Updated rate of return parameter estimates

REPORT PREPARED FOR APA GROUP

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Contents

1 Executive summary

1 Frontier Economics has been retained by APA Group to provide our views on the approach to estimating the equity beta and market risk premium for use in the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM).

1.1 Equity beta

Overview

2 We begin by summarising the approach that the Australian Energy Regulator (AER) takes to estimating the equity beta – starting with a statistical estimate obtained from regression analysis applied to a small set of domestic comparators and then applying uplifts or corrections for various considerations.

3 We then note that the evidence from data since the AER's 2013 Rate of Return Guideline is that the starting point statistical estimate has risen over recent years. In this regard, we report evidence and conclusions from the Economic Regulation Authority of Western Australia (ERA) and present our own analysis.

4 Finally, we examine other domestic infrastructure firms that are comparable to energy network businesses in that they hold long-lived infrastructure assets that produce relatively stable cash flows over time. We find that the equity beta estimates for this expanded set of firms are above the AER's current equity beta allowance of 0.7.

5 Our conclusion is that the more recent evidence from the AER's set of domestic comparators and from an expanded set of infrastructure comparators all points towards an increase in estimates since the AER's 2013 Rate of Return Guideline. This leads us to conclude that the Guideline approach to estimating beta, when applied to the updated evidence, must produce a current estimate of at least 0.7.

The AER's approach

6 In its Rate of Return 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. Four such companies remain in existence: APA Group, Ausnet Services, DUET and Spark Infrastructure.

7 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":

    i. "International estimates"[3] – 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. "Considerations of the Black CAPM"[4] – 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"[5] – the fact that instability in equity beta allowances may cause investors to increase their assessment of regulatory risk.

8   Thus, the AER's approach is to begin with its "best empirical estimate" of 0.5 from domestic comparators, and then apply an uplift to 0.7 on the basis of a number of other considerations.

9   Approximately three years have elapsed since the analysis that was performed at the time of the AER's Guideline, providing approximately 150 more recent weekly returns observations. This report demonstrates that the more recent evidence results in an increase in the statistical beta estimates.

Recent analysis by the ERA

10   The Economic Regulation Authority of Western Australia 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.

11   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 2013 Guidelines.

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

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[2] Ausgrid Final Decision, Attachment 3, p. 3-129.

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

[4] JEN Final Decision, Attachment 3, p. 64.

[5] JEN Final Decision, Attachment 3, p. 64.

> …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.[6]

13   Unlike the AER, the ERA does not apply any uplift in relation to 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 uplift, such as that applied by the AER, would result in a higher estimate.

Recent empirical evidence

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

   a.   Equity beta estimates for 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 unregulated infrastructure firms that operate in workably competitive markets are also higher than the than the 0.5 "best statistical estimate" at the time of the Guideline.

15   Consequently, we conclude that application of the AER's Guideline approach (i.e., begin with a best empirical estimate and apply an uplift 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. If the starting point equity beta estimate is higher and the same type of uplift is applied for the same reasons, the final beta allowance must be at least 0.7.

1.2   Market risk premium

16   In our view, the evidence set out above supports the notion that the MRP has increased materially since the AER's 2013 Rate of Return Guideline. In its Guideline, the AER set out the sort of evidence that it would consider when

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

estimating the MRP. We show that the preponderance of that evidence supports the conclusion that the MRP has risen materially since the Guideline.

17   In selecting a point estimate, we have adopted the approach that the AER employed in its Rate of Return Guideline:

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."[7]

18   This produces a current estimate of at least 7.0%. 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.   The AER's Wright estimates have increased since 2013 and are currently above 7.0%;

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

e.   The Fernandez survey estimates have increased since 2013 and are currently above 7.0%; and

f.   Independent expert estimates are currently above 7.0%.

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

1　Equity beta: Background and context

1.1　The role of equity beta

19　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).[8] 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:

    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.　$(r_m - r_f)$ 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

    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.

1.2　The estimation of equity beta

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

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[8] 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.

21   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:

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

22   This OLS estimation technique was employed by Henry (2014) in a report commissioned by the AER.[9] 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 CAPM definition of beta in Paragraph 20 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.[10]

1.3   Comparator firms and re-levered equity beta estimates

23   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.

24   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.

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[9] 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

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

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.

25   In this report, we follow the standard approach of considering both of these techniques for reducing sampling error.[11]

26   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.

27   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.

28   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.

29   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.

30   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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[11] For example, these two approaches were adopted by Henry (2014).

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 report.

1.4 The AER approach to beta

31 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.

