APPENDIX 39

Estimating the required return on equity
SFG Consulting

Estimating the required return on equity

Report for ENERGEX

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1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by ENERGEX Ltd to provide our views on the estimation of the required return on equity under the National Electricity Rules (**Rules**). In particular, we have been asked to provide advice within the context of the foundation model approach proposed in the Australian Energy Regulator (**AER**) Rate of Return Guideline. We have been instructed to assume that a foundation model approach is to be used and that the Sharpe-Lintner Capital Asset Pricing Model (**CAPM**) is to be used as the foundation model. Within those constraints, we have been asked to provide our opinion on how the Sharpe-Lintner CAPM should be parameterised in a way that:

    a) Has due regard to all relevant estimation methods, financial models, data and other evidence;

    b) Has due regard to the prevailing conditions in the market for equity funds; and

    c) Produces an estimate of the required return on equity that best reflects the efficient financing costs of a benchmark efficient entity.

2. This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of SFG Consulting, a specialist 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 15 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. A copy of my curriculum vitae is attached as Appendix 1 to this report.

3. My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above.

4. I have read, understood and complied with the Federal Court of Australia Practice Note CM7 *Expert Witnesses in Proceedings in the Federal Court of Australia.*

Summary of conclusions

5. Our primary conclusions in relation to the estimation of the allowed return on equity are set out below.

In effect, the AER proposes to adopt the same approach it used under the previous Rules

6. The AER's approach to estimating the required return on equity at the time of its last WACC Review in 2009 (under the previous Rules) was to use the Sharpe-Lintner CAPM exclusively with:

    a) The risk-free rate set to the contemporaneous yield on 10-year Commonwealth Government bonds;

    b) Beta determined from regression analysis applied to a small sample of domestic firms; and

    c) Market risk premium set to 6.5%.

7. The AER's proposed approach, set out in its Final Guideline, is to again estimate the required return on equity using the Sharpe-Lintner CAPM exclusively with risk-free rate set to the contemporaneous

yield on 10-year Commonwealth Government bonds, beta determined from regression analysis applied to a small sample of domestic firms, and MRP set to 6.5%.

The AER's proposed approach under the revised National Electricity Rules

8. Under the previous Rules, the Australian Competition Tribunal (**Tribunal**) held that if a regulator or regulated business (a) was using a well-accepted financial model such as the CAPM, and (b) had a reasonable basis for each of its parameter estimates, then it must automatically be the case that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market. That position was the primary driver for the Australian Energy Markets Commission (**AEMC**) making a return on equity rule change.

9. In making fundamental changes to the Rules, the clear intention of the AEMC was to alter the regulatory practice of relying exclusively on the Sharpe-Lintner CAPM when estimating the required return on equity. In referring to the Tribunal's conclusion that the use of a well-accepted financial model effectively guaranteed that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market, the AEMC stated:

> The Commission considered that this conclusion presupposes the ability of a single model, by itself, to achieve all that is required by the objective. The Commission is of the view that any relevant evidence on estimation methods, including that from a range of financial models, should be considered to determine whether the overall rate of return objective is satisfied.[1]

10. The AEMC went on to state that:

> The Commission considered that no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs [2]

11. The AEMC explicitly linked the consideration of a range of models and other evidence to the production of the best possible estimate of the efficient financing costs as required by the National Electricity Objective (**NEO**) and Revenue and Pricing Principles (**RPP**):

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[3]

12. That is, the AEMC's clear view is that the NEO and RPP require the regulator to produce the best possible estimate of the required return on equity,[4] which in turn requires the consideration of a range of financial models and other evidence.

[1] AEMC Final Determination, p. 48.
[2] AEMC Final Determination, p. 49.
[3] AEMC Rule Change Final Determination, p. 43.
[4] The required return on equity is a key component of the efficient financing costs.

13. In our view, the continued exclusive reliance on the Sharpe-Lintner CAPM, and the parameterisation of that model in a way that effectively excludes some relevant evidence, does not produce "the best possible estimate," and hence does not meet the requirements of the Rules.[5]

The AER's proposed method for estimating Sharpe-Lintner CAPM parameters

14. The AER proposes to estimate Sharpe-Lintner CAPM parameters by separating the relevant evidence into three sub-sets as follows:

    a) Primary evidence is used to specify a range for each parameter in **Step 3** of the proposed approach;

    b) Secondary evidence is used to select a point estimate from within the range, also in **Step 3** of the proposed process; and

    c) Tertiary evidence is used as a check of the estimate of the overall required return on equity in **Step 4** of the proposed process.

15. Step 3 of the proposed process produces ranges and point estimates for the three parameters, which are duly inserted into the Sharpe-Lintner CAPM formula to produce a range and point estimate for the overall required return on equity. Step 4 produces potential cross checks from the relevant information that has been relegated to the tertiary level. The outputs of Steps 3 and 4 are evaluated in **Step 5** of the proposed process and a final point estimate is adopted in **Step 6**.

16. The outcome from the AER's proposed implementation of its foundation model approach will depend crucially on how the relevant evidence is distributed among the three subsets set out above.

17. For example, in relation to beta, the primary evidence consists of regression analysis applied to the small set of Australian comparable firms. The AER concludes that this evidence supports a range of 0.4 to 0.7.[6] The secondary evidence consists of regression analysis applied to a much larger set of US comparable firms and to evidence in relation to the Black CAPM, which suggest that the Sharpe-Lintner CAPM under-estimates the required returns of low-beta firms. Even if both of these pieces of evidence suggest a beta materially above the 0.7 upper bound of the range, the point estimate for beta is constrained to be within the range, in which case the point estimate could not be above 0.7.

18. Similarly, in relation to the market risk premium (**MRP**), the primary evidence consists of mean historical excess returns and estimates from the AER's version of the dividend discount model. The AER concludes that this supports a range of 5% to 7.5% based on the AER's dividend discount model.[7] The AER then adopts a point estimate of 6.5% after also considering secondary evidence including survey responses, conditioning variables, and the decisions of other regulators.[8]

19. The AER also states that evidence from the Wright approach is relevant, but that evidence is relegated to the tertiary sub-set. In particular, the AER determines that the MRP implied by the Wright approach is materially above its 6.5% point estimate.[9] However, because the Wright approach is relegated to the tertiary sub-set, it has no opportunity to inform the range or the point estimate of the MRP parameter. Its only role is as one of the possible cross checks of the final point

[5] Specifically, NER 6.5.2(e).
[6] We discuss the robustness of that interpretation of the evidence below. This section of the report is focussed on the way in which the foundation model approach is implemented, not on the robustness of each piece of evidence.
[7] AER Explanatory Statement, p. 93.
[8] AER Explanatory Statement, p. 94.
[9] AER Appendix D, p. 104 states that the MRP estimate from the Wright approach is 8%.

estimate for the overall required return on equity, which severely limits its opportunity to have any real effect. Indeed, the Guideline materials set out estimates for the Wright approach, but then do nothing at all with those estimates. Not only do they have no effect on the point estimate that comes out of the Sharpe-Lintner CAPM, but they are never even considered. In fact, the point estimate that comes out of the Sharpe-Lintner CAPM is never exposed to any checks against any of the tertiary evidence at all – it is simply adopted as the allowed return on equity.

20. In summary, under the AER's proposed approach of separately allocating evidence into different subsets, the final allowed return on equity is substantially determined by how the evidence is distributed among the three sub-sets. Evidence that is assigned to the primary subset defines the range for the parameter, bounding the effect that any other evidence can have. Thus, the weight that is applied to each piece of evidence is determined by the subset to which it is (somewhat arbitrarily) allocated, rather than by a side-by-side assessment of the relative strengths and weaknesses.

21. Moreover, if the subset of the relevant evidence that was used to estimate each parameter under the old Rules now becomes the primary evidence under the new Rules, the outcome is likely to remain unchanged.

22. For example, under the old Rules, the AER concluded that the appropriate range for beta was 0.4 to 0.7, based on regression analysis applied to the small sample of domestic comparables. That same subset of evidence is now used as the primary subset, and it again constrains the range for beta to be 0.4 to 0.7. Consequently, the additional relevant evidence that the AER must have regard to under the new Rules cannot lead the AER to adopt a point estimate outside its existing range. That is, the AER now has regard to other relevant evidence, but not so much regard that it could ever lead to the adoption of an estimate outside of its existing range.

23. Similarly, the new Rules require the AER to have regard to other relevant evidence when estimating MRP. Under the AER's implementation of its foundation model approach, the AER has regard to this other evidence, but adopts the same estimate as in its 2009 WACC Review under the previous Rules.

Estimating the risk free rate for use in the Sharpe-Lintner CAPM foundation model

24. In our view, the relevant evidence suggests that the 10-year government bond yield should be used to estimate the Sharpe-Lintner CAPM risk-free rate and we agree with the AER's Guideline in that regard.

25. At the time of writing this report, the yield on 10-year government bonds was approximately 3.63%.

Estimating the market risk premium for use in the Sharpe-Lintner CAPM foundation model

26. We consider how the relevant evidence could best be used to estimate MRP for use in a Sharpe-Lintner CAPM foundation model. This requires the estimate of MRP that, when input into the Sharpe-Lintner CAPM, produces an estimate of the allowed return on equity that has regard to the prevailing conditions in the market for equity funds and which is commensurate with the efficient financing costs of a benchmark efficient entity.

27. In relation to historical excess returns (the Ibbotson approach):

    a) Arithmetic averages are relevant and geometric averages are irrelevant;

    b) The inaccurate dividend yield correction applied by Brailsford et al (2008, 2012) should be replaced by the more detailed and accurate correction applied by NERA (2013);

c) The data should be updated to include 2013;

d) Historical mean excess returns produce an estimate of the MRP in *average* market conditions and could inform an estimate of the MRP in *prevailing* market conditions after consideration of the extent to which the prevailing conditions might differ from the average conditions; and

e) The point estimates for the five start years specified by the AER fall within the range of 6.1% to 6.8% if theta is set to 0.7 and within the range of 5.5% to 6.6% if theta is set to 0.35.

28. In relation to the Wright approach:

a) There are two approaches for estimating MRP from the historical data. The Ibbotson approach assumes that the MRP is constant across all market conditions and estimates the MRP as the mean historical excess return. At the other end of the spectrum, the Wright approach assumes that the required return on the market is constant and estimates the MRP by subtracting the contemporaneous risk-free rate. In our view, the Ibbotson and Wright approaches should both be used to inform the estimate of MRP;

b) Lally (2012, 2013) also recommends that the Ibbotson and Wright approaches should both be used to estimate MRP and the Wright approach is also used extensively by UK regulators; and

c) The Wright approach currently produces an MRP estimate of 8.2% if theta is set to 0.7 and 8.1% if theta is set to 0.35.

29. In relation to dividend discount models:

a) We adopt a dividend discount estimate of MRP of 7.8%, which is the current estimate from the SFG approach (for gamma set to 0.25), which we consider to be the most robust and reliable approach.

30. In relation to the responses of survey participants:

a) In our view, none of the surveys considered by the AER fare well against the criteria that have been set out by the Tribunal, in which case "it is dangerous for the AER to place any determinative weight on the results;"[10] and

b) If the AER is to have regard to the survey responses, it should not interpret (standard) ex-imputation estimates of MRP provided by survey respondents as (regulatory) with-imputation estimates of MRP. Rather, it should convert standard ex-imputation estimates into regulatory with-imputation estimates according to Officer (1994) and as implemented by IPART (2013). A 6% estimate of the ex-imputation MRP is equivalent to an 8.1% estimate of the (regulatory) with-imputation MRP if gamma is set to 0.5 and 7.0% if gamma is set to 0.25.

31. In relation to independent expert valuation reports:

[10] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.

a) Independent expert valuation reports currently support higher estimates of the required return on equity that those that would be produced by a mechanistic application of the Sharpe-Lintner CAPM;

b) Independent expert reports provide ex-imputation MRP estimates that would have to be routinely converted into the corresponding with-imputation estimate of MRP for use in the regulatory process; and

c) An ex-imputation MRP of 6% is equivalent to a regulatory with-imputation MRP of 8.1% if gamma is set to 0.5 and 7.0% if gamma is set to 0.25, using the process of Officer (1994) as implemented by IPART (2013).

32. In compiling a final estimate of MRP for use in the Sharpe-Lintner CAPM as a foundation model, we have regard to the following evidence:

a) First, we note that historical returns can be processed in two ways – by assuming that MRP is constant in all market conditions (Ibbotson approach) or by assuming that real required returns are constant in all market conditions (Wright approach). If these two approaches are given equal weight, the estimate of MRP from historical returns is 7.4%[11];

b) The estimate from dividend discount models is 7.8%; and

c) The estimate from independent expert reports is 7.0%.

33. Because all of these approaches have different strengths and weaknesses, we have due regard to all of them, adopting a weighted-average estimate of 7.57%.[12]

Estimating equity beta for use in the Sharpe-Lintner CAPM foundation model

34. We consider how the relevant evidence could best be used to estimate equity beta for use in a Sharpe-Lintner CAPM foundation model. This requires the estimate of beta that, when input into the Sharpe-Lintner CAPM, produces an estimate of the allowed return on equity that has regard to the prevailing conditions in the market for equity funds and which is commensurate with the efficient financing costs of a benchmark efficient entity.

35. In our view, for the benchmark efficient entity, and within the context of the foundation model approach:

a) The best raw statistical estimate of beta is 0.82. This reflects the evidence from regression analysis applied to relevant samples of domestic and international firms. In our view, this approach best manages the trade-off between comparability and statistical reliability. The use of this estimate implies that the Sharpe-Lintner CAPM, alone and unadjusted, is capable of determining the required return on equity;

b) The estimate that best reflects the evidence about the Sharpe-Linter CAPM systematically understating the required return on low-beta stocks is 0.90. This estimate is based on the best raw statistical estimate of 0.82 and the SFG (2014) estimate of the zero beta premium of 3.34%;

[11] 7.4% is the mean of 6.6% and 8.1%.
[12] The weighting procedure we adopt is explained in full in the body of the report.

c) The estimate that best reflects the evidence about the Sharpe-Lintner CAPM systematically understating the required return on high book-to-market stocks is 0.93; and

d) The estimate that best reflects the evidence from the dividend discount model is 0.94.

36. In our view, all of these approaches for determining beta that are set out above have different strengths and weaknesses. For example, the Sharpe-Lintner CAPM is commonly used (in some form) in practice, but there is substantial evidence that, when implemented, it provides a poor fit to the observed data. The Black CAPM provides a better fit to the data and has a stronger theoretical foundation (in the sense that it relaxes the most unrealistic assumption of the Sharpe-Lintner CAPM), but it requires the estimation of an additional parameter, the zero beta premium. Similarly, Fama and French (1993) and many subsequent authors have shown that the inclusion of a book-to-market factor greatly improves the ability of the CAPM to fit the observed data, but this too comes with the cost of having to estimate additional parameters. The dividend discount model framework is widely used and does not require the sorts of strong assumptions that underlie the asset pricing models – requiring only that stock prices, on average, properly reflect the present value of expected future dividends. However, there are different ways of implementing the dividend discount model, some of which are more robust and internally consistent than others.

37. Because these various approaches all have different strengths and weaknesses along different dimensions, we have due regard to them all adopting a weighted-average estimate of 0.91.[13] In our view, given that the required return on equity must be estimated using the Sharpe-Lintner CAPM, a beta estimate of 0.91 produces an estimate of the required return on equity that is:

i) Most commensurate with the efficient financing costs and degree of risk of a benchmark efficient entity; and

ii) Best reflective of prevailing conditions in the market for equity funds.

Conclusions about the required return on equity

38. Given that the Sharpe-Lintner CAPM is to be used as a foundation model, we have produced the set of parameter estimates that we consider to be most likely to produce an estimate of the required return on equity that is:

a) Most commensurate with the efficient financing costs and degree of risk of a benchmark efficient entity; and

b) Best reflective of prevailing conditions in the market for equity funds.

39. Our parameter estimates are as follows:

a) A risk-free rate based on the yield on 10-year government bonds – producing a current estimate of 3.63%;

b) A market risk premium based on historical excess stock returns, the Wright approach, dividend discount models, and independent expert valuation reports – producing a current estimate of 7.57%; and

[13] The weighting procedure we adopt is explained in full in the body of the report.

c) An equity beta based on historical stock returns from domestic and international comparable firms, evidence of a low-beta premium (Black), evidence of a value premium (Fama and French), and evidence from industry dividend discount models – producing a current estimate of 0.91.

40. These parameter estimates produce an estimate of the required return on equity of:

$$\begin{aligned} r_e &= r_f + \beta\left(r_m - r_f\right) \\ &= 3.63\% + 0.91\left(7.57\%\right) = 10.53\%. \end{aligned}$$

2. Regulatory context and the foundation model approach

The AER's approach under the previous Rules

41. At the time of its last WACC Review in 2009, the AER's approach to estimating the required return on equity under the previous National Electricity Rules was to use the Sharpe-Lintner CAPM exclusively with:

    a) The risk-free rate set to the contemporaneous yield on 10-year Commonwealth Government bonds;

    b) Beta determined from regression analysis applied to a small sample of domestic firms; and

    c) Market risk premium set to 6.5%.

The AEMC's rule changes

42. Throughout 2011 and 2012, the AEMC considered a number of Rule change proposals submitted by the AER and a group of major energy users. In its determination in November 2012, the AEMC made a number of fundamental changes to the National Electricity Rules insofar as the allowed return on equity is concerned. The key changes that the AEMC made were:

    a) To introduce an "overall rate of return objective" to ensure that the focus is on the reasonableness of the allowed rate of return – eliminating the silo approach that focused separately on each individual parameter; and

    b) Requiring the regulator to have regard to all relevant approaches and evidence – seeking to eliminate the focus on a single model (the Sharpe-Lintner CAPM) that could be used without having regard to a weight of evidence suggesting that the way the regulator implemented that model produced an estimate of the required return on equity that was implausible in the circumstances.

43. In particular, the new rules require that the allowed rate of return must achieve the **allowed rate of return objective**:

> The allowed rate of return is to be determined such that it achieves the allowed rate of return objective.
>
> The allowed rate of return objective is that the rate of return for a Distribution Network Service Provider is to be commensurate the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Distribution Network Service Provider in respect of the provision of standard control services.[14]

44. In determining the allowed rate of return, regard must be had to:

> 1. relevant estimation methods, financial models, market data and other evidence;
>
> 2. the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and

[14] For example, see NER 6.5.2(b)-(c).

> 3. any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.[15]

45. When determining the allowed return on equity, regard must also be had to:

> the prevailing conditions in the market for equity funds.[16]

46. In addition, the required return on equity must:

> be estimated such that it contributes to the achievement of the allowed rate of return objective.[17]

47. In its Final Determination, the AEMC was very clear about its intention that the regulator should not use a narrow formulaic approach, but should have regard to all relevant evidence while keeping a focus on the reasonableness of the allowed return on equity. For example, the AEMC noted that:

> The Commission also expressed concern that the provisions create the potential for the regulator and/or appeal body to interpret that the best way to estimate the allowed rate of return is by using a relatively formulaic approach. This may result in it not considering the relevance of a broad range of evidence, and may lead to an undue focus on individual parameter values rather than the overall rate of return estimate,[18]

and that the rule changes were designed to:

> encourage the regulator to focus on whether its overall estimate of the rate of return is appropriate.[19]

48. The AEMC was also very clear about the need to ensure that the allowed return on equity has regard to the prevailing conditions in the market for equity funds. The AEMC stated that:

> If the allowed rate of return is not determined with regard to the prevailing market conditions, it will either be above or below the return that is required by capital market investors at the time of the determination. The Commission was of the view that neither of these outcomes is efficient nor in the long term interest of energy consumers,[20]

and:

> The second principal requirement is that the return on equity must take into account the prevailing conditions in the market for equity funds. It reflects the importance of estimating a return on equity that is sufficient to allow efficient investment in, and efficient use of, the relevant services. However, this requirement does not mean that the

[15] For example, see NER 6.5.2(e).
[16] For example, see NER 6.5.2(g).
[17] For example, see NER 6.5.2(f).
[18] AEMC Rule Change Final Determination, p. 40.
[19] AEMC Rule Change Final Determination, p. 41.
[20] AEMC Rule Change Final Determination, p. 44.

> regulator is restricted from considering historical data in generating its estimate of the required return on equity. Rather, it ensures that current market conditions are fully reflected in such estimates to ensure that allowed rates are sufficient for efficient investment and use.[21]

49. The AEMC also noted that for a framework to produce an allowed return on equity that has proper regard to the prevailing conditions in the market for equity funds, it must be flexible enough to respond to changes in financial market conditions. One of the AEMC's primary concerns was that the mechanistic CAPM approach was "overly rigid" such that the AER's mechanistic implementation of the CAPM produced unreasonable results in the current market circumstances. The AEMC stated that:

> The global financial crisis and its continuing impact through the European sovereign debt crisis have highlighted the inherent dangers in an overly rigid approach to estimating a rate of return in unstable market conditions.[22]

and that its rule change would:

> enable the regulator to better respond to changing financial market conditions.[23]

50. The AEMC explicitly linked the consideration of a range of models and other evidence to the production of the best possible estimate of the efficient financing costs as required by the NEO and RPP:

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[24]

51. That is, the AEMC's clear view is that the NEO and RPP require the regulator to produce the best possible estimate of the required return on equity,[25] which in turn requires the consideration of a range of financial models and other evidence.

52. In its Final Determination, the AEMC sought to address concerns that, despite its best efforts in making material changes to the Rules, the regulator would seek to continue to estimate the required return on equity via a mechanistic implementation of the CAPM. The AEMC sought to assuage these concerns, but indicated that it would not set out a list of what other information and models the regulator should consider, due to the risk that any such list itself would be applied in a mechanistic fashion:

> A major concern expressed in numerous submissions is that under the proposed changes the regulator would still be able to, in effect, make exclusive use of the CAPM when estimating a rate of return on equity. The Commission understands this concern is

[21] AEMC Rule Change Final Determination, p. 69.
[22] AEMC Rule Change Final Determination, p. 40.
[23] AEMC Rule Change Final Determination, p. 23.
[24] AEMC Rule Change Final Determination, p. 43.
[25] The required return on equity is a key component of the efficient financing costs.

> potentially of considerable importance given its intention is to ensure that the regulator takes relevant estimation methods, models, market data and other evidence into account when estimating the required rate of return on equity. As discussed above, the Commission takes the view that the balance between flexibility and prescription has been adequately achieved in the final rules. It would be counterproductive to attempt to prescribe a list of models and evidence, which would almost certainly be non-exhaustive and could lead to rigid adherence to them in a mechanistic fashion.[26]

53. Rather:

> To determine the rate of return, the regulator is also required to have regard [to] relevant estimation methods, financial models, market data and other evidence. The intention of this clause of the final rule is that the regulator must consider a range of sources of evidence and analysis to estimate the rate of return. In addition, the regulator must make a judgement in the context of the overall objective as to the best method(s) and information sources to use, including what weight to give to the different methods and information in making the estimate. In doing so, the regulator should also have regard to taking an internally consistent approach and, to the greatest extent possible, use consistent estimates of values that are common across the process, as well as properly respecting any inter-relationships between values used.[27]

and:

> Implicit in this requirement to consider a range of methods, models and information is that checks of reasonableness will be undertaken.[28]

54. The AEMC also noted the need to:

> safeguard the framework against the problems of an overly-rigid prescriptive approach that cannot accommodate changes in market conditions. Instead, sufficient flexibility would be preserved by having the allowed rate of return always reflecting the current benchmark efficient financing costs.[29]

The AER's approach under the new Rules

55. According to its December 2013 Guideline, the AER's approach to estimating the required return on equity under the new National Electricity Rules will be to use the Sharpe-Lintner CAPM exclusively with the three parameters set as follows:

    a) The risk-free rate set to the contemporaneous yield on 10-year Commonwealth Government bonds;

    b) Beta determined from regression analysis applied to a small sample of domestic firms; and

    c) Market risk premium set to 6.5%.

[26] AEMC Rule Change Final Determination, p. 57.
[27] AEMC Rule Change Final Determination, pp. 67-68.
[28] AEMC Rule Change Final Determination, p. 69.
[29] AEMC Rule Change Final Determination, p. 46.

56. A summary of the AER's approach to estimating the required return on equity before and after the AEMC's fundamental Rule changes is summarised in Table 1 below.

Table 1
AER approach to estimating the required return on equity

	2009 WACC Review	2013 Guideline
Approach	Sharpe-Lintner CAPM exclusively.	Sharpe-Lintner CAPM exclusively.
Risk-free rate	Contemporaneous yield on 10-year Commonwealth Government bonds	Contemporaneous yield on 10-year Commonwealth Government bonds
Beta	Regression analysis applied to a small sample of domestic firms, producing a range of 0.4 to 0.7. Figure of 0.8 adopted.	Regression analysis applied to the same small sample of domestic firms, producing a range of 0.4 to 0.7. Figure of 0.7 adopted.
MRP	6.5%.	6.5%.

57. In summary, the AER's year-long Guideline process has led to it adopting exactly the same approach to estimating the required return on equity as it adopted in its last WACC Review under the previous Rules. That is, the AER has concluded that the same approach for estimating the required return on equity that it adopted under the previous Rules should also be adopted under the new Rules. To see how the AER has reached that conclusion, it is instructive to work through the flowchart set out in Figure 5.1 of the AER's Guidelines.[30]

58. In **Step 1** of the proposed approach, the AER identifies which material is relevant and which is irrelevant. The new Rules require the AER to have regard to relevant material, in which case material the AER deems to be irrelevant is disregarded. We also note that the AER has determined that some of the material that it has deemed to be relevant actually has no useful role and is ultimately given zero weight. That is, material that the AER deems to be (a) irrelevant or (b) relevant, but of no use, has no further role in the estimation process.

59. In **Step 2** of the proposed approach, the AER selects the Sharpe-Lintner CAPM as its foundation model for the following reasons:

> As outlined above, our assessment of the Sharpe–Lintner CAPM is that it meets most of the criteria set out in chapter 2. For the following reasons, we consider that the Sharpe–Lintner CAPM may add the most value to our approach as the foundation model:
>
> - It is widely used for estimating the expected return on equity for regulated companies. This includes use by academics, market practitioners and other regulators.
>
> - The Sharpe–Lintner CAPM—estimated as the sum of the risk free rate, and the product of the equity beta and MRP—is relatively simple to implement. This includes that input parameter estimates are supported by robust, transparent and replicable analysis.
>
> - Other relevant material can be used to inform the Sharpe–Lintner CAPM parameter estimates. This may mitigate any limitations of the model. The model, therefore, facilitates the inclusion of a broad range of material, but may still provide some certainty to stakeholders as to the final return on equity value.

[30] AER Guideline, p. 12.

> ▪ The Sharpe–Lintner CAPM can be used to provide both a range of estimates, and a point estimate from within this range. This functionality may provide further predictability to stakeholders regarding the final return on equity value.[31]

60. Having determined that the Sharpe-Lintner CAPM is to be used as the foundation model, the next task is for the AER to estimate the three model parameters. This is done by separating the relevant evidence into three sub-sets as follows:

    a) Primary evidence is used to specify a range for each parameter in **Step 3** of the proposed approach;

    b) Secondary evidence is used to select a point estimate from within the range, also in **Step 3** of the proposed process; and

    c) Tertiary evidence is used as a check of the estimate of the overall required return on equity in **Step 4** of the proposed process.

61. That is, Step 3 of the proposed process produces ranges and point estimates for the three parameters, which are duly inserted into the Sharpe-Lintner CAPM formula to produce a range and point estimate for the overall required return on equity. Step 4 produces potential cross checks from the relevant information that has been relegated to the tertiary level. The outputs of Steps 3 and 4 are evaluated in **Step 5** of the proposed process and a final point estimate is adopted in **Step 6**.

62. In relation to the selection of the final point estimate, the AER explains that:

> The AER's (sic) proposes to use the foundation model point estimate as the starting point for estimating the expected return on equity,[32]

but that the point estimate could be changed, to another point within the range produced in Step 3, on the basis of the tertiary evidence in Step 4 of the proposed approach:

> if the evaluation suggests that the point estimate is too high or low, the point estimate will be changed by an amount informed by the other information (using the AER's regulatory judgment).[33]

63. The AER also notes that:

> The approach outlined is premised on the expectation that the analysis in step five should not suggest a final estimate of the expected return on equity outside the foundation model range. If this expectation is not met, the AER may reconsider the foundation model input parameter estimates, or more fundamentally, the foundation model itself.[34]

The AER's implementation of its foundation model approach

[31] AER Appendix A, p. 13.
[32] AER Guideline, p. 17.
[33] AER Guideline, p. 17.
[34] AER Guideline, p. 17.

