Appendix 5.07 - Expert report by Frontier Economics

The required return on equity under a foundation model approach

Revised 2016-21 access arrangement proposal

Response to the AER's draft decision

January 2016

The required return on equity under a foundation model approach

REPORT PREPARED FOR JEMENA ELECTRICITY NETWORKS, ACTEWAGL DISTRIBUTION, AUSNET SERVICES, AUSTRALIAN GAS NETWORKS, CITIPOWER, POWERCOR, AND UNITED ENERGY

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Executive Summary

1.1 Context

1 Frontier Economics (**Frontier**) has been retained by Jemena Electricity Networks, ActewAGL Distribution, AusNet Services, Australian Gas Networks, CitiPower, Powercor and United Energy to provide our views on a range of issues relating to the computation of the allowed return on equity in the Australian regulatory setting. Specifically, we have been asked to:

a. Review the AER's concerns as to the use of dividend growth model (**DGM**) estimates to inform the MRP.

b. Consider the criticism—that is made in the context of adjusting the Sharpe Lintner Capital Asset Pricing Model (**SL-CAPM**) for low beta bias and use of the Black CAPM—that it is not clear whether the low beta bias reflects risk and, therefore, it is unclear if any adjustment should be made for the bias.

c. Review and critically analyse the AER's selection, analysis, and interpretation of conditioning variables.

d. Determine the best estimate or estimates of the forward-looking MRP, assuming a 10 year term.

e. Consider whether the estimate of the MRP given in response to (d) would be different if the AER's definition of the benchmark efficient entity (**BEE**) did not refer to the entity being regulated, but rather an unregulated entity that supplies services of an analogous kind to standard control services.

f. Set out our best estimate of the required return on equity for the BEE where that return is estimated using:

    i. the SL-CAPM, applied to overcome any bias the expert considers exists in the model; and

    ii. multiple return on equity models, using any models the expert considers are relevant to estimating a return on equity that is commensurate with the efficient financing costs of a BEE with a similar degree of risk as that which applies to a DNSP in respect of the provision of standard control services and which has regard to:

        1. prevailing conditions in the market for equity funds;

        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

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

g. Compare the estimate or estimates from (f) above against other relevant information, including (but not limited to) estimates from:

   i. broker reports;

   ii. independent expert reports; and

   iii. other relevant return on equity models not used to derive the original estimate.

h. Identify the impact on the return on equity estimate or estimates from above of changing gamma from 0.4 to 0.25.

2 In preparing the report, we have been asked to:

a. Consider any relevant comments raised by the AER and other regulators, and experts engaged by those regulators;

b. Use robust methods and data in producing any statistical estimates; and

c. Adopt a sample averaging period of the 20 business days to 30 September 2015 for any prevailing estimates.

3 A copy of the terms of reference for this report is attached at Appendix 1 to this report.

4 This report has been authored by Professor Stephen Gray. Stephen Gray is Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and corporate finance consultancy. He has Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. He teaches graduate level courses with a focus on cost of capital issues, he has published widely in high-level academic journals, and he has more than 15 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues.

5 The author's curriculum vitae is attached as Appendix 2 to this report.

6 The author's opinions set out in this report are based on the specialist knowledge acquired from his training and experience set out above. The author has been provided with a copy of the Federal Court's Practice Note CM 7, entitled "Expert Witnesses in Proceedings in the Federal Court of Australia", which comprises the guidelines for expert witnesses in the Federal Court of Australia (Expert Witness Guidelines). The author has read, understood and complied with the Expert Witness Guidelines.

1.2 Summary of conclusions

7 The context of this report is that:

a. The AER has, in its Rate of Return Guideline and subsequent regulatory decisions, adopted the Sharpe-Lintner Capital Asset Pricing Model (**SL-CAPM**) as its foundation model for the purpose of estimating the required return on equity for the benchmark efficient entity;

b. The revised National Electricity Rules (**NER**) and National Gas Rules (**NGR**) (jointly, the **Rules**) require the AER, when estimating the required return on equity, to have regard to relevant estimation methods, financial models, market data and other evidence;[1] and

c. The revised Rules also require that the allowed return on equity must reflect the efficient financing costs of the benchmark efficient entity and the prevailing conditions in the market for equity funds.[2]

8 In the context of the current Rules, we have previously proposed what has become known as a "multi-model approach," whereby each relevant model is estimated and the resulting estimates of the required return on equity are distilled into a single allowed return on equity by taking a weighted-average, where the weights reflect the relative strengths and weaknesses of each model. That remains our preferred approach and the updated estimates of that approach produce an estimate of the required return on equity of 9.8% as summarised in Table 1 below.

Table 1: Multi-model estimate of the required return on equity

Model	Weight	Required return
SL-CAPM	12.5%	9.2%
Black CAPM	25%	9.8%
Fama-French	37.5%	9.8%
DGM	25%	10.2%
Return on equity	**100%**	**9.8%**

Source: Frontier calculations.

9 In addition, we also consider how a regulator would best have regard to the relevant estimation methods, financial models, market data and other evidence – conditional on using an approach where only one financial model is estimated (i.e., a "foundation model" approach) and where the SL-CAPM is used as that foundation model. This task is to consider how the SL-CAPM parameters would best be estimated so that the resulting estimate of the required return on equity

[1] NER 6.5.2(e)(1); NGR 87(5).

[2] NER 6.5.2(f) and (g); NGR 87(6) and (7).

properly reflects all of the relevant estimation methods, financial models, market data and other evidence. This approach requires estimates of the three SL-CAPM parameters, as summarised below.

10 For the risk-free rate:

a. The AER's Guideline approach for estimating the risk-free rate is to use the yield on 10-year Commonwealth Government Securities (CGS) averaged over a 20-day rate-setting period; and

b. That approach is uncontroversial and produces an estimate of 2.75% when applied to the 20-day period ending on 30 September 2015. This estimate will eventually have to be updated to the averaging period adopted at the beginning of the relevant regulatory period.

11 In regard to the market risk premium (MRP):

a. The AER's November 2014 draft decisions and all subsequent decisions indicate that the AER implements its approach to estimating the MRP by first setting a primary range. This primary range is formed by taking the long-run average of excess returns over different historical periods. Other relevant evidence is then relegated to informing the selection of a point estimate from within that primary range;

b. In its Guideline, the AER adopted a point estimate of 6.5% at the top of its primary range, because the DGM evidence at the time suggested an estimate of at least 6.5%;

c. The AER's own DGM evidence now supports MRP estimates that are materially above 6.5%; however, the AER continues to adopt a final MRP estimate of 6.5%;

d. Our view is that the AER approach does not produce the best possible estimate of the MRP that best reflects the relevant evidence. The approach of capping the MRP to the top of the range derived using historical excess returns is based on no sound rationale because:

    i. The historical excess returns approach provides an estimate of the MRP over *average* market conditions.[3] Thus, the range that is generated from this approach bounds the estimate of the MRP for average market conditions. There is no basis at all for constraining an estimate of the MRP for the *prevailing* market conditions on the basis of a range that bounds the estimate of the MRP for long-run *average*

[3] That is, the average conditions over the particular historical period that was used.

market conditions.[4] The NER and NGR provide that, when estimating the return on equity, the AER must have regard to "the prevailing conditions in the market for equity funds";[5] and

ii. Such an approach would be inconsistent with the AER's own DGM evidence, which suggests that the MRP in the prevailing market conditions has increased materially since the publication of its Guideline;

e. Rather, our view is that the DGM evidence, and other relevant evidence, should not be constrained by a cap of 6.5% that is based on the long-run arithmetic mean of historical excess returns. That approach has produced a MRP estimate of 6.5% even as the AER's own DGM evidence suggests that the contemporaneous MRP is further and further above 6.5%.

f. In our view, the AER's approach of setting an initial immutable cap of 6.5% on the basis of a subset of the relevant evidence effectively neuters the effect of the other relevant evidence.

g. In Section 3.2 of this report, we explain why we consider that a proper consideration of all of the relevant evidence supports a foundation model MRP of 7.9%. In our view, this estimate best reflects:

i. The evidence from historical excess returns, as estimated by the AER;

ii. The evidence from historical real returns (i.e., the approach the AER terms the "Wright approach"), as estimated by the AER;

iii. The evidence from the AER's DGM approach;

iv. Evidence from independent expert valuation reports.

h. We note that the estimates of the MRP depend on the assumed value of distributed imputation credits (theta). However, the effect of change in the estimate of theta from 0.6 (the AER estimate) to 0.35 (our preferred estimate) is small relative to the myriad other factors that affect the MRP estimate. We maintain an MRP estimate of 7.9% for a theta of 0.35.

12 In regards the equity beta:

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[4] That is, the arithmetic mean estimates that the AER considers are estimates of the average risk premium over the relevant sampling periods. Those estimates range from 5.9% to 6.5%. This does *not* imply that the MRP could be as low as 5.9% in some market conditions or as high as 6.5% 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 5.9% to 6.5%.

[5] NER, 6.5.2(g); NGR 87(7).

a. The AER's Guideline approach is to fix a primary range based on regression estimates for a small sample of domestic comparators and to then use other relevant evidence to select a point estimate from within the primary range. The AER's approach begins with a "starting point" equity beta that does not reflect any adjustment to correct for any known biases in the SL-CAPM. This starting point estimate reflects evidence from domestic and international comparators. The AER then makes an adjustment to its starting point beta to correct for the known low-beta bias in the SL-CAPM;

b. Stakeholders have submitted that the AER's approach:

   i. Applies unreasonably disproportionate weight to the very small sample of domestic comparators;

   ii. Assigns a range of 0.4 to 0.7 to the domestic evidence without any proper basis;

   iii. Misconstrues the international evidence, and is vague and unclear about precisely what effect the international evidence has had on the AER's estimate of beta;

   iv. Is vague and unclear about precisely what adjustment the AER has made to its starting point beta to correct for low-beta bias;

   v. Should also apply a correction for book-to-market bias – another known systematic bias in SL-CAPM estimates;

   vi. Relies on flawed conceptual analysis; and

   vii. Addressing any of these issues would result in an equity beta estimate above the AER's current allowance of 0.7.

c. In our view, the AER's approach of setting an initial immutable range on the basis of a subset of the relevant evidence effectively neuters the effect of the other relevant evidence.

d. In Section 3.3 of this report, we explain our approach of:

   i. Setting a starting point equity beta, having regard to the relevant domestic and international evidence;

   ii. Making a specific adjustment to correct for low-beta bias; and

   iii. Making a specific adjustment to correct for book-to-market bias.

e. Section 3.3 also explains why we consider that a proper consideration of all of the relevant evidence supports a foundation model equity beta estimate of 0.91.

13 In summary, our implementation of the SL-CAPM foundation model is as follows:

a. We adopt a risk-free rate of 2.75%, based on the yield of 10-year government bonds;

b. We adopt an equity beta of 0.91, which reflects evidence from domestic and international comparators, and adjustments for low-beta bias and book-to-market bias; and

c. We adopt a market risk premium of 7.9%, which reflects the AER's estimate of historical excess returns, the AER's estimate of historical real returns, the AER's estimate using the DGM approach, and a conservative estimate from independent expert valuation reports.

