly consistent with its role within the regulatory framework.

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[392] Application by SA Power Networks [2016] ACompT 11, Paragraph 196.

[393] *Vic DB* Transcript, p. 653.

[394] *Vic DB* Transcript, p. 653.

[395] *Vic DB* Transcript, p. 654.

Market value or utilisation rate?

23.7 Final conclusions and implications

672 In our view, the answers to the two key questions that arise from the recent Federal Court judgment are as follows:

a. Any suggestion that other WACC parameters are anything other than market value estimates that *do* reflect the effects of personal taxes, personal costs, and every other consideration that investors make when determining how much they would be prepared to pay for stocks or bonds is clearly wrong. This is because other WACC parameters are all derived from the observed prices of traded securities. It then follows that the estimates of the required return on equity and debt are estimates that include the compensation that investors require in relation to personal taxes and personal costs; and

b. Under the regulatory WACC framework and PTRM, theta is an estimate of the ratio of the extent to which investors value imputation credits relative to the extent to which they value dividends and capital gains. This provides the proper indication of the amount of dividends or capital gains investors would give up in order to obtain an imputation credit. Only if theta is interpreted and estimated in this way will investors be appropriately compensated.

673 The main implication of these answers is that theta should be estimated using dividend drop-off analysis. As noted above, that method provides a direct estimate of the extent to which investors value imputation credits relative to the extent to which they value dividends and capital gains.

24 Two rationales for the utilisation rate

24.1 Overview

674   In this section, we note that the AER has provided two mutually exclusive rationales for interpreting and estimating theta as a utilisation/redemption rate, rather than as an estimate of investors' exchange rate between credits and dividends or capital gains. In particular:

   a. The AER's first rationale is that the first step of the regulatory framework estimates the before-personal-tax and before-personal-costs dividends and capital gains that investors would require in the absence of any imputation credits, so the second step of the process must subtract the before-personal-tax and before-personal-costs value of imputation credits. Thus, any additional personal costs that apply only to imputation credits (making them relatively less valuable than dividends and capital gains) are not considered. This is the line of argument run by the AER before the *PIAC-Ausgrid* Tribunal.

   b. The AER's second rationale is that the additional personal costs that apply only to imputation credits *are* relevant, but they have already been taken into account in the return on equity, so to also take them into account when estimating the value of imputation credits would amount to double counting. This is the line of argument run by the AER before the *Vic DB* Tribunal in November 2016 and in the appeal of the *SAPN* proceedings to the Federal Court in June 2017.

675   Clearly, these two rationales are mutually exclusive. The additional personal costs that affect the market value of credits (relative to dividends and capital gains) cannot be simultaneously irrelevant and already taken into account.

676   This is an important consideration because:

   a. If the AER now relies on Rationale 2, the recent judgment of the Federal Court would appear to be redundant because that court considered Rationale 1. Indeed, if Rationale 2 is correct, it must be the case that Rationale 1 is incorrect, so any findings based on it would be irrelevant; and

   b. If the AER now reverts back to Rationale 1, that would imply that the AER now considers its submissions to the *Vic DB* Tribunal and the *SAPN* Court to be incorrect.

677   Our view is that neither rationale is correct. As set out above, we consider that theta is an estimate of the ratio of the extent to which investors value imputation

credits relative to the extent to which they value dividends and capital gains. If that is right, *all* of the reasons why credits are less valuable than dividends or capital gains would have to be considered, not just the extent to which credits are distributed to non-resident investors.

678   That is, if the "utilisation" interpretation of theta is wrong, the reason for proposing it is moot. However, if the utilisation interpretation of theta is proposed, it would be necessary to clearly state the rationale on which that proposal is based.

24.2 Rationale 1: A pre-personal-tax and pre-personal costs regulatory framework

679   In its Ausgrid Final Decision the AER sets out the rationale for its utilisation approach to estimating theta as follows:

> …to be consistent with the Officer framework (and therefore the building block framework in the NER/NGR) the utilisation rate should reflect the before-personal-tax and before-personal-costs value of imputation credits to investors. On a before-personal-tax and before-personal-costs basis, an investor that is eligible to fully utilise imputation credits should value each dollar of imputation credits received at one dollar (that is, have a utilisation rate of 1).[396]

680   It was this rationale – that the value of imputation credits must be estimated on a pre-personal-tax and pre-personal cost basis to be consistent with the regulatory framework in which it is used – that formed the basis of the Court's judgment in the *PIAC-Ausgrid* appeal. The court held that:

> We accept the AER's submission that the Rules require consistency in the way the relevant building blocks interact, that is, a post-company tax and pre-personal tax and personal costs basis…we accept the AER's submission the Tribunal's approach to gamma was underpinned by a misunderstanding on its part about how return to investors was conceptualised in a WACC framework.[397]

681   For the reasons set out above, our view is that the Court has fallen into error on this point. Having correctly identified that it would be wrong for theta to reflect any personal taxes or costs that *equally* affect credits and dividends and capital gains, it then ruled that theta should reflect *no* personal costs or taxes at all – even those that apply only to credits and not to dividends or capital gains. This leaves a hole in the regulatory allowance whereby the additional personal costs that apply to imputation credits are uncompensated.

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[396] Ausgrid Final Decsion, April 2015, Attachment 4, pp. 44-45.

[397] AER v ACT, Paragraphs 752, 755.

Two rationales for the utilisation rate

24.3 Rationale 2: Personal taxes and personal costs *are* relevant, but the allowed return on equity has already taken them into account

The allowed return on equity only reflects <u>some</u> personal taxes and personal costs

682   In the *Vic DB* Tribunal hearing, the AER introduced a new rationale for its "utilisation" approach to theta. This rationale appears to recognise that other WACC parameters *do* reflect the effects of personal taxes and personal costs. It posits that personal taxes and personal costs *are* relevant (including those that apply to credits), but they have already been taken into account in the return on equity, so to also take them into account when estimating the value of imputation credits would amount to double counting.

683   Counsel for the AER began the explanation of this rationale as follows:

> Obviously, the amount of dividends is observed as well but they're observed at their dollar value, but the market values are the asset prices, and they do – that's quite right, that they already incorporate the effects of the differences in investors' tax positions and transaction costs.[398]

684   We agree entirely with this statement. As we have set out above, the return on equity that the AER estimates will reflect the personal taxes and personal costs that pertain to dividends and capital gains. For example, if the AER estimates a required return on equity of 7%, that indicates that the dividends and capital gains that investors receive would have to provide a 7% return, which includes any compensation required to cover the effects of personal taxes and personal costs related to those dividends and capital gains.

685   For example, if there were no personal taxes or personal costs relating to dividends and capital gains, investors may have required a return of only 5%. In this case, the additional 2% is compensation to cover the effects of personal taxes and personal costs. If a regulated business had $1,000 of equity capital, it would be allowed to charge prices so that it was able to provide $70 of dividends and capital gains to its shareholders, of which $20 (the additional 2% return) is to compensate investors for the personal taxes and personal costs that relate to dividends and capital gains.

686   The AER's submission then continued as follows:

> But that's where we depart with the applicants because those matters are incorporated into the asset prices and, therefore, they are incorporated into the allowed rate of return and, therefore, they are incorporated into the allowed revenues for the service

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[398] *Vic DB* Tribunal hearing transcript, p. 650.

> provider…these personal costs, personal valuation matters will be reflected in the return on equity, will be included in the allowed revenues, to then undertake an exercise of seeking to value imputation credits in the allowance for company tax to reduce it by these matters, does bring about an inconsistency in the logic of the post-company tax model and, effectively, provides a second form of compensation for precisely the same costs.[399]

687 In our view, this submission fundamentally misunderstands the role of theta. Theta represents the rate at which investors would be willing to exchange dividends and capital gains. It does *not* double count any compensation in relation to personal taxes and personal costs. Theta represents only the extent to which the personal costs in relation to credits *exceed* those in relation to dividends and capital gains. It represents only the *additional* costs. Any suggestion that it double counts the *same* costs is simply wrong.