64. The outcome from the AER's proposed implementation of its foundation model approach will depend crucially on how the relevant evidence is distributed among the three subsets set out in Paragraph 60 above.

65. For example, in relation to beta, the primary evidence consists of regression analysis applied to the small set of Australian comparable firms. The AER concludes that this evidence supports a range of 0.4 to 0.7.[35] The secondary evidence consists of regression analysis applied to a much larger set of US comparable firms and to evidence in relation to the Black CAPM, which suggest that the Sharpe-Lintner CAPM under-estimates the required returns of low-beta firms. Even if both of these pieces of evidence suggest a beta materially above the 0.7 upper bound of the range, the point estimate for beta is constrained to be within the range, in which case the point estimate could not be above 0.7. Moreover, the point estimate would seem to be fixed to 0.7 whether the secondary evidence suggested an estimate of 0.75 or 1.2.

66. Now suppose that evidence relating to foreign comparables is moved to the primary sub-sample of evidence. This may result in the upper bound of the range being extended to 0.9 or above, in which case a point estimate above 0.7 would now be possible.

67. Similarly, in relation to MRP, the primary evidence consists of mean historical excess returns and estimates from the AER's version of the dividend discount model. The AER concludes that this supports a range of 5% (based on the geometric mean of historical excess returns) to 7.5% based on the AER's dividend discount model.[36] The AER then adopts a point estimate of 6.5% after also considering secondary evidence including survey responses, conditioning variables, and the decisions of other regulators.[37]

68. The AER also states that evidence from the Wright approach is relevant, but that evidence is relegated to the tertiary sub-set. In particular, the AER determines that the MRP implied by the Wright approach is materially above its 6.5% point estimate.[38] However, because the Wright approach is relegated to the tertiary sub-set, it has no opportunity to inform the range or the point estimate of the MRP parameter. Its only role is as one of a number of possible cross checks of the final point estimate for the overall required return on equity, which severely limits its opportunity to have any real effect. Indeed, the Guideline materials set out estimates for the Wright approach, but then do nothing at all with those estimates. Not only do they have no effect on the point estimate that comes out of the Sharpe-Lintner CAPM, but they are never even considered in the Guideline materials. In fact, the point estimate that comes out of the Sharpe-Lintner CAPM is never exposed to any checks against any of the tertiary evidence at all – it is simply adopted as the allowed return on equity.

69. In summary, under the AER's proposed approach of separately allocating evidence into different subsets, the final allowed return on equity is substantially determined by how the evidence is distributed among the three sub-sets. Evidence that is assigned to the primary subset defines the range for the parameter, bounding the effect that any other evidence can have. Thus, the weight that is applied to each piece of evidence is determined by the subset to which it is (somewhat arbitrarily) allocated, rather than by a side-by-side assessment of the relative strengths and weaknesses.

[35] We discuss the robustness of that interpretation of the evidence below. This section of the report is focussed on the way in which the foundation model approach is implemented, not on the robustness of each piece of evidence.
[36] AER Explanatory Statement, p. 93.
[37] AER Explanatory Statement, p. 94.
[38] AER Appendix D, p. 104 states that the MRP estimate from the Wright approach is 8%.

70. Moreover, if the subset of the relevant evidence that was used to estimate each parameter under the old Rules now becomes the primary evidence under the new Rules, the outcome is likely to remain unchanged.

71. For example, under the old Rules, the AER concluded that the appropriate range for beta was 0.4 to 0.7, based on regression analysis applied to the small sample of domestic comparables. That same subset of evidence is now used as the primary subset, and it again constrains the range for beta to be 0.4 to 0.7. Consequently, the additional relevant evidence that the AER must have regard to under the new Rules cannot lead the AER to adopt a point estimate outside its existing range. That is, the AER now has regard to other relevant evidence, but not so much regard that it could ever lead to the adoption of an estimate outside of its existing range.

72. Similarly, the new Rules require the AER to have regard to other relevant evidence when estimating MRP. Under the AER's implementation of its foundation model approach, the AER has regard to this other evidence, but adopts the same estimate as in its 2009 WACC Review under the previous Rules.

73. In summary, the AER's implementation of its foundation model approach has apparently led to precisely the same outcomes that would have been obtained had the Rules not been changed at all.

The reasons for the AEMC's rule change

74. Under the previous Rules, the AER considered only a subset of the relevant evidence when estimating each CAPM parameter.[39] The AER adopted the view that if it (a) was using a well-accepted financial model such as the CAPM, and (b) had a reasonable basis for each of its parameter estimates, then it must automatically be the case that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market.

75. The Tribunal decisions in the ATCO Gas and DBP cases[40] were the primary driver for the AEMC's return on equity rule change. In those cases, the Tribunal held that:

> it is almost inherently contradictory then to say that the approach or the model is not likely to produce a reliable output - assuming that the inputs are appropriate – if that approach and that model are well accepted.[41]

76. In response, the AEMC noted that one of its primary motivations for changing the Rules was to prevent a repetition of the outcomes of the ATCO Gas and DBP Cases. In referring to the Tribunal's conclusion that the use of a well-accepted financial model effectively guaranteed that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market, the AEMC stated:

> The Commission considered that this conclusion presupposes the ability of a single model, by itself, to achieve all that is required by the objective. The Commission is of the view that any relevant evidence on estimation methods, including that from a range of

[39] That is, the list of what the AER considers to be relevant evidence in the current Guideline contains a number of items that the AER has not previously considered when estimating the required return on equity.
[40] Application by WA Gas Networks Pty Ltd (No 3) [2012] ACompT 12; Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14.
[41] ATCO Gas Reasons, Paragraph 63, Application by WA Gas Networks Pty Ltd (No 3) [2012] ACompT 12.

> financial models, should be considered to determine whether the overall rate of return objective is satisfied.[42]

77. The AEMC went on to state that:

> The Commission considered that no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs [43]

and that under the new Rules:

> The focus should be on the outcome of the process rather than on individual steps of the process itself. [44]

78. Consequently, the new Rules appear to require the regulator to:

    a) Have regard to all relevant estimation methods, models, data and evidence; and

    b) To ensure that the regulatory estimate of the required return on equity:

        i) Has regard to the prevailing conditions in the market; and

        ii) Contributes to the allowed rate of return objective, which is to ensure that the allowed return is commensurate with the efficient financing costs of a benchmark efficient entity.

79. In its Final Determination, the AEMC indicated that, in introducing these Rule requirements, it was requiring regulators, regulated entities, and other stakeholders to have regard to a range of financial models and to all relevant evidence, rather than adopting a mechanistic implementation of the Sharpe-Lintner CAPM to the exclusion of all other evidence. Having determined that the Sharpe-Lintner CAPM will be used as the foundation model and that the relevant evidence will be used in such a way as to produce the same outputs as would apparently have been obtained under the previous Rules, the AER's implementation of its foundation model approach appears to collapse to the very mechanistic implementation of the Sharpe-Lintner CAPM that the Rule change seeks to avoid.

Proposed implementation of the foundation model approach

80. In our view, if a Sharpe-Lintner CAPM foundation model approach is to be used, it should not be implemented using the convoluted multi-stage approach proposed in the AER Guideline wherein different pieces of evidence are arbitrarily assigned to different roles in the process in a way that effectively constrains or eliminates the potential influence of some relevant evidence. Rather, the parameters of the foundation model should be estimated in a simpler and more transparent manner. This would be done by first setting out all of the relevant evidence. Then *all* of the evidence that is relevant to beta should be used to produce an estimate of beta, and *all* of the evidence that is relevant to MRP should be used to produce an estimate of MRP. In both cases, different pieces of evidence can receive different weights depending on the reliability and precision of the evidence, or whatever other criteria the regulator determines to be relevant.

[42] AEMC Final Determination, p. 48.
[43] AEMC Final Determination, p. 49.
[44] AEMC Final Determination, p. 49.

81. To be consistent with the new Rules, the goal must be to produce an estimate of the required return on equity that is commensurate with the efficient financing costs of the benchmark efficient entity, having regard to the prevailing conditions in the market. This will affect the basis on which each parameter is estimated. For example, the relevant goal is to determine the estimate of beta that, when inserted into the Sharpe-Lintner CAPM, is most likely to produce an estimate of the required return on equity that best contributes to the allowed rate of return objective. The relevant goal is not to construct the best statistical estimate of the historical covariance between stock and market returns for a particular small sample of companies.

82. In the remainder of this report, we adopt this simpler and more transparent Sharpe-Lintner CAPM foundation model approach. We seek to determine the set of parameters that, when inserted into the Sharpe-Lintner CAPM, are most likely to produce an estimate of the required return on equity that best contributes to the allowed rate of return objective.

3. Estimating the risk-free rate

83. The Sharpe-Lintner CAPM estimates the required return on equity as the sum of a risk-free return plus a premium for risk. Consequently, for an estimate of the required return on equity to be commensurate with the prevailing conditions in the market and with the efficient financing cost of a benchmark efficient entity, it logically follows that both components of the estimate must each be commensurate with the prevailing conditions in the market and with the efficient financing cost of a benchmark efficient entity.

84. In its Guideline, the AER proposes to set the risk-free rate to the contemporaneous yield on 10-year government bonds.[45] In our view, this is both appropriate and consistent with accepted market and regulatory practice.

85. For example, there is broad agreement that the dominant practice of market practitioners and valuation professionals is to set the term of the risk-free rate to 10-years on the basis that this is the longest observable term for Australian government bonds. For example, SFG (2013)[46] note that the overwhelming majority (94%) of independent expert valuation reports in the 2012/13 sample group employed a term assumption for the risk-free rate of ten years. Several reports indicated that the use of a 10-year term assumption was standard practice amongst independent experts in Australia. For example, in its report to ING Real Estate Community Living Group, Deloitte stated that:

> The 10-year bond rate is a widely used and accepted benchmark for the risk free rate in Australia.[47]

86. In its report for Hastings Diversified Utilities Fund (a firm with regulated infrastructure investments), Grant Samuel noted that:

> The ten year bond rate is a widely used and accepted benchmark for the risk free rate. Where the forecast period exceeds ten years, an issue arises as to the appropriate bond to use. While longer term bond rates are available, the ten year bond market is the deepest long term bond market in Australia and is a widely used and recognised benchmark. There is a limited market for bonds of more than ten years. In the United States, there are deeper markets for longer term bonds. The 30 year bond rate is a widely used benchmark. However, long term rates accentuate the distortions of the yield curve on cash flows in early years. In any event, a single long term bond rate matching the term of the cash flows is no more theoretically correct than using a ten year rate. More importantly, the ten year rate is the standard benchmark used in practice.[48]

87. The AER has consistently adopted a ten year term to maturity when estimating the risk-free rate. For example, in its Guideline, the AER concluded that:

> On balance, we are more persuaded by the arguments for a 10 year term, than the arguments for a five year term.[49]

88. The AER also notes that the Australian Competition Tribunal advocates the use of a 10-year term:

[45] AER Guideline, p. 15.
[46] SFG Consulting, 2013, *Evidence on the required return on equity from independent expert reports*, June.
[47] Deloitte (2012), ING Real Estate Community Living Group – Independent expert's report and Financial Services Guide, 24 April 2012, p.93.
[48] Grant Samuel (2012), Hastings Diversified Utilities Fund – Independent Expert's report, 3 August 2012, p.4.
[49] AER Explanatory Statement, p. 49.

> The Australian Competition Tribunal (the Tribunal) decided in its 2003 GasNet decision that 10 years is the appropriate term of the risk free rate in the CAPM. The Tribunal came to this view on the basis of two reasons:
> • as the MRP was estimated using a 10 year risk free rate, consistency demands that a 10 year risk free rate be used in the CAPM, and
> • it is a convention of economists and regulators to use a relatively long-term risk free rate where the life of the assets is relatively long.[50]

89. IPART, which has previously adopted a 5-year term to maturity, has recently announced that it will now adopt a 10-year term:

> We agree with stakeholder views that increasing the TTM [term to maturity] from 5 years to 10 years for all industries is more consistent with our objective for setting a WACC that reflects the efficient financing costs of a benchmark entity operating in a competitive market.[51]

90. In summary, the independent expert evidence and Australian regulatory determinations support the view that investors determine their required return on equity by adding their estimate of the risk premium to the 10-year government bond yield.

91. Consequently:

    a) If investors determine the required return on equity using the yield on 10-year government bonds; but

    b) The allowed return is set on the basis that investors determine the required return on equity on a different basis (e.g., using the yield on 5-year government bonds),

    the allowed return cannot be commensurate with the prevailing conditions in the market or with the efficient financing cost of a benchmark efficient entity. It therefore follows that the allowed return on equity would not be consistent with the Rules, the NEO or the RPP.

92. In our view, the relevant evidence suggests that the 10-year government bond yield should be used to estimate the Sharpe-Lintner CAPM risk-free rate and we agree with the AER's Guideline in that regard.

93. For the purposes of this report, we adopt an estimate of 3.63%, which is the recent (rounded) 20-day average. This would be updated to reflect the most recent data at the time of each determination.

[50] AER Draft Rate of Return Guideline – Explanatory Statement, p. 182.
[51] See IPART (2013), Review of WACC Methodology, December, p. 12.

4. Estimating the market risk premium

The AER's proposed approach

94. In its Guideline materials, the AER states that it proposes to persist with its previous approach for estimating MRP. In particular, the AER states that it proposes to:

> consider a range of theoretical and empirical evidence—including historical excess returns, survey evidence, financial market indicators and dividend growth model (DGM) estimates[52]

which is:

> consistent with our practice over the past five years where we have determined values for the MRP of 6.0 or 6.5 per cent.[53]

95. In the first stage of its process for estimating MRP, the AER proposes a range of 5% to 7.5%. This range is formed from:

a) A lower bound set slightly above the range found by taking the geometric mean of historical excess returns. In particular, the AER states that:

> The geometric mean historical excess return currently provides the lowest estimate of the MRP with a range of 3.6 to 4.8 per cent. However, as we discuss in more detail in appendix D, 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.[54]

and:

b) An upper bound set according to the AER's dividend growth model estimate. In particular, the AER states that:

> On the other hand, using our proposed models, the DGM currently provides the highest estimate of the MRP at about 7.5 per cent. We consider this an appropriate upper bound for the range.[55]

96. The AER then adopts a point estimate of 6.5% from within this range, concluding that:

> Given the available information we consider 6.5 per cent an appropriate estimate of the MRP having regard to prevailing market conditions.[56]

[52] AER Explanatory Statement, p. 89.
[53] AER Explanatory Statement, p. 89.
[54] AER Explanatory Statement, p. 93.
[55] AER Explanatory Statement, p. 93.
[56] AER Explanatory Statement, p. 93.

97. In selecting its 6.5% point estimate, the AER has had regard to the information that was used to specify the range (as set out above) as well as additional information as follows:

    a) Arithmetic and geometric mean historical excess return estimates. The AER concludes (and has consistently concluded) that this evidence supports a point estimate of 6%:

    > We consider 6.0 per cent an appropriate estimate of this source of evidence. This represents the starting point for our determination of a point estimate. We note that while a point estimate of 6.0 per cent is common, the choice of the averaging period and judgments in the compilation of the data result in a range for plausible estimates of about 5.0–6.5 per cent.[57]

    b) Various manifestations of the AER's dividend discount models, which the AER interprets as supporting a range of 6.1% to 7.5%, with a mid-point of 6.8%:

    > these estimates, from two applications of the DGM and a range of inputs, suggest a range of 6.1–7.5 per cent is reasonable[58]

    c) Survey evidence, which the AER says consistently supports an estimate of 6%:

    > surveys of market practitioners consistently support 6.0 per cent as the most commonly adopted value for the MRP.[59]

    d) Conditioning variables, which the AER says provide "mixed results";[60] and

    e) Recent decisions by Australian regulators and the Tribunal, which the AER treats as supporting a 6% MRP.

98. The AER summarises its process for selecting a point estimate as follows:

    > In determining an MRP of 6.5 per cent, we had regard to each source of evidence. Reflecting our assessment of the various sources of evidence, 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. [61]

99. In particular, the AER places most weight on historical mean excess returns, followed by its DGM estimates. The AER notes that whereas the historical mean returns might be more robustly estimated, they are estimates of the risk premium required in the average conditions in the market over the historical period, which may differ from the prevailing conditions in the market. Hence the consideration of DGM estimates:

[57] AER Explanatory Statement, p. 97.
[58] AER Explanatory Statement, p. 94.
[59] AER Explanatory Statement, p. 94.
[60] AER Explanatory Statement, p. 94.
[61] AER Explanatory Statement, p. 94.

> We consider DGM estimates of the MRP a useful source of evidence. While the estimates are not as robust as historical averages they may reflect current market conditions more closely. [62]

100. The AER's point estimate is essentially drawn from the overlap between its historical mean range of 5.0% to 6.5% and its DGM range of 6.1% to 7.5%.

101. In our view, a number of issues need to be addressed in relation to the AER's estimation of MRP. In particular, in some places the AER relies on dated evidence that has now been updated, in other places it relies on inaccurate data that has since been corrected, and in other places it makes improper comparisons (e.g., where estimates that *include* the benefit of imputation credits and estimates that *exclude* that benefit are compared as equals). In the remainder of this section of the report, we review each piece of relevant evidence and discuss the relevant estimation issues.

Historical mean excess returns

102. In this subsection of the report, we consider a range of issues that relate to the estimation of historical mean excess returns.

Arithmetic or geometric means

Context

103. There are two different types of average of historical excess returns. An arithmetic average is computed by adding the observations over the sample period and then dividing by the number of observations:

$$\text{Arithmetic Average} = \frac{r_1 + r_2 + \ldots + r_N}{N}$$

whereas a geometric average is computed as:

$$\text{Geometric Average} = \left[(1+r_1)\times(1+r_2)\times\ldots\times(1+r_N)\right]^{1/N} - 1.$$

AER approach

104. The AER sets out estimates of the historical mean excess return in its Appendix D, Table D.2, p. 83. In this table, the AER reports both arithmetic means (the simple average) and geometric means. The AER notes that:

> There are some concerns with using the geometric mean as a forward looking estimate[63]

but nevertheless decides that:

> We give some weight to geometric mean estimates.[64]

[62] AER Explanatory Statement, p. 94.
[63] AER Explanatory Statement, p. 93.
[64] AER Explanatory Statement, p. 93.

105. The AER goes on to conclude that:

> The best estimate of historical excess returns over a 10 year period is therefore likely to be somewhere between the geometric average and the arithmetic average of annual excess returns.[65]

106. The basis for the AER's conclusion on this point is its assertion that:

> One year historical excess returns are variable. This means that their arithmetic average will overstate the arithmetic average of 10 year historical excess returns.[66]

107. The AER provides no proof or basis or reference for that assertion.

Advice from AER consultants

108. In his advice to the AER, Lally (2013)[67] provides an appendix that demonstrates the opposite of the AER's assertion that the arithmetic average will be an upwardly biased estimate. In that appendix he sets out a test of whether each type of average is consistent with his NPV=0 principle. He concludes that:

> The geometric mean fails this test whilst the arithmetic mean will satisfy it if annual returns are independent and drawn from the same distribution. So, if historical average returns are used, they should be arithmetic rather than geometric.[68]

109. Lally (2013) goes on to advise the AER that:

> I favour arithmetic over geometric averaging.[69]

110. Lally (2012)[70] consistently advised the AER that:

> if historical average returns are used, they should be arithmetic rather than geometric averages.[71]

111. McKenzie and Partington (2011)[72] advise the AER that:

> the arithmetic average is arguably appropriate when attempting to find the best representation of expectations that are formed based on historical data,[73]

and that:

[65] AER Appendix D, p. 83.
[66] AER Appendix D, p. 83.
[67] Lally, M., 2013, *Review of the AER's methodology for the risk free rate and the market risk premium*, 4 March.
[68] Lally (2013), p. 40.
[69] Lally (2013), p. 28.
[70] Lally, M., 2012, *The cost of equity and the market risk premium*, 25 July.
[71] Lally (2012), p. 5, repeated at pp. 32 and 34.
[72] McKenzie, M. and G. Partington, 2011, *Equity Market Risk Premium*, Report for the AER, 21 December.
[73] McKenzie and Partington (2011), Paragraph 31;

> a geometric average is clearly inappropriate for the purposes of characterising expectations.[74]

112. They also advise that:

> The arithmetic mean is also consistent with the assumptions of asset pricing models such as the CAPM.[75]

and that:

> Arithmetic averages are certainly more popular. [76]

113. McKenzie and Partington (2011) go on to note that it might be possible to make an adjustment to the arithmetic mean to reflect the fact that the forward-looking market volatility might differ from the historical market volatility, but conclude that:

> Until such time as the bias inherent in the volatility adjustment process is more fully understood, **we recommend using the arithmetic average**.[77]

114. Two months later, McKenzie and Partington (2012)[78] updated their advice to the AER, recommending that:

> In our opinion there is no indisputable single best estimator for long run returns. The widespread current practice is to use unadjusted geometric and arithmetic averages. Given the current state of knowledge, we see no strong case to depart from this common practice and recommend that (sic) the use of both of these metrics, tempered by an understanding of their inherent biases.[79]

115. McKenzie and Partington (2012) do not suggest precisely how a regulator should "use unadjusted geometric and arithmetic averages…tempered by an understanding of their inherent biases," other than to note that one suggestion is that 10% weight might be applied to the geometric mean and 90% weight applied to the arithmetic mean. [80]

116. In its Guideline materials, the AER does not reference any of the advice that it has received from either of its consultants on the question of arithmetic vs. geometric averages.

Other relevant evidence

117. The AER discusses the practice of other regulators in relation to other aspects of MRP estimation, but is silent on the approach that other regulators take to the issue of arithmetic vs. geometric

[74] McKenzie and Partington (2011), Paragraph 34.
[75] McKenzie and Partington (2011), Paragraph 31.
[76] McKenzie and Partington (2011), Paragraph 31.
[77] McKenzie and Partington (2011), Paragraph 34, emphasis added.
[78] McKenzie, M. and G. Partington, 2012, *Supplementary report on the market risk premium*, Report to the AER, February 22.
[79] McKenzie and Partington (2012), pp. 8-9.
[80] McKenzie and Partington (2012), p. 8.

averages. For completeness, we note that three regulators have specifically considered this issue and that:

a) IPART uses arithmetic averages only;

b) The ERA uses arithmetic averages only; and

c) The QCA uses arithmetic averages only.

118. In addition, a well-known Harvard Business School Case compares the use of arithmetic and geometric means of historical excess stock returns. The instructor solutions to that case note that it is the *expected* annual return that is relevant when estimating MRP and that:

> Students focusing on the geometric average will argue that it is the appropriate growth rate of an investment…However, the arithmetic average is a better measure of the *expected* return on an investment.[81]

119. The instructor solutions are also quite clear about which approach should be used to estimate MRP:

> The arithmetic average annual return is the correct measure of the expected annual return.[82]

Tribunal comments

120. In its Guideline materials, the AER notes that its approach has always been to have regard to both arithmetic and geometric means and that "[t]he Tribunal has found no error with this approach."[83]

121. In the relevant *Envestra* Case, the Tribunal noted that it did not need to decide the arithmetic vs. geometric mean issue, but indicated that it would make "some comments."[84] The Tribunal then made no formal conclusion on the issue, stating that:

> The material before the Tribunal in this matter does not allow it to decide this issue. Rather, it is a matter that the AER should consider in consultation with service providers and other interested parties.[85]

122. That is, whereas the Tribunal has "found no error" with the use of geometric means, it has not endorsed their use either.

123. The Tribunal goes on to note that for any particular historical period, the geometric mean will be less than the arithmetic mean, except for the case where the return is constant over the period, in which case the two means will be equal.

124. The Tribunal then presents a simple example of a case where the geometric mean is less than the arithmetic mean:

[81] HBS Marriott Corporation Case, Instructor Guide.
[82] HBS Marriott Corporation Case, Instructor Guide.
[83] AER Appendix D, p. 83.
[84] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 147.
[85] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 155.

> imagine a portfolio that is worth 100 at the beginning of year one. Suppose that in year one the portfolio falls to 80, a -20% return, before returning to 100 in year two. The cumulative two year return is zero, whereas the average annual return is (-0.2 + 0.25)/2 = 2.5%.[86]

125. An individual who invested $100 in this portfolio at the beginning of the two-year period has clearly earned a zero return over the two years. There is obviously no dispute about this. But that is not the relevant question in terms of estimating the MRP to apply to a forward-looking period.

126. To see this, consider the following simple example which is based on the Tribunal's illustration above. Suppose that the historical data consists of two years in which the returns were -20% and +25%, respectively. Also suppose that we want to estimate the expected return over the next two years. There are two ways to interpret the historical data:

    a) Assume that the historical data will repeat in exactly the same sequence in the future, so that the returns over the next two years will be -20% and 25% respectively, with 100% probability; or

    b) Assume that the historical data tells us that for each future year there is a 50% probability of a return of -20% and a 50% probability of a return of 25%. That is, for each year in the future, returns occur with the same probability as has been observed in the past.

127. The former interpretation (which is clearly unreasonable) implies the use of the geometric mean, and the latter (standard) interpretation implies the use of the arithmetic mean. The standard arithmetic interpretation is set out in Table 2 below. In this case, each year there is a 50/50 chance of the return being -20% or 25%, in which case there are four possible outcomes over the two-year forecast period.

Table 2. Possible sequences of two-year returns in Tribunal example

Year 1	Year 2	Final value of initial $100 investment	Probability
25%	25%	156.25	0.25
25%	-20%	100	0.25
-20%	25%	100	0.25
-20%	-20%	64	0.25

128. First note that the arithmetic mean return from the historical data is:

$$\frac{-20\% + 25\%}{2} = 2.5\%.$$

129. Now note that the expected value of an initial $100 investment is:

$$0.25 \times 156.25 + 0.25 \times 100 + 0.25 \times 100 + 0.25 \times 64 = 105.0625$$

which is identical to the initial investment growing at the arithmetic mean return:

[86] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 150.

$$100(1.025)^2 = 105.0625.$$

Summary of evidence on arithmetic and geometric means

130. As set out above:

a) The arithmetic mean is consistent with the assumption that each year in the historical sample provides an indication of what the future return might be – that for each year in the future, the return is equally likely to be equal to any of the historical returns; and

b) The geometric mean is consistent with the assumption that the historical data will repeat in exactly the same sequence in the future.

131. IPART, the ERA and the QCA use arithmetic means only.

132. Lally (2012) has advised the AER that arithmetic means should be used.

133. McKenzie and Partington (2011) advised the AER that they "recommend using the arithmetic average." Even after the AER commissioned a supplementary report two months later, McKenzie and Partington (2012) did not suggest that the geometric mean should receive more than 10% weight.

134. For the reasons set out above, our view is that the arithmetic mean should be used and the geometric mean should not.

Corrected historical excess returns

135. The AER has traditionally relied on historical excess returns compiled by Brailsford, Handley and Maheswaran (2008, 2012), updated from time to time by Associate Professor Handley in reports commissioned by the AER.

136. In a submission to the AER in June 2013, NERA (2013)[87] identified and corrected a number of errors and inaccuracies in the adjustments that were made in the Brailsford et al (2008, 2012) calculations. In particular, the data for part of the period examined by Brailsford et al was sourced from Lamberton (1961). The Lamberton data reported the mean dividend yield where the mean was taken only over those companies that paid dividends. Consequently, it overstated the dividend yield in that it excluded from the calculation those companies that did not pay any dividends at all.[88] This led Brailsford et al to adjust all of the Lamberton data points using an adjustment based on the proportion of firms that paid no dividends in 1966. NERA show that the proportion of firms that paid no dividends in 1966 was materially different to the proportion that paid no dividends during each of the years actually covered by the Lamberton data. That is, the Brailsford et al adjustment is inaccurate in such a way that it creates a systematic downward bias.

137. NERA (2013) correct the bias in the Brailsford et al (2008, 2012) estimates and go on to make a more accurate and appropriate adjustment according to the proper contemporaneous proportion of non-dividend-paying stocks for each year of the Lamberton data period.

[87] NERA, 2013, *The market, size and value premiums*, June.
[88] This is not a criticism of Lamberton (1961), who was simply reporting the average yield for dividend-paying companies. The point here is that some adjustment to his data is required (for non-dividend-paying companies) if it is to be used for the purposes of estimating the historical MRP.

138. The AER has indicated that its Guideline does not employ the corrected data,[89] citing the following three reasons:

    a) "The original data is published in a peer-reviewed academic journal"; [90]

    b) "The original data (including adjustment in early years) is supplied by a credible source (the ASX)";[91] and

    c) The AER has not yet tested NERA's submissions.[92]

139. The first two of these stated reasons are untrue. The data has not been published in an academic journal. The relevant journal articles contain only the authors' mean estimates, not the original data. Moreover, it is not usual for data to be submitted and tested as part of the peer review process. In any event, if an error in inaccuracy in a published study is identified and substantiated, it should be corrected notwithstanding that the original study was published. The fact that the AER has not (since the NERA submission in June 2013) yet "had the opportunity"[93] to satisfy itself of the inaccuracy of the Brailsford et al data is not a strong reason to support the continued use of the inaccurate data.