14 These parameters jointly produce an estimate of the required return on equity of 9.9%.[6]

15 In its October and November 2015 decisions, the AER conducted a number of cross checks to determine the reasonableness of its allowed return on equity. In our view, the AER's allowed return on equity fails every one of its own cross checks and this should have led the AER to revisit the parameter estimates used in its implementation of the SL-CAPM. Had the AER estimated the equity beta and MRP in the manner proposed in this report, the allowed return on equity would have passed the cross checks – our multi-model and foundation model estimates are consistent with the AER's cross checks.

[6] 2.75% + 0.91 × 7.9%.

2 The regulatory framework

2.1 The AEMC's rule changes

16 Throughout 2011 and 2012, the Australian Energy Markets Commission (**AEMC**) considered a number of Rule change proposals submitted by the AER and a group of major energy users. SFG (now part of Frontier) assisted the AEMC as principal adviser on rate of return issues throughout this process.

17 In its determination in November 2012, the AEMC made a number of fundamental changes to the NER and NGR 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 AER 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.

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

> [t]he rate of return for a Distribution Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Distribution Network Service Provider in respect of the provision of prescribed transmission services.[7]

19 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
>
> 3. any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.[8]

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

> the prevailing conditions in the market for equity funds.[9]

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[7] For example, see NER 6.5.2(c). A similar provision appears at NGR 87(3).

[8] For example, see NER 6.5.2(e). A similar provision appears at NGR 87(5).

[9] For example, see NER 6.5.2(g), NGR 87(7).

21 In addition, the required return on equity must:

> …be estimated such that it contributes to the achievement of the allowed rate of return objective.[10]

22 In its Final Determination, the AEMC was very clear about its intention that the AER 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.[11]

23 The AEMC also noted that the rule changes were designed to:

> …encourage the regulator to focus on whether its overall estimate of the rate of return is appropriate.[12]

24 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.[13]

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 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.[14]

25 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 implementation of the

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[10] NER 6.5.2(f), NGR 87(6).

[11] AEMC Rule Change Final Determination, p. 40.

[12] AEMC Rule Change Final Determination, p. 41.

[13] AEMC Rule Change Final Determination, p. 44.

[14] AEMC Rule Change Final Determination, p. 69.

CAPM produced unreasonable results in an environment where financial market conditions can change significantly. 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.[15]

and that its rule change would:

> …enable the regulator to better respond to changing financial market conditions.[16]

26 The AEMC explicitly linked the consideration of a range of models to the production of the best possible estimate of the efficient financing costs as required by the National Electricity Objective (**NEO**) and the 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.[17]

27 That is, the AEMC's clear view is that the NGO and RPP require the AER to produce the best possible estimate of the required return on equity, which in turn requires the consideration of a range of financial models.[18]

28 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 SL-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 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

[15] AEMC Rule Change Final Determination, p. 40.

[16] AEMC Rule Change Final Determination, p. 23.

[17] AEMC Rule Change Final Determination, p. 43.

[18] The required return on equity is a key component of the efficient financing costs.

> evidence, which would almost certainly be non-exhaustive and could lead to rigid adherence to them in a mechanistic fashion.[19]

29 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.[20]

and:

> Implicit in this requirement to consider a range of methods, models and information is that checks of reasonableness will be undertaken.[21]

30 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.[22]

2.2 The AER's Rate of Return Guideline

2.2.1 Guideline to be published

31 Under the revised NER and NGR, the AER is required to publish a Rate of Return Guideline every three years. The purpose of this Guideline is to indicate what approach the AER will adopt when setting the allowed return on equity in its determinations over the subsequent three years. The Guideline is non-binding in that service providers' proposals and the AER's determinations can depart from the Guideline, but they must explain the reasons for any such departure. The AER published its first Guideline in December 2013.

2.2.2 The AER's approach under the previous Rules

32 Under the previous Rules, the AER's approach was to estimate the required return on equity using the SL-CAPM only.[23] This involved estimating three parameters

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[19] AEMC Rule Change Final Determination, p. 57.

[20] AEMC Rule Change Final Determination, pp. 67-68.

[21] AEMC Rule Change Final Determination, p. 69.

[22] AEMC Rule Change Final Determination, p. 46.

[23] The previous NER required the regulator to use the CAPM. The previous NGR required the regulator to use a "well-accepted financial model such as the CAPM," but in practice the AER has never estimated any financial model other than the CAPM.

and inserting those estimates into the SL-CAPM formula – the result being used as the allowed return on equity:

$$r_e = r_f + \beta \times MRP\,.$$

33 Thus, estimates are required for the three parameters: the risk-free rate, equity beta, and the MRP.

34 Under the previous NER and NGR the AER has traditionally adopted stable estimates of beta and the MRP. For example, it adopted a beta estimate of 0.8 for every one of its determinations after its 2009 WACC Review and its MRP estimates have only ever been 6.0% or 6.5%. Thus, the AER's approach has produced allowed returns on equity that effectively vary in line with movements in government bond yields, which drive estimates of the risk-free rate.

35 This approach created a form of lottery for regulated businesses. Those businesses that were fortunate enough to have prices reset when government bond yields were high were allowed a high return on equity for the entire regulatory period, and other businesses received low returns for their five-year regulatory periods because government bond yields happened to be low at the time their resets were settled. The impact of this approach becomes more extreme during periods of volatility in which government bond yields move to extreme levels in one direction or the other.

36 In our view, the returns that investors require on equity capital do not vary one-for-one with changes in the government bond yield. We do not suggest that required returns are constant, but our view is that actual required returns are more stable than the "lucky dip" or "lottery" estimates would suggest.

2.2.3 The AER's "foundation model" approach

37 In its Guideline, the AER adopted what it called a "foundation model" approach for determining the allowed return on equity, selecting the SL-CAPM as the single foundation model. Under this approach, the AER inserts estimates of the three SL-CAPM parameters into the pricing formula and the output is then adopted as the allowed return on equity.

38 The AER has stated that, under the new Rules, it will have regard to a broader range of evidence to inform its estimates of beta, and the MRP. Specifically, the AER has indicated that:

a. When estimating beta it will have primary regard to empirical estimates for domestic comparators and secondary regard to international evidence (including empirical estimates for international comparators) and to the "theory of the Black CAPM;"

b. When estimating the MRP, the AER will continue to have primary regard to estimates based on the mean of historical excess returns, but will have more regard to estimates from its dividend growth model (**DGM**); and

c. It will have regard to a number of "cross-checks" to test the reasonableness of its overall allowed return on equity. These cross checks include:

   i. Estimates published in independent expert valuation reports;

   ii. Estimates published by equity research analysts (so called "broker estimates"); and

   iii. Estimates based on historical real returns – a method for estimating the MRP that the AER referred to as "the Wright approach".

2.2.4 The prospect of change under the new Rules

39 In its Guideline materials, the AER raised the possibility that its approach under the new Rules might lead to more stable estimates of the allowed return on equity. In this section, we review the AER's statements about the benefits of a more stable allowed return on equity and the process by which that might be achieved under its foundation model approach.

40 In its Guideline materials, the AER summarised the potential benefits of more stability in allowed returns:

> In our consultation paper, we stated that a relatively stable regulatory return on equity would have two effects:
>
> - It would smooth prices faced by consumers.
> - It would provide greater certainty to investors about the outcome of the regulatory process.[24]

41 The AER also noted that:

> Submissions in response to our draft guideline were also broadly supportive of stability.[25]

42 The AER went on to explain the process by which its allowed return on equity might become more stable under the new NER:

> …the DGM and 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, in addition to the DGM and other information, is expected to lead to more stable estimates of the return on equity than under our previous approach. The extent of this stability will depend on:
>
> - the extent to which movements in the estimates of the risk free rate and market risk premium in the foundation model offset each other

[24] AER Rate of Return Guideline, Explanatory Statement, pp. 65-66.

[25] AER Rate of Return Guideline, Explanatory Statement, pp. 65-66.

- the informative value provided by the DGM and Wright approach (and other information that provides relatively stable estimates of the return on equity). [26]

2.3 The AER's foundation model approach

2.3.1 The implementation of the AER's foundation model approach under the new Rules

43 Under the revised Rules, the AER determines the allowed return on equity by inserting estimates of the same three parameters into the same SL-CAPM formula as it used under the previous Rules. The AER does not estimate any parameters for any other financial models.

44 In relation to the risk-free rate parameter, the AER used the contemporaneous yield on 10-year government bonds under the previous Rules, and it adopts the same approach under the new Rules.

45 In relation to the equity beta parameter, under the previous Rules the AER primarily considered regression estimates from a set of domestic comparators and concluded that the evidence supported a range of 0.4 to 0.7. Under the new Rules, the AER primarily considers regression estimates from the same set of comparators (even though some of them no longer exist) and concludes that the evidence still supports the same range of 0.4 to 0.7. Under the previous Rules, the AER adopted a point estimate of 0.8 after weighing up issues such as the reliability of its empirical evidence and the prior regulatory estimates of 0.9 to 1.0. Under the new Rules, the AER adopts an estimate of 0.7 on the basis that there is an additional five years of data since its 2009 WACC Review, which justifies additional weight being applied to its empirical estimates.[27]

46 In relation to the MRP parameter, under the previous Rules the AER relied primarily on historical excess returns and used DGMs as a cross check. This led the AER to adopt a 6.5% MRP in its 2009 WACC Review. The AER now places "most reliance" on historical excess returns and "second most reliance" on DGM estimates:

> The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.[28]

47 This has led the AER to also adopt a MRP estimate of 6.5% under the new Rules.

2.3.2 The effect of the AER's approach under the new Rules

48 Under the revised Rules, the AER has adopted the practice of setting the allowed return on equity to be equal to the contemporaneous 10-year government bond

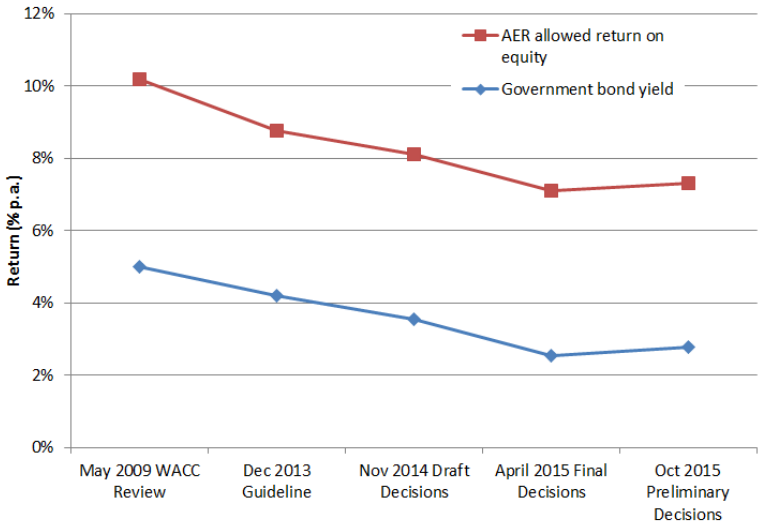
[26] AER Rate of Return Guideline, Explanatory Statement, p. 66.