688 That is, the AER appears to have committed a logical fallacy. Having correctly identified that it would be wrong for theta to reflect any personal taxes or costs that have *already* been taken into account in the return on equity, the AER then concludes that theta should reflect *no* personal costs or taxes at all – even those that have not yet been taken into account in the allowed return on equity.

689 For example, as explained in Paragraph 625 above, the effect of personal taxes has already been taken into account in the allowed return on equity, so it would be wrong to again take it into account when estimating the value of imputation credits. This is precisely why theta must represent only those matters that are unique to imputation credits and which have not yet been taken into account when the AER estimates the required return on equity from dividends and capital gains.

690 This is also precisely why dividend drop-off analysis estimates the value of imputation credits *relative to* dividends and capital gains – to estimate only the effect of those matters that have not already been taken into account in the required return on equity from dividends and capital gains.

The incorporation of the market value of credits

691 In its submissions to the Court in relation to the appeal of the *SAPN* Tribunal's decision, the AER appears to submit that even the personal costs that relate only to imputation credits (over and above those that relate to dividends and capital gains) are incorporated into the allowed return on equity.

692 Our understanding of the AER's argument is as follows. Suppose that, in the absence of imputation, investors would require a return on equity (from dividends and capital gains) of 7%. As set out above, this would include the compensation that investors require to cover the personal taxes and costs that apply to dividends and capital gains. Now suppose that, in line with our earlier example, that:

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[399] *Vic DB* Tribunal hearing transcript, p. 650.

<div align="right">Two rationales for the utilisation rate</div>

a. Imputation credits with a face amount of 1% are distributed to investors;

b. 55% of those credits are distributed to resident investors; and

c. Investors in aggregate value imputation credits at 35% of the value of dividends and capital gains. (That is, for the reasons set out in Paragraph 610 above, investors would only be prepared to give up $35 of dividends and capital gains to receive the $55 of imputation credits that is distributed to resident investors.)

693   In this case, investors will reduce their requirement for dividends and capital gains by 0.35% to 6.65%. Thus, when the AER uses market data to estimate the required return on equity, they will see that the market requires a return of 6.65% from dividends and capital gains. This 6.65% reflects the personal costs that apply only to imputation credits – if those personal costs were lower, the credits would be relatively more valuable and investors would require less return from dividends and capital gains.

694   The AER uses data from 1883 to estimate the required return on equity. For the period up to 1987 there were no imputation credits, so the entire return on equity had to be provided in the form of dividends and capital gains. Thus, in our numerical example, the estimate of the required return from dividends and capital gains will be 7% for the period up to 1987 and 6.65% for the period after 1987. These figures cannot be averaged because they are estimates of different things – the 7% figure reflects the total required return on equity and the 6.65% figure is net of the value of imputation credits. It is for this reason that the regulatory framework requires, via a process known as "grossing up," that the value of any imputation credits must be added back to the return from dividends and capital gains to produce an estimate of the total return on equity. In this case 6.65% + 0.35% = 7% for the post-1987 period. Now the estimates from both sub-periods are comparable and they can be assessed together. The AER explains this point in its submissions in relation to the SAPN appeal:

> The return on equity must be grossed up by the value of distributed imputation credits. The increase reflects the fact that the return on equity is estimated from observed returns in the market (the returns comprise dividends and capital gains and are divided by the stock price to derive a rate of return). However, the observed returns in the market reflect the payment of a proportion of personal taxes at the company level - under an imputation system, the returns received by equity investors include three components: capital gains, dividends and imputation credits. Imputation credits are personal tax paid at the company level. Asset prices (and the resulting "market observed" return on equity) will reflect the value of those three components of return. In other words, asset prices will be higher, and the resulting rate of return on equity that is observed from those asset prices will be lower, in the presence of imputation credits than without them. To derive a nominal vanilla return on equity, that is, on a post company tax pre personal tax basis, an adjustment must be made to the return on equity to take account of the effect of imputation credits. That is done by grossing up the return on equity by the value of imputation credits. The grossed up return on

Two rationales for the utilisation rate

equity is then a rate of return on a post company tax pre personal tax basis. Under the NER, that adjustment is made in accordance with cl 6.5.2(d)(2).[400]

695   The AER now accepts that the reduction in the return that investors require from dividends and capital gains (0.35% in the example above) reflects all of the personal costs that cause investors to value credits less than dividends and capital gains – it is the market value of credits (relative to dividends and capital gains):

> The observed returns in the market in terms of asset prices are assumed to reflect the full range of personal taxes and personal costs that affect investors' valuations of the asset. In other words, to the extent that personal taxes and personal costs associated with returns on the asset (capital gains, dividends and imputation credits) diminish the value of an equity investment, that will be reflected in the asset price and thereby reflected in the resulting return on equity. The resulting (and required) return will be higher as a result.[401]

696   Consequently, it must be the very same market value of credits (relative to dividends and capital gains) that is added back in the grossing-up step of the regulatory process. If anything other than the same market value of credits is added back, the result will be meaningless – it certainly will not produce an estimate of the (7%) total required return on equity that is commensurate with the pre-1987 data.

697   However, the AER has submitted that because the (0.35%) reduction in the market's required return from dividends and capital gains reflects the market value of credits, using the same market value of credits in the grossing-up step of the regulatory process would amount to double counting.

> …the AER adjusts the return on equity estimated from the market by the amount of personal tax paid at the company level, ie the value of distributed imputation credits. It would be incorrect to use the "market" value of imputation credits to make that adjustment because the "market observed" return on equity already incorporates the effects of any personal costs (time value of money, transaction costs etc). The AER adopts the same approach to the allowance for company tax.[402]

698   In our view, this is exactly wrong. It is precisely *because* the reduction in the market's required return from dividends and capital gains reflects the market value of credits that the same market value of credits *must* be used in the grossing-up step of the regulatory process.

699   The correct approach is as follows:

        a.   Estimate the total required return on equity from the pre-1987 data as 7%.

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[400] AER submissions in relation to SAPN appeal, Paragraph 32(c).

[401] AER submissions in relation to SAPN appeal, Paragraph 32(e).

[402] AER submissions in relation to SAPN appeal, Paragraph 32(g).

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b. Estimate the total required return on equity from the post-1987 data as 6.65% and grossed-up for the market value of credits of 0.35% to obtain a gross-up estimate of 7%.

c. Average the estimates over the two periods to produce an average estimate of 7%.

d. Deduct the market value of credits of 0.35% and allow revenues to provide a return from dividends and capital gains of 6.65%.

700   The AER's proposed approach, which results in investors being under-compensated, is as follows:

a. Estimate the total required return on equity from the pre-1987 data as 7%.

b. Estimate the total required return on equity from the post-1987 data as 6.65% and gross-up for the proportion of credits distributed to resident investors of 0.55% to obtain a grossed-up estimate of 7.2%.

c. Average the estimates over the two periods to produce an average estimate of 7.04%.[403]

d. Deduct the proportion of credits of distributed to residents of 0.55% and allow revenues to provide a return from dividends and capital gains of 6.49%, which is less than the 6.65% return that they require.

701   The result is an internally inconsistent implementation of the regulatory model whereby investors are properly compensated for all personal taxes and costs that apply to dividends and capital gains, but not compensated at all for the additional personal costs that apply to imputation credits.

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[403] There are 105 years of data prior to imputation and 29 years post imputation.

Two rationales for the utilisation rate

25 The interpretation of redemption rate estimates

25.1 Point estimates or upper bounds?

702   In the sections above, we have demonstrated that, in the context of the regulatory framework, theta represents the exchange rate at which investors would exchange dividends and capital gains for imputation credits. In Paragraph 610 above, we set out a number of reasons why investors in aggregate would value imputation credits less than dividends and capital gains. In relation to those reasons:

  a. The equity ownership approach provides a noisy estimate of the effect of (a) only – the fact that some credits are distributed to non-residents who obtain no value from them;

  b. ATO tax statistics provide an estimate of the effects of (a)-(c) – that approach produces a direct estimate of the proportion of credits that are *actually* redeemed from the Tax Office; and

  c. The dividend drop-off approach provides a direct estimate of the extent to which investors value imputation credits relative to dividends and capital gains. This estimate includes of all of the effects set out in Paragraph 610, and any other reasons why investors would value credits less than dividends and capital gains.