32 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.[12]

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

34 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:

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[12] 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.[13]

35   The AER has rejected 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. As discussed in section D.2.2, we do not consider individual firm estimates in isolation as it is difficult to select an equity beta estimate from a particular comparator firm over a different estimate from another. Therefore, taking an average over all comparator firms is more likely to be reflective of the benchmark efficient entity. Considering equity beta estimates from various portfolios of comparator firms is also more likely to be reflective of the benchmark efficient entity because it combines the returns of various comparator firms.
>
> Therefore, we base our equity beta range for the benchmark efficient entity on averages of individual firm estimates and fixed weight portfolio estimates…these estimates show a consistent pattern of support for an empirical equity beta range of 0.4 to 0.7.[14]

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

37   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.[15]

38   However, the AER also notes that:

> …there are additional considerations that inform our determination of the equity beta point estimate from within the range.[16]

39   In its recent decisions, the AER has maintained its beta allowance at 0.7.[17] The uplift from 0.5 to 0.7 is said to be based on three considerations:

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

[14] Ausgrid Final Decision, Attachment 3, p. 3-430.

[15] Ausgrid Final Decision, Attachment 3, p. 3-129.

[16] Ausgrid Final Decision, Attachment 3, p. 3-129.

[17] JEN Final Decision, Attachment 3, p. 64.

a. "International estimates" [18] – 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" [19] – 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" [20] – 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.

40   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.

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[18] JEN Final Decision, Attachment 3, p. 64.

[19] JEN Final Decision, Attachment 3, p. 64.

[20] JEN Final Decision, Attachment 3, p. 64.

2 The ERA's recent updated beta estimates

2.1 A current best statistical estimate of 0.7

41   In its recent Final Decision for DBP, 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.[21]

42   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.[22]

43   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 apply any uplift in relation to 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 uplift, such as that applied by the AER, would result in a higher estimate.

2.2 The ERA's estimation methodology

Currently existing comparators

44   The ERA's approach to estimating beta is to focus on the four remaining domestic comparators: APA Group, Ausnet Services, DUET and Spark Infrastructure. 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

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

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

to provide an estimate of beta that is commensurate with the prevailing conditions in the market for equity funds.

Portfolio estimates

45   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.[23] Our approach is to consider average and portfolio estimates.

Range of regression approaches

46   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.[24] 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.

Use of five years of data

47   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 (ten-year) periods.

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

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

3 Current equity beta estimates

48   This section sets out recent beta estimates for:

   a. The remaining four domestic regulated utility comparator firms, APA Group, Ausnet Services, DUET and Spark Infrastructure; and

   b. A broader set of firms that have investments in long-lived infrastructure assets.

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

3.1 Data Source

50   We have obtained weekly and monthly total returns for each stock and the broad market index[25] 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.

3.2 Methodology

3.2.1 Regression analysis

51   All of the beta estimates reported below are estimated by OLS as set out in Section 1.2 above:

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

52   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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[25] ASX 200 Total Return Index.

3.2.2 Equally weighted portfolio construction

53   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.

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

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

55   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.

56   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:

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

3.2.3 Value weighted portfolio construction

57   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:

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

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

58   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:

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

3.3   Current beta estimates for domestic utilities

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

3.3.1   Beta estimates over the past five years

60   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 5-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.

61   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. The mean estimate over the four firms is 0.67, and if DUET is excluded the mean rises to 0.79.

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.

Figure 1: 95% confidence intervals for weekly beta estimates over the last 5 years
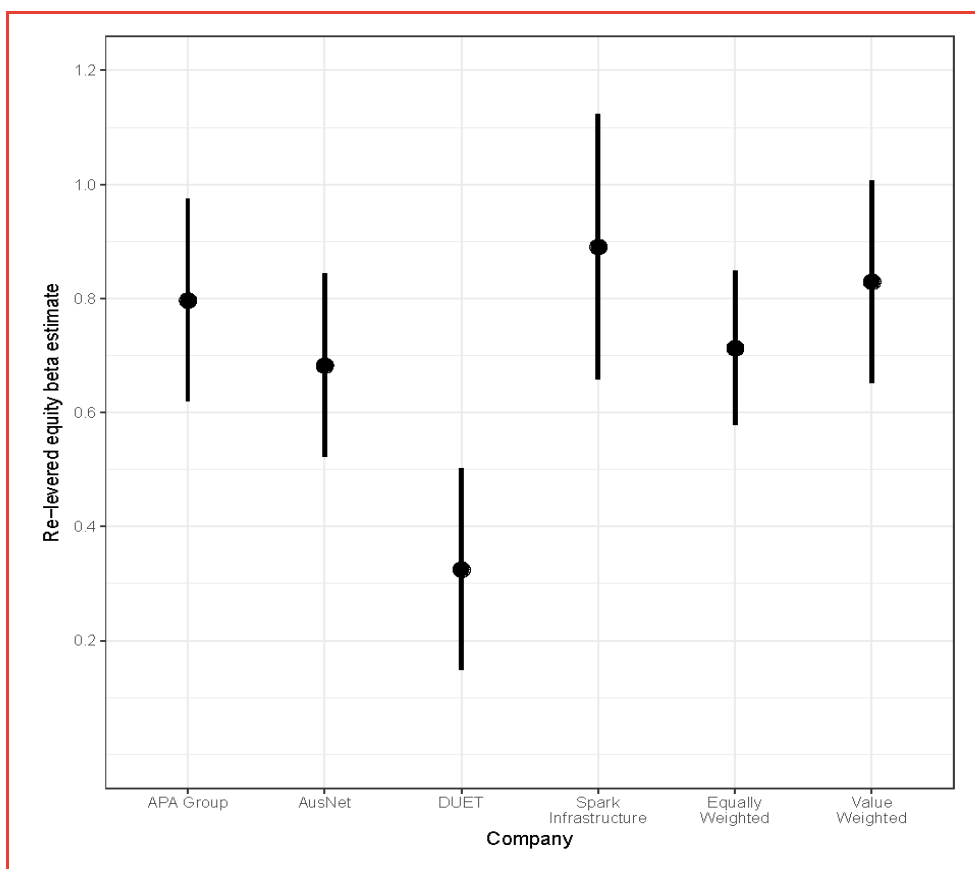
Source: Frontier Economics