[27] AER Rate of Return Guideline, Equity Beta Issues Paper, p. 8.

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

yield plus a fixed premium of 4.55%.[29] Thus, as government bond yields rise and fall, the allowed return on equity rises and falls in one-for-one alignment. Since government bond yields have generally fallen since the AER's 2009 WACC Review, the AER's allowed return on equity has fallen commensurately, as illustrated in Figure 1 below.

Figure 1: Government bond yields and the AER's allowed return on equity



Source: AER decisions.

49 In its October 2015 Preliminary Decisions for the Victorian electricity distributors and its November 2015 Draft Decisions for the ACT and South Australian gas distributors, the AER's allowed return on equity was 7.3%. Relative to this benchmark, the AER's allowed return on equity was:

a. 40% higher at the time of its 2009 WACC Review;

b. 20% higher at the time of its Guideline; and

c. 11% higher at the time of its November 2014 draft decisions (for NSW and ACT network service providers).

50 Moreover, under the AER's approach, the allowed return on equity for the five-year regulatory period would have been:

a. 7.6% for a firm regulated in December 2014;

b. 6.9% for a firm regulated in April 2015; and

c. 7.5% for a firm regulated in May 2015.

51 In summary, the prospect of some measure of stability in the allowed return on equity has not materialised. Rather, the allowed return on equity is still determined by adding a fixed premium (4.55%) to the government bond yield.

52 The reason that the prospect of some stability was not delivered is that the means of delivering that stability (the DGM and Wright approaches for estimating the

[29] Equity risk premium = Equity beta × market risk premium = 0.7 × 6.5% = 4.55%.

MRP) have had no perceptible effect on the outcomes from the AER's decision-making process:

a. The AER's own DGM estimates indicate that the MRP has increased materially since its 2013 Guideline – which would offset much of the effect of falling government bond yields and produce some stability in the allowed return on equity. However, the AER discounts that evidence, concluding that it will have much less regard to its own DGM evidence when government bond yields are very low or very high.[30] That is, in just the scenarios where the DGM evidence could have a stabilising effect on the allowed return on equity, the AER will have less regard to it.

b. Despite its comments about the beneficial stabilising effect of its use of historical real returns to estimate the MRP in the Guideline (i.e., the Wright approach), in practice the AER has had no real regard to that approach.[31]

53 SFG (Feb 2015 Equity) summarise the AER's SL-CAPM parameter estimates at the time of its 2009 WACC Review (under the previous Rules) and at the time of its 2013 Guideline (under the current Rules) in Table 2 that is reproduced below. The material change in the Rules has not had a material change in the AER's approach to setting the allowed return on equity.

[30] JEN Preliminary Decision, Attachment 3, Appendix B, Section B.5.1.

[31] We address this point in more detail below.

Table 2: AER SL-CAPM parameter estimates under different Rules

Parameter	2009 WACC Review	2013 Guideline
Risk-free rate	Contemporaneous yield on 10-year government bonds.	Contemporaneous yield on 10-year government bonds.
Equity beta	Regression analysis applied to domestic comparators leads to a **range of 0.4 to 0.7**. The final beta estimate is 0.8.	Regression analysis applied to domestic comparators leads to a **range of 0.4 to 0.7**. The final beta estimate is 0.7.
Market risk premium	Primary evidence is the mean of historical excess returns. The AER states that some weight is given to Dividend Growth Model (DGM) analysis and survey evidence. The final MRP estimate is **6.5%**.	Primary evidence is the mean of historical excess returns from which the AER derives a range of 5.1% to 6.5%. This is the AER's estimate of a plausible range in average market conditions. The AER states that some weight is given to DGM analysis and survey evidence to derive a range for the market risk premium of 5.1% to 7.8%. This is a hybrid of the range we would observe in average market conditions and a range appropriate for current market conditions. The final MRP estimate is **6.5% which is the upper bound of the range for MRP in average market conditions.**

Source: AER 2009 WACC Review Final Decision; AER 2013 Rate of Return Guideline.

2.4 Estimating the required return on equity

54 The SL-CAPM is only one of a number of financial models that can be used to estimate the required return on equity for the benchmark efficient entity. In its Guideline, the AER concluded that three other financial models are also relevant: the Black CAPM, the Fama-French model and the DGM. Many stakeholders have submitted that all of the relevant models should be estimated and that the regulator should have some regard to those estimates. However, under the AER's foundation model approach no model other than the SL-CAPM is estimated. The other relevant models are used, at most, only to inform the estimation of the parameters of the SL-CAPM.

55 The appropriate use of these other relevant models remains a point of contention between the AER and many stakeholders. In reports commissioned by a number of network service providers,[32] we have submitted that the AER cannot possibly have proper regard to a relevant financial model if it does not even estimate it. In that context, we have previously proposed what has become known as a "multi-model approach," whereby each relevant model is estimated and the resulting estimates of the required return on equity are distilled into a single allowed return on equity by taking a weighted-average, where the weights reflect the relative strengths and weaknesses of each model.

[32] See, for example, SFG (2014 Equity), SFG (2015 Equity), and Frontier (2015 Equity).

56 This remains our preferred approach and we have updated the estimates set out in SFG (2015 Equity) to reflect a risk-free rate of 2.75%, estimated as the yield on 10-year government bonds over the 20 days to 30 September 2015. Our updated estimates are summarised in Table 3 below. All estimation methods and the rationale for the relative weightings are set out in SFG (2015 Equity) – the estimates have simply been updated to reflect recent movements in government bond yields.

Table 3: Multi-model estimate of the required return on equity

Model	Weight	Required return
SL-CAPM	12.5%	9.2%
Black CAPM	25%	9.8%
Fama-French	37.5%	9.8%
DGM	25%	10.2%
Return on equity	**100%**	**9.8%**

Source: Frontier estimates

57 In the next section of this report we consider how all of the relevant evidence can be best accommodated within the AER's foundation model approach. This involves making the best possible use of all of the relevant evidence when estimating the parameters to be inserted into the SL-CAPM.

3 The required return on equity under the AER's SL-CAPM foundation model approach

3.1 The risk-free rate

58 The AER's Guideline approach for estimating the risk-free rate is to use the yield on 10-year Commonwealth Government Securities (CGS) averaged over a 20-day rate-setting period. Since there is unlikely to be a series of CGS with exactly 10 years to maturity, the AER's approach is to interpolate using the yields from two CGS bonds – one with slightly more, and one with slightly less than 10 years to maturity. All yields are converted from semi-annual compounding to annual compounding using the standard conversion formula.[33]

59 That approach is uncontroversial and produces an estimate of 2.75% when applied to the 20-day period ending on 30 September 2015. We apply that estimate throughout this report.

3.2 Market risk premium

3.2.1 The role of the MRP

60 In the SL-CAPM, the market risk premium plays the role of setting the return that investors require, over and above the risk-free rate, to compensate them for bearing the risk of the average firm in the market. The equity beta parameter then scales that premium up or down to the extent that the firm in question is more or less risky than the average firm. Thus, the market risk premium is a market-wide parameter and the equity beta is particular to the firm in question. Consequently, the estimate of the MRP is independent of whether the benchmark efficient entity is defined narrowly (as the firms regulated by the AER) or more broadly (as including firms of similar risk that are competing for equity capital from the same set of investors).

61 Our approach in this report is to adopt the AER's various individual estimates of the MRP, where available. We do this because:

a. The focus of this report is on the way the relevant evidence is distilled into an allowed return; and

b. The difference between our approach and the AER's approach to the MRP lies more in how the individual pieces of relevant

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[33] $r_{annual} = \left(1 + \frac{r_{semi-annual}}{2}\right)^2 - 1.$

evidence are processed into a final allowed MRP than about the level of each individual estimate.

3.2.2 The AER's Guideline approach

62 In its Guideline Factsheet, the AER states that:

> As at December 2013, our market risk premium (MRP) point estimate is 6.5, chosen from within a range of 5 to 7.5 per cent. The MRP compensates an investor for the systematic risk of investing in a broad market portfolio. Analysis of historical estimates of the MRP show a long term average of about 6 per cent. We also have regard to another financial model, the dividend growth model, to determine whether we should adopt an estimate above, below or consistent with the historical estimate. This is a symmetric consideration. As at December 2013, the dividend growth model is above the historical average—leading to an estimate above 6 per cent.[34]

63 The AER provides more detail on its selection of a point estimate in its Explanatory Statement as follows:

> …we give greatest consideration to historical averages. 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.
>
> We also give significant consideration to DGM estimates of the MRP. Using our preferred application of these models, we estimate a range of 6.1–7.5 per cent…
>
> We consider an MRP estimate of 6.5 per cent provides an appropriate balance between the various sources of evidence. This point estimate lies between the historical average range and the range of estimates produced by the DGM. This reflects our consideration of the strengths and limitations of each source of evidence.[35]

64 In summary, the AER's Guideline approach involves estimating ranges from the historical excess returns and DGM approaches, merging those two ranges into a single combined range, and then using judgement to select an estimate from within the combined range.

65 In relation to historical excess returns, the AER states that:

> …we give some weight to geometric mean estimates. Therefore, we consider a lower bound estimate of 5.0 per cent appropriate. The arithmetic average provides a range of 5.7 to 6.4 per cent.[36]

66 The AER has also been very clear about the fact that its Guideline does not set out an estimate of the MRP that is fixed for the Guideline period, but rather that it has

[34] AER Rate of Return Guideline Factsheet, p. 2.

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

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

set out a process that will be applied at the time of each determination. For example, the AER states that:

> Evidence suggests the MRP may vary over time.[37]

67 The AER also notes that the example estimate that appears in its Guideline materials should not be considered to fix the estimate of the MRP for the entire Guideline period:

> This example is provided as a guide only. We intend to consider and review a range of material on the MRP, as it becomes available. We will draw on this material and will consider more up to date information when determining the MRP at each determination.[38]

3.2.3 The AER's Guideline estimate

68 At the time of its Guideline, the AER noted that the maximum of its DGM estimates was approximately 7.5%. Thus, the AER concluded that the final range for MRP was 5.0% (the lower bound of the historical excess returns range) to 7.5% (the upper bound of the DGM range).

69 From within its final range, the AER selected a point estimate of 6.5%. The considerations that appear to have influenced that decision are the following:

a. 6.5% is within the excess returns range and the DGM range (when two-stage and three-stage models are considered);[39]

b. Estimates at the lower end of the excess returns range pertain to geometric averages and the AER notes that "there are concerns with using the geometric mean."[40] Consequently, estimates more towards the top of that range (which are based on the more appropriate arithmetic mean) are likely to be more reliable;

c. The 6.5% estimate is within the range of DGM estimates (so long as two-stage estimates are included); and

d. Although the 6.5% estimate is slightly below the range estimated by the three-stage DGM (minimum of 6.65%) that the AER considers to be conceptually better and more plausible, the AER also considers that the excess returns approach provides the best available evidence.