703   Consequently, if one accepts that theta does properly represent the exchange rate at which investors would exchange dividends and capital gains for imputation credits, dividend drop-off analysis would provide a direct estimate and the other approaches would only serve as upper bounds – because they include the effects of only a sub-set of the reasons why investors would value credits less than dividends or capital gains.

704   However, if one concludes (contrary to the analysis above) that theta should be interpreted as the proportion of credits that are redeemed, the ATO approach would provide a direct estimate, the dividend drop-off approach would provide a lower bound (as it includes the effects of additional factors) and the equity ownership approach would provide an upper bound (because it does not consider the effects of the 45-day rule or indeed *any* reason why investors would not redeem credits other than their ineligibility as foreign investors).

25.2 The reliability of ATO tax statistics

705   In its recent decisions, the AER has questioned the reliability of using tax statistics to inform the estimate of theta and states that it applies limited weight to such estimates.[404] The issue is as follows:

a. Each year a certain amount of credits are created, some of those are distributed to shareholders, and some of those distributed credits are redeemed by shareholders.

b. The ATO provides data on the quantum of credits that are created each year and on the quantum of credits that are redeemed each year. There has never been any dispute about either of these items.

c. The ATO does not provide direct data on the number of credits that are distributed each year – so that quantity has to be derived. Two approaches have been proposed:

    i. The franking account balance (FAB) approach – whereby the amount of distributed credits is derived as the sum of all credits created less those that are retained by firms as reported in the firms' franking account balances;[405] and

    ii. The dividend approach – whereby the amount of distributed credits is estimated by tracking dividend payments and making assumptions about the flow of dividends between companies, trusts and life offices.

d. The FAB and dividend approaches produce different estimates of the amount of credits that are distributed each year.

706   The difference between the FAB and dividend estimates of the amount of credits distributed was first identified by Hathaway (2013).[406] His estimates are summarised in Figure 37 below.

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[404] CitiPower Final Decision, Attachment 4, p. 13.

[405] A firm's 'franking account balance' is a record of the face amount of imputation credits the firm has available for distribution.

[406] Hathaway, N., 2013, "Franking credit redemption ATO data 1988 to 2011," Capital Research, September.

The interpretation of redemption rate estimates

Figure 43: Summary of ATO tax statistics
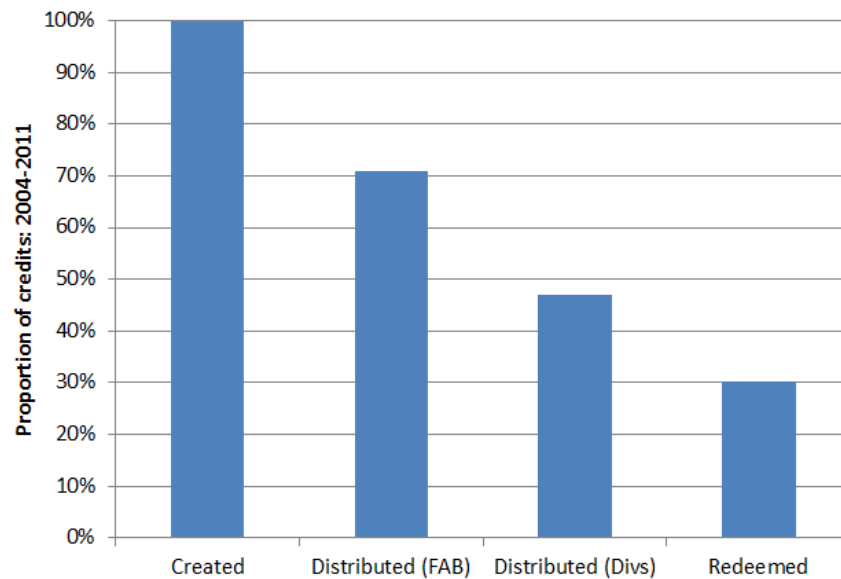
Source: Hathaway (2013), p. 9.

707   Figure 37 shows that the FAB method indicates that 71% of created credits are distributed, whereas the dividend method produces a distribution rate of 47%.

708   Under the AER's contention that theta should be interpreted as the proportion of distributed credits that are redeemed, the ATO tax statistics can be used to estimate theta, and consequently gamma. Under this approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}} .$$

709   Note that the amount of credits distributed cancels out, so we are left with:

$$\gamma = \frac{\text{Credits Redeemed}}{\text{Credits Created}} .$$

710   In this case, there is no issue with the measurement of either term, so no reason to consider the estimate to be unreliable. Hathaway (2014) recognises this point and reports that the proportion of credits redeemed to credits created is 30%.[407]

711   Moreover, it is clear from Figure 37 above that the same outcome would be obtained whether one adopted the FAB approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}} = \frac{71}{100} \times \frac{30}{71} = 0.30$$

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[407] Hathaway (2013), Paragraph 99.

The interpretation of redemption rate estimates

or whether one adopted the dividend approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}} = \frac{47}{100} \times \frac{30}{47} = 0.30 \ .$$

712   In its October 2015 Final Decisions, the AER recognised that it must adopt the same estimate of credits distributed in the two places it appears in the above equation.[408] The AER favoured the FAB method and adopted a gamma estimate of 0.31 based on that approach,[409] and would clearly have arrived at the same estimate of gamma if it had used the dividend approach in both places in the above equation.

713   In its most recent decisions, the AER has updated this estimate to 0.34.[410]

714   As set out above, if it is accepted that theta properly represents the value of credits relative to the value of dividends and capital gains, the ATO tax statistics will only produce an upper bound, which implies that $\gamma < 0.34$.

715   However, in its most recent decisions, the AER has downplayed the use of ATO tax statistics:

> In this final decision, we consider there are potential underlying data issues with tax statistics and as a result, the utilisation rate cannot be estimated reliably from this data. As outlined by Lally, the data issues with tax statistics are generally accepted by service providers, the Tribunal, Hathaway, NERA, Handley and Frontier. For this reason, in this decision, we have placed limited weight on tax statistics.[411]

716   In this regard, the AER notes that Lally (2016) has restated the issue relating to using the tax data to estimate the amount of distributed credits. Lally (2016) does not present any new evidence, but simply restates the well-known issue in relation to the quantum of credits distributed:

> …variation arising from two possible approaches (ATO dividend data and ATO tax data) whose results should match and the divergence cannot be reconciled. This variation casts doubt on all estimates using ATO data, and this problem with the ATO data alleged by Hathaway is generally accepted.[412]

717   As set out above, the fact that it is generally accepted that there are two different estimates of the amount of credits distributed does not mean that the ATO data should be abandoned entirely. The 0.34 upper bound (which had been used as a point estimate by the AER) does not require an estimate of the amount of credits

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[408] See, for example, SAPN Final Decision, Attachment 4, p. 18.

[409] See, for example, SAPN Final Decision, Attachment 4, p. 18.

[410] AusNet Draft Decision, Attachment 4, p. 16.

[411] Citipower Final Decision, Attachment 4, p. 13.

[412] Lally (2016), p. 20.

The interpretation of redemption rate estimates

distributed. It is a ratio of redeemed credits to created credits, and there has been no question raised about the reliability of either of these quantities.

718 Whereas the ATO has no direct reason to monitor the number of "Credits Distributed" in a given year, it would be extraordinary to suggest that either:

    a. The ATO does not know how much corporate tax was paid in a given year, this being the "Credits Created" figure; or that

    b. The ATO does not know how many credits were redeemed from them in a given year, this being the "Credits Redeemed" figure.

719 In our view, the 0.34 figure is relevant evidence that is unaffected by any concerns about the estimate of the quantum of distributed credits. The issues raised by Dr Lally and the AER about the unreliability of tax statistics are not relevant to the calculation of the 0.34 figure, which is independent of the estimate of the quantum of credits distributed (which is the only figure about which concerns have been raised).