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.

3.3.2 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 September 2006 to September 2016. The results are set out in Table 2.

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 May2017.

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 5-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.

3.3.3 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
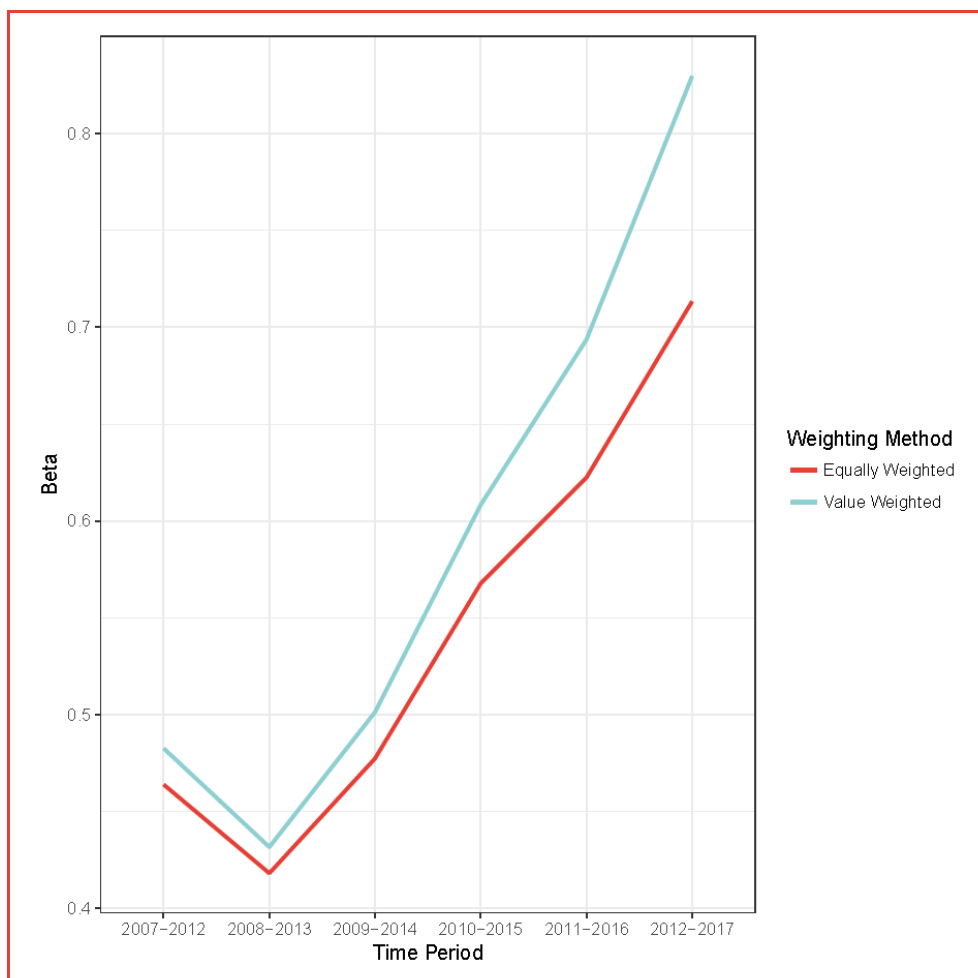
Source: Datastream, Frontier Economics calculations.

67   Figure 3 shows the 95% confidence interval around the rolling 5-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.