3.2.4 The AER's November 2014 estimate

70 In its November 2014 draft decisions, the AER states that:

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

[38] AER Rate of Return Guideline, Explanatory Statement, p. 89.

[39] Whereas the AER Guideline materials refer to a maximum excess returns estimate of 6.4%, the Guideline sets out an excess returns range of 5.0-6.5%. Thus, 6.5% can be interpreted as either within the excess returns range or close to it.

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

> We adopt a point estimate of 6.5 per cent for the MRP. This is from a range of 5.1 to 7.8 per cent. We place most reliance on historical excess returns. However, DGM estimates, survey evidence and conditioning variables also inform this estimate. We also have regard to recent decisions by Australian regulators.[41]

71 The primary data that the AER considers is historical excess returns, wherein the AER considers that:

a. Geometric mean estimates range between 4.0% and 4.9%;

b. Arithmetic mean estimates range between 5.9% and 6.5%; and

c. The compilation of geometric and arithmetic mean estimates supports a range of 5.1% to 6.5%.[42]

72 The AER also considers that its Dividend Growth Model (DGM) estimates support a range of 6.6% to 7.8% as at September 2014.[43] This range is created by implementing the AER's DGM six times – applying three different dividend growth rates to a two-stage and then a three-stage specification. The AER considers that more weight should be applied to the (higher) estimates from its three-stage specification, stating that:

> …a three stage DGM is conceptually better than a two stage DGM,[44]

and that:

> We use a three stage model because we consider the three stage model more plausible. This is because we expect it to take some time for the short term growth in dividends to transition to the long term growth.
>
> In addition to the three stage model, we also consider a two stage model…given the way the short term growth rate is calculated, the two stage model should be used as a cross check.[45]

73 The AER appears to place less weight on survey responses, conditioning variables, and past regulatory decisions,[46] which is consistent with the views set out in the AER's Guideline materials that:

> We also give consideration to survey estimates of the MRP but consider this evidence less informative than historical averages and DGM estimates,[47]

and:

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[41] JGN Draft Decision, Attachment 3, p. 76.

[42] JGN Draft Decision, Attachment 3, p. 77.

[43] JGN Draft Decision, Attachment 3, p. 77.

[44] JGN Draft Decision, Attachment 3, Appendix C, p. 222.

[45] JGN Draft Decision, Attachment 3, Appendix C, p. 222.

[46] JGN Draft Decision, Attachment 3, p. 79.

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

> We also give some consideration to conditioning variables and other regulators' MRP estimates. These sources of evidence are subject to various limitations and should be used with caution.[48]

74 We note that the additional data available to the AER for its November 2014 decisions supports slightly higher excess returns estimates of the MRP. Specifically, the arithmetic mean estimate in the Guideline was 5.7-6.4% whereas the corresponding estimate in the November 2014 decisions is 5.9-6.5%.

75 In its November 2014 decisions, the AER notes that its DGM:

> …estimates k, the expected return on equity for the market portfolio.[49]

76 The AER then subtracts the contemporaneous risk-free rate to obtain an estimate of the MRP.

77 The combined effect of the AER's estimate of the required return on the market and the movements in the AER's estimate of the risk-free rate is a material change in the AER's estimates of the MRP, as summarised in Table 4 and Figure 2 below.

Table 4: AER DGM estimates of the market risk premium

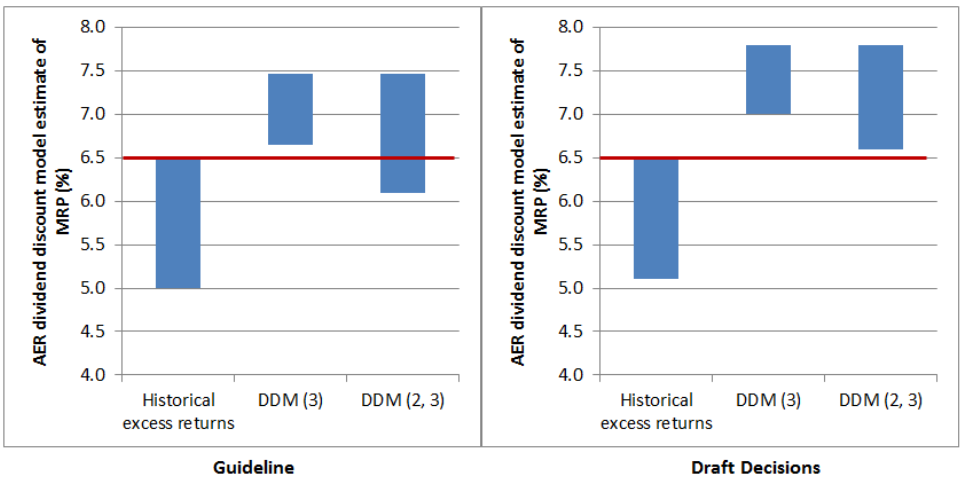
	Growth rate (%)	Two stage model (%)	Three stage model (%)
Guideline	4.0	6.10	6.65
	4.6	6.66	7.10
	5.1	7.13	7.47
Draft Decisions	4.0	6.6	7.0
	4.6	7.2	7.4
	5.1	7.7	7.8

Source: AER Rate of Return Guideline Appendices, p. 87; JGN Draft Decision, Attachment 3, p. 200.

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

[49] JGN Draft Decision, Attachment 3, p. 199.

Figure 2: Range of AER DGM estimates of the required return on the market



Source: AER Rate of Return Guideline Appendices, p. 87; JGN Draft Decision, Attachment 3, p. 200.

78 Figure 2 summarises the information that the AER used to estimate the MRP at the time of its Rate of Return Guideline (left hand panel) and at the time of its November 2014 draft decisions (right hand panel).

79 The AER continues to adopt a 6.5% point estimate for the MRP even though it has increased both its excess returns and DGM estimates of MRP. Moreover:

a. 6.5% is below even the lowest two-stage DGMestimate; and

b. 6.5% is 50 basis points below the lowest three-stage DGM estimate.

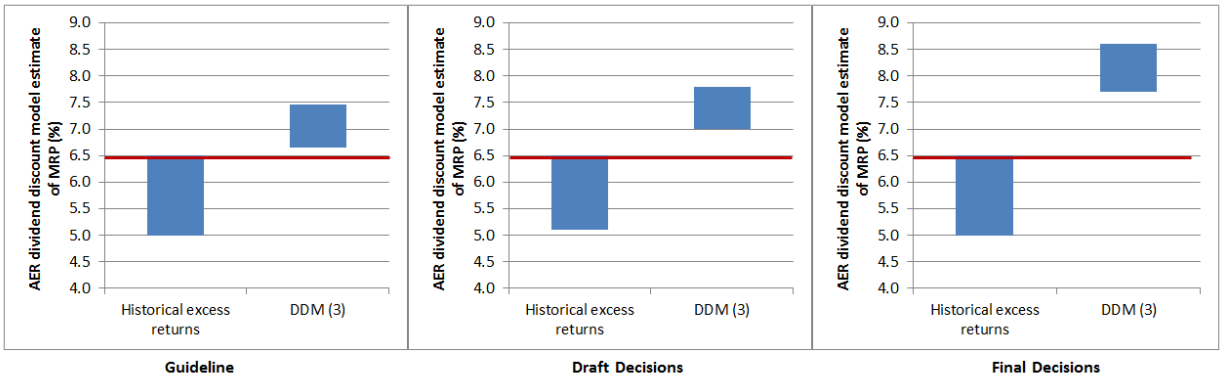
80 It appears that the AER considers the excess returns range to provide an immutable boundary such that the only role of DGM evidence is to inform the selection of a point estimate from within that range. In this case, the DGM evidence would have precisely the same effect whether it suggested an MRP slightly or materially above the top of the excess returns range.

3.2.5 The evolution of the AER's estimates of the MRP

81 The AER has further updated its DGM estimates of the MRP in its October and November 2015 decisions. The evolution of the AER's DGM estimates of the MRP (from the Guideline, to the November 2014 draft decisions, to the October and November 2015 draft, final and preliminary decisions[50]) is summarised in Figure 3 below.

[50] AER Final Decisions for ENERGEX, Ergon and SA Power Networks and Preliminary Decision for JEN.

Figure 3: AER estimates of MRP from historical excess returns and the DGM



Source: AER Rate of Return Guideline (Dec 2013), AER draft decisions (Nov 2014), AER final and preliminary decisions (Oct 2015).

82 Figure 3 shows that:

a. The AER's primary range from historical excess returns has remained relatively stable, as would be expected for a long-term historical average;[51]

b. The AER's DGM estimate has increased materially from Guideline to draft decisions to final decisions;[52] and

c. The AER's point estimate for the MRP has remained fixed at the 6.5% upper bound of its primary range throughout.

83 The AER's preferred DGM estimate of MRP continues to be based on its three-stage model and its mid-point 4.6% estimate of long term growth.[53] Using this approach, the AER's MRP estimates are:

a. 7.1% in its Guideline;[54]

b. 7.4% in its draft decisions in November 2014;[55] and

c. 8.2% in its October and November 2015 decisions.[56]

84 That is, the AER's DGM estimates of MRP have increased materially since the Guideline and are now well above the AER's 6.5% upper bound of the AER's

[51] The AER increased the lower bound of its primary range from 5.0% to 5.1% between the Guideline and its November 2014 draft decisions, reflecting the additional annual observation that became available. This was reduced back to 5.0% in the October and November 2015 decisions on the basis that the AER no longer sets the bottom of the range by adding 20 basis points to the maximum geometric mean estimate, but now simply "has regard to" the geometric mean estimates [JEN Preliminary Decision, Footnote 377, p. 3-114]. The upper bound has remained fixed at 6.5% throughout.

[52] Figure 3 shows the AER's range for its preferred three-stage DGM. The AER state that it has lesser regard to estimates from its two stage model (the AER states this is used as a cross check), which also increase materially between the Guideline and the recent final decisions.

[53] TransGrid Final Decision, Table 3-36, p. 301 and Table 3-40, p. 3-305; JEN Preliminary Decision, p. 3-341.

[54] AER Rate of Return Guideline, Appendix D, p. 87.

[55] TransGrid Draft Decision, Attachment 3, p. 200.

[56] JEN Preliminary Decision, Table 3-42, p. 3-362.

primary range. However, the AER has maintained its MRP point estimate at 6.5% throughout. This is consistent with the primary range from historical excess returns being treated as immutable, whereby the AER's 6.5% upper bound is apparently treated as a maximum that cannot be exceeded even as the weight of relevant evidence evolves. In our view, there is no other way to explain the AER's decision to maintain its MRP estimate of 6.5% even in the face of the material increase in its own DGM estimates.