140. The second of the AER's claims is also false. The data that has been supplied by Lamberton (1961) is not in question at all – what is in question is the adjustment that Brailsford et al have applied to it. Lamberton (1958) provides data on the average dividend yield for dividend-paying stocks. Brailsford et al make an adjustment to that data to account for non-dividend-paying stocks. The "adjustment in early years" was performed by Brailsford et al, not by any ASX source, as the AER claims. NERA simply point out that the Brailsford et al adjustment was inaccurate in such a way as to cause a downward bias in the mean estimate. Indeed, the NERA adjustment is based on the same original sources that Lamberton used, whereas Brailsford et al simply multiply all of the Lamberton dividend yields by a constant 0.75.[94]

141. In our view, the AER has no legitimate reason for refusing to use the more accurate data provided by NERA (2013).

Current estimates

142. The AER sets out estimates of the historical mean excess return in its Appendix D, Table D.2, p. 83. These estimates are based on a theta estimate of 0.7 and use data through to the end of 2012. We have updated the relevant data series to the end of 2013, based on the more accurate data compiled by NERA (2013), and report the updated estimates in Table 3 and Figure 1 below.

[89] AER Appendix D, p.83.
[90] AER Appendix D, p. 83.
[91] AER Appendix D, p. 83.
[92] AER Appendix D, p. 84.
[93] AER Appendix D, p. 84.
[94] See NERA (2013), pp. 6-17.

Table 3
Mean excess return by sampling period

Period	Mean excess return
1883 to 2013	6.8%
1937 to 2013	6.1%
1958 to 2013	6.7%
1980 to 2013	6.7%
1988 to 2013	6.1%

Source: NERA data through to 2011, updated from RBA publications.

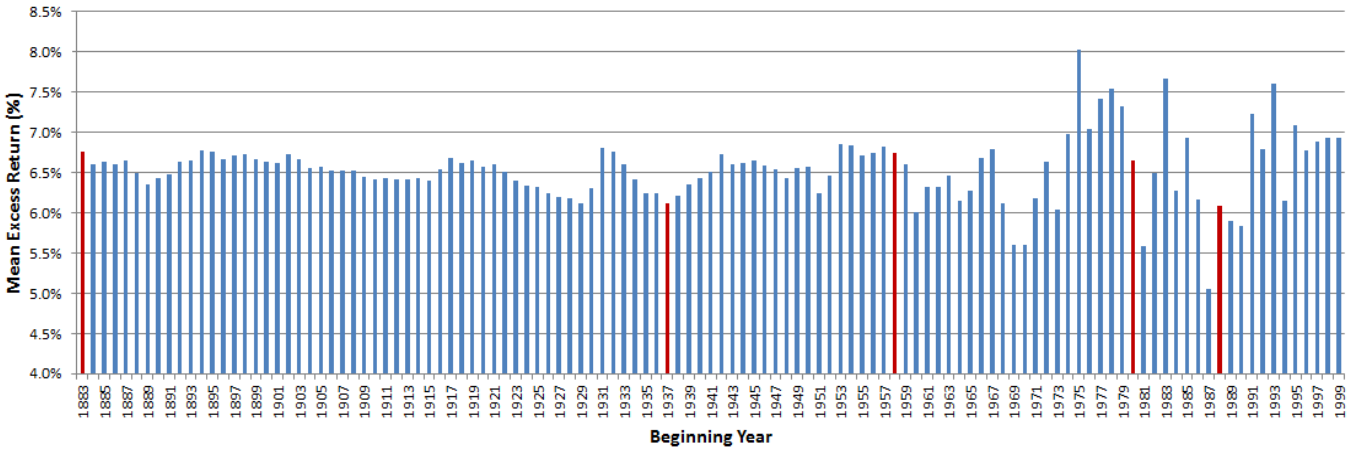
143. Table 3 shows that the mean excess return from every one of the AER's sample periods exceeds 6%. The average estimate over the five sample periods is 6.5%.[95]

144. Figure 1 shows the mean excess return through to 2013 as the beginning year of the sample period varies. That is, the first bar represents the mean excess return from 1883 to 2013, the second pertains to the period 1884 to 2013, and so on. The five start dates used by the AER are highlighted. We note that the volatility of these estimates increases from left to right as the sample size becomes smaller. Of all of the estimates set out in Figure 1:

a) 95% are greater than 6%; and

b) 58% are greater than 6.5%.

Figure 1
Mean excess return to 2013



Source: NERA data through to 2011, updated from RBA publications.

145. Based on the estimates set out in its Appendix D, Table D.2, p. 83, the AER concludes that:

> The arithmetic average provides a range of 5.7 to 6.4 per cent.[96]

[95] The mean over the five periods is essentially a weighted-average wherein more recent periods receive progressively more weight than older periods.
[96] AER Explanatory Statement, p. 93.

146. Our results above correct the inaccuracy in the Brailsford et al (2008, 2012) dividend yield adjustment and update the data to the end of 2013. The range of estimates from the five start years specified by the AER is 6.1% to 6.8%, using the AER's theta estimate of 0.7.[97]

Interpretation of historical mean excess return

147. In any long historical period it is likely that there will be a range of market conditions and consequently the market risk premium will be higher in some market conditions and lower in other market conditions. In this regard, the AER notes that:

> Evidence suggests the MRP may vary over time. In their advice to the AER, Professor Lally and Professor Mackenzie and Associate Professor Partington have expressed the view that the MRP likely varies over time.[98]

148. The historical mean excess return is, by definition, an estimate of the excess return in the average market conditions over the sampling period. That is, the historical mean estimates in Table 3 above are estimates of the average risk premium over the relevant sampling periods. The estimates in that table range from 6.1% to 6.8%. This does *not* imply that the MRP could be as low as 6.1% in some market conditions or as high as 6.8% in other market conditions. What it does imply is that a point estimate for the MRP in *average* market conditions should come from the range of 6.1% to 6.8%.

149. Such an estimate of the MRP in *average* market conditions could inform an estimate of the MRP in *prevailing* market conditions after consideration of the extent to which the prevailing conditions might differ from the average conditions.

Implications of using historical mean excess return to estimate MRP

150. If estimated over a long sample period, the historical mean excess return will be very slow to move as each additional year of data becomes available – indeed, it will be effectively constant. For example, the AER has traditionally used 6% as an estimate of the historical mean excess return and continues to adopt that estimate.[99]

151. If a constant historical mean estimate is used to estimate the MRP for the Sharpe-Lintner CAPM, the implication is that required returns on equity are at a minimum when government bond yields are at their minimum. This is because the required return on the average firm would be estimated as the constant historical mean plus the prevailing government bond yield.

152. Government bond yields tend to fall during financial crises and have been at historical lows since the onset of the global financial crisis (**GFC**). Consequently, setting the MRP equal to a constant historical mean would imply that the onset of the GFC caused the cost of equity across the economy to also fall to historical lows, which is clearly unreasonable.[100]

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[97] The range of estimates for the five start years specified by the AER is 5.5% to 6.6% if theta is set to 0.35.
[98] AER Explanatory Statement, p. 91.
[99] AER Explanatory Statement, p. 93.
[100] In its Explanatory Statement (p. 81) the AER questions whether it is correct to say that government bond yields fell to historically low levels with the onset of the GFC, on the basis that pre-war government bond yields were similar to post-GFC yields. Appendix 2 to this report shows why the comparison to pre-war yields is inappropriate. In any event, the simple point being made here is that government bond yields fell materially with the onset of the GFC and it would be clearly unreasonable to conclude that a global financial crisis would result in a material decline in the required return on equity.

Conclusions in relation to historical mean excess returns

153. Our conclusions in relation to historical mean returns are:

a) The arithmetic mean should be used and the geometric mean should not;

b) The data should be updated to include 2013 and the more accurate dividend yield adjustment provided by NERA (2013);

c) The point estimates for the five start years specified by the AER fall within the range of 6.1% to 6.8% if theta is set to 0.7 and 5.5% to 6.6% if theta is set to 0.35. The estimates from the longest data periods are 6.8% and 6.6% respectively;

d) Historical mean excess returns produce an estimate of the MRP in *average* market conditions and could inform an estimate of the MRP in *prevailing* market conditions after consideration of the extent to which the prevailing conditions might differ from the average conditions; and

e) Government bond yields tend to fall during financial crises and have been at historical lows (relative to the last 50 years) since the onset of the GFC. Consequently, setting the MRP equal to a constant historical mean would imply that the onset of the GFC caused the cost of equity across the economy to also fall to record lows, which is clearly unreasonable.

The Wright approach

Context

154. In its Guideline materials, the AER observes that there are two ways to estimate the required return on the market (or for the average firm) – each at the end point of a theoretical spectrum:

a) At one end of the spectrum, one could assume that the MRP is constant over time, in which case the required return on the market would be estimated as the sum of the constant MRP and the prevailing risk-free rate. This approach is often called the *Ibbotson* approach in the regulatory setting; and

b) At the other end of the spectrum, one could assume that the required return on the market is constant, in which case the MRP could be estimated by subtracting the prevailing risk-free rate from that constant required return. This approach has become known as the *Wright* approach in the Australian regulatory setting.

155. In summary, under the Ibbotson approach, the required return on the market is assumed to vary up and down one-for-one with changes in the risk-free rate, and under the Wright approach the required return on the market is assumed to be constant.

156. In its Guideline materials, the AER recognises that it is unlikely that either of these extreme cases perfectly reflects reality, in which case it will not select one or the other, but will give some weight to both:

> our approach to estimating the expected return on equity will consider estimates of the Sharpe–Lintner CAPM that assume both no consistent relationship, and a negative relationship between the MRP and risk free rate.[101]

Implementation of the Wright approach

157. The Wright approach assumes that the real required return on the market (or average stock) is constant. This approach implies that the real risk-free rate and the MRP are perfectly negatively correlated – any increase in the real risk-free rate is exactly offset by a corresponding decrease in the MRP such that the real required return on the market remains constant.

158. The Wright approach involves the following steps:

a) Estimate the real return on the market portfolio each year for some historical period using the Fisher relation:

$$r_{m,t}^{real} = \frac{1 + r_{m,t}^{nominal}}{1 + inflation_t} - 1;$$

b) Take the average real market return over the relevant historical period; and

c) Use the Fisher relation, and a contemporaneous estimate of expected (forward-looking) inflation to obtain an estimate of the nominal required return on the market:

$$r_m^{nominal} = \left(1 + \overline{r_m^{real}}\right)\left(1 + E[inflation]\right) - 1.$$

159. The Wright approach produces a direct estimate of the required return on the market. The implied MRP can be determined by deducting the contemporaneous estimate of the risk-free rate.

Comparison of the Ibbotson and Wright approaches

160. The key differences between the Ibbotson and Wright approaches are illustrated in Figure 2 and Figure 3 below. These figures show data from 1996 because the Wright approach requires an estimate of expected inflation and any such estimate prior to 1996 would be controversial. In 1993 the RBA began inflation targeting and since 1996 inflation has generally remained within (or close to) the RBA target band of 2-3%.

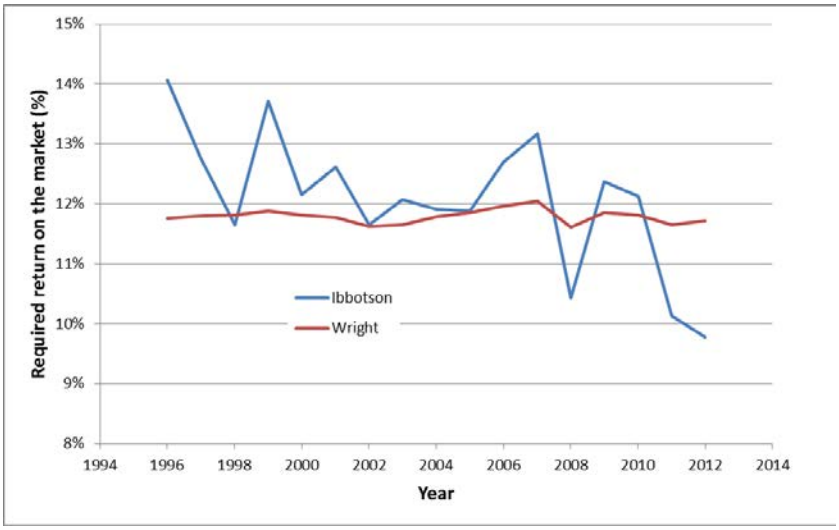
161. The Ibbotson approach produces a very stable estimate of MRP,[102] in which case the required return on the market varies directly with the risk-free rate. By contrast, the Wright approach produces a very stable estimate of the required return on the market,[103] in which case the MRP varies inversely with the risk-free rate.

162. Figure 2 shows that the Wright estimate of the required return on the market is stable throughout the period. By contrast the Ibbotson approach implies that equity is more expensive than average during economic expansions and bull markets (the late 1990s and mid 2000s) and cheaper than average during financial crises (the dramatic reduction in 2008). The implausibility of the implications from

[101] AER Appendix B, p. 26.
[102] Changing each year only due to the addition of another year of data when estimating the mean historical excess return.
[103] Changing each year only due to the addition of another year of data when estimating the mean historical real return.

the Ibbotson approach should be taken into account when considering how much weight it should be afforded.

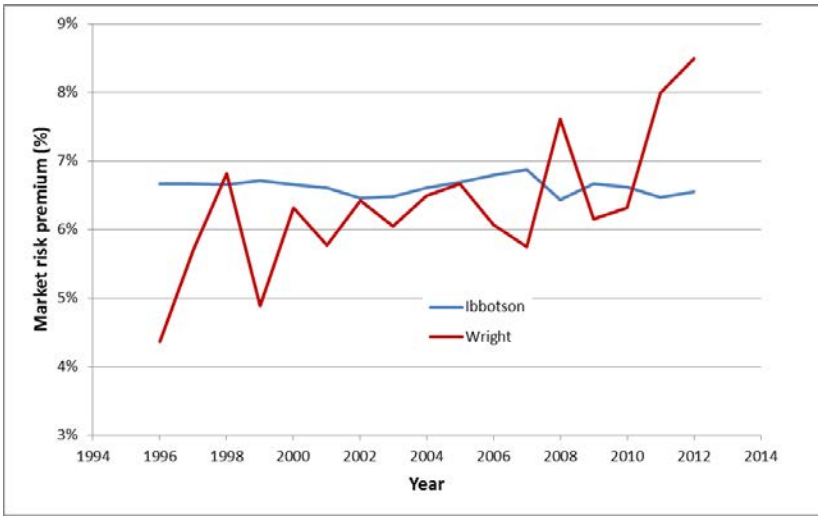
Figure 2
Comparison of Ibbotson and Wright estimates of the required return on the market



Source: SFG calculations.

163. Figure 3 shows that the Wright estimate of the market risk premium varies over different market conditions – the implied MRP is lower than average during economic expansions and bull markets (the late 1990s and mid 2000s) and higher than average during financial crises (the dramatic increase in 2008). This is consistent with the notion that the perceived amount of risk and the price of risk fall during expansions and rise during crises. By contrast, the Ibbotson approach implies that the MRP is essentially constant across all market conditions.

Figure 3
Comparison of Ibbotson and Wright estimates of MRP



Source: SFG calculations.

Recommended use of the Wright approach

164. In his advice to the AER, Lally (2013)[104] implies that the Ibbotson and Wright estimates of MRP should both be considered in the same way – he includes these two estimates in his set of relevant estimates for the AER to consider.[105]

165. In his more recent advice to the QCA, Lally (2013)[106] confirms his view that the Wright estimate of MRP is one of the estimates that should be considered, along with the Ibbotson estimate and other relevant estimates:

> I consider that the set of methodologies considered by the QCA should be augmented by one involving estimating the expected real market cost of equity from the historical average actual real return and then…converting the estimate of the expected real market cost of capital to its nominal counterpart.[107]

166. In recommending that the Wright approach should be used, Lally (2013) recognises that the two approaches set out above are the end points of a spectrum. The first assumes that the MRP is constant so that the required return on the market varies one-for-one with the risk-free rate. The second assumes that the (real) expected return on the market is constant so that the MRP varies one-for-one with the risk-free rate. Lally (2013) concludes that the evidence on which end of the spectrum should be preferred is "not decisive"[108] and consequently recommends that both approaches should be given some weight.

167. Lally (2013) also notes that the Wright approach is used extensively by UK regulators.[109]

AER's use of the Wright approach

168. In its Guideline materials, the AER has stated that it too will have regard to the Wright approach when determining the allowed return on equity. In setting out its reasons for having regard to the Wright approach, the AER noted that the Wright approach is likely to produce allowed returns on equity that are more stable over time than those produced by its previous mechanistic implementation of the Sharpe-Lintner CAPM:

> …the Wright approach (for implementing the Sharpe–Lintner CAPM) will result in estimates of the return on equity that may be relatively stable over time. The informative use of these implementations of the Sharpe–Lintner CAPM…is expected to lead to more stable estimates of the return on equity than under our previous approach.[110]

169. The AER also noted that more stability in the allowed return on equity was favoured by a broad cross section of stakeholders and is more likely to properly reflect the efficient financing costs of a benchmark efficient entity.[111]

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[104] Lally M., 2013, *Review of the AER's methodology for the risk free rate and the market risk premium*, 4 March.
[105] Lally (2012), p. 7.
[106] Lally, M., 2013, *Response to submissions on the risk-free rate and the MRP*, Report for the QCA, 22 October.
[107] Lally (2013), p. 3.
[108] Lally (2013), p. 6.
[109] Lally (2013), p. 13.
[110] AER (2013), Explanatory statement, p. 66.
[111] AER (2013), Explanatory statement, p. 66.

170. The AER also considers the Wright approach to have the attractive features of transparency and replicability – relative to its previous mechanistic implementation of the CAPM:

> …we consider that implementing the Wright approach is more transparent and replicable than our standard implementation of the Sharpe–Lintner CAPM.[112]

171. Having decided that the Wright approach is relevant, the AER has determined that it will have regard to that approach to "inform the overall return on equity" [113] rather than to inform its estimate of MRP. That is, the Ibbotson method of processing the historical data is directly used to set the point estimate for the allowed return on equity and the Wright method of processing the historical data is relegated to be one of five things that the AER will look at when deciding whether or not to maintain its initial point estimate. It seems highly unlikely that the Wright approach, used in this way, would ever have a tangible effect on the allowed return on equity. Consistent with this view is the fact that, in the sample implementation in the Guidelines, there is not even any reference to the use of the Wright approach.

172. Using the parameter estimates set out in its Guideline materials, the AER's point estimate for the allowed return on equity for the benchmark efficient entity is:

$$r_e = r_f + \beta \times MRP = 4\% + 0.7 \times 6.5\% = 8.55\%.$$

173. The AER's estimate of the required return on equity for the benchmark efficient entity from the Wright approach is 9.6%[114] – a material increase of more than 12%. The Guideline materials provide no indication of how, or even whether, this evidence would be used to "inform the overall cost of equity." It is clearly materially higher than the AER's default estimate, but it is not at all clear how it could have any tangible effect.

174. In our view, the Wright approach should be one of the techniques that are used to inform the estimate of MRP, as recommended by Lally (2013).

Current estimates from the Wright approach

175. We have computed the average real return on the market portfolio using:

a) Data from 1883 to 2013, inclusive;

b) The NERA (2013) correction for the inaccuracy of the Brailsford et al (2008, 2012) dividend yield adjustment; and

c) An estimate of the value of distributed imputation credits of 0.7, consistent with the AER's Guideline.

176. The average real return on the market portfolio (including imputation credits with theta set to 0.7) is 9.1%. If expected inflation is set to 2.5% (the mid-point of the RBA target band), a 9.1% real return is consistent with a nominal return of 11.8% (using the standard Fisher relation). That is, if the current real return is expected to be the same as the long-run historical average, the current nominal required return is 11.8%. If the current risk-free rate is set to 3.63%, the implied MRP is 8.2%.

[112] AER (2013), Draft rate of return guideline: Explanatory statement, p. 186.
[113] AER Guideline, p. 14.
[114] Using an MRP estimate of 8%, as set out in Appendix D, p. 104.

177. If theta is set to 0.35 the Wright approach produces a current estimate of MRP of 8.1%.

Conclusions on the Wright approach

178. There are two approaches for estimating MRP from the historical data. The Ibbotson approach assumes that the MRP is constant across all market conditions and estimates the MRP as the mean historical excess return. At the other end of the spectrum, the Wright approach assumes that the required return on the market is constant and estimates the MRP by subtracting the contemporaneous risk-free rate.

179. In our view, the Ibbotson and Wright approaches should both be used to inform the estimate of MRP for use in a Sharpe-Lintner CAPM foundation model.

180. Lally (2013) also recommends that the Ibbotson and Wright approaches should both be used to estimate MRP.

181. The Wright approach is also used extensively by UK regulators.

182. The Wright approach currently produces an MRP estimate of 8.2% for theta set to 0.7 and 8.1% for theta set to 0.35.

Dividend discount models

AER's proposed use of dividend discount models

183. In its Guideline materials, the AER notes that it intends to use dividend discount models[115] to inform its estimate of the market risk premium.[116] The Guideline materials set out the AER's views about the strengths and weaknesses of dividend discount models as follows:

> Strengths include the theoretical underpinnings of this estimation method and there is some support for the ability of valuation models (DGMs) to predict returns.
>
> Limitations include the practical difficulties with estimating the DGM. These models are highly sensitive to assumptions made when estimating them and there is no clear answer about what those assumptions should be. [117]

184. The Guideline materials also recognise that dividend discount models have a strong theoretical foundation (in that they are simply based on stock prices properly reflecting the present value of future cash flows) and that they reflect current required returns (as opposed to historical averages):

> we consider DGM estimates have strong theoretical grounding and are more likely to reflect prevailing market conditions than other approaches.[118]

185. When specifying the precise form of the dividend discount model to be used, a range of choices are available. In the simplest form of dividend discount model, one can impose the additional

[115] This class of models is interchangeably referred to as "dividend discount models" and "dividend growth models" (DGMs). Our practice is to use the former term on the basis that it is descriptive of the basis for these models – observable stock prices are modelled as the sum of discounted future dividends. The AER's Guideline materials use the latter term, but both refer to the same class of models.
[116] See, for example, AER Guideline, p. 13.
[117] AER Explanatory Statement, p. 90.
[118] AER Appendix D, p. 85.

assumption that dividends grow at a single constant rate in perpetuity. However, multi-stage models (whereby different growth rates apply to different future periods) provide more accurate results and are more commonly used in practice. For these reasons, the AER adopts two- and three-stage dividend discount models, noting that:

> Our use of two and three stage versions of the DGM reflects that these models are commonly used. Reputable sources including the Bank of England and Damodaran support this conclusion. [119]

and:

> Bloomberg provides estimates of the cost of equity using a three-stage model.[120]

Downward adjustments

186. However, unlike the Bank of England, Damodaran, and Bloomberg, the AER proposes to apply a downward adjustment to its estimate of the long-run growth in dividends. The source of this downward adjustment is a practitioner paper by Bernstein and Arnott (2003), who argue that the dividends (and consequently the market capitalisation) of existing companies must grow at a slower rate than the rest of the economy. They suggest that long-run dividend growth should be set equal to long-run GDP growth less some adjustment. The AER adopts a long-run GDP estimate of 3% and three different downward adjustments (0.5%, 1% and 1.5%) that produce (lower) long-run dividend growth rates of 1.5%, 2% and 2.5%, respectively.

187. The downward adjustments appear to be based on Bernstein and Arnott (2003) and Lally (2013).[121] Bernstein and Arnott recommend a downward adjustment of 2%, but Lally identifies two errors in their approach, both of which lead to their calculation being upwardly biased. Consequently, the AER examines three downward adjustments that are arbitrarily selected to be above 0 and below 2%. The AER claims that this:

> reflects the range of Lally's estimates.[122]

188. However, in his recent advice to the AER, Lally (2013)[123] does not suggest that the long-run dividend growth rate could be 1.5% or 2.5%. Rather, Lally's actual advice to the AER is as follows:

> In summary, all of this evidence suggests that an appropriate estimate for the long-run expected real growth rate in DPS is 2% per year, which accords with the AER's view.[124]

189. Moreover, The AER has adopted this class of dividend discount models based on their use by "reputable sources" such as the Bank of England, Damodaran, and Bloomberg. None of these sources apply any Bernstein-Arnott adjustment at all despite the fact that Bernstein and Arnott (2003) was published more than 10 years ago.

[119] AER Appendix D, p. 85.
[120] AER Appendix D, Footnote 385, p. 85.
[121] Lally M., 2013, *The Dividend Growth Model*, 4 March.
[122] AER Explanatory Statement, p. 119.
[123] Lally (2013), *Review of the AER's proposed dividend growth model*, 16 December.
[124] Lally (2013), p. 18.

190. IPART also provides estimates of MRP based on the dividend discount models of the Bank of England, Damodaran and Bloomberg.[125] IPART does not apply any Bernstein-Arnott adjustment and reports a contemporaneous MRP estimate of 7.9%.

The SFG approach

191. In a submission to the AER's Guideline process, SFG (2013)[126] use a multi-stage dividend discount model similar to those adopted by the AER and IPART. However, rather than imposing a particular long-run growth rate (with or without a downward adjustment) SFG simultaneously *estimate* it. That is, the SFG approach selects the combination of long-run growth rate and required return on equity that best fits the observable data. In our view, there are a number of reasons to have regard to the SFG approach:

    a) As set out above, by estimating the long-run dividend growth rate that best fits the observable data, SFG avoid having to make arbitrary assumptions about existing companies growing at a slower rate than the broad economy;

    b) The SFG approach is based on Fitzgerald, Gray, Hall and Jeyaraj (2013), a peer-reviewed paper published in a journal that has an A* rating in the Australian Business Deans Council rating system;

    c) IPART has indicated that it has regard to the SFG approach when estimating the contemporaneous MRP; and

    d) The AER indicates that its dividend discount approach cannot be applied at the industry level because it produces estimates that are volatile and fail a "basic sanity check" in that they suggest that the required return is higher for the benchmark firm than for the average firm.[127] Estimates produced using the SFG approach do not exhibit either of these problems.

Conclusions in relation to dividend discount models

192. The AER's Guideline materials summarise a number of dividend discount estimates of MRP in Appendix D, Table D.4, p. 88. The last four entries in that table use more recent estimates of dividend yields and government bond yields and are repeated in Table 4 below.

Table 4
AER summary of dividend discount estimates of MRP

Submission	MRP estimate
NERA (March 2012)	7.69-7.72, midpoint of **7.7%**
CEG (November 2012)	**8.89%**
Lally (March 2013)	5.9-8.39, midpoint of **7.1%**
SFG (June 2013)	**7.90%**

Source: AER Appendix D, Table D.4, p. 88.

193. Since the compilation of the SFG (2013) estimate in the first half of 2013, government bond yields have changed materially. Using updated data, SFG (2014)[128] report an estimate of the required return

[125] IPART (2013), p. 15.
[126] SFG (2013), *Dividend discount model estimates of the cost of equity,* June.
[127] AER Appendix E, p. 121.
[128] SFG (2014), *Alternative versions of the dividend discount model and the implied cost of equity,* April.

on the market of 12.5% for theta set to 0.7 and 11.4% for theta set to 0.35. This implies an MRP estimate of 8.9% for theta set to 0.7 and 7.8% for theta set to 0.35.[129]

194. The recent estimates compiled by Australian regulators are summarised in Table 5 below.

Table 5
Regulatory dividend discount estimates of MRP

Regulator	MRP Estimate
AER (with Lally recommended adjustment)	6.7 - 7.1%[a]
AER (with no adjustment)	7.6 – 7.9%[b]
IPART	7.9%[c]
ERA	7.0 - 7.5%[d]

Sources: a=AER Appendix E, Table E.1, p. 119; b=SFG calculation based on AER approach; c=IPART (2013), p. 70; d=ERA Explanatory Statement, Paragraph 732.

195. In our view, the SFG (2014) estimates are the most robust, reliable and up-to-date estimates that are currently available:

a) For theta set to 0.7: MRP of 8.9% and required return on the market of 12.5%; and

b) For theta set to 0.35: MRP of 7.8% and required return on the market of 11.4%.