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
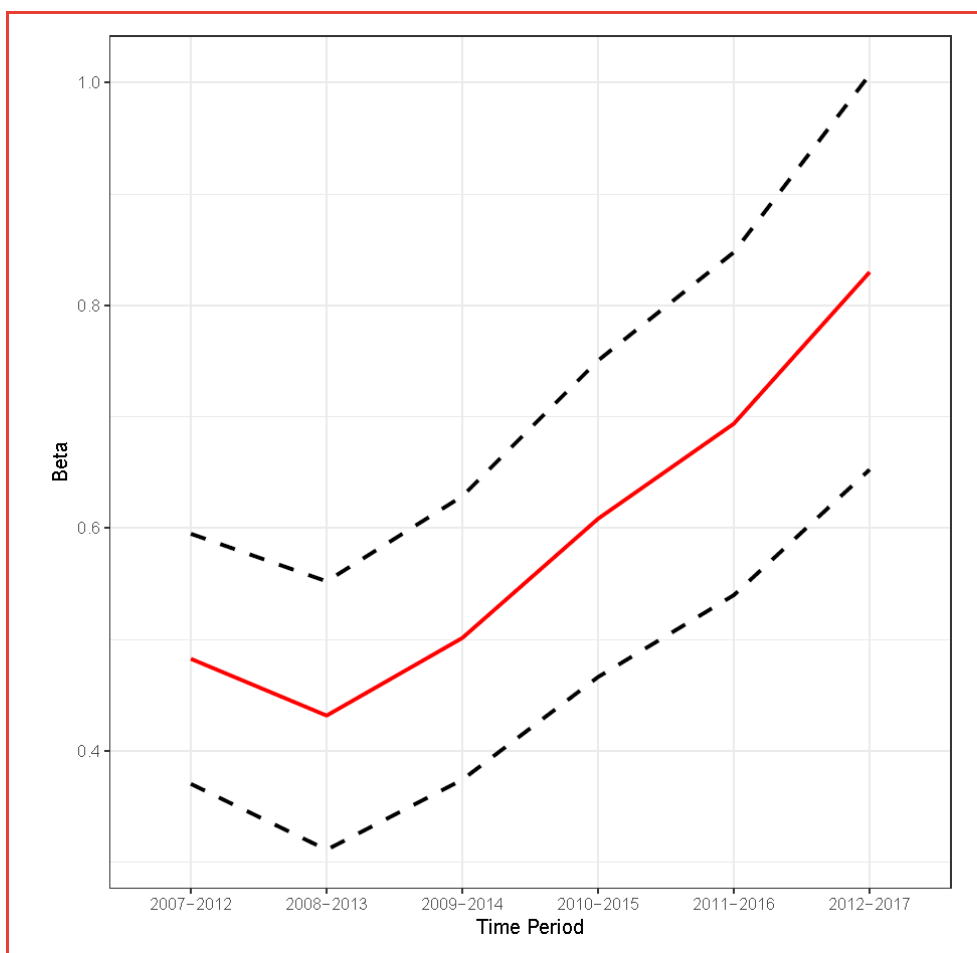
Source: Datastream, Frontier Economics calculations.

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 2013 Rate of Return Guideline.

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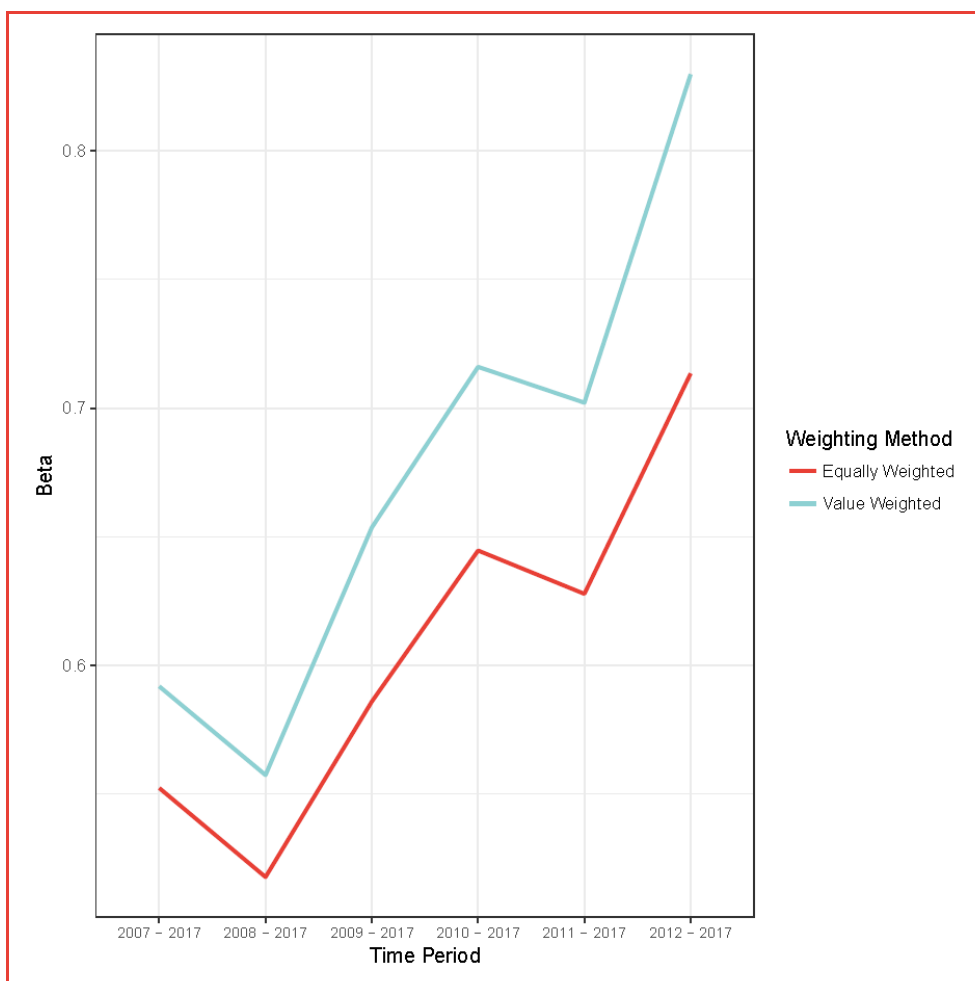
Source: Datastream, Frontier Economics calculations.