85 In our view, the AER's approach of capping the MRP estimate to the top of the range set by historical excess returns has no logic to it because:

a. The historical excess returns approach provides an estimate of the MRP over *average* market conditions.[57] Thus, the range that is generated from this approach bounds the estimate of the MRP for average market conditions. There is no basis at all for constraining an estimate of the MRP for the *prevailing* market conditions on the basis of a range that bounds the estimate of the MRP for long-run *average* market conditions;[58] and

b. Such an approach would be inconsistent with the AER's own DGM evidence, which suggests that the MRP in the prevailing market conditions has increased materially since the publication of its Guideline.

86 In its recent decisions, the AER has stated that it will place less weight on its DGM estimates of the MRP when government bond yields are materially above or below their average levels. That is, in just the scenarios where the DGM evidence could have a stabilising effect on the allowed return on equity, the AER will have less regard to it.[59] In our companion report, Frontier (2015 rf-MRP),[60] we evaluate, and reject, the AER's reasons for its approach of applying less and less weight to its DGM estimates as those estimates indicate a higher and higher MRP.

87 In summary, our view is that:

a. The AER's approach appears to be one of setting the MRP to the top of the historical excess returns range if the other relevant evidence (particularly the AER's DGM evidence) suggests a contemporaneous MRP above 6.5%;

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[57] That is, the average conditions over the particular historical period that was used.

[58] That is, the arithmetic mean estimates that the AER considers are estimates of the average risk premium over the relevant sampling periods. Those estimates range from 5.9% to 6.5%. This does *not* imply that the MRP could be as low as 5.9% in some market conditions or as high as 6.5% 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 5.9% to 6.5%.

[59] JEN Preliminary Decision, Attachment 3, Appendix B, Section B.5.

[60] See Section 4.2.3 of that report.

b. The application of that approach would currently produce an MRP estimate of 6.5% (as indicated in the AER's recent final decisions; and

c. The approach of capping the MRP estimate at 6.5% has no logic to it and does not produce the best estimate, as explained in the previous paragraph.

88 Rather, our view is that:

a. The DGM evidence should not be constrained by a cap of 6.5% that is based on the long-run mean of historical excess returns. As shown above, that approach has produced a fixed MRP of 6.5% even as the AER's own DGM evidence suggests that the contemporaneous MRP is further and further above 6.5%; and

b. Regard should be given to other relevant evidence, in particular MRP estimates derived using historical real returns. We address this issue below.

3.2.6 The Wright approach to estimating the market risk premium

89 There is broad agreement between stakeholders that historical excess returns and DGM estimates of the MRP are relevant and should be considered. The main point of contention between stakeholders and the AER is whether the historical real returns should also be used to estimate the MRP – a method that the AER refers to as the "Wright approach".

90 Under that approach, the MRP is estimated by:

a. Estimating the mean of the real market return over an historical period;

b. Grossing-up that estimate for current expected inflation; and

c. Subtracting the current risk-free rate.

91 Whereas the excess returns approach assumes that the MRP is constant over all market conditions and the required return on equity varies one-for-one with changes in the risk-free rate, the historical real returns approach assumes that the real required return on equity is more stable and the MRP varies (inversely with changes in the risk-free rate) over different market conditions.

92 These two approaches are the end points of the theoretical spectrum. At one extreme is the excess returns approach, which implies that the MRP is constant across the whole range of market conditions that occurred over the relevant historical period. At the other end of the spectrum is the historical real returns approach, which implies that the MRP varies inversely with the risk-free rate such that the overall required return on equity is stable over time.

93 In its October and November 2015 decisions, the AER concludes that the historical real returns approach produces an estimate of the MRP of 7.2%[61] to 9.9%[62] with a midpoint of 8.6%.[63] We adopt the AER's mid-point estimate in the remainder of this report.

3.2.7 Independent expert estimates of the market risk premium

94 For the reasons set out in SFG (2015 ROE) we also consider that the MRP estimates adopted in independent expert valuation reports are relevant evidence that should be afforded some weight.

95 In our companion report, Frontier (2016 rf-MRP)[64] we consider the most recent evidence on independent expert valuation reports from HoustonKemp (2016). HoustonKemp demonstrates that, since the pronounced decline in government bond yields that began in late 2011, independent expert reports have, on average, departed from an approach of estimating the required return on equity by adding a fixed risk premium to the contemporaneous government bond yield. Some have done this by adopting a higher estimate of the MRP. Others have achieved the same outcome by using a risk-free rate in excess of the contemporaneous government bond yield.

96 We note that the AER's foundation model approach takes the contemporaneous government bond yield as the estimate of the risk-free rate. In this context, the appropriate way to estimate the MRP that is consistent with the independent expert evidence is to take the independent expert estimate of the required return on the market and subtract the contemporaneous government bond yield. This approach produces a discount rate that is consistent with that used in the independent expert valuation.

97 Using that approach, HoustonKemp (2016) reports an estimate of the MRP of 7.58% as at 30 September 2015. This estimate includes an adjustment for the value of imputation credits where theta is set to 0.35.

98 We note that this is a conservative estimate in that it reflects none of the "uplifts" that independent experts frequently apply to their estimates of the required rate of return.

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[61] 10.0% - 2.74%.

[62] 12.7% - 2.74%.

[63] JEN Preliminary Decision, p. 3-511.

[64] See Section 2.5 of that report.

3.2.8 Selecting an MRP estimate

Summary of MRP estimates

99 The analysis above considers four approaches for estimating the MRP and the resulting estimates are summarised in Table 5 below. In our view, the approaches set out in Table 5 have different relative strengths and weaknesses:

a. The historical excess return and historical real returns approaches each represent end points of a spectrum when using historical data to estimate the required return on the market. The historical real returns approach assumes that the real required return on equity is constant across different market conditions and the excess returns 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. However, that is no reason to place exclusive reliance on one approach to the exclusion of the other; both approaches should be used to formulate an overall estimate of the MRP. We note that both approaches are used in practice, including in regulatory practice. We also note that it is common in practice to have some regard to long-run historical data when estimating the required return on the market and MRP.

b. We agree with the Guideline's assessment that DGM evidence is relevant and should be considered when estimating the required return on the market. The DGM is theoretically sound in that simply it 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 the MRP based on contemporaneous market prices.

c. Independent expert valuation reports provide an indication of the required return on equity that is being used in the market for equity funds. We agree with the Guideline's conclusion that this information is relevant and should be considered. In this report, we adopt the estimate of 7.58% from HoustonKemp (2016).

100 Taking account of the relevant strengths and weaknesses of the different estimation approaches, we propose the weighting scheme set out in Table 5 below. Our reasons for proposing this weighting scheme are as follows:[65]

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

[65] We have applied the same reasoning for these weightings in SFG (2014) and SFG (2015).

b. We apply equal weight to the historical excess returns and historical real returns approaches for deriving MRP estimates using the historical market return data. Those two approaches represent 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.

101 Our final weighted-average estimate of the MRP is 7.9%.

Table 5: Market risk premium estimates

Estimation approach	Estimate	Weight
AER estimate from mean historical excess returns	6.5%	20%
AER estimate from the historical real returns approach	8.6%	20%
AER estimate from the DGM approach	8.2%	50%
HoustonKemp (2016) estimate from independent expert valuation reports	7.6%	10%
Weighted average	**7.9%**	**100%**

Adjustment for imputation: Historical returns

102 When estimating the MRP, we adopt the AER's estimates from the historical excess returns, historical real returns, and DGM approaches. All of these are with-imputation estimates that reflect the AER's theta estimate of 0.6.

103 For its historical returns estimates, the AER grosses-up the historical dividends since 1987 to include the assumed value of distributed imputation credits as follows:[66]

$$Imp = Div \times \left(\frac{\rho \times \theta \times \tau}{1 - \tau} \right)$$

where:

ρ is the proportion of dividends that are franked – assumed to be 75%;

θ is the value of distributed imputation credits – assumed to be 0.6; and

τ is the corporate tax rate of 30%.

104 This same adjustment is applied to historical returns for use in the historical excess returns and the historical real returns (Wright) approaches.

105 For an average dividend yield of 5%, this produces a return from imputation of:

[66] JEN Preliminary Decision, pp. 3-402-403.

$$Imp = 5\% \times \left(\frac{0.75 \times 0.6 \times 0.3}{1 - 0.3} \right) = 0.96\%.$$

106 If theta were set to 0.35 instead of 0.6, the estimate of the return from imputation would be:

$$Imp = 5\% \times \left(\frac{0.75 \times 0.35 \times 0.3}{1 - 0.3} \right) = 0.56\%.$$

107 Thus, the reduction in theta would result in a reduction of 40 basis points in the estimate of the required return on the market in each of the post-imputation years. For example, for the historical period from 1883, approximately 20% of the period is post-imputation, in which case the lower theta would have an effect of 8 basis points.[67] For the period since 1958, approximately 46% of the period is post-imputation, in which case the lower theta would have an effect of 19 basis points. Both of these figures are small relative to the range of estimates that the AER sets out for:

a. Different historical periods;[68] and

b. Different methods of estimating historical dividends.[69]

Adjustment for imputation: DGM estimates

108 For its DGM estimates of the MRP, the AER grosses-up its forecasts of future dividends to include the assumed value of distributed imputation credits as follows:[70]

$$Div_{with-imp} = Div_{ex-imp} \left(1 + \frac{\rho \times \theta \times \tau}{1 - \tau} \right)$$

109 To estimate the effect of reducing theta to 0.35, we consider a simple constant growth DGM framework where:

$$P = \frac{d}{r_m - g}$$

in which case:

$$r_m = \frac{d}{P} + g\,.$$

That is, the required return on the market is estimated as the market dividend yield (for which we use an average rate of 5%) plus growth (for which we use the AER's mid-point estimate of 4.6%).

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[67] 0.2 × 0.4%.

[68] JEN Preliminary Decision, Table 3-48, p. 3-384.

[69] JEN Preliminary Decision, Table 3-48, p. 3-384.

[70] JEN Preliminary Decision, p. 3-403.