Survey responses

Proposed use of survey responses

196. In its Guideline materials, the AER concludes that one of the key strengths of survey data is the fact that MRP is a forward-looking parameter and survey data seeks to obtain a direct indication of investor expectations at a point in time. The AER also notes that survey data can be compared against empirical estimates of MRP:

> Strengths include the direct theoretical link between expected excess returns and stated expectations, and the triangulation of results across surveys and across time.[130]

197. The AER also sets out some of the limitations of survey data:

> Limitations include timeliness, survey design and the representativeness of the respondents.[131]

198. Ultimately, the AER concludes that:

> We propose to give survey estimates some consideration when estimating MRP[132]

[129] We recognise that the AER is still considering how the implied MRP estimates from this approach should be adjusted to incorporate the assumed value of imputation credits. See for example AER Appendix E, p. 125. Resolution of that issue is beyond the scope of this report.
[130] AER Explanatory Statement, p. 90.
[131] AER Explanatory Statement, p. 90.
[132] AER Appendix D, p. 88.

and that:

> In December 2013, these estimates generally support an MRP of about 6.0 per cent.[133]

Advice from AER consultants

199. In its discussion of the use of survey data, the AER cites advice that it received from McKenzie and Partington (2011[134], 2012[135]) and Lally (2013)[136] on the use of survey data under the previous Rules.

200. Lally (2013) recommends that survey results "should be considered" [137] but warns against the use of older survey information on the basis that it may be untimely (and consequently not reflect the prevailing conditions in the market for equity funds):

> Since the MRP may have risen since the commencement of the GFC, surveys conducted prior to 2009 are not relevant.[138]

201. McKenzie and Partington (2011)[139] conclude that survey evidence suffers from potential problems and review a number of those problems, which include:

a) the wording of the survey questions is unclear – it is generally not known precisely what respondents were asked to provide;

b) the surveys typically do not explain how those surveyed were chosen;

c) a majority of those surveyed did not respond;

d) it is unclear what incentives were provided to ensure respondents would provide accurate responses, or whether respondents face incentives to provide self-serving responses;

e) whether respondents supplied MRP estimates that use continuously compounded or not continuously compounded returns is unclear;

f) the risk-free rate that respondents use is unclear;

g) whether the respondents supplied MRP estimates that include the assumed effect of dividend imputation tax credits is not made explicit; and

h) the relevance of some of the surveys is unclear given changes in market conditions since the surveys were conducted.

202. Nevertheless, McKenzie and Partington (2012) conclude that:

---

[133] AER Appendix D, p. 88.
[134] McKenzie, M. and G. Partington, 2011, *Equity market risk premium*, Report to Coors Chambers Westgarth, December 22.
[135] McKenzie, M. and G. Partington, 2012, *Review of regime switching framework and critique of survey evidence*, Report to the AER, September 7.
[136] Lally, M., 2013, *Review of the AER's methodology for the risk free rate and the market risk premium*, 4 March.
[137] Lally (2013), p. 29.
[138] Lally (2013), p. 29.
[139] See McKenzie and Partington (2011), pp. 21-22.

> despite the potential problems, we give significant weight to the survey evidence.[140]

Tribunal requirements

203. The Australian Competition Tribunal has also recognised the problems that relate to the use of survey data and has ruled that:

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate.
>
> When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.[141]

204. In essence, the Tribunal requires that three conditions must be met for survey responses to be given any material consideration:

a) The survey must be timely – there must have been no change in the prevailing conditions in the market for funds since the survey was administered;

b) There must be clarity about precisely what respondents were asked so that there is no ambiguity about how to interpret their responses; and

c) The survey must reflect the views of the market and not a sample that is small, unresponsive, or without sufficient expertise.

AER application

205. In its Guideline materials, the AER sets out a list of 13 surveys.[142] These surveys are divided into groups and discussed in turn below.

Pre-2009 surveys

206. The first five of the surveys cited in the AER's Guideline materials use data from 2009 or before. Under the previous Rules, Lally (2013) has advised that such dated information is "not relevant"[143] and should be "disregarded."[144] Under the new Rules, it seems unlikely that data pre-dating the GFC, European debt crisis, and the AER's previous WACC Review could be said to be commensurate with the prevailing conditions in the market for equity funds.

[140] McKenzie and Partington (2012), p. 6.
[141] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.
[142] AER Appendix D, Table D.5, p. 92.
[143] Lally (2013), p. 29.
[144] Lally (2013), p. 30.

Asher surveys

207. Two of the remaining studies are by Asher (2011, 2012). These studies are singled out for special criticism by both Lally (2013)[145] and McKenzie and Partington (2012).[146]

208. The Asher surveys are both two-page notes in a magazine. For example, the Asher (2012) survey is sandwiched between letters to the editor and the puzzle page, which notes that the name of the South Australian town of Glenelg is a palindrome. Moreover, more than 12% of the respondents indicated that there was no risk premium at all and the text commentary indicates that respondents provided different MRP values for assets in different risk classes. This is a clear indication that the respondents were not providing estimates of MRP for use in the Sharpe-Lintner CAPM. In addition, McKenzie and Partington (2012) note that:

> Asher stated in a seminar in front of individuals whom he later surveyed that, "the implied equity premium is more or less equal to the dividend yield which is probably at this stage somewhere between 3 and 4 per cent".[147]

For the reasons set out above, our view is that the Asher surveys should receive no weight at all.

Fernandez surveys: Reliability

209. Of the remaining surveys, four have been performed by Spanish academic Pablo Fernandez and various of his co-authors. Obviously, the most recent of these surveys provides the most timely information and is most likely (relative to more dated information) to be commensurate with the prevailing conditions in the market. In their most recent reports on MRP issues, both Lally (2013)[148] and McKenzie and Partington (2013)[149] refer only to the most recent Fernandez survey that was available at the time.

210. The most recent Fernandez survey that is available is that of Fernandez, Aguirreamalloa and Linares (2013), which asks respondents about MRP values for 2013. This is also the most recent survey in the AER's list.[150] The AER notes that the mean MRP estimate from this survey is 6.8%.[151] However, there are a number of problems with this survey:

a) The results are based on only 17 participants;

b) There is no information about the qualifications of respondents;

c) There is no information about the non-response rate;

d) There is no information about what the respondents use their estimate of MRP for (e.g., classroom examples vs. long-term equity investment decisions);

[145] Lally (2013a), p. 30 notes that these surveys are targeted at a narrow segment of the professional community and warrant lower weight.
[146] McKenzie and Partington (2012), p. 29 argue that surveys should be weighted according to their reliability so that less reliable surveys receive "lesser weight," noting that "one such survey is provided by Asher."
[147] McKenzie and Partington (2012), p. 28.
[148] Lally, M., 2013, *Response to submission on the risk-free rate and the MRP*, Report for the QCA, 22 October.
[149] McKenzie, M. and G. Partington, 2013, *Review of Aurizon Network's draft access undertaking*, Report for the Queensland Resources Council, October 5.
[150] AER Appendix D, Table D.5, p. 92.
[151] AER Appendix D, Table D.5, p. 92.

e) There is no information about the values that participants use for other WACC parameters (e.g., whether they are using higher values of the risk-free rate in lieu of a higher value for MRP); and

f) There is a wide dispersion of estimates among the 17 participants.

211. In our view, it is difficult to imagine that any survey could fare worse against the criteria set out by the Tribunal.

212. In spite of these problems, the AER's interpretation of this study is that:

> This survey adds to the triangulation of evidence around 6.0 per cent[152]

on the basis that "outliers at the upper end"[153] have inflated the mean estimate of 6.8%. However, our view is that, if the responses of survey participants are to be used, they should *all* be used – the regulator should not determine which respondents have provided acceptable responses and which have not. That is, the dispersion of responses should not be used as the basis for filtering out individual responses, but would be relevant when assessing how much weight might be applied to the survey evidence.

Fernandez surveys: Relevance

213. Another issue with the Fernandez surveys has been identified by Lally (2013).[154] He suggests that the Fernandez surveys may not reflect the views of investors who actually provide equity capital in the market. He suggests that actual equity investors may arrive at their estimate of MRP using a different set of information to that used by survey respondents. In particular, he states that:

> However, the respondents to these surveys are academics, analysts and managers rather than investors per se.[155]

214. The fact that the Fernandez survey results do not reflect the views or requirements of actual investors is another factor that might lead to them being afforded less weight.

Fernandez surveys: Stability

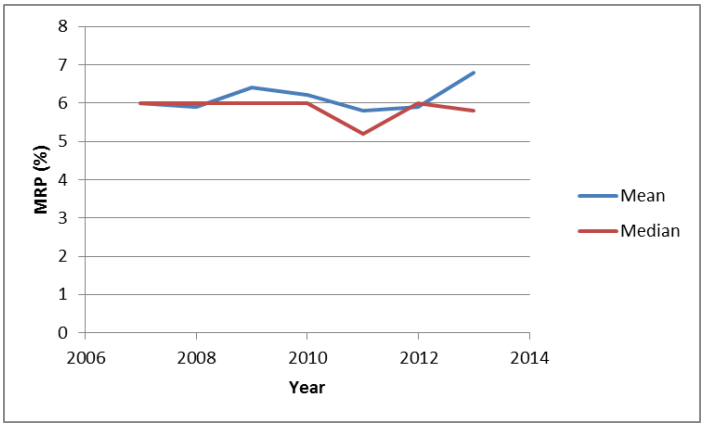
215. The Fernandez surveys consistently produce mean and median estimates that are close to 6%, regardless of the prevailing conditions in the market at the time. The mean and median MRP estimates for Australia from the Fernandez surveys are set out in Figure 4 below. These figures clearly are very slow-moving over time. Indeed Fernandez himself notes that:

> The median has been remarkably stable: 6% for USA and Australia.[156]

and Lally (2013) concludes that between 2007 and 2012 "there has been no significant movement"[157] in the Fernandez survey results.

[152] AER Appendix D, p. 91.
[153] AER Appendix D, p. 91.
[154] Lally, M., 2013, *Response to submissions on the risk-free rate and the MRP*, Report for the QCA, 22 October.
[155] Lally (2013), p. 23.
[156] Fernandez (2010), p. 6.
[157] Lally (2013 QCA), p. 64.

Figure 4
Fernandez survey MRP estimates



Source: Fernandez surveys.

216. The period covered by Figure 4 includes the last year of a remarkable bull market and the peak of the GFC and European debt crises, yet the estimate is essentially stuck at 6% throughout. That is, there is something about the phrasing of the questions and the nature of the small sample of respondents that (empirically) has had the effect of producing an estimate of close to 6% over all market conditions since 2007.

217. The Fernandez surveys pertaining to 2012 and 2013 both report that the vast majority have based their MRP values on the Ibbotson estimate, historical data, or textbooks. The fact that the vast majority of respondents have provided MRP values that are historical averages that are very slow to move (rather than contemporaneous forward-looking estimates) is consistent with the stability of the survey averages over different market conditions.

218. In summary, the survey evidence appears to simply regurgitate the long-run historical average excess return.

KPMG (2013)

219. The AER's Guideline materials refer to a KPMG survey of six banks, six professional services firms, and six infrastructure funds. No information is provided about which organisations responded to the survey, what the response rate was, which individuals within each organisation completed the survey or their qualifications or roles within the organisation. Consequently, this survey does not fare well against the criteria set out by the Tribunal.

220. The AER notes that this survey concludes that:

> Survey participants are overwhelmingly using an MRP of 6.0 per cent for Australia, with some bias to 7.0 per cent.[158]

221. The information set out in Figure 12 of the KPMG document enables the mean MRP estimate to be computed as 6.24%.[159]

[158] AER Appendix D, p. 91.
[159] 0.03×5% + 0.72×6% + 0.23×7% + 0.02×8% = 6.24%.

222. KPMG (2013) also report that 81% of the survey respondents based their estimate in full or in part on historical excess returns and that more than two thirds of respondents have not revised their estimate of MRP to reflect the increased volatility in financial markets brought on by the GFC.[160] Both of these results indicate that, like the Fernandez survey results, participants are simply regurgitating the long-run historical average excess return. This evidence suggests that it would be dangerous to interpret the KPMG survey results as a forward-looking estimate of MRP that is commensurate with the prevailing conditions in the market.

Independent expert reports

223. The AER's Guideline materials also refer to a summary of independent expert valuation reports conducted by Ernst and Young (2012). That study has since been updated by SFG (2013)[161] in a report that was submitted to the AER in June of 2013. These reports differ from the surveys that are considered by the AER in that they do not ask for a participant's view of what the MRP is or should be, they document the practice of independent expert valuation professionals. For this reason, we deal separately with the summaries of independent expert valuation reports in the following section of this report.

Summary of survey evidence

224. As set out above, we disregard the pre-2009 and Asher survey information, noting the recommendations of Lally (2013) and McKenzie and Partington (2012) in this regard. We also note that the advice the AER has received on this issue was under the previous Rules and if anything it is more important under the new Rules to obtain a timely estimate that is commensurate with the prevailing conditions in the market. Also, we note that we consider independent expert evidence separately in the following section of this report.

225. This leaves the following survey information:

a) **The Fernandez surveys**. In the above discussion we have highlighted many problems with these surveys and concluded that it is difficult to imagine that any survey could fare worse against the criteria set out by the Tribunal. One of the key issues is that these surveys consistently report mean and median estimates that are close to 6.0%, across a range of market conditions and it is difficult to imagine that an MRP of 6% could be commensurate with the prevailing conditions in an historic bull market and with the prevailing conditions in the market during a global financial crisis. The most recent survey reports mean and median estimates of 6.8% and 5.8% respectively.

b) **The KPMG (2013) survey**. In the above discussion we have also highlighted many problems with the KPMG survey and concluded that it too should not be afforded any material weight. One of the key issues is that 81% of the survey respondents based their estimate in full or in part on historical excess returns and that more than two thirds of respondents have not revised their estimate of MRP to reflect the increased volatility in financial markets brought on by the GFC.[162] Both of these results indicate that, like the Fernandez survey results, participants are simply regurgitating the long-run historical average excess return. The KPMG survey reports mean and median estimates of 6.24% and 6% respectively.

[160] KPMG (2013), p. 18.
[161] SFG, 2013, *Evidence on the required return on equity from independent expert reports*, June.
[162] KPMG (2013), p. 18.

226. In our view, neither of these surveys should be afforded material weight. However, if they are considered to be relevant, they support an MRP estimate in the range of 5.8 to 6.8%. Importantly, as we explain below, these estimates of MRP cannot be compared directly with the AER's estimate of MRP because the survey estimates do not include the benefits of imputation credits whereas the regulatory estimate does.

Incorporation of imputation credits

Comparison of with-imputation and ex-imputation returns

227. None of the survey estimates considered by the AER can be directly compared with the AER's estimate of MRP. This is because the AER reports an MRP estimate that includes the benefit of imputation credits, whereas the survey estimates above do not. In particular, the AER uses the following approach:

a) Estimate the total required return on equity (including the benefits of imputation credits) using a with-imputation estimate of MRP (that also includes the benefits of imputation credits);

b) Estimate the return that shareholders obtain from their receipt of imputation credits; and

c) Estimate the ex-imputation return that the firm is allowed to generate as the difference between (a) and (b), and set allowed revenues accordingly.

228. The relationship between the ex-imputation credit return that will be generated by the firm's allowed revenues,[163] and the with-imputation total required return[164] is well-known from Officer (1994):[165]

$$r_{e,Ex\,IC} = r_{e,With\,IC}\left[\frac{1-T}{1-T(1-\gamma)}\right].$$

229. By analogy, one cannot directly compare an ex-GST price in one store against a with-GST price in another – but there is a well-known formula to convert one definition of price into the other.[166]

Surveys report ex-imputation returns

230. KPMG (2013) explicitly acknowledge the difference between with-imputation and ex-imputation returns by showing how their base ex-imputation MRP would have to be grossed-up to incorporate the benefits of imputation.[167]

231. None of the Fernandez surveys make any mention of imputation credits. In our view, the most reasonable interpretation is that the survey responses represent unadjusted ex-imputation MRP estimates – the same definition of MRP that is used for all other countries in the Fernandez surveys.

232. In this regard, Lally (2013) notes that the Fernandez survey:

[163] In (c) above.
[164] In (a) above.
[165] Officer (1994), Equation 7, p. 6.
[166] The with-GST price can be obtained by multiplying the ex-GST price by 1.1.
[167] KPMG (2013), p. 17.

> does not invite respondents to include imputation credits to the extent they think appropriate, because an MRP of this type is sought here. However, given that the survey asks the respondent for the MRP estimate that they are using, respondents could reasonably be expected to have included imputation credits in their estimate to the extent that they thought to be appropriate.[168]

233. However, all of the evidence suggests that the dominant market practice is to make no adjustment for imputation credits anywhere in the valuation process. Consequently, it seems unlikely that a material number of survey respondents would have provided a grossed-up with-imputation estimate of MRP. The vast majority of respondents are likely to have provided a standard ex-imputation estimate of MRP. Consistent with this view, McKenzie and Partington (2012)[169] have advised the AER that:

> the survey evidence suggests that imputation credits are not typically allowed for in project evaluation or expert valuations, so it would seem unlikely that they would typically be added to the market risk premium.[170]

234. In summary, the advice to the AER and the relevant evidence suggests that the survey estimates of MRP should be interpreted as standard ex-imputation estimates.

235. McKenzie and Partington go on to conjecture about reasons why survey respondents may be providing standard ex-imputation estimates of MRP. For example, they conjecture that survey respondents may believe that imputation credits will be taken into account elsewhere in the valuation process so that there is no need to take them into account in the MRP estimate or that they may simply be regurgitating long-run historical excess return estimates.[171] However, the reason for the provision of an estimate of the ex-imputation required return on equity is not really important here. The key point is that, in both of the above cases, the survey participant will have provided a standard ex-imputation estimate of MRP, which cannot be directly compared with the regulatory with-imputation estimate of MRP.

Like-with-like comparisons

236. Having concluded that survey respondents are likely to be reporting standard ex-imputation estimates of MRP, whereas regulators use a with-imputation definition of MRP, McKenzie and Partington (2012) recommend that no adjustment should be made to the survey estimate of MRP because any such adjustment would be relatively small:

> any adjustment for imputation would likely lie within the margin of measurement error.[172]

237. But nowhere in their report do McKenzie and Partington consider the conversion of an estimate of the (practitioner) ex-imputation MRP into an estimate of the (regulatory) with-imputation MRP and nowhere do they show that the adjustment would be relatively small.

238. In their recent WACC Review, IPART (2013) devoted substantial consideration to the exact question of how an ex-imputation estimate of MRP should be converted in a with-imputation estimate.

[168] Lally (2013), Footnote 15, p. 30.
[169] McKenzie, M. and G. Partington, 2012, *Supplementary report on the market risk premium*, Report to the AER, February 22.
[170] McKenzie and Partington (2012), p. 16.
[171] McKenzie and Partington (2012), p. 16.
[172] McKenzie and Partington (2012), p. 16.

IPART begins by noting that it is well-known from Officer (1994) that the with-imputation and ex-imputation required returns on equity are linked by the familiar equation:[173]

$$r_{e,Ex\,IC} = r_{e,With\,IC}\left[\frac{1-T}{1-T(1-\gamma)}\right].$$

239. For example, if the ex-imputation MRP is considered to be 6.0% and the risk-free rate is 3.63% (commensurate with the contemporaneous yield on 10-year government bonds), the estimate of the ex-imputation required return on the market is 9.63%. The corresponding with-imputation required return, using the AER's proposed gamma estimate of 0.5, is then:

$$r_{e,With\,IC} = r_{e,Ex\,IC} / \frac{1-T}{1-T(1-\gamma)} = 9.63\% / \frac{1-0.3}{1-0.3(1-0.5)} = 11.7\%.$$

in which case the with-imputation MRP (which can be compared directly to the regulatory with-imputation MRP) is 8.1%. IPART (2013) use exactly this approach to convert estimates of "MRP including imputation benefits" into estimates of "MRP excluding imputation benefits."[174]

240. That is, given the AER's estimate of gamma, a 6% estimate of the ex-imputation MRP is equivalent to an 8.1% estimate of the (regulatory) with-imputation MRP according to Officer (1994) and as implemented by IPART (2013) – for the case where gamma is set to 0.5.

Conclusions on the use of survey responses

241. In our view, none of the surveys discussed above fare well against the criteria that have been set out by the Tribunal, in which case "it is dangerous for the AER to place any determinative weight on the results."[175]

242. If the AER is to have regard to the survey responses, it should not interpret (standard) ex-imputation estimates of MRP provided by survey respondents as (regulatory) with-imputation estimates of MRP. Rather, it should convert standard ex-imputation estimates into regulatory with-imputation estimates according to Officer (1994) and as implemented by IPART (2013). Given the AER's estimate of gamma, a 6% estimate of the ex-imputation MRP is equivalent to an 8.1% estimate of the (regulatory) with-imputation MRP if gamma is set to 0.5 and 7.0% if gamma is set to 0.25.

Independent expert valuation reports

Role of independent expert reports

243. In a submission to the AER Guideline process, SFG (2013)[176] note that independent expert valuation reports that are prepared as part of the process of corporate transactions (such as mergers, acquisitions and divestitures) are:

a) Governed by the Corporations Law and ASX Listing Rules;

b) Regulated by the Australian Securities and Investments Commission;[177] and

[173] Officer (1994), Equation 7, p. 6.
[174] IPART (2013), pp. 17-18 sets out a worked example of the conversion process.
[175] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.
[176] SFG Consulting, 2013, *Evidence on the required return on equity from independent expert reports*, June.
[177] See ASIC Regulatory Guides 111 and 112.

c) Form the basis of numerous transactions involving the investment of material amounts of equity capital.

244. For these reasons, information from independent expert valuation reports is likely to be relevant evidence for the purpose of determining allowed returns in the regulatory setting.

Use of independent expert reports

245. In its Guideline, the AER states that it also proposes to have regard to information from independent expert valuation reports.[178] In particular, the AER states that it will use "takeover and valuation reports" to inform its estimate of the overall return on equity.[179] This implies that the independent expert reports will not be used to inform the estimates of individual Sharpe-Lintner CAPM parameters, but will be used in the final step when the AER considers whether any adjustment might be required to its point estimate from the Sharpe-Lintner CAPM. However, in its discussion of MRP estimation, the AER includes two summaries of independent expert reports.[180]

246. Within the context of the Sharpe-Lintner CAPM foundation model approach, we agree with the use of independent expert reports to inform the estimate of MRP. In our view, these reports provide relevant evidence which, if relegated to the final cross-check stage of the estimation process, is unlikely to ever receive any real weight.

247. Consistent with this view, Lally (2013)[181] recommends that the QCA should have regard to independent expert valuation reports when estimating MRP.[182] Lally goes on to propose that these reports should receive equal weight to survey responses.

248. In its Guideline materials the ERA indicates that independent expert valuation reports (which the ERA refers to as "brokers' estimates" even though they are compiled by independent expert valuation and accounting firms rather than brokers) "have potential to provide relevant information."[183] However, the ERA provides no real guidance on precisely how it considers that these reports should be used.

Evidence from independent expert reports

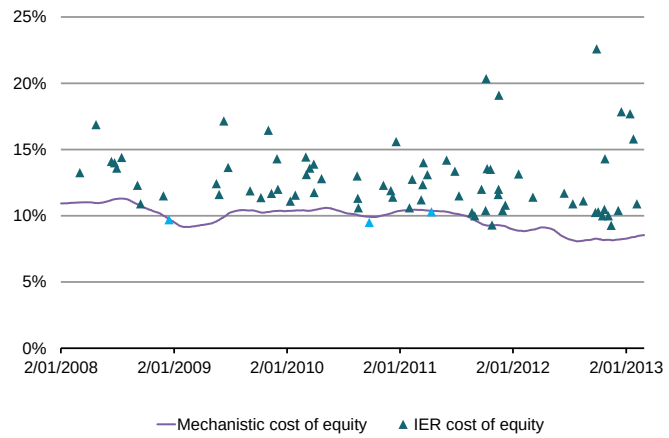
249. SFG (2013),[184] in a report submitted to the AER in June 2013, examine all of the independent expert valuation reports from January 2008 to April 2013 that set out a cost of capital calculation. Figure 5 below shows a comparison between:

a) Mechanistic estimates of the required return on the market (10-year government bond yield plus 6%); and

b) Independent expert estimates of the final required return on equity for firms for which the independent expert adopted an equity beta estimate between 0.75 and 1.25. They restricted the sample to this set of firms with an equity beta estimate close to 1.0 to ensure a reasonable basis of comparison with an estimate of the required return on the market (which also has a beta of 1.0).

[178] AER (2013), Rate of Return Guideline, pp. 14, 16.
[179] AER (2013), Rate of Return Guideline, pp. 14, 16.
[180] AER Appendix D, pp. 90-91.
[181] Lally, M., 2013, *Response to submissions on the risk-free rate and the MRP*, Report for the QCA, 22 October.
[182] Lally (2013), p. 5.
[183] ERA Appendix 29, Paragraph 65.
[184] SFG Consulting, 2013, *Evidence on the required return on equity from independent expert reports*, June.

Figure 5
Expert report cost of equity estimates (for beta estimates between 0.75 and 1.25) compared to mechanistic market cost of equity (for beta of 1.0)



Source: SFG analysis

250. The striking feature of this graph is that, with only three exceptions, every one of the independent expert estimates of the required return on equity is higher than the mechanistic estimate. The three exceptions all have equity beta estimates between 0.75 and 0.80 – below the market beta of 1.0 – and all have cost of equity estimates that are only marginally below the mechanistic estimate of the market cost of equity.

251. SFG (2013) also determine, for each report in their sample, the overall cost of equity capital estimated by the independent expert. The average cost of equity capital calculated for the entire sample (2008-2013) is 14.4%, within a range of 9.3% to 35%.

252. They then compare:

a) The independent expert's estimate of the required return on equity for each firm; with

b) An estimate formed by inserting the following values into the Sharpe-Lintner CAPM:

i) Contemporaneous 10-year government bond yield for risk-free rate;

ii) 6% for market risk premium; and

iii) The equity beta estimate adopted by the independent expert.

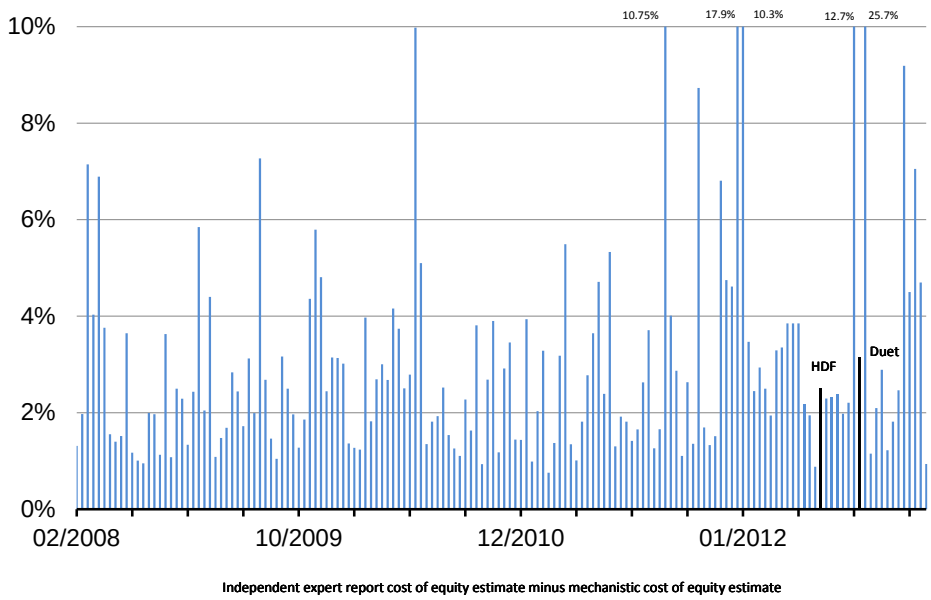
253. The average estimate of the required return on equity from the former approach is 14.4%, and the average from the latter approach is 11.1%.

254. The pair-wise comparisons of the two estimates for each asset are set out in Figure 6 below, which shows that in every case the mechanistic estimate is below the figure that is adopted in the independent expert report. In that figure, the vertical scale is capped at 10% to show sufficient detail, but in a number of cases the difference is even greater than that. In almost every case, the difference is greater than 1% and the difference is greater than 2% in many cases.

255. The results for the 2012-13 period are particularly striking. In almost every case the difference between the two estimates exceeds 2% and the average differential of 4.1% is substantially higher than for the earlier period.

256. Highlighted in the graph are the differences between the expert estimate and the mechanistic estimate for the only two utilities companies in the data (Hastings Diversified Fund and the Duet Group) in the recent period sub-sample. Both show that the market-based assessment of the cost of equity is materially higher than the mechanistic approach would suggest. That is, the approach that the independent experts have taken in the Hastings and Duet cases has resulted in estimates of the required return on equity that are materially greater than the mechanistic approach would suggest – in line with all of the other expert reports in the sample.