25.3 The role of the equity ownership estimate

720 The equity ownership approach provides an upper bound for the proportion of credits that are redeemed. Whereas the ATO data provides a direct estimate of the proportion of credits that are actually redeemed from the Tax Office, the equity ownership approach (at best) captures the effect of non-residents, but no other reason why credits might not be redeemed. That is, if any credit is not redeemed for any reason other than it being distributed to a non-resident, the equity ownership estimate will be overstated. Consequently, it should be interpreted as an upper bound for the redemption rate.

721 In summary:

    a. If one accepts that theta does properly represent the exchange rate at which investors would exchange dividends and capital gains for imputation credits, dividend drop-off analysis would provide a direct estimate, ATO tax statistics would provide an upper bound, and the equity ownership estimate would be of little relevance because the ATO estimate provides a tighter upper bound.

    b. If one concludes that theta should be interpreted as the proportion of credits that are redeemed, the ATO approach would provide a direct estimate and the equity ownership approach would provide an upper bound (because it does not consider the effects of the 45-day rule or indeed *any* reason why investors would not redeem credits other than their ineligibility as foreign investors).

Chapter 5: Return on debt

Chapter 5: Return on debt

26   Introduction

26.1 Instructions

722   Frontier Economics has been asked by Ausgrid to set out the process for calculating and updating annually the trailing average return on debt allowance, consistent with the approach set out by the AER in the 2013 Guideline, assuming that the return on debt transition is complete.

723   The methodology we set out in this Chapter follows closely the approach outlined by the AER in its 'Final decision – TransGrid transmission determination 2015-16 to 2017-18 – Attachment 3 – Rate of return', Appendix I, page 530.

26.2 Structure of Chapter

724   This Chapter is organised as follows:

  a.   Section 27 describes the methodology to derive the trailing average return on debt;

  b.   Section 28 explains how to update the trailing average return on debt;

  c.   Section 29 lists the assumptions made by Frontier Economics to implement the AER's guidelines.

27 Estimation of the trailing average return on debt

27.1 Overview

725   The methodology to derive the trailing average return on debt can be divided in four main steps:

    a. **Derive adjusted RBA estimate.** For the current year and each of the previous 9 years we derived an adjusted RBA estimate as the average of the daily RBA curve over the averaging period chosen for each year. The daily RBA curve is derived from data on non-financial corporate BBB bonds published by the RBA.

    b. **Derive adjusted BVAL estimate.** For the current year and for each of the previous 9 years we derived an adjusted BVAL estimate as the average of the daily BVAL curve over the averaging period chosen for each year. The daily BVAL curve is derived from data on the Australian BVAL curve published by Bloomberg.

    c. **Derive on-the-day return on debt.** For the current year and for each of the previous 9 years we derived the on-the-day return on debt for that year as an average of the adjusted RBA estimate and the adjusted BVAL estimate.

    d. **Derive trailing average return on debt.** We derived the trailing average return on debt for the current year as the arithmetic average of the on-the-day return of debt estimated for the current year and each of the previous 9 years, for a total of 10 years.

726   The methodology relies on the availability of the data series and on the choice of the averaging period for each of the 10 years. The flow chart in Figure 44 summarises the inputs required and each of the steps applied to derive the return on debt. More details can be found in the following sub-sections.

Figure 44: Methodology for estimating the trailing average return on debt
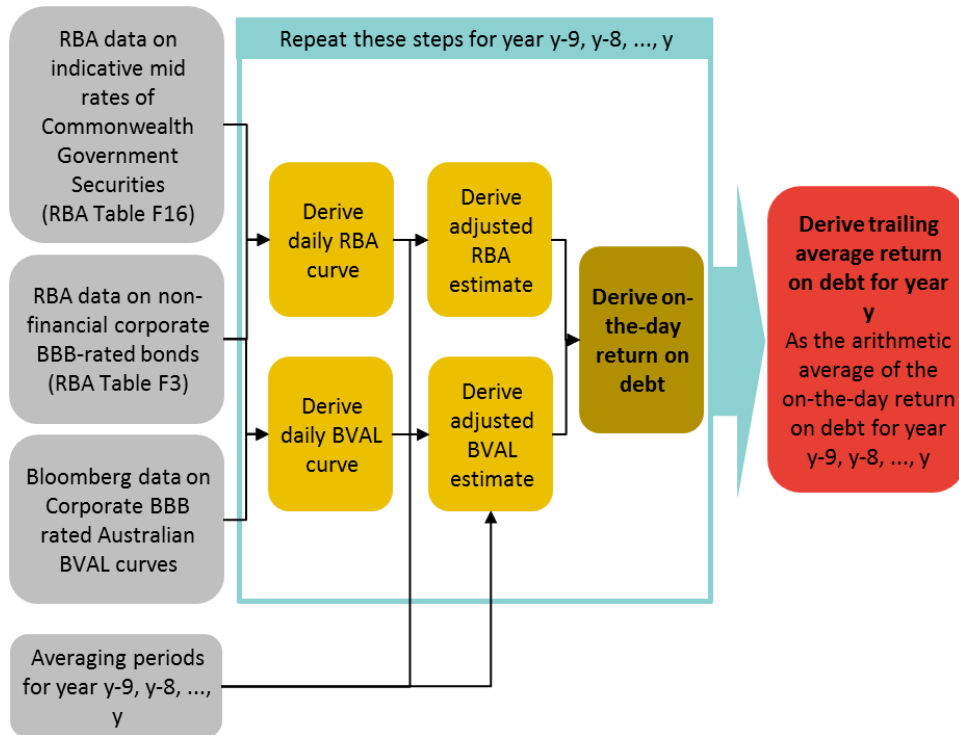
Source: Frontier Economics. Inputs are in grey boxes, calculations to be repeated for the current year and the previous 9 years are in the yellow boxes enveloped in the light blue border, final result is in the red box.

27.2 Data used and notation

727   The data that we have used to derive the return on debt is listed below:

a. **RBA data on indicative mid rates of Commonwealth Government Securities.** This data is extracted from the RBA table F16 'Indicative Mid Rates of Commonwealth Government Securities – 2013 to Current' (http://www.rba.gov.au/statistics/tables/) and consists of the 'Treasury Bonds' time series. These series are daily series of treasury bonds and they are denoted CGS_d^t, where t represents the maturity date and d the daily date;

b. **RBA data on non-financial corporate BBB-rated bonds.** This data is extracted from the RBA table F3 'Aggregate measures of Australian corporate bond yields' (http://www.rba.gov.au/statistics/tables/). The data consists of nine time series of 'Non-financial corporate BBB-rated bonds' with monthly frequency. The series are

    i. **5-year, 7-year, and 10-year RBA yields.** These are the series of 5, 7 and 10-year 'Non-financial corporate BBB-

rated bonds - Yield'. These series as denoted by $RBA_m^{i,y}$, where i=5, 7, 10, y stands for yield, and m stands for monthly date;

ii. **5_year, 7-year, and 10-year RBA spreads to swaps.** These are the series of 5, 7, and 10-year 'Non-financial corporate BBB-rated bonds – Spread to swap'. These series are denoted by $RBA_m^{i,s}$, where s stands for spread to swap;

iii. **5-year, 7-year and 10-year RBA effective tenors.** These are the series of 5, 7, and 10 year 'Non-financial corporate BBB-rated bonds – Effective tenor'. The series are denoted by $RBA_m^{i,e}$, where e stands for effective tenor.

c. **Bloomberg data on Corporate BBB-rated Australian BVAL curve.** This data is downloaded from Bloomberg and consists of the 5, 7, and 10-year Corporate BBB rated Australian BVAL curve (BVCAB05, BVCAB07, BVCAB10). These curves are daily series and they are denoted by $BVAL_d^i$, where i=5, 7, 10 and d stands for the daily date.

728   An additional input to the model is the **averaging period.** This is a range of date over which the RBA and BVAL curves are averaged. The averaging period can change by year but the same period is used for a given year to average the two curves. The averaging period is denoted by [a, b], where 'a' is the first day of the averaging period and 'b' is the last day of the averaging period. The months before the start of the averaging period is denoted by 'A', while the month following the end of the averaging period is indicated by 'B'.