110 In this case, the estimate of the required return on the market would be:

$$r_m = 5\%\left(1+\frac{0.75\times 0.6\times 0.3}{1-0.5}\right)+4.6\% = 10.56\%.$$

111 If theta were set to 0.35 instead of 0.6, the estimate of the required return on the market would be:

$$r_m = 5\%\left(1+\frac{0.75\times 0.35\times 0.3}{1-0.5}\right)+4.6\% = 10.16\%.$$

112 Thus, the reduction in theta would result in a reduction of 40 basis points in the estimate of the required return on the market, and consequently in the MRP. This change is small given that:

a. It is an upper bound in the sense that the differential would be smaller if the dividend growth rate were a larger proportion of the return on the market, which it is for the AER's two- and three-stage DGMs, where the initial growth rate is higher than the long-run growth rate; and

b. Even the 40 basis point differential is very small relative to the sensitivity analyses that the AER conducts in relation to dividend growth rates, averaging periods and dividend forecasts. For example, the AER reports combined sensitivities of 6.68% to 9.21% for its three-stage DGM estimates.[71]

Previous AER comments on altering the MRP estimate for imputation

113 In the *ENERGEX Gamma* case, the Tribunal noted that there is a link between the assumed value of imputation credits and the estimate of the MRP. The Tribunal noted that:

> …in the event that the Tribunal were to set aside or vary the theta aspect of the gamma constituent decision, one possible outcome or effect on each distribution determination of such a decision could be that it would be necessary for the AER to consider whether it is necessary to make any consequential adjustment to the market risk premium (MRP).[72]

114 However, the Tribunal also noted the AER's submission that, even if the Tribunal were to materially vary the estimate of theta (and, therefore, the estimate of gamma), the AER would not make a consequential change to its estimate of the MRP in the case at hand. In those submissions, the AER noted that its 6.5% estimate of the MRP was based primarily on historical excess returns and that even if theta was varied from 0.65 to 0.2, the historical excess return estimates would

[71] JEN Preliminary Decision, Table 3-46, p. 3-367.

[72] Application by ENERGEX Limited (No 2) [2010]ACompT 7.

vary by only 20 basis points. Consistent with our conclusions above, the AER then concluded that:

> In the present review of the AER's distribution determinations for ETSA Utilities, Ergon Energy and Energex, a change to theta from 0.65 to 0.5, 0.4 or 0.2, if considered in isolation, would not in itself constitute persuasive evidence for departing from the MRP of 6.5% adopted in the SORI.[73]

Conclusions in relation to adjustments for imputation

115 For the reasons set out above, our view is that changing theta from 0.6 to 0.35 will have an effect on the estimates of the MRP that is small relative to the variation in the other factors that affect the estimate of the MRP.

116 Moreover, we have adopted the AER's historical returns and DGM estimates of the MRP. We consider that these estimates are conservative in that the AER's historical returns estimate does not reflect the NERA correction for historical dividends and the AER's DGM estimates are based on ad hoc reductions to long-term GDP growth rates. Correcting for these effects would more than offset any adjustment in relation to a reduction in the estimate of theta. Also, we note that the HoustonKemp (2016) estimate from independent expert reports already reflects a theta of 0.35. Consequently, we maintain an MRP estimate of 7.9% for a theta of 0.35.

3.3 Equity beta

3.3.1 The AER's Guideline approach

117 In its Rate of Return Guideline, the AER proposes to implement its foundation model approach by dividing the relevant evidence into two groups. The AER considers evidence from domestic comparators to represent its "primary" evidence, and all other evidence to be secondary. The domestic comparators are used to estimate a primary range, and then all other relevant evidence is used (at most) to inform the selection of a point estimate from within that range.

118 In its Guideline, the AER concluded that the domestic comparators support a range of 0.4 to 0.7. From within this range, the AER selected a point estimate of 0.7 after considering other relevant evidence including "the theoretical underpinnings of the Black CAPM"[74] and international evidence.

119 That approach, and the 0.7 point estimate, has been endorsed in the AER's recent decisions where the AER has proceeded through the following steps:[75]

a. **Conceptual analysis.** The AER conducted a conceptual analysis and concluded that the equity beta of the efficient benchmark firm is likely to be less than 1.0.

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[73] AER submissions of 1 October 2010, Paragraph 17.

[74] JEN Preliminary Decision, Attachment 3, p. 3-128.

[75] JEN Preliminary Decision, Attachment 3, Appendix D.

b. **Range.** The AER decided that beta would be estimated from within a range of 0.4 to 0.7. This range was formed with reference to empirical beta estimates for nine Australian-listed stocks, compiled by Henry (2014). The AER stated that if it were to arrive at a point estimate for beta on the basis of empirical estimates from Australian-listed stocks, the point estimate would be 0.5,[76] referring to this as its "best empirical estimate." The basis for this conclusion was that, across a number of beta estimates made for different firms and portfolios over different time periods, the AER's view was that the beta estimates appear to be concentrated near 0.5.

c. **Black CAPM.** The AER decided not to make a separate estimate of the cost of equity from the Black CAPM. The rationale for this decision was that the Black CAPM requires an estimate of the zero-beta premium, and the AER concluded that this parameter cannot be estimated with any degree of confidence. However, the AER considered that the theory underlying the Black CAPM has some merit. In theory, the cost of equity for stocks with low beta estimates will lie above the return expected under the Sharpe-Lintner CAPM. So the AER used this theory as support for a beta estimate towards the upper end of the AER's initial range.

d. **International listed firms.** The AER decided not to make a separate estimate of beta from analysis of firms listed in markets other than Australia. The AER refers to beta estimates from several reports, considers that the beta estimates implied by these reports range from 0.3 to either 1.0 or 1.3,[77] and that in general the empirical beta estimates from international listed firms support a beta estimate towards the upper end of the AER's initial range.

e. **Regulatory Predictability.** The AER considered that certainty and predictability was important for stakeholders in setting the estimated rate of return, and noted that a beta estimate at the top of the AER's initial range was a modest step down from its prior estimate of 0.8.[78]

120 In summary, the AER adopted an equity beta estimate of 0.7 in its Guideline and it has confirmed that estimate in all of its subsequent draft, preliminary and final decisions.

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[76] JEN Preliminary Decision, p. 3-127.

[77] JEN Preliminary Decision, Attachment 3, p. 3-126.

[78] The AER also noted that its beta estimate provided a balance between the views expressed by consumers and the views expressed by service providers. Consumers advocated for a lower regulated rate of return and businesses advocated for a higher regulated rate of return. It is unclear whether balancing these two views is used as a separate criterion for estimating the regulated rate of return, or whether the AER is merely emphasising that it has had regard to submissions received from all stakeholders. For the purpose of this report we do not consider this a relevant issue.

121 Importantly, the AER concluded that:

> …there is no compelling evidence that the return on equity estimate from the SLCAPM will be downward biased given our selection of input parameters.[79]

122 The key words in this passage are "given our selection of input parameters." As set out above, the AER concluded that the domestic data supports a beta point estimate of 0.5. Recognising that:

a. the "theory of the Black CAPM" indicates that the SL-CAPM produces estimates of the required return on equity that are systematically downwardly biased for low-beta firms; and

b. the international evidence supports a beta estimate above 0.5,

the AER made an upward adjustment to its equity beta point estimate – from 0.5 to 0.7.

123 The AER then concluded that, after making that adjustment, its foundation model produced an unbiased estimate of the required return on equity.

3.3.2 Points of contention

124 In previous reports, we have submitted[80] that the AER's estimate of 0.7 is unreasonable and does not represent the best estimate that is available from the relevant evidence. The main points of contention are the following:

a. **No Basis for categorisation of evidence.** Stakeholders have submitted that there is no basis for the AER to use one subset of the relevant evidence to form an immutable range that bounds the point estimate even if all of the other evidence suggests an estimate outside of the "primary range."

b. **No basis for setting the primary range to 0.4 to 0.7**. The AER's own consultant advised the AER that the appropriate range is 0.3 to 0.8 based on analysis undertaken in accordance with the terms of reference provided by the AER.[81] The AER does not state what its range represents or how it was selected. It is not a confidence interval, it is not a range that bounds all of the relevant estimates and it is inconsistent with the advice of its own consultant.

c. **No basis for exclusive reliance on domestic comparators**. Stakeholders have also submitted that even if it were appropriate to select a subset of the evidence to create an immutable primary range, the evidence from domestic comparators should not be used for that purpose. Specifically, there are currently only four domestic comparators, which is such a small sample that no reliable

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[79] JEN Preliminary Decision, p. 3-62.

[80] See, for example, SFG (May 2014 Beta) and SFG (February 2015 Beta).

[81] The AER provided detailed and specific terms of reference to its consultant, Henry (2014), who concluded that the evidence produced under those terms of reference supported a range of 0.3 to 0.8.

estimates could be derived from such a sample, and so no material weight should be applied to it. Moreover, the AER's beta estimates for domestic comparators vary materially across time periods and estimation methods. For example:[82]

i. The estimates are imprecise with wide standard errors;[83]

ii. The estimates span a wide range[84] with the vast majority of estimates for comparable firms falling outside the AER's proposed range of 0.4 to 0.7;

iii. Many of the estimates vary materially across different estimation methods;

iv. Many of the estimates vary materially across different sampling frequencies;

v. Many of the estimates vary materially across time;

vi. Over the same period where the estimates for some comparators increase by 20%, others decrease by 20%. This indicates that either (a) the true systematic risk of the two firms moved materially in the opposite direction, in which case it is impossible that those two firms are both comparable, or (b) beta *estimates* are statistically unreliable; and

vii. Many of the estimates vary materially depending on the day of the week used to measure returns.

d. **Mischaracterisation of the international evidence**. The AER concludes that the international evidence supports a range of 0.3 to either 1.0 or 1.3.[85] However, all of the estimates that are lower than 0.7 are badly mischaracterised. For example, the AER concludes that one UK study supports a beta estimate of 0.45. However, that study uses data for only three comparators over only one year. That study was submitted to a UK regulator that assigned it negligible weight relative to other evidence and adopted a final beta of 0.95. The AER also mistakenly makes an apples-with-oranges comparison of re-levered equity beta estimates with raw equity beta estimates.

e. **Failure to have proper regard to the Black CAPM**. In its Guideline, the AER recognises that the empirical evidence establishes that the SL-CAPM systematically under-estimates the

[82] The following points were made in SFG (May 2014 Beta) and SFG (February 2015 Beta).

[83] Estimation errors can be reduced by expanding the sample of comparators used.

[84] From less than 0.2 to more than 1.0.