Figure 6
Difference between expert report and adjusted mechanistic estimates of cost of equity



Source: SFG analysis

257. In summary, SFG (2013) show that the return on equity estimates used in independent expert reports are materially higher than comparable regulatory estimates. It can be misleading to compare the MRP estimates from independent expert reports with regulatory estimates because it is common for independent expert reports to make other adjustments in their estimation process. SFG (2013) note that such adjustments include adopting a risk-free rate above the contemporaneous yield on government bonds and adding a margin to the required return on equity to reflect the extent to which a mechanistic CAPM estimate might not reflect the prevailing conditions in the market. It is for this reason that SFG (2013) present comparisons at the overall return on equity level. To extract information about MRP requires a case-by-case consideration of each report, such as the example set out below.

Example: Grant Samuel Envestra report

258. One very recent independent expert report is particularly relevant. Grant Samuel (2014) present a discounted cash flow valuation of Envestra Ltd, a company that is primarily engaged in gas distribution and transmission. Grant Samuel adopt a risk-free rate of 4.2% (commensurate with the contemporaneous yield on 10-year government bonds) and a market risk premium of 6%. This implies an ex-imputation return on equity for the average firm of 10.2%. However, Grant Samuel state that this is not a mid-point estimate but is towards the lower end of the reasonable range, and that a particularly conservative estimate such as this was appropriate given the purpose of the particular report.

259. Grant Samuel (2014) go on to explain that they consider this to be a conservative estimate for the following reasons:

    a) They note that "alternative approaches for estimating the cost of equity such as the Gordon Growth Model suggest higher rates";[185]

    b) They note that "equity investors have repriced risk since the global financial crisis and that acquirers are pricing offers on the basis of hurdle rates above those implied by theoretical models"[186] and go on to consider "an increase in the market risk premium of 1%"[187];

    c) They note that government bond yields are at historical lows, in which case it may be "inappropriate to add a "normal"[188] market risk premium (e.g. 6%) to a temporarily depressed bond yield, and go on to consider the use of a higher estimate for the risk-free rate; and

    d) They have indicated that the return on equity estimate that they have adopted is "towards the lower end"[189] of the reasonable range "in order to ensure that the fairness assessment for the Proposal is robust (i.e. higher NPV's are generated)".[190]

260. Grant Samuel (2014) also clearly state that their MRP estimate of 6% "makes no explicit allowance for Australia's dividend imputation system."[191] Consequently, even if the 6% figure was adopted for MRP, it would have to be converted from a standard ex-imputation estimate into a with-imputation estimate for use in the regulatory setting. As set out in Paragraphs 238 to 240 above, with gamma set to 0.5, an ex-imputation MRP of 6% is equivalent to a with-imputation MRP of 8.2% according to Officer (1994) and as implemented by IPART (2013).

Incorporation of imputation credits

261. SFG (2013) note that the uniform practice of independent experts is to make no allowance for imputation credits when estimating MRP (or in any part of the cost of capital estimation process). In this regard, SFG (2013) report that:

> For the entire sample over the period 2008 – 2013, we were unable to find any independent expert report that made any adjustment in relation to dividend imputation. No adjustments of any kind were made to any cash flows and no adjustments of any kind were made to any discount rates.
>
> We identified nineteen independent expert reports in 2012/13 that made a specific reference to dividend imputation in relation to cost of capital. Every one of these reports concluded that no adjustment should be made to any cash flows or to any discount rates.[192]

262. Consequently, ex-imputation MRP estimates from independent expert reports would have to be routinely converted into the corresponding with-imputation estimate of MRP (as set out above) for use in the regulatory process.

[185] Grant Samuel (2014), Appendix 3, p. 8.
[186] Grant Samuel (2014), Appendix 3, p. 9.
[187] Grant Samuel (2014), Appendix 3, p. 9.
[188] Grant Samuel (2014), Appendix 3, p. 9.
[189] Grant Samuel (2014), Appendix 3, p. 9.
[190] Grant Samuel (2014), Appendix 3, p. 9.
[191] Grant Samuel (2014), Appendix 3, p. 6.
[192] SFG (2013 IER), Paragraphs 88-89.

Conclusions on the use of independent expert reports

263. Within the context of the Sharpe-Lintner CAPM foundation model approach, we agree with the use of independent expert reports to inform the estimate of MRP. In our view, these reports provide relevant evidence which, if relegated to the final cross-check stage of the estimation process, is unlikely to ever receive any real weight.

264. Our assessment of the relevant evidence is that independent expert valuation reports support higher estimates of the required return on equity that those that would be produced by a mechanistic application of the Sharpe-Lintner CAPM. In particular, SFG (2013) show that the return on equity estimates used in independent expert reports are materially higher than comparable regulatory estimates.

265. Independent expert reports provide ex-imputation MRP estimates that would have to be routinely converted into the corresponding with-imputation estimate of MRP for use in the regulatory process. Given current AER parameter values, an ex-imputation MRP of 6% is equivalent to a regulatory with-imputation MRP of 8.1% if gamma is set to 0.5 and 7.0% if gamma is set to 0.25, using the process of Officer (1994) as implemented by IPART (2013).

Conclusions in relation to market risk premium

266. Our main conclusions in relation to the market risk premium evidence are as follows.

267. In relation to historical excess returns (the Ibbotson approach):

a) Arithmetic averages are relevant and geometric averages are irrelevant;

b) The inaccurate dividend yield correction applied by Brailsford et al (2008, 2012) should be replaced by the more detailed and accurate correction applied by NERA (2013);

c) The data should be updated to include 2013;

d) Historical mean excess returns produce an estimate of the MRP in *average* market conditions and could inform an estimate of the MRP in *prevailing* market conditions after consideration of the extent to which the prevailing conditions might differ from the average conditions; and

e) The point estimates for the five start years specified by the AER fall within the range of 6.1% to 6.8% if theta is set to 0.7 and within the range of 5.5% to 6.6% if theta is set to 0.35.

268. In relation to the Wright approach:

a) There are two approaches for estimating MRP from the historical data. The Ibbotson approach assumes that the MRP is constant across all market conditions and estimates the MRP as the mean historical excess return. At the other end of the spectrum, the Wright approach assumes that the required return on the market is constant and estimates the MRP by subtracting the contemporaneous risk-free rate. In our view, the Ibbotson and Wright approaches should both be used to inform the estimate of MRP;

b) Lally (2012, 2013) also recommends that the Ibbotson and Wright approaches should both be used to estimate MRP and the Wright approach is also used extensively by UK regulators; and

c) The Wright approach currently produces an MRP estimate of 8.2% if theta is set to 0.7 and 8.1% if theta is set to 0.35.

269. In relation to dividend discount models:

a) For gamma set to 0.25, we adopt a dividend discount estimate of MRP of 7.8%, which is the current estimate from the SFG approach, which we consider to be the most robust and reliable approach;

b) This value is consistent with the range of estimates proposed by Lally (2013);[193]

c) This value is consistent with the AER's 3-stage model with the adjustment proposed by Lally (2013); and

d) This value is within the range considered by the ERA.

270. In relation to the responses of survey participants:

a) In our view, none of the surveys discussed above fare well against the criteria that have been set out by the Tribunal, in which case "it is dangerous for the AER to place any determinative weight on the results;"[194] and

b) If the AER is to have regard to the survey responses, it should not interpret (standard) ex-imputation estimates of MRP provided by survey respondents as (regulatory) with-imputation estimates of MRP. Rather, it should convert standard ex-imputation estimates into regulatory with-imputation estimates according to Officer (1994) and as implemented by IPART (2013). Given the AER's estimate of gamma, a 6% estimate of the ex-imputation MRP is equivalent to an 8.1% estimate of the (regulatory) with-imputation MRP if gamma is set to 0.5 and 7.0% if gamma is set to 0.25.

271. In relation to independent expert valuation reports:

a) Independent expert valuation reports support higher estimates of the required return on equity that those that would be produced by a mechanistic application of the Sharpe-Lintner CAPM; and

b) Independent expert reports provide ex-imputation MRP estimates that would have to be routinely converted into the corresponding with-imputation estimate of MRP for use in the regulatory process;

c) Given current AER parameter values, an ex-imputation MRP of 6% is equivalent to a regulatory with-imputation MRP of 8.1% if gamma is set to 0.5 and 7.0% if gamma is set to 0.25, using the process of Officer (1994) as implemented by IPART (2013).

272. The MRP estimates from the various approaches are summarised in Table 6 below. The estimates that form the basis of our final estimate of MRP appear in bold face. Historical excess return estimates are based on the longest data set available.

[193] Although it is not clear what values of theta and gamma are implicit in these other estimates.
[194] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.

Table 6
Estimates of market risk premium

Method	Theta=0.35	Theta=0.7
Historical excess returns	**6.6%**	6.8%
Wright approach	**8.1%**	8.2%
Dividend discount model	**7.8%**	8.9%
Survey responses	7.0%	8.1%
Independent expert valuation reports	**7.0%**	8.1%

273. In our view, the best estimate of theta is 0.35 and the best estimate of gamma is 0.25. These are the estimates that were adopted by the Tribunal and which have since been used in the AER's determinations. Our recommended estimate of MRP is based on these estimates of theta and gamma. If theta and gamma are to be revised in accordance with the AER's Guideline, the estimate of MRP would be correspondingly higher.

274. In compiling a final estimate of MRP for use in the Sharpe-Lintner CAPM as a foundation model, we have regard to the following evidence:

    a) First, we note that historical returns can be processed in two ways – by assuming that MRP is constant in all market conditions (Ibbotson approach) or by assuming that real required returns are constant in all market conditions (Wright approach). If these two approaches are given equal weight, the estimate of MRP from historical returns is 7.4%[195];

    b) The estimate from dividend discount models is 7.8%; and

    c) The estimate from independent expert reports is 7.0%.

275. In our view, the approaches set out above have different relative strengths and weaknesses:

    a) The Wright and Ibbotson approaches each represent end points of a spectrum when using historical data to estimate the required return on the market. The Wright approach assumes that the real required return on equity is constant across different market conditions and the Ibbotson approach assumes that the MRP is constant so that the required return on equity rises and falls directly with changes in the risk-free rate. We agree with the conclusion in the Guideline materials that there is no compelling statistical evidence to support one or the other of these assumptions and that regard should be had to both. We also note that both approaches are used in practice, including regulatory practice. We also note that it is also common in practice to have some regard to long-run historical data when estimating the required return on the market.

    b) We agree with the Guideline's assessment that dividend discount model evidence is relevant and should be considered when estimating the required return on the market. The dividend discount model is theoretically sound in that simply equates the present value of future dividends to the current stock price and it is commonly used for the purpose of estimating the required return on the market. This approach is also the only approach that provides a forward-looking estimate of MRP.

    c) Independent expert valuation reports provide an indication of the value of the required return on equity that is being used in the market for equity funds. We agree with the

[195] 7.4% is the mean of 6.6% and 8.1%.

Guideline's conclusion that this information is relevant and should be considered. However, we note that certain assumptions must be made when seeking to extract an appropriate MRP estimate from an independent expert report (in particular, the extent to which various uplift factors should be incorporated into the MRP estimate). It is for this reason that we adopt a conservative ex-imputation MRP estimate of 6% in this report.

276. Taking account of the relevant strengths and weaknesses of the different estimation approaches, we propose the weighting scheme set out in Table 7 below. Our reasons for proposing this weighting scheme are as follows:

a) We apply 50% weight to the forward-looking DDM estimate and 50% weight to the approaches that are based on historical averages;

b) We apply equal weight to the Ibbotson and Wright approaches for processing the historical market return data, those two approaches representing the two ends of the spectrum in relation to the processing of that data; and

c) We apply some weight to our estimate from independent expert valuation reports, noting that this is a conservative estimate in that it is not influenced by any uplift factors or adjustments to the historically low risk-free rate.

277. We note that the final estimates are relatively insensitive to the proposed weighting scheme. For example, the final MRP estimate changes by less than 10 basis points if:

a) If a weight of 25% was applied to each of the four estimates;

b) Equal weight is applied to the Ibbotson and Wright approaches only; or

c) Equal weight is applied to the Ibbotson, Wright and DDM approaches only.

278. We consider that the final estimates set out in the table below are commensurate with the prevailing conditions in the market for equity funds.

Table 7
Estimates of the required return on the market and MRP

Method	MRP	Required return on the market	Weighting
Historical excess returns (Ibbotson)	6.63%	10.26%	20%
Wright approach	8.08%	11.71%	20%
Dividend discount model	7.79%	11.42%	50%
Independent expert valuation reports	7.03%	10.66%	10%
Weighted average	**7.57%**	**11.20%**	**100%**

5. Equity beta

279. In this section of the report, we begin by reviewing the approach to estimating equity beta that is set out in the AER's Guideline, and then set out our preferred approach for obtaining an estimate of equity beta – within the context of the Sharpe-Lintner CAPM foundation model approach.

The AER's conceptual analysis

Overview of the issue

280. The AER's Guideline materials begin the process for estimating equity beta by conducting what it refers to as a "conceptual analysis."

281. The conceptual analysis begins by noting that equity beta is determined by two factors, business risk and leverage. Business risk refers to the fundamental systematic risk of the firm's business operations and is often called the firm's asset beta, β_a. Leverage refers to the extent to which the firm's assets are financed by debt. This can be represented by the debt-to-value ratio, D/V, or the debt-to-equity ratio, D/E. The AER notes that throughout its Guideline it adopts the following approach for compiling an asset beta and leverage into equity beta:

> We propose to continue using the Brealey–Myers formula to de-lever and re-lever the comparable businesses' equity beta estimates. That is:
>
> $$\beta_e = \beta_a\left(1+\frac{D}{E}\right)$$
>
> where:
> β_e is the equity beta
> β_a is the un-levered asset beta, and
> $\frac{D}{E}$ is the debt to equity ratio. [196]

282. Next, the AER notes that:

> It is generally accepted that the benchmark efficient entity has lower business risk than the market average firm.[197]

and that:

> It is generally accepted that the benchmark efficient entity has higher financial risk than the market average firm. The key characteristic causing this higher financial risk is the relatively high financial leverage (gearing) for the benchmark efficient entity (60 per cent) relative to the market average firm (roughly 30 to 35 per cent).[198]

[196] AER Appendix C, p. 51.
[197] AER Appendix C, p. 40.
[198] AER Appendix C, p. 41.

283. That is, the benchmark firm is considered to have lower-than-average business risk (or asset beta) and much higher-than-average leverage. The former has the effect of lowering the equity beta, whereas the latter has the effect of increasing the equity beta. The conceptual analysis is designed to examine which of the two effects might dominate the other. In this regard, the AER states that:

> The conceptual assessment of equity beta relative to the market average is determined by the direction and relative magnitude of these two systematic risk factors: business risk and financial risk.[199]

284. That is, the goal is to determine which of the two effects dominates: the benchmark firm's lower-than-average business risk or its higher-than-average leverage. The AER uses two approaches to answer this question: empirical estimation and conceptual analysis. The role of the conceptual analysis is to determine whether there is any a priori reason to expect that one factor would dominate the other – based on conceptual reasoning and not empirical analysis (which is to be considered later).

285. The AER bases its conceptual analysis on two consultant reports, each of which is reviewed below.

The McKenzie and Partington (2012) report

286. In its conceptual analysis, the AER relies upon advice from McKenzie and Partington (2012).[200] McKenzie and Partington recognise that equity beta depends on two things:

a) The business risk of the firm (asset beta); and

b) Leverage (the relative proportion of debt financing).

287. McKenzie and Partington (2012) advise the AER that:

> the level of systematic risk for the firm comes down to a question of the extent to which the higher leverage *per se* offsets the lower business risk of the firm[201]

and we agree that this is the nub of the issue. That is, what is required is a way of determining how business risk (asset beta) and leverage (the proportion of debt financing) jointly determine the equity beta.

288. McKenzie and Partington (2012) go on to note that there are a number of ways of specifying the relationship between equity beta, asset beta, and leverage, but that all of them:

> find in favour of an increasing equity beta as financial leverage increases.[202]

289. Of the various ways of specifying the relationship between equity beta, asset beta, and leverage, one is used extensively throughout the AER's estimation process and is embedded within the AER's PTRM and the others are not. McKenzie and Partington (2012) note that the specification that has been

[199] AER Appendix C, p. 42.
[200] McKenzie, M., and G. Partington, 2012, *Estimation of the equity beta (conceptual and econometric issues) for a gas regulatory process in 2012*, April.
[201] McKenzie and Partington (2012), p. 13.
[202] McKenzie and Partington (2012), p. 10.

adopted by the AER implies that equity beta is related to leverage according to the formula set out above.[203]

290. McKenzie and Partington (2012) conclude that the asset beta for a network business is likely to be lower than for the average firm, but that:

> the assumption of 60% debt financing for a regulated network distribution or transmission business is (approximately) twice that of the average firm.[204]

291. At this stage, McKenzie and Partington (2012) have done nothing more than restate what is generally accepted:

a) The AER has set out a formula that disaggregates equity beta into asset beta and leverage;

b) The benchmark entity is likely to have lower than average asset beta; and

c) The benchmark entity has approximately twice the leverage of the average firm.

292. At this stage, there is no possible way of knowing which has the greater effect on equity beta – the lower-than-average asset beta or the higher-than-average leverage. This leads McKenzie and Partington (2012) to turn to the empirical literature:

> the level of systematic risk for the firm comes down to a question of the extent to which the higher leverage *per se* offsets the lower business risk of the firm. For insights on this issue, we can look to the empirical literature for guidance.[205]

293. That is, McKenzie and Partington (2012) advise the AER that it is impossible to conceptualise which of the two effects dominates, and that this is ultimately an empirical question. They then submit two pieces of empirical evidence to support the notion that that higher-than-average leverage has a weaker effect than that implied by the AER's re-levering formula above. This leads them to conclude that the leverage effect is relatively small (or possibly even non-existent),[206] in which case the lower-than-average asset beta will be the dominant effect.

294. However, there are three problems with this approach:

a) It is not a conceptual analysis, it is an empirical one. Consequently it would be wrong to conclude (as the AER does) that one can conceptually reason that the lower-than-average business risk dominates the higher-than-average leverage. The net effect of these two factors can only ever be determined empirically;

b) It is inconsistent with all of the AER's empirical beta estimates and with its PTRM, which adopt the re-levering formula set out in Paragraph 281 above; and

c) It is wrong, in that both pieces of empirical evidence have been misinterpreted, as set out below.

[203] McKenzie and Partington (2012), p. 8.
[204] McKenzie and Partington (2012), p. 7.
[205] McKenzie and Partington (2012), pp. 13-14.
[206] McKenzie and Partington (2012), p. 14.

295. As set out above, McKenzie and Partington (2012) use empirical evidence to support their contention that the leverage effect may be smaller than that implied by the AER's re-levering formula. For example, they state that:

> Empirical support for this proposition may be found by looking at the industry beta tables of Damodaran (see Appendix 2). The equity betas for water, gas and electricity are the lowest in the table, while their debt to equity ratios are among the highest. Although this evidence is based on US companies, there is no reason to believe that a similar pattern would not exist in Australia. [207]

296. The specific regression-based beta estimates referred to are as follows, along with market value Debt/Equity ratios:

- Water utility beta = 0.66, Debt/Equity = 0.8142;
- Natural gas utility beta = 0.66, Debt/Equity = 0.6738;
- Electric utility (East) beta = 0.70, Debt/Equity = 0.6616;
- Electric utility (West) beta = 0.75, Debt/Equity = 0.8454;
- Electric utility (Central) beta = 0.75, Debt/Equity = 0.8616.

297. So there are five utility industries with beta estimates less than one, but with all five utility industries having Debt/Equity ratios which are less than 1.5, which is the AER's assessment of benchmark Debt/Equity.[208] If the regression-based estimates of beta were re-estimated under the assumption that Debt/Equity is 1.5, under the exact same re-levering process the AER adopts in all of its empirical analysis, the beta estimates would be as follows:

- Water utility re-levered beta = 1.22;
- Natural gas utility re-levered beta = 1.47;
- Electric utility (East) re-levered beta = 1.59;
- Electric utility (West) re-levered beta = 1.33;
- Electric utility (Central) re-levered beta = 1.31.

298. Moreover Appendix 2 of McKenzie and Partington (2012) sets out beta estimates for 95 industries. Even without any re-levering, only three of those industries are within the AER's proposed range and the other 92 are above it. After re-levering, zero of those industries are within the proposed range of 0.4 to 0.7.

299. In our view, it would be quite wrong to interpret this evidence as providing conceptual support for the AER's proposed range of 0.4 to 0.7. Rather than conceptual evidence to support an equity beta below 0.7, this is in fact empirical evidence that clearly supports an equity beta well above 1.

300. The other empirical work that McKenzie and Partington (2012) use to support their contention that the leverage effect may be smaller than that implied by the AER's re-levering formula is work that suggests that equity beta depends more on sales growth risk (part of asset beta) than financial risk. In this regard, they cite Schleuter and Sievers (2014) multiple times, supporting the contention that:

> intrinsic risk [asset beta] is the main driver of a firm's beta rather than either its operating or financial leverage.[209]

[207] McKenzie and Partington (2012), p. 15.
[208] A debt-to-value ratio of 0.6 is equivalent to a debt-to-equity ratio of 1.5.
[209] McKenzie and Partington (2012), p. 14.

301. Schleuter and Sievers (2014) is a paper about how one might go about using accounting information from financial statements, rather than stock returns, to estimate beta. For example, "financial risk" is defined to be the percentage change of net income associated with a given percentage change in operating income"[210] rather than in terms of the market value proportion of debt financing. For this reason, it would not appear to be directly relevant, given that all of the empirical estimates considered in the AER's Guideline materials are based on observed stock returns from equity markets rather than on accounting information. However, if it is to be used to inform the regulatory estimate of equity beta, it should be noted that the average result that underpins the advice from McKenzie and Partington (2012) does not apply to utilities. In fact, quite the contrary. In their Table 1, Schleuter and Sievers (2014) report that, for utilities, financial risk dominates all other risks, including growth risk. Moreover, financial risk is higher for utilities than for any other sector and growth risk is lower than for any other sector.[211] That is, to the extent that this paper is to be used to inform the estimation of beta, it establishes that financial risk is important for the utilities sector.

The Frontier Economics (2013) report

302. The AER interprets the Frontier Economics (2013) report as supporting the contention that the lower-than-average business risk of the benchmark firm will more than offset its higher-than-average financial risk, and that this supports an equity beta less than 1.

303. The basis for this claim comes from Frontier's discussion of the various risks that the benchmark firm may be exposed to. The AER notes that several of these risks are financial in nature (specifically, default risk, financial counterparty risk, illiquidity risk, refinancing risk, and interest rate reset risk). In its discussion of these risks, the AER notes that Frontier Economics assesses a number of these risks to be "low" or "medium."[212]

304. The AER also asserts that these risks are likely to be reduced further under its Guideline. For example, the AER states that its new trailing average approach for the cost of debt is likely to reduce interest rate risk and that its new procedure for determining the allowed return on equity is likely to procedure more stable cash flows to shareholders. The AER then concludes that:

> Taken together, conceptual analysis of the new approach to the determination of the return on capital should reduce the benchmark efficient entity's exposure to financial risk.[213]

305. In our view, it is far from clear that the approach set out in the AER's Guideline will have the effect of reducing the risk of holding equity in the benchmark firm. However, this is a moot point because the AER has indicated that it does not intend to set equity beta on the basis of the possibility that its new approach may reduce risk to equity holders, but that it intends to wait until any such reduction in risk has been demonstrated.[214] Consequently, the AER intends to estimate equity beta using information that is currently available.

306. This means that the relevant considerations are the extent to which the five financial risks identified in the Frontier Economics report provide a basis for the AER's conclusion that the lower-than-average asset beta of the benchmark firm outweighs its higher-than-average leverage.

[210] Schleuter and Sievers (2014), p. 546.
[211] Schleuter and Sievers (2014), pp. 545-546.
[212] AER Appendix B, p. 42.
[213] AER Appendix C, p. 42.
[214] AER Appendix C, p. 39.

307. In particular, the AER appears to contend that leverage affects equity beta via the financial risks that are set out in the Frontier Economics report. That contention is entirely incorrect and demonstrates a fundamental misunderstanding of the way leverage affects equity beta. Leverage does not have an effect on equity beta via the five risks set out in the Frontier Economics report and Frontier Economics never say that it does. Rather, leverage will increase equity beta simply because it has the effect of making positive returns in up-markets even better and negative returns in down-markets even worse. This is why it is called "leverage."

308. Consider the following simple analogy. Suppose five people each contribute $20,000 to buy a house for $100,000. Also suppose that the value of the house might increase to $120,000 or decrease to $90,000 over the course of a year. That is, the house may appreciate by 20% or depreciate by 10%. In this case, one share of the house might increase in value to $24,000 (up 20%) or decrease to $18,000 (down 10%).

309. Now suppose that one person contributes $20,000 equity and takes on leverage by borrowing the other $80,000 at a 5% interest rate. At the end of the year, the investor must repay the loan plus interest – a total of $84,000. If the house increases in value to $120,000, the equity increases to $36,000 (120,000-84,000) an increase of 80%. If the house decreases in value to $90,000, the equity decreases to $6,000 (90,000-84,000), a decrease of -70%. With no leverage, the range of returns were -10% to +20%. With the leverage in place, the range of returns is -70% to +80%. Leverage has dramatically increased risk – simply because leverage "levers up" the range of possible returns. None of this requires any consideration at all of liquidity or potential counterparty defaults.

310. Specifically, leverage has an effect on beta via the re-levering formula set out above, which is independent of each of the five financial risks identified in the Frontier Economics report. This point is demonstrated in detail in Appendix 3 to this report. Even if all five of the financial risks are eliminated entirely, leverage would still have the same effect on equity beta.

311. In our view, it is fundamentally wrong to conceptualise equity beta as a trade-off between business risk (asset beta) and the five types of financial risks set out in the Frontier Economics report. Rather, equity beta is a trade-off between business risk (asset beta) and leverage, as set out in Appendix 3.

312. In summary, the Frontier Economics report provides no basis for any a priori expectation that the equity beta of the benchmark firm is less than 1, and Frontier Economics have never said that it does.

The conclusions from the AER's conceptual analysis

313. In its Guideline materials, the AER draws the following conclusions from its conceptual analysis:

> Based on the available evidence, including the expert reports from Frontier and McKenzie and Partington, we consider there are reasonable conceptual grounds to expect that the equity beta of a benchmark efficient regulated energy network will be below 1.0. However, we recognise the limits of this type of approach, and use it to inform our assessment with regard to these limitations. Further, conceptual analysis does not indicate the magnitude of the difference between the benchmark efficient entity and the market average (1.0), and we propose to rely on empirical estimates for this assessment. [215]

314. In our view, there is nothing in the Frontier Economics report to suggest an a priori expectation that the lower-than-average business risk of the benchmark firm would more than offset its higher-than-

[215] AER Appendix C, p. 43.

average leverage so that there is an a priori expectation that the equity beta for the benchmark firm would be less than 1. In our view this is an empirical question and cannot be answered by conceptual reasoning.

315. Moreover, the McKenzie and Partington report relies on two pieces of empirical evidence to support the notion that leverage has a smaller effect on equity beta than the AER's methodology would imply. However, one of those pieces of evidence is the Damodaran utility beta estimates which are uniformly above 1.2. Rather than conceptual evidence to support an equity beta below 0.7, this is in fact empirical evidence that clearly supports an equity beta well above 1. The other piece of evidence is the result from Schleuter and Sievers (2011), however they report that financial risk is not negligible, but in fact of primary importance, for the utilities sector.

316. The AER then appears to use its conceptual analysis to confirm the reasonableness of its primary range for beta of 0.4 to 0.7:

> This empirical range is consistent with our conceptual analysis, which we use to cross check our range for the equity beta. This is because our conceptual analysis suggests the systematic risks of a benchmark efficient entity would be less than the systematic risks of a market average entity (that is, less than 1.0).[216]

317. The Guideline materials do not report how this cross check was performed or what effect it has had on the final estimate of beta. In our view:

    a) If the conceptual analysis has had no effect on the estimate of beta (i.e., the same estimate of beta would have been used whether or not the conceptual analysis had been carried out) it should be dispensed with as unnecessary and irrelevant; but

    b) If the conceptual analysis *has* had an effect on the estimate of beta, that conceptual analysis should be revised in light of the issues set out above.