729   A summary of the series used and the notation adopted in the following sections is summarised in Table 19 below.

Table 19: Data series used and notation adopted

Data series	Notation
5-year, 7-year, and 10-year RBA yields	$RBA_m^{i,y}$, where i=5,7,10, y=yield, m=monthly date
5_year, 7-year, and 10-year RBA spreads to swaps	$RBA_m^{i,s}$, where s = spread to swap
5-year, 7-year and 10-year RBA effective tenors.	$RBA_m^{i,e}$, i=5,7,10, e=effective tenor, m=monthly date
Commonwealth government securities	CGS_d^t, t=maturity date, d=daily date
5-year, 7-year and 10-year BVAL curve	$BVAL_d^i$, i=5, 7, 10, d=daily date

Estimation of the trailing average return on debt

Averaging period	[a, b]
Monthly date before the start of the averaging period	A
Monthly date after the end of the averaging period	B

Source: Frontier Economics.

27.3 Derivation of the daily RBA curve

730   The daily RBA curve is derived as follows:

a. For each $i = 5, 7, 10$, and for each day d in [A, B] we derived a CGS yield for day d with i years to maturity by interpolating the closer CGS yields that are i year to maturity from day d as follows:

$$CGS_d^i = CGS_d^{t_{i,l}} + \frac{CGS_d^{t_{i,u}} - CGS_d^{t_{i,l}}}{t_{i,u} - t_{i,l}} * (d_i - t_{i,l})$$

Where

$$d_i = daily\ date\ which\ is\ i\ years\ from\ the\ daily\ date\ d$$

$$CGS_d^{t_{i,u}} := \{CGS_d^t :\ t = \min\{t : t > d_i\}\ and\ CGS_d^t\ is\ not\ missing\}$$

$$CGS_d^{t_{i,l}} := \{CGS_d^t :\ t = \max\{t : t \leq d_i\}\ and\ CGS_d^t is\ not\ missing\}$$

b. For each $i = 5, 7$ and for each month m in [A, B] we extrapolated the published RBA i-year yield to an effective tenor of i years using the margins of the RBA curve as follows:

$$RBA_m^{i,y,i} = RBA_m^{i,y} + \frac{RBA_m^{10,s} - RBA_m^{i,s}}{RBA_m^{10,e} - RBA_m^{i,e}} * (i - RBA_m^{i,e})$$

c. For $i = 10$ and for each month m in [A, B] we extrapolated the published RBA 10-year yield to an effective tenor of 10 years using the same formula at the previous bullet point but where 10 was replaced by 7. The formula becomes:

$$RBA_m^{i,y,i} = RBA_m^{i,y} + \frac{RBA_m^{7,s} - RBA_m^{i,s}}{RBA_m^{7,e} - RBA_m^{i,e}} * (i - RBA_m^{i,e})$$

d. For $i = 5, 7, 10$ and for each month m in [A, B] we computed the adjusted RBA spreads as follows:

$$RBA_m^{i,spred} = RBA_m^{i,y,i} - CGS_{d_m}^i$$

Such that d_m is the last business day of month m.

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e. For $i = 5, 7, 10$ and for each day d in [A, B] we obtained daily estimates of the adjusted RBA spreads by interpolation as follows:

$$RBA_d^{i,spread} = RBA_{m_{d,l}}^{i,spread} + \frac{RBA_{m_{d,u}}^{i,spread} - RBA_{m_{d,l}}^{i,spread}}{m_{d,u} - m_{d,l}} * (d - m_{d,l})$$

Where

$m_{d,u}$ is the first month such that $d >$ last business day of $m - 1$

$m_{d,l}$ is the first month such that $d <=$ last business day of m

f. For $i = 5, 7, 10$ and for each day d in [A, B] we obtained daily estimates of the RBA yields as follows:

$$\widehat{RBA_d^{i,y}} = RBA_d^{i,spread} + CGS_d^i$$

g. For $i = 5, 7, 10$ and for each day d in [A, B] we converted the daily RBA yield estimates to an effective annual rate as follows. This is the daily RBA curve.

$$\widehat{\widehat{RBA_d^{i,y}}} = \left(\left(1 + \frac{\widehat{RBA_d^{i,y}}}{200}\right)^2 - 1\right) * 100.$$

27.4 Derivation of the adjusted RBA estimate

731   The adjusted RBA estimate is defined as the average of the 10-year RBA effective annual rates as follows:

$$RBA^* = \frac{1}{total\ business\ days\ in\ [a,b]} * \sum_{d\ business\ days\ in\ [a,b]} \widehat{\widehat{RBA_d^{10,y}}}.$$

27.5 Derivation of the daily BVAL curve

732   For each $i = 5, 7$ and for each month m in [A, B] we defined the margin between the 10-year RBA yield and the i-year RBA yield as follows:

$$RBA_m^{m,10,i} = RBA_m^{10,y,10} - RBA_m^{i,y,i}$$

733   For each $i = 5, 7$ and for each d in [A, B] we obtained daily estimates of the RBA margin by interpolation as follows:

$$RBA_d^{m,10,i} = RBA_{m_{d,l}}^{m,10,i} + \frac{RBA_{m_{d,u}}^{m,10,i} - RBA_{m_{d,l}}^{m,10,i}}{m_{d,u} - m_{d,l}} * (d - m_{d,l})$$

Where

$m_{d,u}$ is the first month such that $d >$ last business day of $m - 1$

$$m_{d,l} \text{ is the first month such that } d <= \text{last business day of } m$$

734   For each i =5, 7 and for each day d in [a, b] we converted the i-year BVAL curve to an effective term of 10-year using the margin between the 10-year and the i-year annualised RBA series as follows:

$$BVAL_d^{i,10} = BVAL_d^i + RBA_d^{m,10,i}$$

735   For each day d in [a, b] we defined the 10-year BVAL curve to be the 10-year BVAL series. If there were any missing values in the averaging period, we substituted the missing values with the values from the 7-year BVAL curve extrapolated to a 10-year tenor as indicated in the previous step. If there were still missing values in the resulting series we substituted the missing values with the 5-year BVAL curve extrapolated to a 10-year tenor as indicated in the previous step. Remaining missing values were left missing. In formula:

$$BVAL_d \begin{cases} BVAL_d^{10} & if \ BVAL_d^{10} is \ non-missing \\ BVAL_d^{7,10} & if \ BVAL_d^{10} \ is \ missing \ and \ BVAL_d^{7,10} \ is \ non-missing \\ BVAL_d^{5,10} & if \ BVAL_d^{10} \ and \ BVAL_d^{7,10} are \ missing \end{cases}$$

736   For each day d in [a, b] we converted the 10-year BVAL curve into effective annual rates as follows. This is the daily BVAL curve

$$\widehat{BVAL}_d = \left(\left(1 + \frac{BVAL_d}{200} \right)^2 - 1 \right) * 100.$$

27.6 Derivation of the adjusted BVAL estimate

737   The adjusted BVAL estimate is defined as the average of the 10-year BVAL effective annual rate as follows:

$$BVAL^* = \frac{1}{total \ business \ days \ in \ [a,b]} * \sum_{d \ business \ days \ in \ [a,b]} \widehat{BVAL}_d.$$

27.7 Derivation of the on-the-day return on debt allowance

738   The annual on-the-day return on debt for regulatory year y is defined as the weighted average of the adjusted RBA estimate and the adjusted BVAL estimate, where the weights are calculated as the total number of days over which each of the curve could be derived. In formula

$$R_y = (w_{RBA} \cdot RBA^* + w_{BVAL} \cdot BVAL^*)$$

739   Where $w_{RBA} + w_{BVAL} = 1$. For instance if the averaging period covers a period over which the BVAL curve was not published then the on-the-day return on debt will be equal to the adjusted RBA estimate (i.e. $w_{RBA} = 1$). Instead, if both the RBA and BVAL curves are defined than equal weights will be given to the two estimates (i.e. $w_{RBA} = w_{BVAL} = 0.5$. Finally, if the BVAL curve is defined only for $x\%$ of the days in the averaging period then $x\%/(1 + x\%)$ of the weight will be given to the adjusted BVAL estimate and $1 - w_{BVAL}$ to the adjusted RBA estimate.