[85] JEN Preliminary Decision, p. 3-127.

expected return for low-beta stocks (i.e., stocks with a beta less than 1.0). Thus, for any beta within its range of 0.4 to 0.7, the SL-CAPM is likely to produce an under-estimate. This issue can be addressed by estimating the Black-CAPM, which is a version of the CAPM that has been modified to provide estimates that are more consistent with the observed data. Rather than estimate the Black CAPM and have regard to the resulting estimate, the AER's foundation model approach requires that the Black CAPM can only be used to inform the estimation of parameters for the SL-CAPM. Consequently, this requires a convoluted exercise whereby one considers what beta estimate, when inserted into the SL-CAPM, would produce an estimate of the return on equity that is consistent with the Black CAPM. When that exercise is performed using parameters that the AER defines as "plausible," the result is a beta estimate strictly greater than 0.7. That is, the Black CAPM evidence suggests that a beta strictly greater than 0.7 must be inserted into the SL-CAPM in order to produce estimates that are consistent with the empirical data. However, the AER has no regard to any estimates of the Black CAPM, even those that it defines to be plausible. Rather, the AER proposes to address this issue by "having regard to the theoretical underpinnings of the Black CAPM." Stakeholders have submitted that the only way to have proper regard to the Black CAPM is to estimate it; that vague assertions about theoretical underpinnings are insufficient.

f. **Failure to have proper regard to other relevant models.** Under the AER's foundation model approach, the only way that other relevant financial models can have an impact on the allowed return on equity is by influencing the beta estimate in the SL-CAPM. The AER recognises that the Fama-French model and the DGMs are both relevant financial models for the purpose of estimating the required return on equity for the benchmark efficient entity, but it gives them no weight at all when determining the allowed return on equity.[86] Stakeholders have argued that the AER has erred in assigning zero weight to these relevant models. For example, the DGM approach is used extensively in regulation cases in other jurisdictions, and the empirical evidence establishes that the Fama-French model materially out-performs the SL-CAPM in fitting the observed data. In particular, there is a substantial body of evidence to support a book-to-market bias whereby the SL-CAPM

[86] The AER has regard to DGM evidence when estimating the market risk premium, but this involves the application of the DGM to the broad market. The DGM can also be applied to provide a direct estimate of the required return on equity for the benchmark efficient entity, but the AER gives zero weight to that evidence.

systematically underestimates the returns on stocks with a high book-to-market ratio.[87]

g. **Mischaracterisation of the conceptual analysis**. There is broad agreement that equity beta is determined by (a) the business risk of the firm's operations, and (b) the amount of leverage (debt financing) employed by the firm. There is also broad agreement that, for the benchmark efficient entity, the business risk is lower than average and the leverage is higher than average. The AER concludes that the former dominates the latter, in which case the equity beta would be lower than average. However, there is no basis for this conclusion. The AER is misled by confusing (a) the components of business risk that have a financial flavour with (b) leverage. However the two are materially different concepts. Indeed, the authors of the report on which the AER relies have advised the AER that it is impossible to determine *ex ante* which of the two components of equity beta dominates – that it is an empirical question, and one that neither the AER nor its advisers have assessed.[88]

125 In summary, there are many points of contention in relation to the AER's beta estimate of 0.7. All of the issues set out above suggest an estimate above 0.7.

3.3.3 A "starting point" estimate for use in the foundation model

The AER's sequential approach

126 Under its foundation model approach, the AER begins with a "starting point" estimate of the equity beta. This estimate seeks to conform with the theoretical definition of beta in the SL-CAPM and has no regard to any evidence of systematic biases in the SL-CAPM. Specifically, in the SL-CAPM the equity beta is theoretically defined to be equal to the covariance between stock returns (for the firm in question) and market returns divided by the variance of the market return. This concept of beta is estimated as the slope coefficient from a regression of stock returns on market returns.

127 This starting point estimate is a statistical estimate of the theoretical definition of the SL-CAPM beta that has no regard to any evidence of bias in the SL-CAPM – it implicitly assumes that the SL-CAPM alone provides an accurate estimate of the required return on equity. The AER then makes adjustments to its starting point estimate to reflect the regard the AER has had to other relevant evidence. For example, the AER makes an adjustment to its starting point beta estimate to reflect its assessment of the theoretical underpinnings of the Black CAPM. We adopt the

[87] Or more specifically, stocks with a high exposure to the book-to-market factor.

[88] Frontier Economics (2015 Risks).

same sequential approach in this report in that the terms of reference ask us to consider how to best implement the foundation model approach.[89]

Estimating the starting point beta

128 The starting point beta is estimated by regression analysis – this produces an estimate that is consistent with the theoretical definition of beta in the SL-CAPM (covariance divided by variance). The AER has regard to regression estimates of beta from a set of four domestic firms, five former domestic firms (that have been delisted for various lengths of time) and various sets of international firms. All of these are "pure" SL-CAPM estimates that make no adjustment for the documented weaknesses of that model.

129 That is, in determining its SL-CAPM beta estimate (before any adjustment for low-beta bias or any other problems with the SL-CAPM), the AER has regard to regression estimates for domestic and international comparators – with primary weight applied to the domestic comparators and unspecified lesser weight applied to the international comparators.

130 Within the strictures of the foundation model approach, we agree with the general approach of having regard to domestic and international regression estimates of the SL-CAPM beta in setting a starting point SL-CAPM beta, and then making adjustments to correct for known biases in the SL-CAPM. Specifically, for the reasons set out in our companion report, Frontier (2016 Beta), we consider that the domestic data alone is insufficient to produce a reliable estimate of the SL-CAPM beta and that it is appropriate to also have regard to the international evidence for that purpose.

131 The AER states that it considers the "best empirical estimate" from the domestic data only to be 0.5.[90] The AER states that it also has regard to SL-CAPM estimates of beta from international comparators, but nowhere does the AER reveal what regard it had to the international SL-CAPM beta estimates. All that can be inferred from the AER's decisions is that its starting point SL-CAPM beta estimate (i.e., the estimate that reflects all of what the AER considers to be the relevant evidence for estimating the covariance between stock returns for the benchmark firm and market returns divided by the variance of market returns) is somewhere between 0.5 and 0.7.

132 In our view, the AER has misinterpreted and artificially constrained the relevant international evidence, as explained in the following sub-sections of this report.

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[89] Under the alternative multi-model approach, one simply estimates each of the relevant financial models – there is no need to adjust the parameters of one model to reflect the relevant evidence associated with another model.

[90] JEN Preliminary Decision, p. 3-127.

International evidence

133 In our view, the best assessment of the international evidence is set out in the reports of CEG (2013)[91] and SFG (2013 Beta estimates).[92] These reports were commissioned by the Energy Networks Association as part of the AER's 2013 Guideline process. CEG identified a set of 56 international comparator firms that each has more than 50% of its assets invested in regulated energy distribution. SFG then estimated the equity betas for each of these 56 firms.

134 SFG estimated equity betas for each of the nine domestic comparators used by the AER and for the 56 international comparators identified by CEG. SFG estimated the mean beta for each sample as well as a portfolio estimate for each sample. SFG then explained how it distilled this evidence into a single beta estimate:

> 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%. Placing twice as much weight on an Australian observation compared to a U.S. observation implies…[f]or the CAPM, a beta estimate of 0.82.[93]

135 In our view, this is the best available estimate of the SL-CAPM equity beta (i.e., an equity beta that does not reflect any evidence from any other financial model or any evidence about the systematic biases of the SL-CAPM). Thus, we adopt a "starting point" estimate of 0.82 for the SL-CAPM equity beta for the remainder of this report.

136 As set out below, we conclude that a reasonable consideration of the other international evidence that has been submitted also corroborates an estimate materially above 0.7.

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[91] CEG, 2013, Information on equity beta from US companies, June.

[92] SFG Consulting, 2013, Regression-based estimates of risk parameters for the benchmark firm, June.

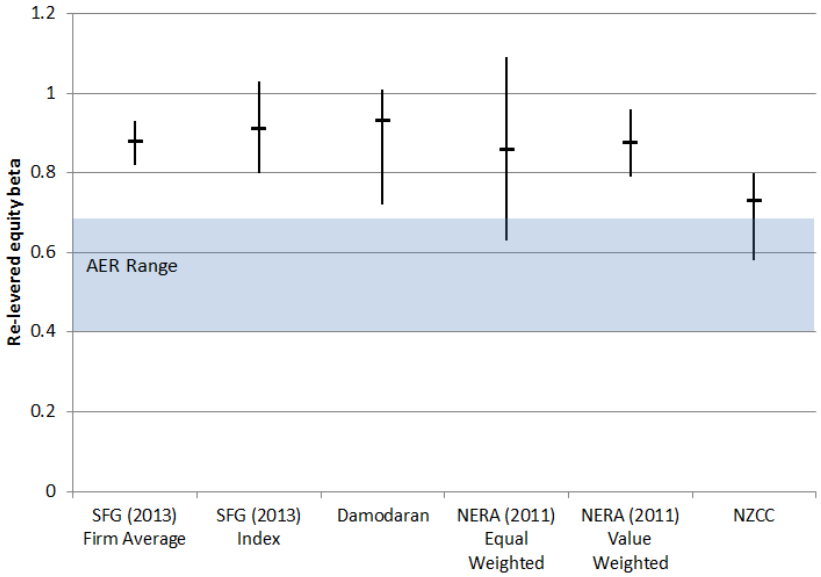
[93] SFG (2013 Beta Estimates), p. 16.

International evidence considered in the Guideline

137 The Guideline indicates that the AER considers that empirical estimates of beta for overseas energy networks are relevant evidence,[94] but that this evidence can only be used to select a point estimate from within the primary range of 0.4 to 0.7 based on the (now) four domestic comparators.

138 The AER's Guideline considered a number of pieces of evidence in relation to international comparators, set out in Appendix C to the Explanatory Statement.[95] We summarise that evidence in Figure 4 below.

Figure 4. Summary of AER international beta estimates



Source: AER, Rate of Return Guideline, Explanatory Statement, 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 New Zealand Commerce Commission (NZCC); the figure shows the range and mean.

139 Two additional points are relevant to the interpretation of the evidence set out in Figure 4. The New Zealand Commerce Commission (NZCC) estimates are based on a sample that includes:

a. The Australian firms that have already been taken into account elsewhere in the estimation process; and

b. A number of very small US listed firms that trade so infrequently that their betas cannot be estimated reliably, as explained by SFG (2013 Beta).

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

[95] Specifically, at pp. 66–67.

140 Clearly, this international evidence supports an equity beta estimate materially above the 0.7 estimate that is proposed in the Guidelines.

141 In its recent decisions, the AER states that:

> In the Guideline, we set out a number of international empirical equity beta estimates that ranged from 0.5 to 1.3[96]

and the AER has concluded in its recent final, preliminary and draft decisions that the international evidence supports estimates in the range of 0.3 to 1.3 (if SFG's re-levered global estimates are included).[97]

International evidence considered in recent AER decisions

142 The AER's recent decisions also present new evidence of contemporaneous estimates of equity beta from international comparators, and the AER confirmed its reliance on that evidence in its recent final, preliminary and draft decisions. However, there are some material problems with a number of these estimates. For example:

a. Some of the estimates have not been regeared using a consistent gearing assumption of 60% and therefore cannot be compared with the proposed estimate of 0.7. The level of gearing is an important component of equity beta and all of the domestic estimates of equity beta that the AER has ever relied upon have been regeared to 60%, including the recent Henry (2014) estimates where the AER's terms of reference required beta estimates to be regeared to 60% and all of the estimates in Henry's report were in fact regeared to 60%.[98] It would be a clear error to make an apples-with-oranges comparison of regeared equity beta estimates with raw equity beta estimates, as explained in Frontier Economics (2015 Risks). Such an error results in a beta estimate for the benchmark efficient entity that is lower than would be the case, had the estimates been regeared properly using a consistent gearing assumption of 60%[99]; and

b. Some of the estimates are based on the analysis of only three comparator firms using only one year of daily data. In our view, the analysis of such a small and short-term data set cannot possibly produce a reliable beta estimate. In this regard, we note that the AER's terms of reference for Henry (2014):

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[96] JEN Preliminary Decision, p. 3-488.