3.3.4 Conclusions in relation to domestic energy network comparators

71   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.

3.3.5 Beta estimation of transport utilities

72   In its February 2016 *Ausgrid* decision, the Australian Competition Tribunal considered the definition of the benchmark efficient entity (BEE) and concluded that the BEE should be considered to be a hypothetical unregulated competitor:

> The BEE, in the view of the Tribunal, is likely to refer to the hypothetical efficient competitor in a competitive market for those services. Such a BEE is not a regulated competitor, because the regulation is imposed as a proxy for the hypothetical

unregulated competitor. Otherwise, the starting point would be a regulated competitor in a hypothetically regulated market. That would not be consistent with the policy underlying the purpose of the NEL and the NGL in relation to the fixing of terms on which monopoly providers may operate. [26]

73   In reaching this conclusion, the Tribunal cited a determination of the Australian Energy Markets Commission (AEMC) which set out the objective of regulation as being:

> …to reproduce, to the extent possible, the production and pricing outcomes that would occur in a workably competitive market in circumstances where the development of a competitive market is not economically feasible.[27]

74   Consequently, we examine the beta estimates of a set of firms that are comparable to an energy distribution business, but which operate in workably competitive markets. 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.   Listed on the ASX.

75   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 set out in the appendix to this report.

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

77   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.

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[26] *Ausgrid*, Paragraph 914.

[27] Ausgrid, Paragraph 80.

78   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.

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.

79   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.

80   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.

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.

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

82   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.

4 Market risk premium: Current estimate

4.1 Instructions

83   In previous submissions, we have proposed that the MRP should be estimated by:

   a.   Setting out all of the relevant evidence;

   b.   Specifying the relative weight to be applied to each piece of evidence; and

   c.   Explaining the reasons why different weight was applied to different pieces of evidence.

84   We remain of the view that this is the only way of showing how the MRP allowance was derived with the appropriate degree of transparency.

85   In this report, we have been asked to follow and update the approach set out in the AER's Guideline insofar as the approach in the Guideline was to:

   a.   First form a combined range based on:

      i.   The AER's estimates of the mean historical excess return over various historical periods; and

      ii.   The AER's DGM estimates of the MRP; and

   b.   To then select a point estimate that "lies between the historical average range and the range of estimates produced by the DGM."[28]

86   Specifically, we have been asked 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 as per the approach adopted in the Guideline; and

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

4.2 Historical excess returns approach

87   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 0.25. We do not make the NERA correction for dividend yields

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

– again to maintain consistency with the approach set out in the AER's Rate of Return Guideline. The relevant estimates are set out in Table 5 below.

Table 5: Updated estimates of the MRP from the AER's DGM 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.

88   In our view, these estimates support a range of 6.0% to 6.5%. 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.

4.3   DGM approach

89   We have applied the DGM approach, as set out in the AER's Rate of Return Guideline, using data through to the end of July 2017. The relevant estimates are set out in Table 6 below.

Table 6: Contemporaneous estimates of the MRP from the AER's DGM approach

| Growth rate (% p.a.)	Two-stage model MRP (% p.a.)	Three-stage model MRP (% 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.

4.4   The combined range

90   The combined range, based on updated data as at July 2017, is set out in Figure 5 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.