27.8 Derivation of the trailing average return on debt

740   The trailing average return on debt for regulatory year y is defined as the arithmetic average of the annual on-the-day return on debt for the current year and the annual on-the-day return on debt for the previous 9 years. In formula:

$$k^y = \sum_{i=y}^{y-9} 0.1 * R_i.$$

28   Updating the trailing average return on debt allowance over time

741   The methodology described in Section 27 can be used to estimate the trailing average return on debt for each year y. When a new year of data becomes available it is sufficient to follow these steps:

    a. Derive the on-the-day return on debt R_{y+1} for year $y + 1$ by following the steps described in sub-section 27.3-27.7;

    b. Derive the estimate of the trailing average return on debt as the average of the on-the-day return on debt for year $y + 1, y, \dots, y - 8$ by following the steps described in sub-section 27.8:

$$k^{y+1} = \sum_{i=y+1}^{y-8} 0.1 * R_i.$$

    c. Note that if historical data is revised one would need to update the estimate of the on-the-day return on debt even for the historical years, i.e. revise the estimate for all R_i.

29   Assumptions

742   The guidance from the AER to derive the trailing average return on debt is quite detailed. However, the AER does not explicitly explain how it would treat cases where the BVAL curve is missing for a part of the averaging period.

743   In order to implement the AER's methodology we have estimated the annual on-the-day return on debt for regulatory year y as the weighted average of the adjusted RBA estimate and the adjusted BVAL estimate, where the weights are calculated as the total number of days over which each of the curve could be derived.

744   We have also assumed that the business days are Australian business days (i.e., weekends and public holidays have been excluded).

745   Finally, as the RBA monthly data series had some missing months, we estimated the value of the missing observations by interpolating between the closest non-missing values.

30 Recommendations

746 In our view, proper regulatory transparency requires that a determination should set out clear answers to the following questions:

   a. Does the AER agree that its allowed return on equity includes compensation for the personal taxes and personal costs that apply to dividends and capital gains?

   b. Does the AER consider that its allowed return on equity should also include compensation for any additional personal costs that apply to imputation credits (beyond those which apply to dividends and capital gains)?

      i. If not, why not?

      ii. If so, where in the regulatory model is such compensation accounted for?

   c. If investors reduce the dividends and capital gains that they would otherwise require by the market value of imputation credits (i.e., reflecting any additional personal costs that apply only to imputation credits), and if the AER then applies a different definition of value in the grossing-up step, how should the resulting figure be interpreted? In particular, can total return on equity estimates computed in this way for post-1987 data be averaged with return on equity estimates from pre-1987 data as like with like?

Declaration

747   I confirm that I have *made all the inquiries that* I *believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Court.*

_____

Professor Stephen Gray

Instructions

29 March 2018

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Dear Stephen & Dinesh,

Letter of engagement – Ausgrid – Ausgrid 2019-24 Regulatory Proposal

Ausgrid is currently preparing its 2019-24 Regulatory Proposal to the Australian Energy Regulator (AER). The regulatory proposal will set out, amongst other things, proposed revenue requirements over the 2019-24 regulatory period using the "building blocks" approach set out in the National Electricity Rules (NER). A key input to determining our proposed revenue requirements under the building blocks approach is the required rate of return (this is the weighted average required rates of return on debt and equity funding for a benchmark efficient business).

This letter engages Frontier Economics as economic and financial market experts to advise us on the rate of return incorporated in Ausgrid's 2019-24 Regulatory Proposal.

Scope of engagement

Frontier is engaged by Ausgrid to:

- Provide an expert report within which Frontier will cover the requirements Attachment 1 to this engagement letter.

- Assist Ausgrid develop its rate of return proposal including attending meetings, as well as preparing briefing notes and presentations to Ausgrid management and Board.

Kind Regards,

Simon Camroux
Head of Regulation
Ausgrid

Attachment 1 – Requirements for Expert Report

The National Electricity Objective (NEO) set out in section 7 of the National Electricity Law is:
"The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—

> *(a) price, quality, safety, reliability and security of supply of electricity; and*
> *(b) the reliability, safety and security of the national electricity system."*

Your report should address the following topics in the context of the NEO:

1. Set out the AER's methodology—as specified in the AER's 2013 Rate of Return Guideline (Guideline)—for deriving estimates of the equity beta for Australian energy network businesses;

2. Update the statistical estimates of the equity beta using the AER's methodology using market data that has become available since the publication of the Guideline;

3. Consider the latest evidence on Australian energy network businesses published by the Economic Regulation Authority of Western Australia (ERA), noting that the Guideline had regard to similar evidence published by the ERA in 2013;

4. Consider any adjustments that the AER has made in the past to its statistical estimate of the equity beta to arrive at its final equity beta estimate;

5. Provide an expert opinion on a reasonable, current estimate of the equity beta for Australian energy network businesses;

6. Explain the concept of low-beta bias in the context of the SL-CAPM;

7. Examine the approaches for correcting for low-beta bias;

8. Summarise the evidence about the quantum of low-beta bias;

9. Provide an expert opinion on the reasonableness of the AER's approach to correcting for low-beta bias;

10. Explain where the estimation of the Market Risk Premium (MRP) fits within the AER's regulatory framework;

11. Explain the approach to estimating the MRP that the AER set out in its 2013 Rate of Return Guideline (Guideline) and contrast that approach in the Explanatory Statement with the AER's approach to the MRP in recent decisions;

12. Summarise the evolution of the relevant evidence and empirical estimates since 2013;

13. Explain the implications of applying a constant, or substantially constant, MRP to contemporaneous estimates of the risk-free rate;

14. Provide a reasonable, current estimate of the MRP;

15. Provide an expert opinion on the findings of the Federal Court, in relation to gamma, in the PIAC-Ausgrid appeal proceedings;

16. Provide an expert opinion on the AER's new rationale for its utilisation estimate of theta, as developed in the Tribunal hearings in relation to the Victorian distribution businesses and in the AER's submissions to the Federal Court in relation to the SAPN appeal proceedings;

17. Set out the process for calculating and updating annually the trailing average return on debt allowance, consistent with the approach set out by the AER in the Guideline, assuming that the return on debt transition is complete.

Curriculum Vitae of Professor Stephen Gray

Stephen Gray is Professor of Finance at the University of Queensland Business School and Chairman of Frontier Economics (Australia). He has Honours degrees in Commerce and Law from the University of Queensland and a PhD in financial economics from the Graduate School of Business at Stanford University.

In his university role, he teaches a range of award and executive education courses in financial management, asset valuation, and corporate finance. He has received a number of teaching awards, including a national award for university teaching in the field of business and economics. He has published widely in highly-ranked journals and has received a number of manuscript awards, most notably at the *Journal of Financial Economics.*

Stephen is also an active consultant to industry on issues relating to valuation, cost of capital, and corporate financial strategy. He has acted as a consultant to many of Australia's leading companies, government-owned corporations, and regulatory bodies. His clients include the Independent Pricing and Regulatory Tribunal (IPART), Australian Competition and Consumer Commission (ACCC), Melbourne Water, Qantas, Telstra, Origin Energy, AGL, Foxtel, ENERGEX, Queensland Treasury Corporation, Rio Tinto Alcan and the Australian Securities and Investments Commission (ASIC). Projects include corporate cost of capital reviews, asset valuation, independent valuation of executive stock options, and the assessment of capital structure and financing strategies.

He has also appeared as an independent expert in several court proceedings relating to the valuation of assets and businesses and the quantification of damages.

Key experience

Cost of capital

Energy sector

- **TransGrid (2015) –** Advised the electricity transmission operator in NSW on the appropriateness of the Australian Energy Regulator's (AER's) proposed transitional arrangements before the full introduction of a trailing average approach to setting the cost of debt allowance for regulated networks. The AER recently revised its rate of return methodology. In doing so, the AER announced that it would adopt a trailing average approach to setting cost of debt allowances (similar to the approach used by Ofgem in Great Britain). However, the AER argued that it should phase this approach in to allow businesses sufficient time to align their debt management practices to the new methodology. Frontier prepared a report on behalf of TransGrid explaining

the circumstances in which such transitional arrangements would not be appropriate.