Regulatory estimates of beta for water utilities

AER's use of regulatory estimates of beta for water utilities

318. In its Guideline, the AER notes that it has changed the way it intends to have regard to regulatory estimates of beta for water utilities, relative to the approach that was proposed in the draft Guideline. Whereas the draft Guideline proposed that this information would be used as a final cross check, the AER now gives "limited value" to this information:

> One element of our approach has changed since our equity beta issues paper. That is, we now give limited value to equity betas from regulated Australian water networks, rather than using this information as a cross check.[217]

319. The Guideline materials do not explain precisely how or where in its estimation process the AER has given "limited value" to regulatory equity betas for water utilities. However it appears that this information has been used to support the proposed range of 0.4 to 0.7. In particular, the Guideline materials state that:

[216] AER Explanatory Statement, p. 83.
[217] AER Explanatory Statement, p. 86.

> this information supports an equity beta estimate within our proposed range.[218]

and that:

> this information supports an equity beta estimate within a 0.55 to 0.8 range. This is similar to our proposed 0.4 to 0.7 range.[219]

Basis for regulatory estimates of beta for water utilities

320. The Guideline materials note that Australian regulatory estimates of beta for water utilities are based on two pieces of evidence:

    a) Australian regulatory estimates of beta for energy networks; and

    b) Empirical estimates of beta for international water utilities.[220]

321. To the extent that they are based on regulatory estimates of beta for energy networks, the reliance on regulatory estimates of beta for water utilities would be entirely circular. The AER notes that this point has been made by PIAC and other stakeholders.[221]

322. This leaves the empirical estimates of beta for international water utilities as the only new information that is contained within regulatory water betas. In our view, there is no place for such evidence because there is already a large sample of international energy network betas available. Indeed, as set out below, the AER's main issue with international energy network betas is that the firms may not be sufficiently comparable to the benchmark entity. Water utilities will be even less comparable. There may have still been a place for water utilities if the available sample of energy networks was too small to provide statistically meaningful results, but there is a large sample of international energy networks available.

323. In this regard, the AER states that it considers empirical estimates of beta for overseas water utilities to be "problematic" and "less relevant."[222] That is, two sources of information have been used to compile Australian regulatory water betas: regulatory energy network beta estimates, which are entirely circular, and empirical estimates for overseas water utilities, which the AER considers to be problematic and less relevant.

324. The AER notes that it has changed the way in which has regard to regulatory estimates of beta for water utilities, but that the change has no effect on its primary range or point estimate:

> we consider this information should have limited application to estimating the equity beta for a benchmark efficient entity. However, this decision does not have a material impact on our proposal to apply a 0.7 equity beta point estimate from a 0.4 to 0.7 range.[223]

325. It seems that, in effect, regulatory estimates of beta for water utilities have had no observable effect on the AER's proposed range or on its point estimate. In our view:

[218] AER Explanatory Statement, p. 86.
[219] AER Appendix B, p. 45.
[220] AER Appendix B, p. 45.
[221] AER Appendix B, p. 46.
[222] AER Appendix C, p. 46.
[223] AER Appendix C, p. 46.

a) If the water betas have had no effect on the estimate of beta for the benchmark firm (i.e., the same estimate of beta would have been used whether or not the water betas had been considered) they should be dispensed with as unnecessary and irrelevant; but

b) If the water betas *have* had an effect on the estimate of beta for the benchmark firm, that estimate of beta should be revised in light of the issues set out above.

An assessment of the AER's proposed approach for estimating equity beta

A multi-stage approach

326. In its Guideline, the AER proposes to use the following approach to estimate equity beta:

> 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.[224]

327. In summary, the AER layers a "foundation implementation" on top of its foundation model approach. In relation to equity beta the AER has determined that a subset of the relevant evidence will be used to define a primary range and that all other evidence will only be used (at most) to select a point estimate from within that range, even if the other evidence supports a value from outside the range.

The proposed approach effectively excludes relevant evidence

328. The AER proposes to fix the range for beta to 0.4 to 0.7 on the basis of its analysis of a subset of the relevant evidence. Importantly, this range is determined before the AER considers all of the relevant evidence. To show why this is a problem, we consider a number of scenarios. First, suppose that there is one piece of evidence to be considered in the second stage of the AER's estimation process and that this evidence supports a beta of 0.9. The maximum effect that this piece of evidence can have is to cause the AER to adopt a point estimate at the top of the primary range, 0.7.

329. Now suppose that there are six pieces of evidence to be considered in the second stage of the estimation process, and that all of them support a beta of 0.9 or above. Again, the primary range constrains the AER from setting the equity beta above 0.7. Had a different piece of evidence been used as the primary determinant, the initial range may have been set as 0.8 to 1.0. The AER would

[224] AER Guideline, p. 15.

then have to select a point estimate from within this range based on five remaining pieces of evidence supporting a value of 0.9 or above and one piece of evidence supporting an estimate of 0.4 to 0.7.

330. In summary, under the two-stage approach, the same set of evidence can produce materially different beta estimates depending on which piece of evidence is selected as the primary determinant and which is relegated to the second stage.

331. Moreover, any evidence that is relegated to the second stage is disregarded to the extent that it is inconsistent with the primary range. That is, a piece of evidence that supports an estimate above the primary range can, at most, result in the final estimate being selected at the top of the primary range. Once the AER has determined that the point estimate should be set at the top of the primary range, any further evidence that supports higher values must be disregarded, because the point estimate has already been set at the maximum that is allowed.

332. In our view, an approach that pre-emptively dilutes or eliminates the potential impact of relevant evidence (before any consideration of the relative strengths and weaknesses of the evidence) is unlikely to produce estimates that are consistent with the allowed rate of return objective. A better approach would be to set out all of the evidence that is relevant to the estimation of beta and to select a point estimate by weighting each piece of evidence according to its relative strengths and weaknesses.

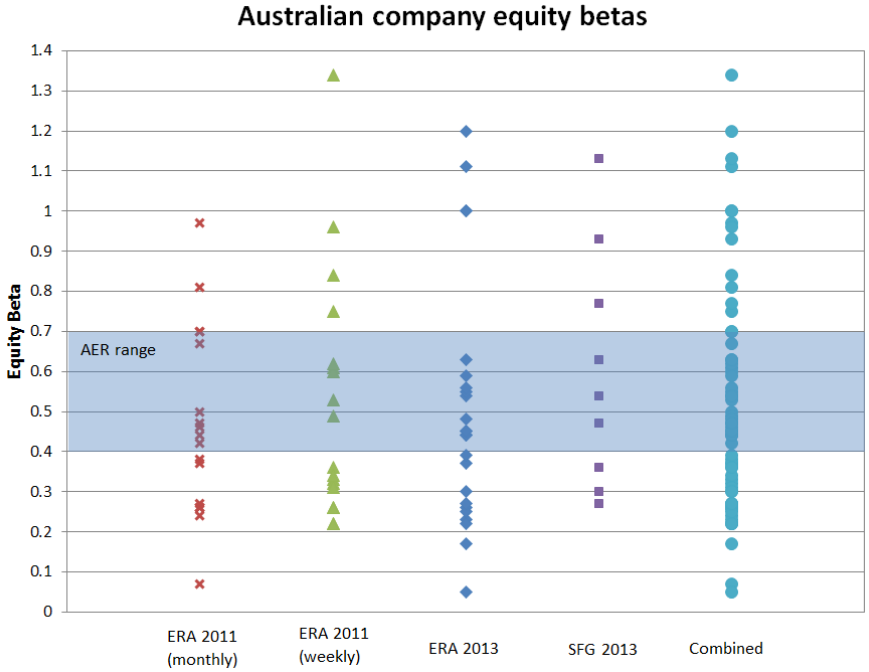
333. By way of analogy, consider some foreign tourists exchanging currency with a street vendor. If the tourists are exchanging Australian dollars for US dollars, they may decide that a reasonable range is 89-91 cents. Now suppose that there is evidence that the street vendor will not be handing over US dollars, but New Zealand dollars instead (for which a fair exchange rate would be in the order of $1.10). The AER Guideline process suggests that this new evidence should lead the tourists to demand a rate at the top of their "primary range" – 91 cents.[225]

Primary range is arbitrary and meaningless

334. The AER uses a range of methods to apply statistical regression analysis on the very small set of domestic comparables (currently numbering five). A summary of the results that support the AER's primary range of 0.4 to 0.7 is set out in Figure 7 below.

[225] In our experience, readers are sometimes tempted to try to extend analogies beyond the point being made. In this case, the simple point is that if there is evidence that the entire initial range is wrong, it is not an appropriate response to have regard to that evidence by simply selecting a point at one end of that initial range.

Figure 7. Regression-based estimates of Australian-listed energy networks



Source: ERA (2011),[226] ERA (2013),[227] SFG (2013).

335. Figure 7 above sets out re-levered (to 60%) equity beta estimates for the AER's set of comparable firms. The important thing to note is that these are all estimates of the same thing – the regression-based equity beta for an energy network business with 60% leverage. However, the range of point estimates is almost uniformly distributed over a wide range that begins below 0.4 and ends well above 0.7. The lowest estimate is 0.05 and the highest is 1.34. There is no a priori reason to believe that any of these estimates is more reliable than any other – they are all supposed to be equally valid estimates of the same thing.

336. The AER has provided no basis for why it has constrained the range to 0.4-0.7, nor even explained what the range means. It is not a confidence interval, it is not the minimum-to-maximum, it appears to be an arbitrarily selected band. But the selection of this range is very important because the final value of equity beta is constrained to come from within this range – regardless of any other relevant evidence to the contrary.

337. That is, the key point here is that this primary range is considered to be so precise and so reliable that no value from outside that range can be entertained, regardless of the strength of any other relevant evidence.

338. Moreover, the fact that these estimates cover such a wide range should lead the AER to question the reliability of the beta estimates produced from this small subsample of the available data.

Primary data produces unreliable estimates

339. Another reason to question the use of a primary range based on a subset of the relevant evidence is that the estimates produced by that subset of the relevant evidence have been shown to be unreliable in several respects. The very wide range of estimates in the figure above is one reason to have

[226] Economic Regulation Authority, 2011, Western Power access arrangement: Draft Decision, March.
[227] Economic Regulation Authority, 2013, Draft Rate of Return Guidelines for Gas Transmission and Distribution Networks – Final Guidelines – Explanatory Statement, August.

concern about the reliability of the estimates from the small set of domestic firms. Other reasons are set out below.

Variation in estimates across methodological choices

340. The estimates on which the AER has relied vary alarmingly depending on the methodological choices of regression technique and sampling period. This is best illustrated in relation to HDF. The AER summarises a number of estimates (on which it relies) in Tables 4.4 and 4.5 of the Issues Paper. Those estimates for HDF are summarized in the following table.

Table 8
Regression-based beta estimates for HDF from ERA (2011) reported by the AER

		Regression Method	
		OLS	**LAD**
Sampling	Monthly	0.07	0.47
Period	Weekly	1.34	0.84

341. The estimates set out in the table above are for the same company for the same time period.

Variation in estimates across time

342. According to the ERA estimates on which the AER relies, the average estimate of beta for Envestra increased by 20% between 2011 and 2013. There are two explanations for this:

a) The true systematic risk of Envestra did actually increase by 20% over a two-year period; or

b) The beta *estimates* are unreliable.

343. Moreover, the results also imply that, over the same two year period, the average estimate of beta for Envestra *increased* by nearly 20% and the beta of DUET *decreased* by 25%. Moreover, of the six firms examined by the ERA in 2013, three had *higher* beta estimates and three had *lower* beta estimates relative to the ERA's estimates two years earlier. Again, there are two possible explanations:

a) The true systematic risk of some of the benchmark firms increased materially over the two-year period and the true systematic risk for others decreased materially (which would call into question whether these firms are all properly included in the same set of "comparables"); or

b) The beta *estimates* are unreliable.

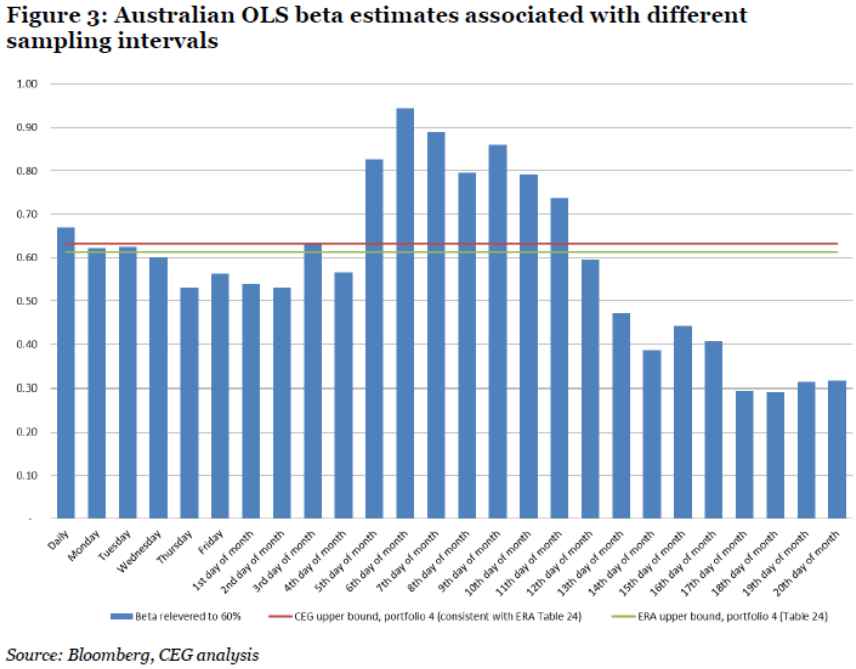
Variation in estimates across sampling days

344. The report by SFG (2013) highlighted the fact that beta estimates can vary materially depending on which day of the month is used as the reference point when determining returns. In a recent submission to the ERA, CEG (2013)[228] has documented a similar pattern in weekly data. The relevant figure from that report is reproduced below. This figure shows the mean (re-geared to 60%) equity beta estimate for the ERA's sample of six domestic comparables (the five that remain listed plus HDF) according to the way returns are measured. The mean estimate of beta can change by a

[228] CEG (2013), Regression estimates of equity beta.

factor of three simply by measuring returns from the sixth day of each month rather than from the 17th.

Figure 8. Australian OLS beta estimates associated with different sampling intervals



Source: CEG (2013), Figure 3.2, p. 26.

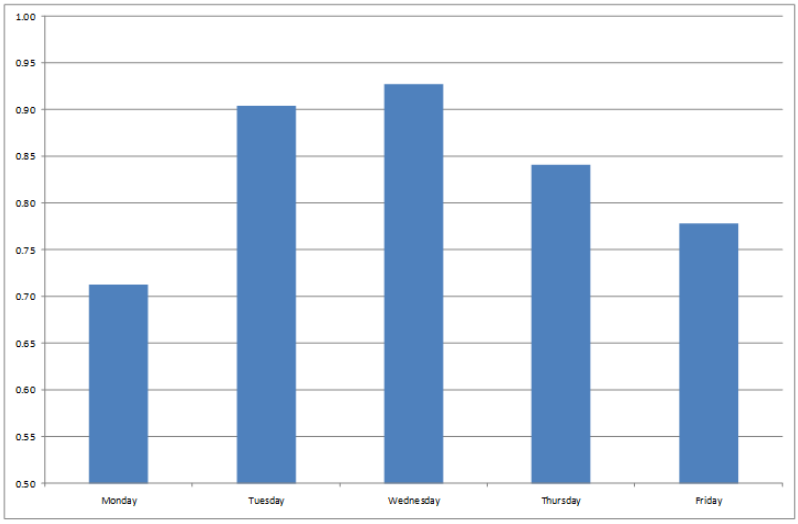
345. Moreover, CEG (2013)[229] show that there is variation in the mean beta of the sample of ten US firms that the AER instructed its consultant to examine in Henry (2008) and Henry (2009). The CEG report demonstrates that the results in Henry (2008) appear to be based on Friday-to-Friday returns and that the results of Henry (2009) appear to be based on Monday-to-Monday returns.[230]

346. The following figure, reproduced from CEG (2013) summarises the mean beta estimates for the Henry sample according to the day of the week that is used to measure returns. CEG conclude that the move from Friday-based returns to Monday-based returns:

> involves a move from the second lowest to the lowest beta. Had Henry moved from Friday to Wednesday rather than Monday the estimated beta would have been 0.21 higher.[231]

[229] CEG (2013), AER equity beta issues paper: international comparators.
[230] CEG (2013), Paragraph 127.
[231] CEG (2013), AER equity beta issues paper: international comparators, Paragraph 129.

Figure 9. Domestic beta estimates by day of week



Source: CEG (2013), Figure 13, p. 44.

347. In our view, this wide variation in returns – caused by nothing more than changing the day of the week (or month) from which returns are measured – is evidence of a lack of reliability. This provides further evidence that adopting a narrow range of 0.4 to 0.7 for equity beta unreasonably restricts the relevance that other information can have in reaching a final decision on equity beta.

International evidence

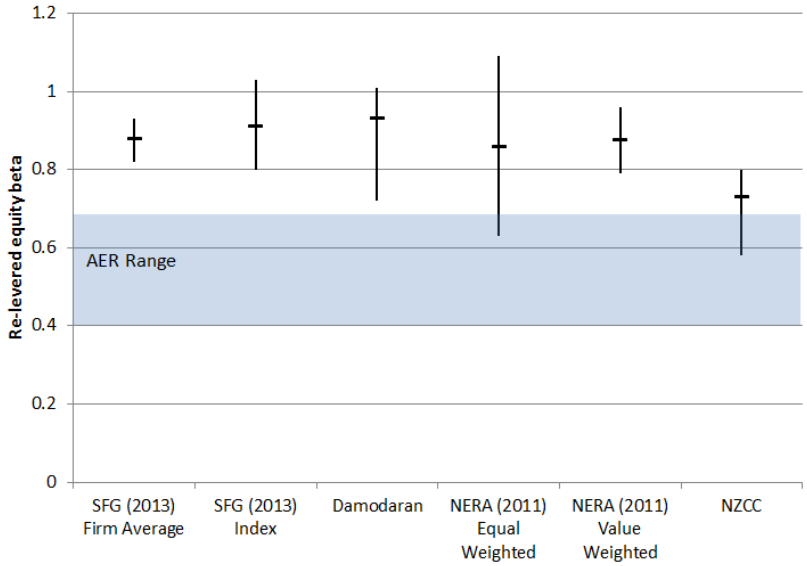
Summary of the international evidence

348. In this section of the report, we first summarise the international evidence that the AER has considered and then we discuss the AER's interpretation of this evidence and its use in the AER's beta estimation process.

349. The AER summarises the international evidence that it has considered in Appendix C of its Guideline materials.[232] We summarise that evidence in Figure 10 below.[233]

[232] Specifically, at pp. 66-67.
[233] Note that the figure does not contain estimates from prior to 2010, such as the 2007 and 2008 Damodaran estimates of 1.34 and 1.31 that were referenced by McKenzie and Partington (2012).

Figure 10. Summary of AER international beta estimates



Source: AER Appendix C, pp. 66-67.

Notes: The AER only reports the point estimates from SFG (2013), so ranges have been obtained directly from the SFG (2013) report. The figure shows the range and mean of the four point estimates from Damodaran that are set out in the AER's appendix. The AER sets out only the ranges from NERA (2013); the figure shows the mid-point in each case. The AER sets out four estimates from the NZCC; the figure shows the range and mean.

350. Two additional points are relevant to the interpretation of the evidence set out in Figure 10:

a) The NZCC estimates are based on a sample that includes:

i) The Australian firms that have already been taken into account by the AER elsewhere in its estimation process; and

ii) A number of very small US firms that trade so infrequently that their betas cannot be reliably estimated, as explained by SFG (2013); and

b) Updated 2014 estimates provided by Damodaran indicate a mean re-levered equity beta estimate of 1.00 for utilities.[234]

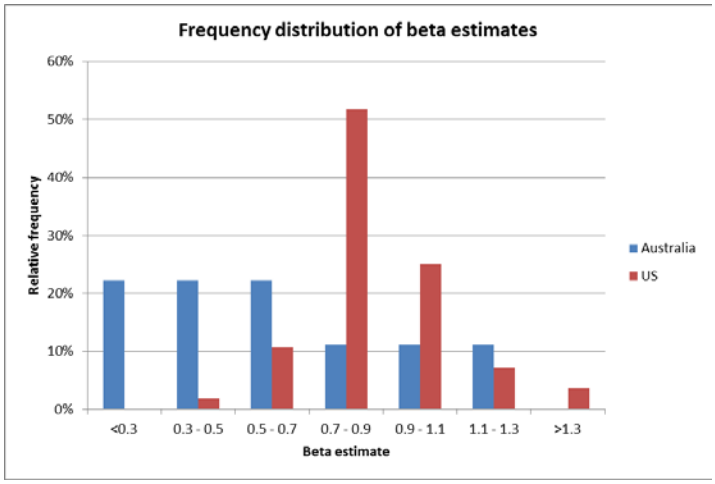
351. Quite clearly, the international evidence supports an equity beta estimate above the top end of the AER's proposed range.

352. Another relevant consideration is the distribution of beta estimates. SFG (2013) presented equity beta estimates for nine domestic firms and 56 US firms. As noted above, the estimates for the Australian firms are disbursed over a very wide range. By contrast, the distribution of beta estimates from the much larger sample of US firms is uni-modal and approximately symmetric with a large majority of estimates within a narrow range. The distributions of the two sets of beta estimates are set out in Figure 11 below.

353. We note that the Australian distribution looks like the distribution of a tiny sample of random numbers whereas the US distribution looks like the standard probability distribution of a statistically valid sample of estimates.

[234] See http://www.stern.nyu.edu/~adamodar/pc/datasets/betas.xls

Figure 11. Frequency distribution of beta estimates



Source: Re-levered equity beta estimates from SFG (2013).

AER questions about the reliability of international beta estimates

354. In its Guideline materials, the AER raises a number of questions about the reliability of international beta estimates, each of which is addressed in turn below.

Climate and geographical considerations

355. The first issue raised by the AER is that the systematic risk of US firms might differ from that of Australian firms due to factors such as weather and geography. That is, the AER appears to suggest that the beta of a network business may differ materially between cold and warm climates or between city and rural areas. However, the AER has not explained the mechanism by which these factors may affect systematic risk nor provided any evidence that they do affect systematic risk. Moreover, if these factors do materially affect systematic risk, it would be wrong for the AER to use the same beta estimate for all network assets, because that would result in some customers being overcharged and others being undercharged. Rather, allowed returns would have to be set according to the beta that was appropriate for the climate and geography of the network in question.

Market composition

356. Next, the AER argues that investors may require materially lower returns from Australian energy network businesses than they might require from US energy network businesses because there are relatively more mining companies based in Australia. This conjecture is based on the following insight:

> The Australian market portfolio may exhibit a relatively high systematic risk since it contains many mining stock returns of which are very dependent on the global economy and therefore have high systematic risk.[235]

357. We cannot be sure what point the AER is making here, since under the CAPM the market portfolio always has a systematic risk (or beta) of exactly 1 by definition. However, it seems that the AER has in mind some version of market segmentation whereby investors in Australian investors do not have

[235] AER Appendix C, p. 60.

access to US stocks and are forced to invest more in mining stocks than they would otherwise choose to – and vice versa for US investors. However, in reality any investor (Australian or US) can just as easily buy US stocks or Australian mining stocks. No evidence has been presented to support the notion that investors in the real world require lower returns from their Australian network businesses because they happen to be co-located with relatively more mining stocks. It seems unlikely that BHP and Rio moving their primary listings to the UK would cause an increase in the returns required from Australian energy network businesses.

358. Moreover, the Rules would seem to require the regulator to produce an allowed return on equity (and consequently parameter estimates such as beta) having regard to the prevailing conditions in the actual market for equity funds, not some alternative segmented market.

Vertical integration

359. The AER notes that some of the firms that might be included in a sample of US comparables are vertically integrated to some extent, with some level of investment in retail and/or generation activities. The suggestion is that retail and generation activities may have higher systematic risk, in which case the beta of the integrated entity may over-estimate the beta of distribution/transmission activities only.[236]

360. By contrast, in their advice on this matter to the ACCC, Frontier Economics (2010) set out a number of reasons why:

> a vertically integrated company may be expected to have a lower beta than the average of its component parts.[237]

361. This led Frontier to recommend a *lower* equity beta for more vertically integrated businesses:

> Victoria's rural water sector is relatively more vertically integrated than the energy sector. In this regard an equity beta for Victorian rural water businesses would be lower than that of an energy business. The water sector in NSW is less integrated and the case for a lower equity beta is less compelling in NSW.
>
> Given the general lack of competition within an irrigation scheme, the materiality of any difference is not expected to be great.[238]

362. The issue of vertical integration would seem to be a moot point given that the AER has compiled a small subsample of businesses that are exclusively engaged in gas and electricity transmission and distribution, and the mean beta for that sample remains materially above the top end of the AER's proposed range.[239]

Use of international evidence

363. The AER has apparently considered the use of international evidence as a binary choice – that it will either rely on the small set of domestic comparables *or* the large set of international comparables. In this regard, the AER has stated that:

[236] AER Appendix C, pp. 61-63.
[237] Frontier Economics (2010), p. 23.
[238] Frontier Economics (2010), p. 30.
[239] AER Appendix C, p. 63.

> We consider service providers and their consultants have not established reasonable basis to conclude that US data should be used in place of Australian data.[240]

and:

> we consider this sensitivity analysis does not lead to the conclusion that Australian equity beta estimates should not be used.[241]

364. In our view, there is no binary choice to be made. Beta estimates for the few Australian firms are relevant evidence that should be considered. And beta estimates for the much larger sample of international comparables are also relevant evidence, so should also be considered. Our understanding is that, under the new Rules, the task is not to divide the relevant evidence into subsets and then select the "best" sub-set of evidence to the exclusion of all other evidence. Rather the new Rules would seem to require stakeholders to have regard to all relevant evidence and, in our view, the Australian and the international evidence are both relevant and regard should be had to both. In having regard to both, the regulator would consider a range of factors such as sample size and the statistical reliability of the estimates, comparability of sample firms, and so on.

365. Our understanding is that the AER has received no submissions suggesting that the international evidence should be used to the exclusion of the domestic evidence. But the AER has apparently applied a binary test in selecting a single subset of evidence to determine the primary range for beta. Given that a single subset of evidence is required to determine the primary range, the AER selects the small sample of domestic firms for that purpose:

> we consider the equity beta estimates based on international comparators should not be used as the primary determinant of the equity beta range or the point estimate for the benchmark efficient entity.[242]

366. However, the AER has artificially constrained itself by:

    a) Requiring that beta must be estimated by first using a subset of the relevant evidence to establish a primary range for beta; and

    b) Requiring that the primary range must be determined either by reference to domestic comparables or by reference to international comparables, but not by both.

367. Under this process, which ever piece of evidence is not used to determine the primary range is effectively relegated to having negligible weight at best. By contrast, a process whereby all relevant evidence is set out and considered in light of the relative strengths and weaknesses is more likely to produce an estimate that properly reflects the body of relevant evidence.

[240] AER Appendix C, p. 60.
[241] AER Appendix C, p. 61.
[242] AER Appendix C, p. 59.

Evidence from the Black CAPM

Background and context

368. The initial empirical tests of the Sharpe-Lintner CAPM indicated that the relationship between equity beta and stock returns tends to be flatter than the Sharpe-Lintner CAPM would suggest.[243] Black (1973) 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 be-tween 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).[244]

369. In trying to develop a conceptual rationale for this observed and consistent empirical finding, Black (1973) 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.[245]

370. That is, Black (1973):

a) Notes that there is consistent evidence about the empirical failings of the Sharpe-Lintner CAPM; and

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

c) Sets out the conceptual rationale for his augmentation to the Sharpe-Lintner CAPM.

Analysis of the Black CAPM in the Guideline materials

371. The AER sets out a series of numerical examples of how Sharpe-Lintner beta estimates can be adjusted such that the Sharpe-Lintner CAPM (with the adjusted beta estimate) would produce an

[243] See, for example, Black, Jensen and Scholes (1972).
[244] Black (1973), p. 445.
[245] Black (1973), p. 445.

estimate of the required return on equity that is commensurate with the Black CAPM. These examples are set out in Appendix C, Table C.11, p. 71.

372. The first row of that table considers a case where the risk-free rate is 4%, market risk premium is 6%, and zero beta premium is 3%. In this case, the required return on the market is 10%[246] and the intercept for the Black CAPM line is 7%[247] as illustrated in Figure 12 below.

373. Figure 12 also shows that when a beta of 0.4 is inserted into the Sharpe-Lintner CAPM, it produces an estimate of the required return on equity of 6.4%.[248] The Black CAPM suggests that the required return on equity for a firm with beta of 0.4 is 8.2%.[249]

374. The AER then asks the question: What beta, when inserted into the Sharpe-Lintner CAPM, would produce the Black CAPM estimate of required return of 8.2%? Figure 12 shows that the relevant 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.