Figure 5: Current MRP range – AER Guideline approach
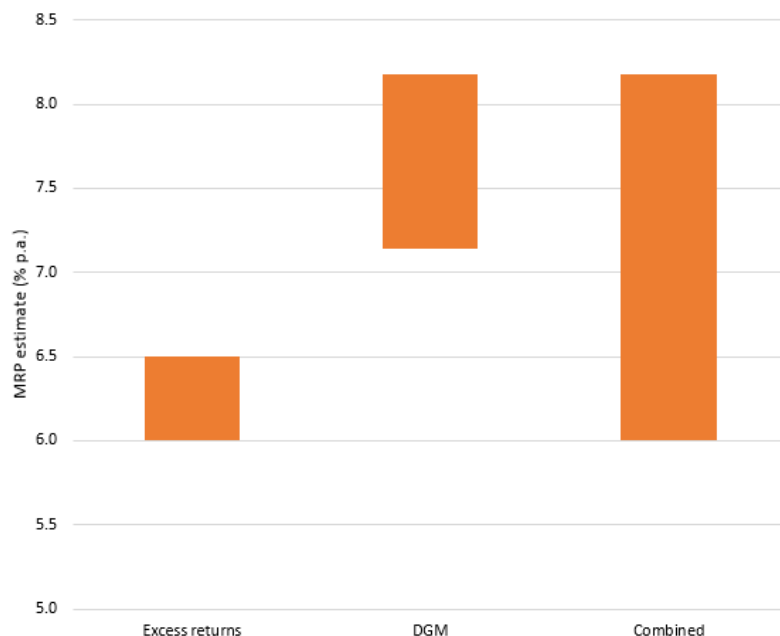
Source: Frontier Economics calculations based on estimates set out in Table 5 and Table 6 above.

4.5 The selection of a point estimate from within the range

91   The second step of the AER's Guideline approach is to select a point estimate from within the combined range. In this regard, we note that the AER's Guideline approach is to select a point estimate where:

> 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.[29]

92   In its Guideline, the AER adopted a point estimate MRP of 6.5%. The following factors appear to be relevant to the selection of that figure:

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

a. The AER's historical excess returns mid-point estimate is 6.0%[30] and its mid-point three-stage DGM estimate is 7.1%.[31] The mid-point of these two estimates is 6.55%;

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%[32] to 7.5%, with a mid-point of 6.6%.

93   In summary, the approach to the MRP that is set out in the AER's Rate of Return 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"[33] and is given only "some"[34] or "limited"[35] consideration.

94   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%.

95   We also note that, since the 2013 Rate of Return Guideline, the AER's excess returns estimates have increased somewhat and its DGM estimates have increased substantially. Figure 6 below shows the increase in the estimates from each of the

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

[31] 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.

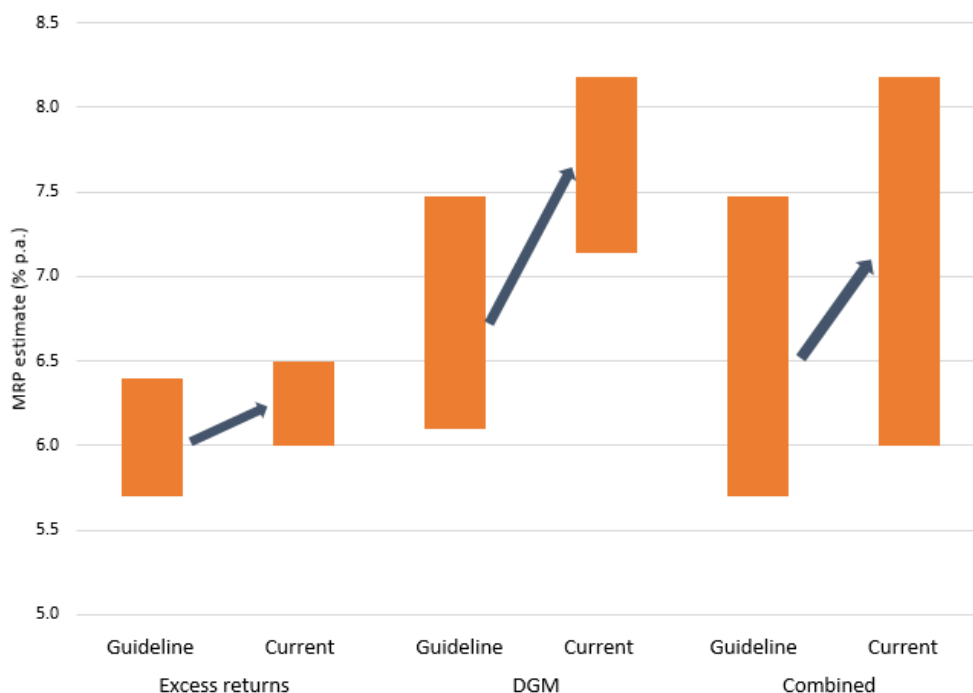[32] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 93.