- **Australian Energy Markets Commission (AEMC) (2012)** – The regulator (AER) and a group of large energy users (EURCC) proposed changes to the National Electricity Rules and National Gas Rules (Rules). The AEMC, which is the government agency that is responsible for maintaining the Rules, conducted a year-long review and consultation process in relation to the proposed rule changes. Stephen was appointed to advise the AEMC on rate of return issues. His role involved the provision of advice to the AEMC secretariat and board, the preparation of a number of public reports, the co-ordination and chairing of public hearings, and a series of one-on-one meetings with key stakeholders. The process resulted in material changes being made to the Rules, with revised Rules being published in November 2012.

- **Energy Networks Association (2013)** – The National Electricity Rules and National Gas Rules (Rules) require the regulator to publish a series of regulatory guidelines every three years. The Australian Energy Regulator (AER) conducted a year-long process in 2013 that ended with the publication of its first Rate of Return Guideline. Throughout this process, Stephen advised the Energy Networks Association (ENA) on rate of return issues. This involved working with the ENA's Regulatory Affairs Committee, specialist working groups, and legal advisors, preparing expert reports, drafting submissions, and representing the ENA at stakeholder forums.

- **TransGrid (2013) Return on Debt Analysis** – The 2012 changes to the National Electricity Rules included, inter alia, a provision that permitted the allowed return on debt to be set according to a trailing average approach. TransGrid sought an analysis of the effect that such a change would have on the residual cash flows that were available to its shareholders. Stephen developed a Monte Carlo simulation model that generated many scenarios for the possible future evolution of interest rates, incorporating empirical relationships between government bond yields, credit spreads, and inflation. His analysis quantified the extent to which the trailing average approach would better match the actual cost of servicing debt under TransGrid's longstanding debt management approach, thereby reducing the volatility of the cash flow to equity holders.

- **Aurizon Network (2014) Split Cost of Capital Analysis** – In a discussion paper, the Queensland Competition Authority advocated consideration of a split cost of capital regulatory approach. Under the proposed approach the regulator would allow a standard "debt and equity" regulated return on assets during their construction, but a "100% debt" return once the asset had been included in the firm's regulatory asset base. Stephen was retained by Aurizon

(operator of a regulated coal rail network). His role was to prepare an expert report that considered the economic and financial basis for the proposed approach, and which considered the likely consequences of such an approach. After his presentation to the QCA board, the proposal was shelved indefinitely.

- **Energy Networks (2014-15) Regulatory Reviews –** Stephen has prepared expert reports and submissions on behalf of all businesses that are in the current rounds of regulatory resets. These reports cover the whole range of regulatory cost of capital issues. Clients over the last year include ATCO Gas, DBP, ActewAGL, TransGrid, Jemena, United Energy, CitiPower, Powercor, SA Power Networks, Ausgrid, Essential Energy, Endeavour Energy, ENERGEX, and Ergon Energy.

- **Legal and Appeal Work –** Stephen has assisted a number of regulated business, and their legal teams, through merits review and appeal processes. One example is the 2011 *Gamma* case in the Australian Competition Tribunal. That case involved the "gamma" parameter, which quantifies the impact that dividend imputation tax credits have on the cost of capital. The regulator (AER) proposed an estimate that was based on (a) an assumption that was inconsistent with the observed empirical evidence, and (b) a point estimate that was based partly on a paper with questionable reliability and partly on data that was irrelevant to the task at hand. Stephen's role was to prepare a series of expert reports, to assist the legal team to understand the issues in detail, and to attend the hearings to advise as the matter was heard. The end result was that the Tribunal set aside the entire basis for the AER's proposed estimate and directed us to perform a "state of the art" empirical study. Stephen performed the required study and its results were accepted in full by the Tribunal, who set the estimate of gamma on the basis of it.

Water sector

- **Melbourne Water (2015) –** In preparation for the 2016 Victorian price review, Stephen is part of the Frontier team currently advising Melbourne Water on ways in which the rate of return methodology used by the Victorian regulator, the Essential Services Commission (ESC), could be improved, and the likely revenue impact of any methodological changes. At the last (i.e. 2013) price reset, the ESC indicated that it intended to review its rate of return methodology but to date has not done so. By comparison, most other major Australian regulators have revised their methodologies significantly, in part due to recognition of the need to make their estimation approaches more resilient to the effects of global financial crises. A comparison of the methodologies used by different regulators in Australia suggests that the ESC's methodology is out of line with best regulatory practice. Frontier's advice has focused on

Curriculum Vitae of Professor Stephen Gray

identifying the areas for improvement, and the development of the economic arguments that would support the case for change.

- **Unity Water, SEQ Water, Gladstone Area Water Board (2013-14) –** Stephen has prepared a series of reports for a number of Queensland water utilities. These reports include (a) a response to the QCA's (Queensland regulator) proposed split cost of capital approach (which has now been shelved indefinitely), and (b) a response to the QCA's proposed cost of capital estimates.

Telecommunications sector

- **NBN Co (2012-13) –** Stephen advised NBN Co on a range of cost of capital issues in relation to their proposed special access undertaking. This work included the drafting of expert reports, meetings with and presentations to various NBN Co committees and working groups, and representing NBN Co in discussions with the regulator (ACCC). Key issues included the length of the proposed access arrangement, the extent to which higher risk during the construction and proof-of-concept phases justified a higher allowed return, and the process by which early year losses might be capitalized into the regulatory asset base.

- **C7 Case (2006-07), Federal Court of Australia**

  The Seven Network brought an action against a number of Australian media and entertainment firms in relation to the abandonment of its cable TV business, C7. Seven alleged that the respondents colluded to prevent C7 from securing the rights to broadcast AFL and NRL matches and that this prevented its C7 business from being economically viable.

  Stephen was retained by a group of respondents including PBL, Telstra, and News Corporation. His role was to address various matters relating the quantification of damages. He prepared several reports, was involved in several discussions with other valuation expert witnesses, and was cross examined in the Federal Court.

  The Court found in favour of the respondents.

Transport sector

- **CBH Group (2015) –** Stephen was part of the Frontier team that developed, on behalf of CBH (a major Australian grain producer and access seeker to rail infrastructure in Western Australia) and its legal counsel, a submission to the Economic Regulation Authority (ERA) of Western Australia on the regulator's approach to estimating WACC. The submission focused on, amongst other issues, the ERA's approach to estimating the market risk

premium, the estimation approach to beta, and the way in which the WACC ought to be used within the negotiate-arbitrate arrangements within the rail access regime.

- **Brockman Mining Australia (2015) –** Stephen was part of the Frontier team that advised Brockman, a potential access seeker to rail infrastructure in Western Australia, on its submission to the Economic Regulation Authority (ERA) of Western Australia in relation to the ERA's approach to WACC under the Railways (Access) Code 2000. Subsequently, the ERA released a Revised Draft Decision on its proposed WACC methodology. Frontier was engaged again by Brockman to help develop its submission to the ERA on the Revised Draft Decision. The submissions focused on the appropriateness of the beta estimates proposed by the ERA, the methodology used to estimate the market risk premium (and consistency between the methodologies used by the ERA in different sectors), the appropriateness of the ERA's credit rating assumption for the benchmark efficient entity (which affects the cost of debt allowance under the ERA's methodology).

- **Brookfield Rail (2014) –** The WA Railways (Access) Code requires railway operators to provide certain information to access seekers to enable them to compute "floor" and "ceiling" prices as defined in the Code. Brookfield provided access seekers with certain information and other relevant information was available from public sources. Stephen prepared an expert report that considered whether the information available to an access seeker, together with specialist assistance from relevant experts, would be sufficient to compute floor and ceiling prices.

- **Brisbane Airport Corporation (2013-14) –** Stephen was engaged by Brisbane Airport Corporation (BAC) to advise on a range of regulatory and cost of capital issues in relation to the development of the airport's new parallel runway (NPR). BAC identified the need for an additional runway to accommodate steadily increasing demand. The development of a new runway required a large capital commitment ($1.5 billion) and would take approximately eight years to complete. BAC proposed that the airlines would contribute to the financing of the NPR during construction – the alternative being the capitalisation of a return on capital expenditure until completion and a sharp spike in landing fees when the NPR become operational. One of the key issues in the negotiations with airlines was the WACC that would be used to determine the return on capital. Stephen's role was twofold. He produced an expert report providing a strong basis for BAC's proposed WACC. He also advised BAC on the likely approach of the ACCC (the regulator in question) should they become involved – the regulatory arrangements provide for the parties to negotiate a commercial outcome and for the regulator to become involved if they are unable to do so. BAC was successful in their

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negotiations with the relevant airlines and the NPR is now under construction.