375. The logic behind these calculations can be summarised as follows:

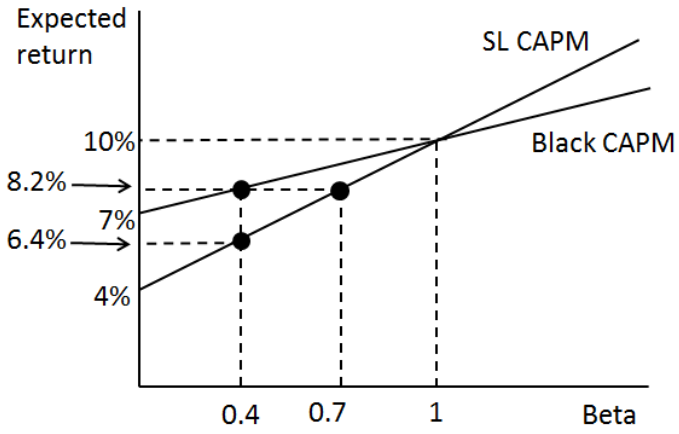
a) We estimate beta to be 0.4;

b) We recognise that the theoretical and empirical evidence establishes that if this beta estimate is inserted into the Sharpe-Lintner CAPM, the resulting estimate of the required return on equity (6.4%) will be under-stated;

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

d) Rather than insert the estimated beta into the Black CAPM, we adjust the beta from 0.4 to 0.7 and insert back into the Sharpe-Lintner CAPM. This also produces an estimate of the required return on equity of 8.2%.

Figure 12. AER Black CAPM example



Source: AER Appendix C, Table C.11, Row 1.

[246] 4%+6%=10%.
[247] 4%+3%=7%.
[248] 4%+0.4×6%=6.4%.
[249] The slope of the Black CAPM line is given by (10-7)/(1-0)=3%. Consequently, the required return for a firm with beta of 0.4 is 7%+0.4×3%=8.2%.

376. The AER then examines a number of different values for the zero beta premium, concluding that a range from 1.5% to 3% appears to be reasonable:

> 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,

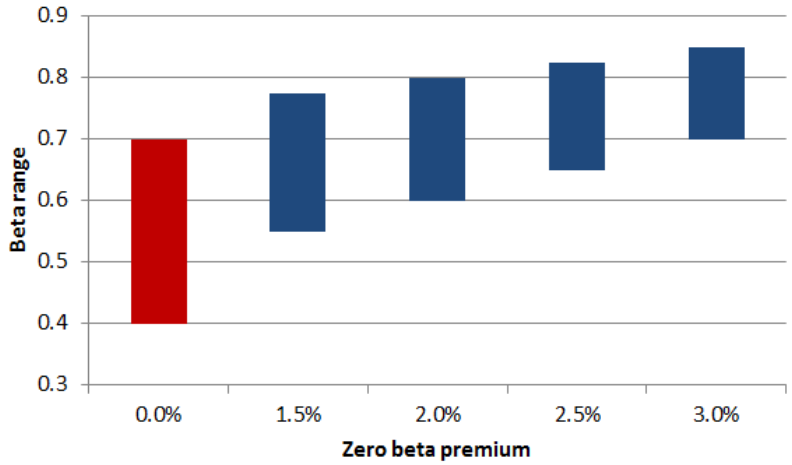
and:

> this magnitude of adjustment appears open to us.

377. In Figure 13 below, the AER's range for equity beta of 0.4 to 0.7 is displayed in red. The figure then shows the adjusted range for equity beta for different estimates of the Black CAPM zero beta premium. For example, we have shown above that an equity beta of 0.4 would be adjusted upward to 0.7 if the zero beta premium was set to 3% (i.e., the calculation in the first row of the AER's Table C.11). Similarly, a raw beta of 0.7 would be adjusted upward to 0.85. Thus the raw range of 0.4 to 0.7 corresponds to an adjusted range of 0.7 to 0.85.

378. That is, if the zero beta premium is 3% and the raw betas (0.4 to 0.7) are inserted into the Sharpe-Lintner CAPM, the resulting estimates of the required return on equity will be systematically understated. But the adjusted beta estimates (0.7 to 0.85) *can* be used in the Sharpe-Lintner CAPM to produce reasonable estimates of the required return on equity.

Figure 13. AER Black CAPM beta ranges



Source: SFG calculations.

379. Figure 13 shows how the AER's raw beta range of 0.4 to 0.7 would have to be adjusted to be consistent with the range of estimates of the zero beta premium that the AER considers to be reasonable. For example, if the AER considers that the reasonable range for the raw equity beta is 0.4 to 0.7, and if it considers a zero beta premium of 3% to be reasonable, it should be selecting its final equity beta estimate from within the range of 0.7 to 0.85.

380. We note that SFG (2014)[250] estimate the zero beta premium to be in the order of 3%, which is consistent with the range that the AER considers to be reasonable. In this case, a raw empirical beta range of 0.4 to 0.7 is equivalent to an adjusted beta range of 0.7 to 0.85.

Conclusions in relation to empirical estimates of equity beta

381. In our view, there is substantial evidence that the approach to estimating equity beta that is set out in the AER's Guideline (by using regression analysis applied exclusively to a very small sample of domestic comparables to determine the range of allowable beta estimates) produces unreliable estimates. This evidence includes:

    a) The beta estimates vary wildly across firms, with the majority of estimates falling outside the 0.4 to 0.7 range that the AER adopts;

    b) The beta estimates vary wildly over time with estimates for some firms increasing by 20% and others decreasing by 20% over a short period;

    c) The beta estimates vary wildly depending on which sampling frequency is used;

    d) The beta estimates vary wildly depending on which regression specification is used; and

    e) The beta estimates vary substantially depending on the day of the week on which they are computed.

382. Moreover, the evidence from a larger sample of overseas comparables does not suffer, to nearly the same degree, from the problems set out above. Our view is that the evidence from foreign comparables is relevant and should be considered.

383. In the following two sections, we set out our views about:

    a) How to best process the relevant empirical evidence into a raw empirical beta estimate that has no regard to the theoretical and empirical failings of the Sharpe-Lintner CAPM; and

    b) How to best adjust the raw empirical beta estimate to have regard to the theoretical and empirical failings of the Sharpe-Lintner CAPM for use in the AER's foundation model approach.

Raw Sharpe-Lintner CAPM beta estimates

Overview of the issues

384. In the framework that is proposed in the Guideline, there are two types of evidence that the AER will have regard to when estimating equity beta. First, there is evidence about the raw beta estimates, and then there is evidence about how those estimates may need to be adjusted to take account of the empirical and theoretical failings of the Sharpe-Lintner CAPM. In this section, we summarise the data relating to the raw beta estimates and in the subsequent section we consider the evidence about adjustments to account for the failings of the Sharpe-Lintner CAPM.

385. The evidence that the AER uses to estimate the raw beta is summarised as follows:

    a) Regression estimates of beta for listed domestic energy network businesses;

[250] SFG (2014), *Cost of equity in the Black capital asset pricing model*, May.

b) Regression estimates of beta for listed international energy network businesses;

c) The AER's conceptual analysis; and

d) Regulatory estimates of beta for water utilities.

386. As set out above, our view is that regulatory estimates of beta for water utilities are not relevant evidence and should be disregarded. This is because those water utility beta estimates are based entirely on:

a) Regulatory estimates of beta for energy network businesses; and

b) Regression estimates of beta for international water utilities.

387. The estimates of beta for energy network businesses add nothing. Obviously it would be entirely circular to corroborate regulatory estimates of energy network betas using something that is based on regulatory estimates of energy network betas.

388. The regression estimates of beta for international water utilities are also of no marginal benefit because a large sample of international energy networks is already available. It would obviously make no sense to have more regard to evidence that is based on international water utilities than to evidence based on international energy networks.

389. The AER also reaches much the same conclusion:

> It is problematic to rely on these regulatory determinations, because these do not provide material additional information. [251]

390. Moreover, the AER has indicated that its regulatory estimates of beta for water utilities have "limited application to estimating the equity beta for a benchmark efficient entity."[252] The AER also notes that, although they have changed the way they use this information "the change to our approach has no material impact on our outcome." [253]

391. In our view, regulatory estimates of beta for water utilities are not relevant evidence and should be disregarded. We note that this information appears to have had no material effect on the AER's range or point estimate for beta.

392. As set out above, our view is that the AER's conceptual analysis adds nothing to the estimation of equity beta. That analysis recognises that the benchmark firm is likely to have lower-than-average business risk (asset beta) and higher-than-average leverage. The former would have the effect of reducing equity beta and the latter would have the effect of increasing it. The goal of the conceptual analysis is to determine (conceptually) which of the two effects dominates.

393. The AER concludes that the higher-than-average leverage has the smaller effect on equity beta. This conclusion is based on:

a) The Frontier Economics (2013) report insofar as it relates to financial risks; and

[251] AER Appendix C, p. 45.
[252] AER Appendix C, p. 44.
[253] AER Appendix C, p. 44.

b) The McKenzie and Partington (2012) report insofar as it relates to the relative effects of business risk and leverage.

394. For the reasons set out above, our view is that the AER has fundamentally misinterpreted the advice presented in both reports:

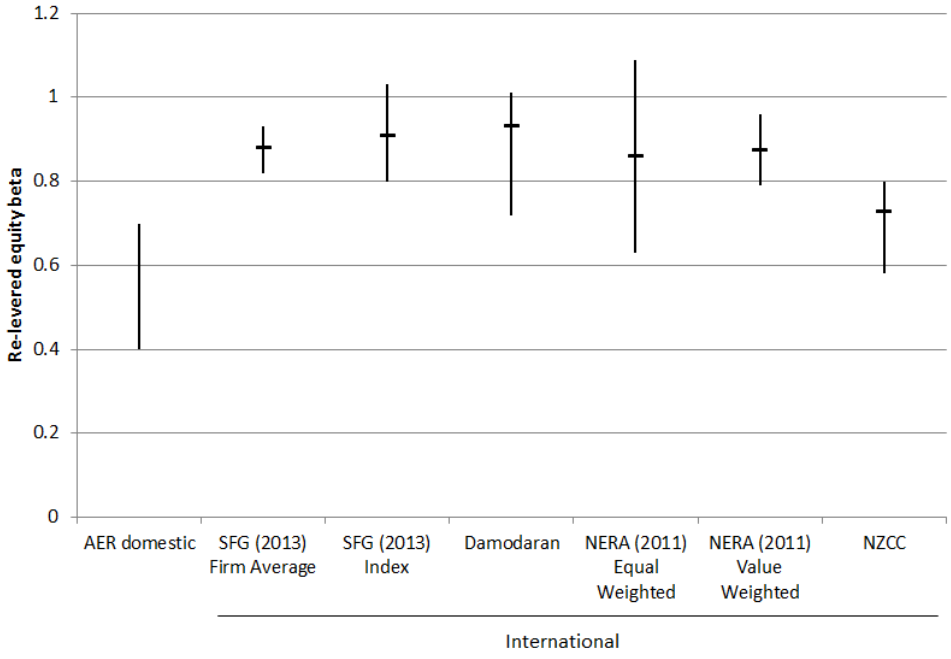
a) The AER interprets the Frontier Economics report as supporting the notion that there is an a priori expectation that the lower-than-average business risk will dominate the higher-than-average leverage, in which case equity beta is expected to be less than 1. However, Frontier Economics have never made such a statement and are well known to hold the view that this is an empirical question; and

b) The McKenzie and Partington report uses the Damodaran empirical estimates of US energy network utility betas to support the proposition that "conceptually" the equity beta for such firms is likely to be materially lower than 1. However, the (re-levered to 60%) equity betas for all five industry sectors are above 1.2. That is, the AER uses equity beta estimates above 1.2 to support the conceptual notion that equity beta is likely to be materially less than 1.

395. For these reasons, and those set out above, our view is that the conceptual analysis adds nothing to the estimation of equity beta. Indeed, it is difficult to imagine any circumstance in which a conceptual analysis could supplant the empirical estimates. Consistent with this view, the AER appears to have made no use of its conceptual analysis other than to conclude that it is not inconsistent with its empirical estimates of beta.

396. Since the AER's conceptual analysis and the regulatory estimates of beta for water utilities add nothing material, the AER is left with its empirical estimates that are summarised in Figure 14 below. Figure 14 sets out the empirical estimates that the AER refers to in Appendix C, and the AER's interpretation of that evidence. For example, the figure shows that the AER's interpretation of the domestic data is that it supports a range of 0.4 to 0.7. The international evidence that is discussed in the AER's Guideline has previously been summarised in Figure 10 above.

Figure 14. AER empirical estimates of beta



Source: AER Appendix C.

397. The regulator then has the task of distilling the empirical evidence set out above into a regulatory estimate of the raw beta. This will involve a consideration of the relative strengths and weaknesses of each piece of evidence. For example, the five domestic energy network firms that remain in the sample are likely to be more comparable to the benchmark firm, which the AER defines to be a firm operating in Australia. Conversely, the international samples include dozens of firms, which improves the precision and statistical reliability of the estimates.

398. In this regard, we note that the Guideline materials state that:

> …data are now only available for five energy infrastructure businesses: APA Group; DUET; Envestra Limited; SP AusNet; and Spark Infrastructure Group. Given the strong assumptions required when implementing DGMs, we are sceptical about the robustness of deriving a benchmark estimate of the return on equity based on the data of five businesses.[254]

399. Similarly, and in light of the evidence set out above, we are also sceptical about the robustness of deriving a benchmark estimate of the return on equity based on the data of five businesses – whether data from those five businesses is used in a dividend discount model or in the Sharpe-Lintner CAPM. That is, the Sharpe-Lintner CAPM does not, and cannot, correct for the inadequacy of data used to estimate the input parameters.

400. In our view, the best approach for distilling the domestic and international empirical evidence is that set out in SFG (2013).[255] They consider the same 9 domestic firms that are used to compile the domestic beta estimates on which the AER's primary range is based. They also consider 56 international energy network businesses that were selected by CEG (2013) on the basis of their comparability to the benchmark efficient regulated firm. Having compiled beta estimates (re-levered to 60%) they state that:

> The next question is to consider how much weight should be placed on the evidence from Australian-listed firms and the U.S.-listed firms. In reaching a conclusion we considered the issues of comparability and reliability. Ideally we would have a large number of Australian-listed firms to analyse. But the reality is that this sample is so small that to consider it in isolation leads to estimates that are highly unreliable, as demonstrated in our companion report.[29] It should also be noted that the set of comparable firms from the United States was carefully scrutinised by CEG (2013) with respect to the proportion of assets under regulation, their industry classification and their prior use in comparable firm analysis for regulatory decision-making.
>
> So in reaching our final parameter estimates we allowed for each observation of an Australian-listed firm to count for twice as much weight as a U.S.-listed firm. This means that the weight placed on the evidence from the Australian-listed firms is 24% [that is, 9 × 2 ÷ (9 × 2 + 56) = 0.24] and the weight placed on the estimates from the U.S.-listed firms is 76%. [256]

401. This approach produces a final equity beta estimate of 0.82. In our view, this remains the best currently available empirical estimate of equity beta for the benchmark efficient entity, having regard to the trade-off between comparability and statistical reliability.

[254] AER Appendix E, p. 119.
[255] SFG, 2013, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June.
[256] SFG (2013), p. 16.

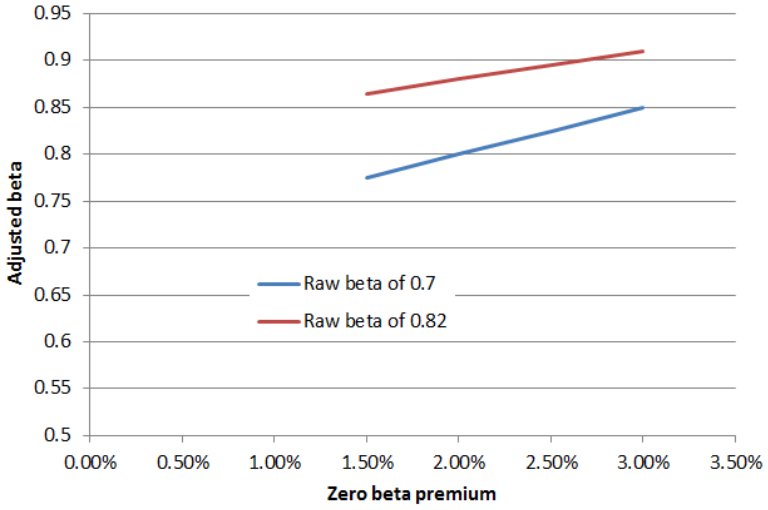
Adjusted beta estimates

Adjustments for evidence of low beta bias

402. In its Guideline materials, the AER recognises the theoretical and empirical failings of the Sharpe-Lintner CAPM and seeks to redress those failings by adjusting its estimate of equity beta. For example, the AER recognises that there is substantial evidence to suggest that required returns on low beta stocks are higher than the Sharpe-Lintner CAPM would suggest. The AER also notes that the Black CAPM, which was developed in response to this empirical observation, provides a better empirical fit to the data. However, under the AER's foundation model approach the Black CAPM is not considered directly. Rather, the AER considers what adjustment would be required to its beta estimate in order for the Sharpe-Lintner CAPM (with the adjusted beta) to produce the same estimate of the required return on equity as the Black CAPM (with the original beta).

403. Figure 15 below summarises the adjustments that are required to the raw empirical beta estimates. For example, a raw empirical beta estimate of 0.7 would need to be adjusted to 0.85 to be consistent with a zero beta premium of 3%. Similarly, a raw empirical beta estimate of 0.82 would need to be adjusted to 0.91 to be consistent with a zero beta premium of 3%.

Figure 15. Adjustments required for Black CAPM evidence



Source: SFG calculations.

404. In our view, the best raw empirical beta estimate is 0.82, as set out above, and the best estimate of the zero beta premium is 3.34% per SFG (2014).[257] This implies that, when populating the Sharpe-Lintner CAPM foundation model, 0.90 is the best estimate of beta that is reflective of the evidence that the Sharpe-Lintner CAPM systematically understates the required return on low-beta stocks.[258]

Adjustments for evidence of a value premium

405. There is also evidence that the required return for high book-to-market (or "value") stocks is consistently and materially higher than the Sharpe-Lintner CAPM would suggest. Indeed the

[257] SFG (2014), *Cost of equity in the Black capital asset pricing model*, April.
[258] In particular, the required return on equity for the benchmark firm under the Black CAPM is given by (3.63+3.34)+0.82×(11.20-3.63-3.34)=10.43. An equity beta of 0.90, when used in the Sharpe-Lintner CAPM, produces the same outcome, within rounding error: 3.63+0.90×(11.20-3.63)=10.43.

evidence for the book-to-market effect is at least as extensive and comprehensive as the evidence of the low-beta/Black CAPM effect. A summary of that evidence is set out in SFG (2014).[259]

406. In our view, the evidence that high book to market firms earn higher than average returns is compelling. The relationship between book to market ratio and subsequent stock returns is consistent over many decades and across many different national markets.[260] It is more statistically and economically significant than the relationship between beta and subsequent stock returns. Indeed, in our view there is no plausible argument against the proposition that there is a well-documented, consistent and significant relationship between book-to-market and stock returns. This is quite independent of arguments about whether the Fama-French model or the Sharpe-Lintner CAPM is "best" or most consistent with the Rules. It is also independent about arguments about other factors such as size. In our view, the basic point that there is a well-documented, consistent and significant relationship between book-to-market and stock returns is unarguable.

407. Logically, there are two possible explanations for this relationship:

    a) It has occurred by random chance (in which case it is unlikely to persist in the future); or

    b) It has occurred for some good reason (in which case it is likely to persist in the future).

408. The former explanation seems unlikely given the persistence of the relationship over time and across markets. In particular, the relationship has persisted in the decades since it was first identified.

409. For the present purposes, the relevant question is whether investors require higher returns to invest in high book-to-market stocks. Again, there are logically two possibilities:

    a) Investors do not require higher returns for high book-to-market stocks, and the observed higher returns of these stocks is simply due to random chance and represents a windfall gain to the holders of those stocks over many decades in many different markets; or

    b) Investors do require higher returns for high book-to-market stocks, which must be priced (in equilibrium) to generate higher returns if they are to attract investors.

410. Again, the former explanation seems unlikely given the persistence of the relationship over time and across markets.

411. If investors do require higher returns for high book-to-market stocks (consistent with the large body of empirical evidence), it logically follows that an estimate of the required return that disregards the book-to-market effect cannot be commensurate with the prevailing conditions in the market or with the efficient financing cost of a benchmark efficient entity.

412. Note that this conclusion does not rely on the adoption of the Fama-French model in addition to or instead of the Sharpe-Lintner CAPM and it does not require any particular interpretation or theoretical rationale for the relationship between book-to-market and stock returns. Rather, the simple point is that:

    a) If investors *do* require higher returns for high book-to-market stocks; and

    b) If the allowed return is set on the basis that investors *do not* require higher returns for high book-to-market stocks,

[259] SFG (2014), *Using the Fama-French model to estimate the required return on equity for the benchmark efficient entity*, April.
[260] The most comprehensive evidence in relation to the Australian market is provided by Brailsford, Gaunt and O'Brien (2012).

the allowed return cannot be commensurate with the prevailing conditions in the market or with the efficient financing cost of a benchmark efficient entity.

413. Consequently, our view is that – given that the foundation model approach is to be maintained – the beta estimate should be informed by evidence about high book-to-market stocks requiring higher returns. The Guideline already demonstrates how a raw beta estimate can be adjusted to reflect the Black CAPM evidence of a low beta bias. The same approach can also be used to reflect the Fama-French evidence of a book-to-market bias (also known as the "value premium").

414. SFG (2014) show that an equity beta estimate of 0.93, when inserted into the Sharpe-Lintner CAPM, produces an estimate of the required return on equity that is consistent with the Fama-French evidence of a value premium.[261] We therefore adopt 0.93 as the estimate of beta that best corrects for the empirical evidence that the required return for high book-to-market stocks is consistently and materially higher than the Sharpe-Lintner CAPM would suggest.

Adjustments for dividend discount evidence

415. The dividend discount model can be used as an alternative way of estimating the required return on equity for the benchmark firm. A detailed explanation and assessment of the dividend discount approach is set out in SFG (2013a)[262] and SFG (2013b).[263] As set out above, evidence from the dividend discount model can be used in the regulatory process in different ways:

    a) The dividend discount model could be used as one of a number of relevant models that each produce an estimate of the required return on equity, and those estimates could be distilled into an allowed return on equity after having regard to the relative strengths and weaknesses of each model; or

    b) The dividend discount model could be used to inform the estimate of beta in the Sharpe-Lintner CAPM foundation model – beta could be set so that the resulting estimate of the required return on equity reflected the evidence from the dividend discount model.

416. In our view, the best available dividend discount model estimate of the required return on equity for the benchmark firm is that set out in SFG (2014).[264] SFG apply the approach of Fitzgerald, Gray, Hall and Jeyaraj (2013) to a broad market index and also to the set of comparable firms that are used to estimate equity beta for use in the CAPM. They compare the estimates of the required returns of the comparable firms with those of the broad market index. They report that the risk premium for the comparable firms (i.e., the difference between the dividend discount model estimate of the required return and the risk-free rate) averages 94% of the risk premium of the market. This implies that an equity beta estimate of 0.94 reflects the contemporaneous evidence in relation to the dividend discount model.

417. In its Guideline materials, the AER expresses a number of reservations about the application of its own dividend discount model at the industry level. In particular, the AER notes that its own dividend discount model cannot be applied at the industry level because it produces estimates that are volatile and fail a "basic sanity check" in that they suggest that required return is higher for the

[261] Using the parameter values of SFG (2014) and a risk-free rate of 3.63% produces an estimate of the required return on equity for the benchmark firm of 10.66% under the Fama-French model. This equates to an equity beta of 0.93 being used in the Sharpe-Lintner CAPM, within rounding error: $3.63 + 0.93 \times 7.57 = 10.66$.
[262] SFG Consulting, 2013, *Dividend discount model estimates of the cost of equity*, June.
[263] SFG Consulting, 2013, *Reconciliation of dividend discount model estimates with those compiled by the AER*, August.
[264] SFG (2014), *Alternative versions of the dividend discount model and the implied cost of equity*, April.

benchmark firm than for the average firm.[265] Estimates produced using the SFG approach do not exhibit either of these problems.

Conclusions and recommendations in relation to the foundation model approach

418. Table 9 below summarises the estimates of equity beta that reflect the contemporaneous evidence in relation to each of the relevant financial models – for the purposes of the foundation model approach. The relevant financial models that might be used to inform the estimate of beta to be used in the foundation model all have different strengths and weaknesses along different dimensions. For example:

    a) The Sharpe-Lintner CAPM has the disadvantage of producing estimates of expected returns that have little or no relationship with actual returns – that is, it provides a poor fit to the observed data. However, the Sharpe-Lintner CAPM is commonly used in practice, albeit often in a modified form and we agree that systematic risk is a useful way to think about risks incorporated into market prices. Also, the Australian regulatory practice has been to use the Sharpe-Lintner CAPM exclusively, in which case it would be appropriate to at least continue to have regard to that approach. Consequently, our view is that the Sharpe-Lintner CAPM estimate of the required return is relevant evidence and some regard should be given to it. The limitations of the Sharpe-Lintner CAPM are that it does not account for all priced risks and its parameter estimates from standard empirical analysis have limited reliability.

    b) The Black CAPM provides a better fit to the empirical data than the Sharpe-Lintner CAPM and it is commonly used in rate of return regulation cases in other jurisdictions (where it is known as the "empirical CAPM"). The Black CAPM is also more theoretically sound than the Sharpe-Lintner CAPM because it does not rely upon the assumption that investors can borrow at the risk-free rate, but rather that investors can sell short. The Black CAPM does not, however, overcome a major disadvantage of the Sharpe-Lintner CAPM, which is that there is no statistically significant relationship between beta estimates and stock returns. In our view, the fact that the Black CAPM requires the estimation of an additional parameter does not affect the fact that it provides relevant evidence and some regard should be given to it.

    c) The Fama-French model has the advantage of providing an unambiguously better fit to the data than the Sharpe-Lintner CAPM. However, whereas it is commonly used as an estimate of required returns in academic studies, it is less commonly used in valuation and regulatory practice. Our view is that the Fama-French estimate of the required return is relevant evidence and some regard should be given to it.

    d) The dividend discount model approach has the advantage of not requiring any assumptions about what factors drive required returns – it simply equates the present value of future dividends to the current stock price. It is also commonly used in industry and regulatory practice. Whereas the Guideline materials identify some concerns with the dividend discount approach, the specification adopted in this report addresses most of those concerns. Consequently, our view is that the dividend discount estimate of the required return is relevant evidence and some regard should be given to it.

419. Because all of the models have different strengths and weaknesses along different dimensions, it is impossible to identify one superior model that alone would out-perform the combined evidence of all

[265] AER Appendix E, p. 121.

of the relevant models – in producing an equity beta estimate for use in the foundation model. This is consistent with the AEMC's views that:

a) "no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs;"[266] and that

b) The NEO, NGO and RPP can only be achieved by obtaining "the best possible estimate of the benchmark efficient financing costs," which in turn requires the use of a range of financial models.[267]

420. Consequently, our view is that any approach that adopts a single "superior" model to inform the estimate of beta, and which effectively disregards other relevant models, will not provide "the best possible estimate of the benchmark efficient financing costs." Any sub-standard estimate of financing costs will inevitably lead to investors being either under- or over-compensated – neither of which are in the long-run interests of consumers.

421. A summary of the relevant estimates of the required return on equity, and our proposed weighting scheme, is set out in Table 9 below. The rationale for the proposed weights is as follows:

a) 25% weight is applied to the estimate of beta informed by the dividend discount model and a total of 75% weight is applied to the three asset-pricing models. Because all four models have different strengths and weaknesses as set out above, our default starting point would be to assign 25% weight to the beta estimates informed by each model. We then adjust weights among the asset pricing models for the reasons set out below;

b) Of the 75% weight that is applied to asset-pricing model estimates, we apply half to the Fama-French model and half to the CAPM. That is the question of whether the value premium is a proxy for a risk factor or a statistical aberration is addressed by applying equal weight to each possibility;

c) A total of 37.5% weight is applied to the CAPM. The two forms of the CAPM differ only in terms of the intercept that is used (since the same values of beta and the required return on the market are used for both models). The Black CAPM uses an empirical estimate of the intercept – selected to provide the best possible fit to the observed data. The Sharpe-Lintner CAPM uses a theoretical lower bound for the intercept (i.e., the intercept cannot possibly be lower than the risk-free rate). Thus, we do not have two estimates to choose between – we have an empirical estimate and a theoretical lower bound. It is for this reason that we apply twice as much weight to the Black CAPM. This approach is equivalent to setting the CAPM intercept two-thirds of the way between the theoretical lower bound and the empirical estimate to inform the estimate of beta.