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

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

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

two main approaches set out in the AER's Rate of Return 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 2013 Rate of Return Guideline.

Figure 6: 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 5 and Table 6 above.

96   In our view, the evidence set out above suggests that the application of the AER's 2013 Guideline approach to the current evidence supports an MRP estimate of at least 7.0%. Certainly, this evidence, if applied in accordance with the AER's Guideline, no longer supports an estimate of 6.5%.

4.6   Other relevant evidence

97   In its 2013 Rate of Return Guideline, the AER indicated that it considered other evidence to be "less informative"[36] and that it would be given only "some"[37] or "limited"[38] consideration. In this section, we consider how that other evidence has moved since the 2013 Guideline.

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

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

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

4.6.1 Other regulators' decisions

98   We note that those regulators who seek to obtain an estimate of the MRP that is commensurate with the prevailing conditions in the market are currently adopting higher estimates:

    a. The ERA adopted MRP estimates of 7.6% and 7.4% in its recent ATCO Gas and DBP decisions;

    b. IPART has adopted an MRP estimate of 7.3%, which it applies to a risk-free rate set 120 basis points above the contemporaneous yield in its most recent update – an effective MRP of 8.5%;

    c. Ofgem has recently adopted an effective MRP of 7.1%; and

    d. FERC has recently adopted an effective MRP estimate of 8.3%.

4.6.2 Survey evidence

99   In its 2013 Rate of Return Guideline materials, the AER noted that:

> McKenzie and Partington place significant weight on survey evidence[39]

and that:

> Lally also supported the use of survey evidence and suggested the recent Fernandez survey is the most relevant survey evidence. [40]

100   The AER then cited five versions of the Fernandez surveys in its Table D.5.[41]

101   An updated Fernandez survey was released in April 2017.[42] This new survey is clearly the most timely of the available surveys.

102   The Fernandez (2017) survey reports that:

    a. **The median MRP for Australia has increased to 7.6%** and the mean is 7.3%;[43]

    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.[44] Of the 10 countries for which the

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

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

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

[42] 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.

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

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

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.[45] Since the AER's approach is to estimate the risk-free rate as the 10-year government bond yield 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 would certainly be quite unreasonable to suggest 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).

103   The AER has stated that it relies on surveys mainly as a source of directional evidence. In this regard, we note that the Fernandez survey on which the AER placed primary regard in its 2013 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 2013 Guideline, as shown in Figure 7 below.

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

Figure 7: 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.

4.6.3 Updated independent expert report evidence

104   We note that the set of independent expert reports previously submitted to the AER has become more dated and less timely with the passage of time. Consequently, we have conducted a search for independent expert valuation reports that were released since 2016 and which pertained to transactions in excess of $100 million. Since independent experts generally apply consistent approaches over time, we consider only one report per expert firm. This process produced four recent independent expert reports, as set out in Table 7 below.

Table 7: Recent independent expert valuation reports

Company name	Independent expert	Report date	Transaction value ($ millions)
Ethane Pipeline Income Fund	Lonergan Edwards[46]	31/03/2016	122
Pacific Brands Ltd	Grant Samuel[47]	20/05/2016	1,055
Patties Foods Ltd	Deloitte[48]	15/07/2016	197
STW Communications Group Ltd	KPMG[49]	29/02/2016	338

Source: Connect 4.

105   All four experts set the required return on equity materially above the figure that would be obtained from inserting the current government bond yield and a 6.5% MRP into the SL-CAPM formula. The independent expert reports achieve the higher estimates of the required return on equity in three different ways:

      a.   By using an estimate of the MRP higher than 6.5%;

      b.   By using a risk-free rate above the contemporaneous government bond yield; and

      c.   By applying an ad hoc increase to the mechanistic CAPM estimate.

106   For example, Grant Samuel begins with a mechanistic CAPM estimate of the required return on equity using the contemporaneous government bond yield and a MRP based on historical excess returns, concludes that the outcome is implausible in the prevailing market conditions, and makes a material upward adjustment.

107   Lonergan Edwards state:

> In our view, the application of the current (very low) government bond yields and long-term average MRP is inappropriate in the context of determining required equity rates of return (discount rates). Theoretically, the anomalous currently low government bond interest rates could be allowed for by increasing the MRP. However, as it is difficult to reliably measure short-term movements in the MRP, we have instead increased the risk-free rate for the purposes of estimating required rates of return.[50]

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[46] Lonergan Edwards, 2016, Independent Expert Report on Ethan Pipeline Income Fund, April.

[47] Grant Samuel, 2016, Independent Expert Report on Pacific Brands Ltd, May.

[48] Deloitte, 2016, Independent Expert Report on Patties Foods Ltd, July.