- **Abbott Point Coal Terminal (2014) –** Stephen was engaged by a consortium of mining companies in relation to arbitration with Adani, the owner and operator of the Abbott Point Coal Terminal. The parties had in place a user agreement that was similar to a regulatory-style building block model. Stephen advised on a range of cost of capital and other issues including detailed reports on the cost of debt and the level of corporate costs.

Financial litigation support

- **APLNG (2014-15)**

  The Australia-Pacific LNG (APLNG) project is a joint venture between Origin Energy, ConocoPhillips and Sinopec that involves the extraction of coal seam methane and processing into liquefied natural gas (LNG) for export. The relevant Queensland royalties legislation provides that a 10% royalty is to be levied on the value of the gas at the first point of disposal. Since the project is integrated from end-to-end, there is no arm's length price at the relevant point. Stephen was retained by APLNG to prepare an expert report on the process for determining what the arm's length price at the first point of disposal would be if such a thing existed. This involves estimating the costs, including a fair return on capital, for a hypothetical upstream gas producer and a hypothetical downstream LNG operator, and allocating any excess profit between the parties.

- **CDO Case (2013)**

  This case involved a class action against the Australian distributor of collateralised debt obligations (CDOs) and the international credit ratings agency that assigned credit ratings to them. The CDOs in question were financial products with a payoff that depended on the number of defaults (or "credit events") among a reference set of 150 different corporate bonds issued by companies in different industries and different geographical locations. A typical CDO structure would involve the investor being repaid all of their initial investment plus an attractive rate of interest so long as there were less than say 7 defaults out of the reference set of 150 bonds during the five-year life of the CDO. However, if there were say 11 or more defaults, the investor would lose their entire investment. If the number of defaults was between 7 and 11, the return to the investor would be proportional (e.g., 8 defaults would involve a 25% loss of principal).

  The CDOs in question were created by US investment banks and were distributed in Australia by a large Australian commercial bank. One of the key issues in the case was whether the Australian distributor made proper

disclosures about risk to investors, which included individuals, self-managed superannuation funds, and local councils. The CDOs in question were assigned strong investment grade credit ratings by an international ratings agency. The process used to assign those ratings did not properly take into account the correlation between defaults – the empirical fact that during recessions and financial crises many bonds default at the same time.

Stephen's role was to prepare an expert report that explained to the Court how CDOs were structured, how they operated, and what risks were involved. His report also examined the risk disclosures that were contained in the materials that were provided to potential investors and the process by which the credit rating agency assigned ratings.

- **Wright Prospecting litigation (2012-14)**
  Wright Prospecting Pty Ltd (WPPL) is involved in several legal disputes about the payment of royalty streams in relation to iron ore and coal mining operations. WPPL had assigned various rights and licenses in relation to iron ore mines in WA and coal mines in Queensland to other parties, in return for royalties on the revenues received from the sale of the ore. Stephen's role was to prepare a series of expert reports quantifying the present value of the royalty streams.

- **Public Trustee of QLD v. Octaviar Ltd (2009), Supreme Court of Queensland**
  The Octaviar Group (formerly the MFS Group) is a Gold Coast based group of listed companies with funds management and leisure services businesses. Octaviar was unable to refinance a loan in early 2008 and sought to raise equity via a rights issue as part of a substantial corporate restructure. The stock price fell some 70% on this announcement and Octaviar subsequently sold a 65% interest in its leisure business known as Stella. Octaviar then sought to make arrangements with its creditors, including the Public Trustee, as trustee for note holders.

  Stephen was retained by the Public Trustee. His role was to prepare several reports on (a) whether the companies in the Octaviar Group were insolvent, (b) the date the companies became insolvent, and (c) whether the note holders would be made better or worse off by the proposed arrangement, relative to a liquidation. He was cross examined by four parties with an interest in these proceedings on issues relating to the date of the insolvency.

- **Telstra v. ACCC (2008), Federal Court of Australia**
  Telstra brought an action against the ACCC in relation to access charges that Telstra was allowed to charge its retail competitors for access to its fixed line and broadband networks – arguing that the return on capital allowed by the ACCC was unreasonably low.

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Stephen was retained by Telstra. His role was to prepare several reports on the issue of whether the ACCC has been inconsistent in its application of valuation methods – in a way that reduced Telstra's allowed return. He was also involved in several discussions with other valuation expert witnesses, prepared a joint statement of experts, and was cross examined in the Federal Court individually and in a "hot tub" setting.

- **Alcan Northern Territory Alumina Pty Ltd v. Commissioner of Taxes (2006-07), Supreme Court of Northern Territory**
  First Engagement: Consulting Expert

Alcan bought out the equity of its joint venture partner in a combined bauxite mine and alumina refinery in the Northern Territory. The NT Revenue Authority claimed that the transaction was caught by the NT "land rich" provision, under which the transaction would be subject to stamp duty if more than 60% of the consideration was attributable to land assets.

The key economic issue is the apportionment of value between the mine (predominately land assets) and the refinery (substantially intangible assets arising out of intellectual property and expertise).

Stephen was retained by Alcan as consulting experts. Their role was to prepare a range of financial models and analysis to support the view that a substantial portion of the value of the transaction was attributable to non-land assets in the refinery. This involved complex financial modelling and market analysis. A full integrated model was produced, allowing users to select whether they preferred the appellant's or respondent's submission on each input parameter, and automatically re-calculating the land-rich ratio.

Stephen worked closely with Alcan's legal team, Counsel, and various independent experts. Stephen assisted the legal team during the trial and in preparing sections of final submissions.

Second Engagement: Independent Expert

The initial judgment contained findings about certain matters and was sent back to the Commissioner for re-assessment. A dispute arose between the parties about the effect of the judgment. In particular, the value of a primary 10-year lease had to be disaggregated from the value of an option to continue the project.

Stephen was retained by Alcan to produce an expert valuation report that addressed the matters in dispute. Two expert reports were prepared and Stephen was cross-examined on this material. Stephen prepared an easy to use spreadsheet calculator to assist the Court in testing how different input assumptions (where the experts could not agree) affected the bottom line. This was used by His Honour as an *aide memoire* and was considered to be

particularly helpful in the case in terms of simplifying the effects of a number of complex matters.

Judgment was in favour of Alcan. Stephen's evidence was accepted and endorsed by the Court.

Career: Professional

2014-Present	Chair, Frontier Economics
1997-2014	Director, SFG Consulting

Career: Academic

2000 - Present	Professor of Finance, UQ Business School, University of Queensland
1997-1999	Associate Professor of Finance, UQ Business School, University of Queensland
1997-2001	Research Associate Professor of Finance, Fuqua School of Business, Duke University
1995-1997	Assistant Professor of Finance, Fuqua School of Business, Duke University

Education

1987	Bachelor of Commerce (Hons), University of Queensland
1989	Bachelor of Laws (Hons), University of Queensland
1995	PhD, Stanford University

Papers and publications: Cost of capital

- Gray, S. and J. Nowland, 2015, "The Diversity of Expertise on Corporate Boards in Australia," *Accounting and Finance*, forthcoming.

- Darat, A., S. Gray, J. C. Park and S. Wu, (2014), "Corporate governance and bankruptcy risk" *Journal of Accounting, Auditing and Finance,* forthcoming.

- Gray, S., I. Harymawan and J. Nowland, (2014), "Political and government connections on corporate boards in Australia: Good for business?" *Australian Journal of Management,* forthcoming.

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- Gray, S. (1996), "Modeling the Conditional Distribution of Interest Rates as a Regime- Switching Process," *Journal of Financial Economics*, 42, 27-62.

- Gray, S. (1996), "Regime-Switching in Australian Interest Rates," *Accounting and Finance*, 36(1), 65-88.

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