422. We note that the final estimate of beta is relatively insensitive to the choice of weights. For example, the final estimate varies by less than 0.1 if:

a) The Sharpe-Lintner and Black CAPM are assigned equal weight and no other changes are made;

b) All four models are assigned equal weight;

[266] AEMC Final Determination, p. 49.
[267] AEMC Final Determination, p. 43.

c) The dividend discount model is omitted and the other models are assigned equal weight; or

d) The Fama-French model is omitted and the other models are assigned equal weight.

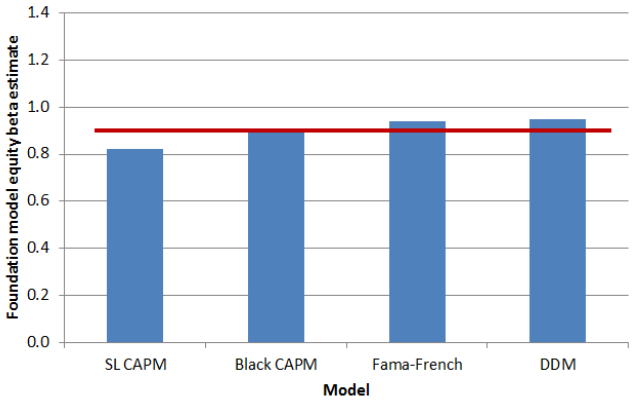
423. We do not recommend any of the alternative weighting schemes listed above – we simply note that the final estimate of foundation model beta is relatively insensitive to the proposed weighting scheme. In our view, the 0.91 estimate in Table 9 is the best available estimate of the required return on equity for a benchmark efficient entity and best reflects the prevailing conditions in the market for equity funds.

Table 9
Estimates of equity beta to reflect evidence from relevant financial models

Model	Equity beta	Weighting
SL CAPM	0.82	12.5%
Black CAPM	0.90	25.0%
Fama-French	0.93	37.5%
DDM	0.94	25.0%
Average	**0.91**	**100%**

424. Consequently, we adopt a composite foundation model equity beta of 0.91, as illustrated in Figure 16.

Figure 16. Foundation model equity beta estimates



425. In our view, given that the required return on equity must be estimated using the Sharpe-Lintner CAPM, a beta estimate of 0.91 produces an estimate of the required return on equity that is:

i) Most commensurate with the efficient financing costs and degree of risk of a benchmark efficient entity; and

ii) Best reflective of prevailing conditions in the market for equity funds.

6. Conclusions about the required return on equity

426. Given that the Sharpe-Lintner CAPM is to be used as a foundation model, we have produced the set of parameter estimates that we consider to be most likely to produce an estimate of the required return on equity that is:

a) Most commensurate with the efficient financing costs and degree of risk of a benchmark efficient entity; and

b) Best reflective of prevailing conditions in the market for equity funds.

427. Our parameter estimates are as follows:

a) A risk-free rate based on the yield on 10-year government bonds – producing a current estimate of 3.63%;

b) A market risk premium based on historical excess stock returns, the Wright approach, dividend discount models, and independent expert valuation reports – producing a current estimate of 7.57%; and

c) An equity beta based on historical stock returns from domestic and international comparable firms, evidence of a low-beta premium (Black), evidence of a value premium (Fama and French), and evidence from industry dividend discount models – producing a current estimate of 0.91.

428. The composite foundation model equity beta estimate of 0.91 produces an estimate of the required return on equity of 10.53%, as set out below:

$$\begin{aligned} r_e &= r_f + \beta \times MRP \\ &= 3.63\% + 0.91 \times 7.57\% = 10.53\%. \end{aligned}$$

Declaration

429. 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

References

Asher, A., 2011, "Equity Risk Premium Survey – Results and Comments," Actuary Australia, July, 13-14.

Asher, A., 2012, "Equity Risk Premium Survey – Results and Comments," Actuary Australia, July, 28-29.

Australian Competition Tribunal, 2012, Application by Envestra Ltd (No 2) [2012] ACompT 3.

Australian Competition Tribunal, 2012, Application by WA Gas Networks Pty Ltd (No 3) [2012] ACompT 12.

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

Australian Energy Regulator, 2013, *Rate of return guideline*, December.

Australian Energy Regulator, 2013, *Rate of return guideline – Explanatory Statement*, December.

Australian Energy Regulator, 2013, *Draft rate of return guideline*, August.

Australian Energy Regulator, 2013, *Draft rate of return guideline – Explanatory Statement*, August.

Australian Energy Regulator, 2012, *Envestra (Victoria) – Access arrangement 2013-17: Draft Decision*, September, http://www.aer.gov.au/node/14473.

Australian Energy Regulator, 2013, *Envestra (Victoria) – Access arrangement 2013-17: Final Decision*, March, http://www.aer.gov.au/node/14473.

Australian Office of Financial Management, 2011, Annual Report 2010-2011 – *A history of treasury bond tenders and performance*, http://www.aofm.gov.au/content/publications/reports/AnnualReports/2010-2011/html/05_Feature_Article.asp[18/11/2013 12:30:04 PM].

Bernstein, P. and R. Arnott, 2003, 'Earnings Growth: The Two Percent Dilution', *Financial Analysts Journal*, Sept/October, pp. 47-55.

Black, Fischer, 1972, "Capital Market Equilibrium with Restricted Borrowing," *Journal of Business*, 45:3, 444-454.

Black, Fischer, Michael C. Jensen and Myron 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.

Brailsford T, C. Gaunt and M.A. O'Brien, 2012, "Size and book-to-market factors in Australia," *Australian Journal of Management*, 37(2) 261-281.

Brailsford, T., J. Handley and K. Maheswaran, 2008, Re-examination of the historical equity risk premium in Australia, *Accounting and Finance* 48, 73-97.

Brailsford, T., J. Handley and K. Maheswaran, 2012, The historical equity risk premium in Australia: Post-GFC and 128 years of data, *Accounting and Finance*, 237-247.

CEG, 2013, *AER equity beta issues paper: international comparators*, October, http://www.aer.gov.au/sites/default/files/ENA%20-%20Submission%20to%20AER%20equity%20beta%20issues%20paper%20-%20Attachment%20A%20-%20CEG%20report%20-%20International%20comparators%20-%2028%20October%202013.pdf.

CEG, 2013, *Regression estimates of equity beta*, September, http://www.erawa.com.au/cproot/11629/2/DBP%20-%20CEG%20Beta%20Study.pdf.

Economic Regulation Authority, 2013, *Rate of Return Guidelines for Gas Transmission and Distribution Networks – Final Guidelines*, December.

Economic Regulation Authority, 2013, *Rate of Return Guidelines for Gas Transmission and Distribution Networks – Final Guidelines – Explanatory Statement*, December.

Economic Regulation Authority, 2013, *Rate of Return Guidelines for Gas Transmission and Distribution Networks – Final Guidelines -- Appendices*, December.

Ernst and Young, 2012, *Market Evidence on the Cost of Equity: Victorian Gas Access Arrangement Review 2013-2017*, Report for Envestra, Multinet Gas, SP Ausnet and APA Group, 8 November.

Fernandez, P., J. Aguirreamalloa and P. Linares, 2013, "Market Risk Premium Used for 51 Countries in 2013: A Survey with 6237 Answers," IESE Business School Working Paper.

Fernandez, P., J. Aguirreamalloa and L. Corres, 2012, "Market Risk Premium used in 82 Countries in 2012: A Survey with 7192 Answers," working paper, University of Navarra (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2084213).

Fernandez, P., J. Aguirreamalloa and L. Corres, 2011, "Market Risk Premium Used in 56 Countries in 2011: A Survey with 6014 Answers," IESE Business School Working Paper WP-920.

Fernandez, P., 2009, "Market Risk Premium Used in 2008 by Professors: A Survey with 1400 Answers," working paper, University of Navarra (http://www.regie-energie.qc.ca/audiences/3690-09/repddrinterv_3690-09/c-1-9_acig-6doc6-1_kolbeir18-1_3690_17aout09.pdf).

Fitzgerald, T., S. Gray, J. Hall, R. Jeyaraj, 2013, "Unconstrained estimates of the equity risk premium," *Review of Accounting Studies*, 18, 560-639.

Friend, Irwin and Marshall Blume, 1970, "Measurement of Portfolio Performance under Uncertainty," *American Economic Review*, 60, 561-75.

Frontier Economics, 2013, *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, Report for the AER, July.

Frontier Economics, 2010, *The cross sectoral application of equity betas: Energy to water*, Report for the ACCC, April.

Grant Samuel, 2014, *Envestra: Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March.

Grant Samuel, 2012, *Hastings Diversified Utilities Fund – Independent Expert's report*, 3 August.

HBS Marriott Corporation Case, Instructor Guide.

Henry, O., 2009 *Estimating β*, Report for the AER, April.

Henry, O., 2008, *Econometric advice and beta estimation*, Report for the AER, November.

IPART, 2013, *Review of WACC Methodology: Final Report*, December.

KPMG, 2013, *Valuation practices survey*, www.kpmg.com.au.

Lally, M., 2013, *Review of the AER's proposed dividend growth model*, 16 December.

Lally, M., 2013, *Response to submissions on the risk-free rate and the MRP*, Report for the QCA, 22 October.

Lally M., 2013, *The Dividend Growth Model*, 4 March.

Lally M., 2013, *Review of the AER's methodology for the risk free rate and the market risk premium*, 4 March.

Lally, M., 2012, *The cost of equity and the market risk premium*, 25 July.

Lamberton, D., 1961, "Ordinary share yields: A new statistical series," *Sydney Stock Exchange Official Gazette*, 14 July.

Miller, Merton H. and Myron Scholes, 1972, "Rates of Return in Relation to Risk: A Re-Examination of Some Recent Findings," in Studies in the Theory of Capital Markets, Michael C. Jensen ed., New York: Praeger.

McCray, 2000, *The Australian Government bond market*, Australian Office of Financial Management, 28 March, www.aofm.gov.au/content/publications/speeches/2000-03-28-1/speechtoadb_paper.asp.

McKenzie M. and G. Partington, 2013, *Risk, Asset Pricing and the WACC*, Draft Report to the AER, provided as part of workshop materials.

McKenzie, M. and G. Partington, 2013, *Review of Aurizon Network's draft access undertaking*, Report for the Queensland Resources Council, 5 October.

McKenzie, M. and G. Partington, 2012, *Supplementary report on the market risk premium*, Report to the AER, February 22.

McKenzie, M. and G. Partington, 2012, *Review of regime switching framework and critique of survey evidence*, Report to the AER, September 7.

McKenzie, M. and G. Partington, 2013, *Review of the AER's overall approach to the Risk free rate and Market Risk Premium*, Report to the AER, 28 February.

McKenzie, M. and G. Partington, 2011, *Equity market risk premium*, Report to Coors Chambers Westgarth, December 22.

NERA, 2013, *Estimates of the Zero-Beta Premium*, June, http://www.aer.gov.au/sites/default/files/Report%202%20-%20Black%20CAPM%20Zero%20Beta%20Estimate%20%28Final%29%20-%2027%20June.pdf.

NERA, 2013, *The market, size and value premiums*, June, http://www.aer.gov.au/sites/default/files/Report%2015%20-%20ENAMRPReport28062013%20Final.pdf.

Officer, R. R., 1994, "The Cost of Capital of a Company under an Imputation Tax System," *Accounting and Finance*, 34, 1-17.

Pratt, Shannon P. "Relationship between Viability of Past Returns and Levels of Future Returns for Common Stocks, 1926-1960," memorandum (April 1967).

Schleuter, T. and S. Sievers, 2014, "The determinants of market beta: The impacts of firm-specific accounting figures and market conditions," *Review of Quantitative Finance and Accounting*, 42, 535-570.

SFG Consulting, 2014, *Cost of equity in the Black capital asset pricing model*, May.

SFG Consulting, 2013, *Reconciliation of dividend discount model estimates with those compiled by the AER*, August, http://www.aer.gov.au/sites/default/files/ENA%2C%20Attachment%202%20-%20SFG%20Report%20-%20Reconciliation%20of%20DDM%20estimatesl%2C%20Submission%20to%20draft%20AER%20rate%20of%20return%20guideline%20-%2011%20Oct%202013.pdf.

SFG Consulting, 2013, *Dividend discount model estimates of the cost of equity*, June, http://www.aer.gov.au/sites/default/files/Report%203%20-%20DGM%20Estimate%20%28Final%29%20-%2027%20June.pdf

SFG Consulting, 2013, *Evidence on the required return on equity from independent expert reports*, June, http://www.aer.gov.au/sites/default/files/Report%204%20-%20Use%20of%20Independent%20Expert%20Reports%20%28Final%29%20-%2026%20June.pdf.

SFG Consulting, 2013, *Regression-based estimates of risk parameters for the benchmark firm*, Report for the Energy Networks Association, June, http://www.aer.gov.au/sites/default/files/Report%207%20-%20Beta%20Parameter%20Estimates%20%28Final%29%20-%2024%20June.pdf.

Appendix 1: Curriculum vitae of Professor Stephen Gray

Appendix 2: Historical comparison of risk-free rates

430. In its Guideline materials, the AER concludes that:

> The available evidence does not support a conclusion that yields on CGS are 'abnormally low'. Indeed, it may be more appropriate to conclude interest rates during the 1970s and 80s were abnormally high.[268]

431. This conclusion is based primarily on advice from McKenzie and Partington (2013)[269] who seek to show that, whereas current government bond yields are materially lower than at any time in the previous 50 years, they are not materially lower than yields in the late 1800s and early 1900s.

432. In a more recent report for the Queensland Resources Council (**QRC**), McKenzie and Partington (2013)[270] compare the current 10-year CGS yield with the average from the 1883-1972 period, noting that the current yield at the time of their report (4.02%) "is reasonably close to the long run average (4.23%)."[271] This leads McKenzie and Partington to conclude that:

> The current environment is nothing more than a return to the 'normal' long run interest rate regime.[272]

433. In our view, there are a number of reasons to reject this conclusion. Generally, a comparison with the most recent 40 years would be more relevant than a comparison with a period that begins in the 1880s and ends more than 40 years ago. But this is particularly the case for CGS yields which were set on an entirely different basis during the historically dated period that McKenzie and Partington prefer. In particular, prior to August 1982, CGS yields were not market rates at all. Prior to 1982, the so-called TAP system was used whereby the Australian government fixed the yield and then issued as many government bonds as the market demanded at the set rate. Thus, the yields were not a market rate at all, but a number that was set from time to time by the government of the day. The current tender system (whereby government fixes the supply of bonds to be issued and a market clearing price is determined) was introduced in August 1982. The Australian Office of Financial Management (**AOFM**) notes that:

> The Australian Government first introduced competitive price tenders for Treasury Bonds in August 1982. The key feature of this approach is that the issuer sets the volume of securities issued while the market determines the issuance yield.[273]

434. The AOFM explains the historical system as follows:

> Prior to tenders, the Australian Government borrowed through individual cash loans and a more flexible continuous offer mechanism known as the TAP system. Under these arrangements the Government set the yield and the market would determine how much was purchased.

[268] AER Explanatory Statement, p. 81.
[269] McKenzie, M. and G. Partington, 2013, Review of the AER's overall approach to the Risk free rate and Market Risk Premium, A report to the AER, 28 February.
[270] McKenzie, M. and G. Partington, 2013, Review of Aurizon Network's draft access undertaking, Report for the Queensland Resources Council, 5 October.
[271] McKenzie and Partington (2013), p. 16. The current yield on 10-year CGS at the time of this report was 3.97%.
[272] McKenzie and Partington (2013), p. 16.
[273] AOFM Annual Report 2010-2011, p. 1.

> The financial environment in which the TAP system operated was very different to that of today. [274]

435. Moreover, the historical system was not compatible with the free and flexible interest rates that are available today and it caused the intertwining of monetary policy and government debt management:

> The TAP mechanism was not sustainable with increasingly flexible interest rates. As a result, a tender system was first adopted for short-term Treasury Notes in December 1979 and for Treasury Bonds in August 1982. The move to a tender approach supported the Government moving to fully funding its Budget without recourse to central bank financing. This effectively separated monetary policy from debt management.[275]

436. The AOFM concludes that the key risk-free market yield was not "freed up" until the tender system was put in place in 1982:

> The adoption of tenders for debt issuance was critical in freeing up the key risk-free market yield in the economy. This proved essential for the financial innovation that was to occur in the financial markets in the following years.[276]

437. McCray (2000) notes that under the TAP system, the majority of government bonds were issued to institutions that were effectively forced (by government regulation) to buy and hold:

> The market was essentially 'buy and hold' in its orientation and distinguished by a variety of 'captive market' arrangements, which obliged financial institutions to hold specified proportions of their assets in the form of government securities. In like manner, life insurance offices and pension funds were provided with significant tax concessions in return for holding 30 per cent of their assets in public securities.[277]

438. The captive market had two effects. First, it resulted in there being no effective secondary market, since the institutions that bought at issuance were required to hold through to maturity:

> One consequence of these captive market arrangements was that there was only a very limited secondary market in government securities. Derivatives markets as they are known today did not exist…In summary, captive investor arrangements discourage the taking of positions in the market and, in doing so, act to inhibit liquidity and secondary market development.[278]

439. The captive market also had the effect of artificially reducing the yield:

> …the arrangements also ensured a continued demand from growing financial institutions for government securities and doubtless assisted the authorities to issue government bonds at lower interest rates than would otherwise have been the case.[279]

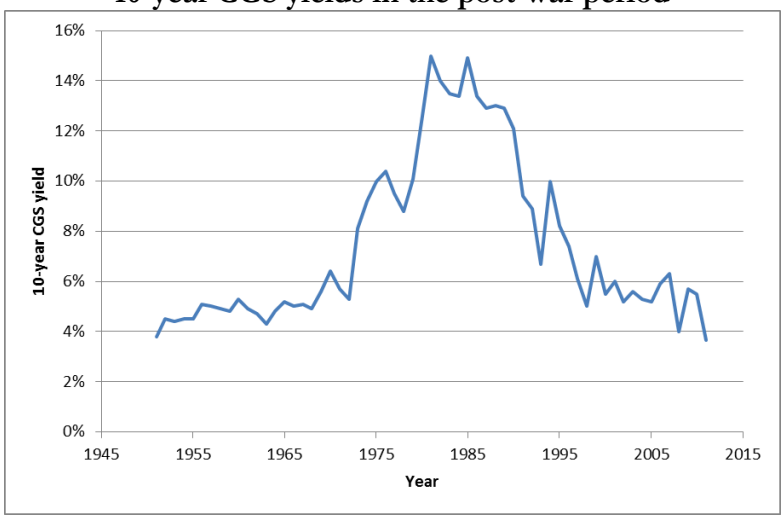
[274] AOFM Annual Report 2010-2011, p. 1.
[275] AOFM Annual Report 2010-2011, p. 1.
[276] AOFM Annual Report 2010-2011, p. 1.
[277] McCray (2000), p. 5.
[278] McCray (2000), p. 9.
[279] McCray (2000), p. 9.

440. McKenzie and Partington (2013) now conclude that the current low CGS yields may be "nothing more than a return to the 'normal' long run interest rate regime." [280] In summary, McKenzie and Partington now conclude that, although current CGS yields are lower than at any time in the last 40 years, they are "reasonably close" to the yields that were artificially set by government 50 or more years ago.

441. Our view is that a more careful and appropriate interpretation of the relevant evidence is that CGS yields have not been this low since governments ceased artificially fixing them and allowed them to become market prices.

442. Even setting aside the McKenzie and Partington (2013) comparison of apples and oranges, the fact remains that CGS yields in the period since the onset of the GFC have been lower than at any time since World War Two, as illustrated in Figure 17 below.

Figure 17
10-year CGS yields in the post-war period



Source: RBA

443. Consequently, it is a fact that the approach of estimating the required return on equity by using the Sharpe-Lintner-CAPM with a fixed MRP of 6% leads inevitably to the conclusion that equity capital has been cheaper since the onset of the GFC than at any other time since WWII.

[280] McKenzie and Partington (2013), p. 16.

Appendix 3: The effect of leverage

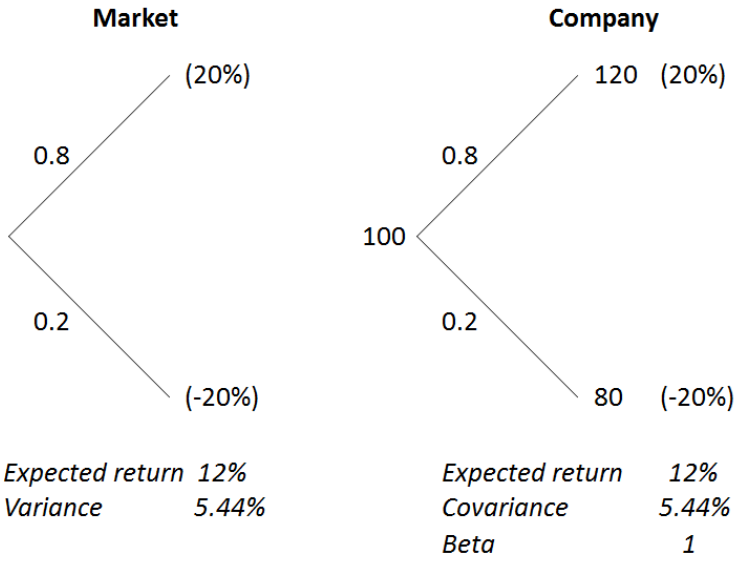
444. The reason that leverage increases the systematic risk of equity, by definition, is that it increases the variability of the returns to shareholders. To see this via a simple illustration, consider an unlevered firm that currently has assets valued at $100. Over the next year there is an 80% chance of a market expansion and a 20% chance of a contraction. In the event of an expansion the value of the assets will increase to $120 and in the event of a contraction the value of the assets will fall to $80. In this case, the expected return for the firm is:

$$r_e = 0.8 \times 20\% + 0.2 \times (-20\%) = 12\%$$

as set out in the figure below.

445. Also suppose that the market return is 20% in the expansion state and -20% in the contraction state. In this case the beta of this unlevered firm is 1.0. In particular:[281]

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.0544}{0.0544} = 1.$$



446. Now suppose the same firm is financed with $70 equity and $30 debt, on which the interest rate is 10% p.a. At the end of the period, the firm must repay its debt plus interest, a total of $33. The residual is then available to the shareholders as set out in the figure below.

447. In this case, the return on equity in the up-market is better than before and the return on equity in the down-market is worse than before. Again, this is why it is called "leverage." In this case, the

[281] $\text{var}(r_m) = 0.5(0.20 - 0.12)^2 + 0.5(-0.20 - 0.12)^2 = 5.44\%$ and
$\text{cov}(r_e, r_m) = 0.5(0.20 - 0.12)(0.20 - 0.12) + 0.5(-0.20 - 0.12)(-0.20 - 0.12) = 5.44\%$.

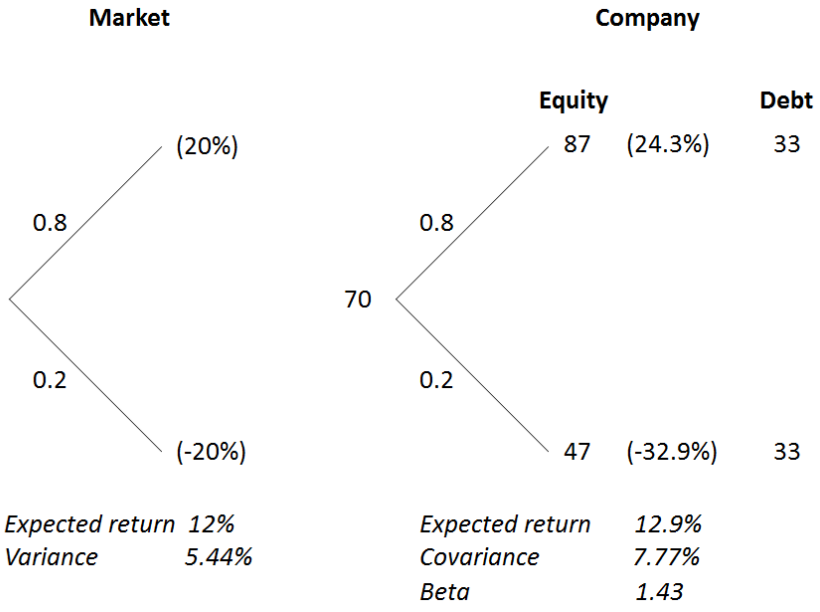
leverage has no effect on the fundamental business risk of the firm (the asset beta), but it does increase the systematic risk of equity (the equity beta). In particular, the equity beta increases to:

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.0777}{0.0544} = 1.43$$

and the expected return on equity rises, commensurate with the increase in the equity beta:

$$r_e = 0.8 \times 24.3\% + 0.2 \times (-39.9\%) = 12.9\%.$$

448. These effects are all set out in the figure below.



449. Note that the relationship between the (levered) equity beta and the (unlevered) asset beta is described perfectly by the re-levering equation that the AER has adopted. The asset beta is known to be 1 from the analysis of the unlevered firm above. With 30% leverage, the levered equity beta is 1.43. In this case:

$$\beta_a = \beta_e \frac{E}{V}$$
$$1 = 1.43 \times 0.7.$$

450. Also note that in this case there is no default risk (even in the down-market the firm is able to service its debt), there is no counterparty risk, there is no illiquidity risk, there is no refinancing risk and there is no reset risk. That is, even if the five financial risks in the Frontier report are eliminated entirely, leverage still has an important effect on the equity beta – an effect that is captured by the AER's re-levering formula. The five financial risks are *not* the means by which leverage has an effect on equity beta. Leverage has an effect on equity beta by widening the range of possible returns, as captured by the AER's re-levering formula. The actual leverage effect is entirely independent of the five types of

risk discussed in the Frontier report – indeed, the same leverage effect exists even if all five risks are eliminated entirely.

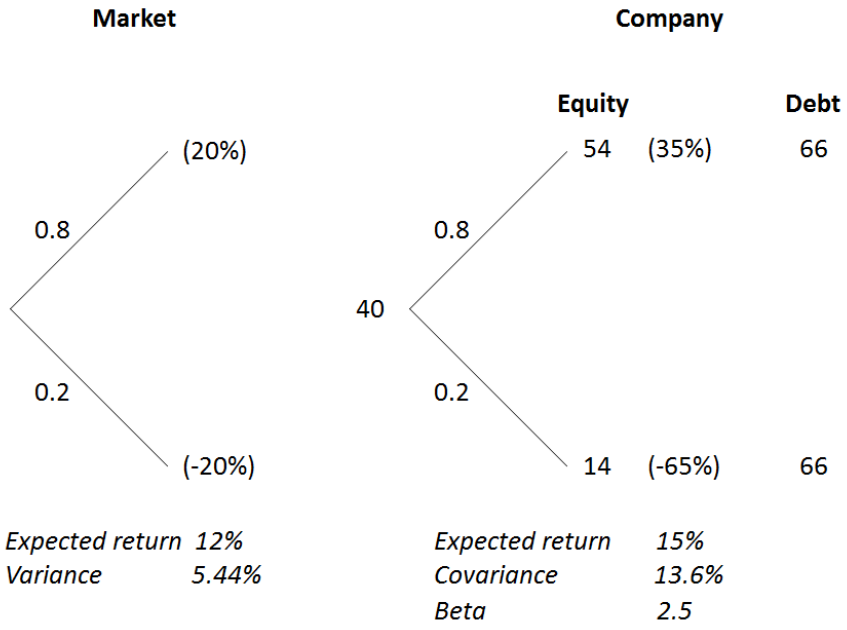
451. Now suppose the firm's leverage is doubled to 60%. At the end of the period, the firm must repay its debt plus interest, a total of $66. The residual is then available to the shareholders as set out in the figure below.

452. In this case, the return on equity in the up-market is even better than before (+35%) and the return on equity in the down-market is even worse than before (-65%). Again leverage has no effect on the fundamental business risk of the firm (the asset beta), but it does increase the systematic risk of equity (the equity beta). In particular, the equity beta increases to:

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.136}{0.0544} = 2.5.$$

and the expected return on equity rises, commensurate with the increase in the equity beta:

$$r_e = 0.8 \times 35\% + 0.2 \times (-65\%) = 15\%.$$



453. Again, the relationship between the (levered) equity beta and the same (unlevered) asset beta is described perfectly by the re-levering equation that the AER has adopted:

$$\beta_a = \beta_e \frac{E}{V}$$
$$1 = 2.5 \times 0.4.$$