[49] KPMG, 2016, Independent Expert Report on STW Communications Group Ltd, March.

[50] Lonergan Edwards, 2016, p. 47.

108   KPMG also use a risk-free rate that is higher than the contemporaneous government bond yield. They specifically note that the MRP and risk-free rate must be considered jointly and not in isolation:

> …the individual variables should not be considered in isolation but rather be viewed as components appropriate for the construction of a discount rate as a whole…Consideration of these components in isolation may result in an inappropriate discount rate being determined.[51]

109   For this reason, we consider the sum of the risk-free rate and MRP and define that to be the "required market return." We then subtract the contemporaneous government bond yield to obtain an estimate of the "effective MRP." These calculations are set out in Table 8 below.[52]

Table 8: 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.

110   The evidence in Table 8 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. In our view it would be inconsistent and wrong to consider the quoted MRP estimates from the independent experts and to ignore the fact that, when implementing the CAPM, those estimates are being paired with a risk-free rate that is materially higher than the risk-free rate used by the AER.

111   Moreover, the MRP figures set out in Table 8 are ex-imputation estimates. Consequently, before they 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.

112   On the issue of imputation credits, Lonergan Edwards specifically states that its WACC parameter estimates have been derived:

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[51] KPMG, 2016, p. 85.

[52] 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.

…without adjustment for imputation.[53]

and Grant Samuel conclude that:

> 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.[54]

113   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.

114   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.

4.6.4 Wright estimates

115   Under its Guideline approach, the AER does not use the Wright approach to directly inform its estimate of the MRP. Rather, the AER inserts its estimate of the Wright MRP, and then its proposed allowed MRP, into the CAPM formula and then compares the two outputs. If the AER was then concerned about differences between the two outputs, it would presumably be led to reconsider its proposed allowed MRP. For this reason, we report current estimates of the MRP using the Wright approach in Table 9 below.

Table 9: 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.

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

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

116   Figure 8 below shows that the Wright estimates of the MRP have also materially increased since the AER's 2013 Guideline.

Figure 8: Comparison of Wright estimates of the MRP: 2013 Guideline vs. current
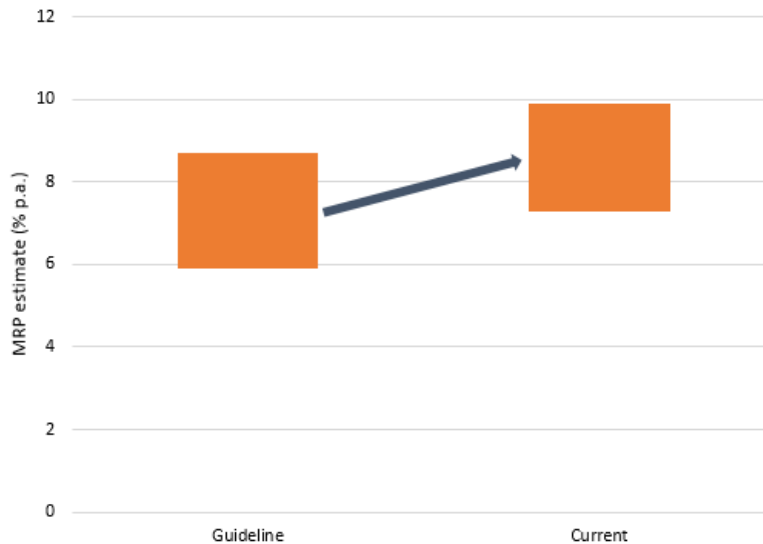
Source: AER Wright estimates, updated to end 2016 by Frontier Economics.

4.7   Conclusions in relation to MRP

117   In our view, the evidence set out above supports the notion that the MRP has increased materially since the AER's 2013 Rate of Return Guideline. In its Guideline, the AER set out the sort of evidence that it would consider when estimating the MRP. As set out above, the preponderance of that evidence supports the conclusion that the MRP has risen materially since the Guideline.

118   In selecting a point estimate, we have adopted the approach that the AER employed in its Rate of Return Guideline:

> 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."[55]

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

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

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

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

    e. The Fernandez survey estimates have increased since 2013 and are currently above 7.0%; and

    f. Independent expert estimates are currently above 7.0%.

5 Appendix

121 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.

5.1.1 Auckland International Airport Limited (AIA)

122 Auckland International Airport Limited provides airport facilities and supporting infrastructure in Auckland, New Zealand. 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.

5.1.2 Aurizon Holdings Limited (AZJ)

123 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.

5.1.3 Macquarie Atlas Roads Group (MQA)

124 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.

5.1.4 Qube Holdings Limited (QUB)

125   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.

5.1.5 Sydney Airport (SYD)

126   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.

5.1.6 Transurban Group (TCL)

127   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 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.