[97] JEN Preliminary Decision, p. 3-128.

[98] Henry (2014) sets out some raw beta estimates in the final appendix to his report, but the 30 tables in the body of the report all contain estimates that have been regeared to 60%.

[99] A comparator firm with less than 60% gearing would produce a higher equity beta estimate when regeared to 60%.

i. Instructed the consultant to use a minimum data period of five years;

ii. Instructed the consultant to use a minimum return frequency of weekly data; and

iii. Instructed the consultant to use a minimum sample size of nine companies.

Hence, some of the estimates that the AER has relied on do not meet even the minimum requirements that it set.

143 In the remainder of this section we consider each of the new pieces of international evidence reported in the AER's recent decisions:

a. **Damodaran (2013).** The AER reports an updated estimate from Damodaran of 0.83 (regeared to 60%) using data through to the end of 2013. This estimate is for U.S. comparators only. Beta estimates for the three comparator groups (again, regeared to 60%) are:

   i. U.S. comparators (20 firms): 0.83;

   ii. European comparators (20 firms): 1.30; and

   iii. Global comparators (55 firms): 0.90.

b. **FTI (2012**). This report provided raw beta estimates for three comparators using daily data over one- and two-year periods. For the reasons set out above, it is our view that it would be a gross error to place any weight on the resulting figures when seeking to estimate the regeared equity beta for the benchmark efficient entity. This would also be inconsistent with the terms of reference provided by the AER to its consultant Henry when estimating betas for the nine Australian comparator firms.[100]

   Moreover, the AER's recent draft, preliminary and final decisions only report the raw equity betas for the three comparators and imply that they can be compared with its regeared equity beta estimate of 0.7. The AER does not mention that the FTI (2012) study itself notes that the estimates that are cited by the AER are just one of the pieces of evidence that are used to inform the estimate of beta. The FTI report notes that Ofgem has previously adopted a beta range of 0.9 to 0.95[101] after considering all of the relevant evidence and that "[r]ecent regulatory precedent suggests a range of 0.9 to 1.1".[102] The FTI report itself then concludes that:

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[100] It would be inconsistent with the AER's terms of reference in respect of (a) the number of firms to be considered, (b) the time period of data to be used, and (c) the frequency of returns to be used.

[101] FTI Consulting (2012), Paragraph 4.3.

[102] FTI Consulting (2012), Paragraph 4.46.

> We have not identified any evidence to suggest that Ofgem should update its range for beta in light of either recent regulatory precedent or recent market conditions[103]

and that:

> We consider that, similarly, Ofgem should not take into consideration recent market evidence indicating that the equity beta has fallen, as this may reflect the effects of unusual market conditions during the credit crisis, which may not be representative of the future.[104]

The AER's recent decisions also do not mention that Ofgem has subsequently adopted equity betas of 0.95 for National Grid Electricity Transmission (with 60% gearing) and 0.91 for National Grid Gas Transmission (with 62.5% gearing) after considering the FTI (2012) study.[105]

Even more telling is the fact that the AER's response to this point in its recent final, preliminary and draft decisions is as follows:

> We consider international empirical estimates of equity beta in this section, not other regulators' equity beta decisions. Therefore, Ofgem's decisions on equity beta are not relevant for this analysis.[106]

Nowhere in the AER's recent final, preliminary and draft decisions does the AER return to address the point that the FTI estimates were disavowed by both FTI and Ofgem.

c. **Alberta Utilities Commission (2013).** This report documents *submissions* to the regulator in relation to equity beta – it does not present any *estimates* of beta. Unsurprisingly, user groups such as the Canadian Association of Petroleum Producers (CAPP) submitted that a low equity beta should be used. The report provides no information at all about the basis for the equity beta submissions. There is no information about how many, or which comparator firms were used. There is no information about what statistical techniques were employed or how the range of resulting estimates was distilled into a point estimate or range.

   Moreover, the process for determining the allowed return on equity in Alberta is fundamentally different from the process that is adopted by the AER.[107] Specifically, the Alberta process begins with the assignment of an equity beta. The regulator then checks whether the allowed revenue will be sufficient to satisfy three key

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[103] FTI Consulting (2012), Paragraph 4.57.

[104] FTI Consulting (2012), Paragraph 4.49.

[105] Ofgem (2012) Paragraphs 3.45 and 3.47.

[106] JEN Preliminary Decision, p. 3-493.

[107] The issue here is not with the use of international data per se, but with the use of submissions by interested parties rather than empirical estimates from market data.

credit rating metrics. If these metrics are not achieved, the regulator will adjust the assumed level of gearing and/or add an increment to the allowed return on equity – the so-caller "adder" premium to ensure that the metrics are achieved. The equity beta estimates that form the lower bound of the range that was submitted to the Alberta regulator involve material adder adjustments. That is, the role and the use of the equity beta are very different in Alberta than in the Australian regulatory setting.

For the reasons set out above, it is our view that the Alberta Utilities Commission report does not contain any evidence that is relevant to the regeared equity beta for use in the Australian regulatory framework.

d. **PwC (2014).** In its recent decisions, the AER summarises the evidence from an annual report published by PwC for New Zealand:

PwC's June 2014 report presents the following raw equity beta estimates for two New Zealand energy network firms as at 31 December 2013:

o raw:

- 0.6 for the average of individual firm estimates

o re-levered to 60 per cent gearing:

- 0.87 for the average of individual firm estimates.[108]

The AER implies that this estimate of 0.6 can be compared with its allowed equity beta of 0.7. However, such a comparison would be an error for the reasons set out below. First, the 0.6 estimate does not appear anywhere in the PwC report in relation to utilities. The beta estimates set out in the "Utilities" section of the report are set out in the table below.

[108] JEN Preliminary Decision, p. 3-490.

Table 6. PwC (2014) beta estimates for the Utilities sector in New Zealand

Company	Raw beta	Leverage	Regeared beta (gearing = 60%)
Contact	0.9	0.27	1.64
Horizon	0.5	0.31	0.86
NZ Windfarms	0.5	0.33	0.84
NZ Refining	0.8	0.17	1.66
TrustPower	0.5	0.36	0.80
Vector	0.7	0.50	0.88

Note: The regeared beta estimates are our computations.

The AER's estimate of 0.6 appears to be the average of the raw beta estimates for Horizon and Vector,[109] the "New Zealand energy network firms" referred to by the AER. As the AER itself recognises, the average of the regeared estimates for these two firms is 0.87. It is misleading to suggest that the PwC (2014) report provides any support at all for the AER's regeared equity beta of 0.7.

e. **Brattle Group (2013).** This report examined seven European comparators and three US comparators using daily data over three years. In our view, three years is too short a period to provide reliable beta estimates, and this view is consistent with the AER's terms of reference provided to Henry. Nevertheless, the AER reports re-geared (to 60%) equity beta estimates from this report of:

   i. 0.71 for the average of European individual firm estimates;

   ii. 1.01 for the average of US individual firm estimates; and

   iii. 0.80 for the average of European and U.S. individual firm estimates.

   The Brattle Group (2013) also notes that the relevant regulatory rules require that the set of comparators must include at least ten firms – in contrast to the AER's set of domestic comparators, which now numbers just four.

144 In summary:

a. The Damodaran estimates all support an equity beta materially above the AER's estimate of 0.7;

b. The FTI (2012) analysis of three companies using one year of daily data is incapable, by itself, of producing a reliable estimate of equity

[109] JEN Preliminary Decision, p. 3-490.

beta. FTI (2012) and Ofgem (2012) conclude that the appropriate equity beta is in excess of 0.9;

c. The Alberta Utilities Commission (2013) report does not contain beta estimates, but rather beta submissions. Since there is no information about the basis of those submissions, it would be an error to place any material weight on them;

d. The PwC (2014) report indicates that the relevant regeared equity beta estimate is 0.87;

e. The Brattle Group (2013) estimates are based on such a short period of data that they are unreliable. The average re-geared equity beta estimate reported by the AER is 0.80, which is materially above the AER's estimate of 0.7.

Conclusions on the SL-CAPM starting point estimate

145 As set out above, regression analysis produces beta estimates that conform to the theoretical definition of beta in the SL-CAPM and will jointly form our recommended SL-CAPM starting point beta estimate in the AER's foundation model approach. The only remaining issue is the question of the relative weight that should be afforded to the domestic and international estimates. The SFG (2014 Beta) estimate of 0.82, which we adopt in this report, applies twice as much weight to the domestic comparators relative to each of the international comparators. The reasons for that choice are set out in SFG (2014 Beta). Since this choice inevitably involves the exercise of some judgment, we summarise the sensitivity of the final beta estimate to different weighting schemes in Table 7 below.

Table 7: Sensitivity of starting point SL-CAPM beta estimates to the weight applied to international evidence

Relative weighting factor on domestic observations	SL-CAPM starting point beta estimate
1	0.85
2	0.82
3	0.79
4	0.77
5	0.76

Source: Frontier calculations using estimates reported in SFG (2014 Beta).

Note: A weighting factor of N means that each domestic comparator receives N times as much weight as each international comparator.

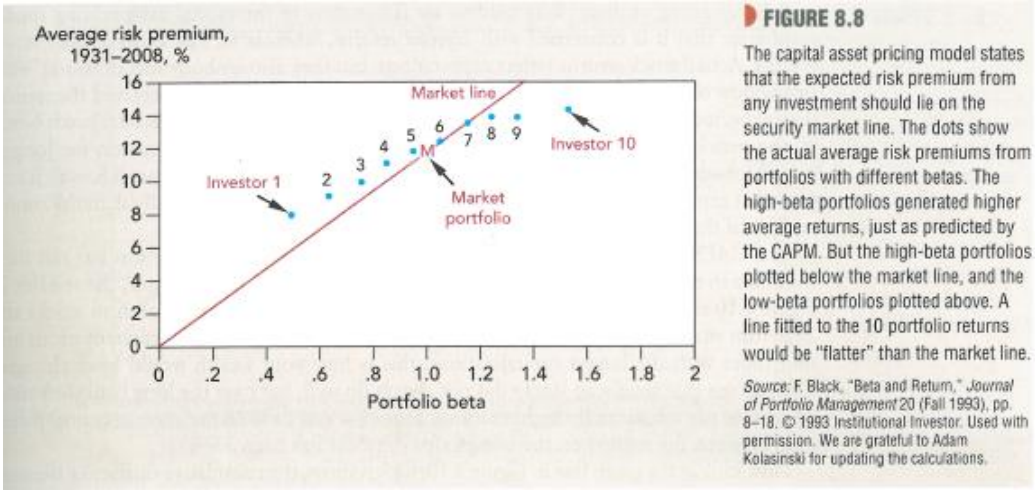
146 We have adopted a relative weighting factor of two, which is consistent with the recommendation of SFG (2014 Beta), and which produces a starting point SL-

CAPM equity beta of 0.82.[110] A different relative weighting of the domestic and international evidence can easily be applied by selecting the relevant SL-CAPM starting point beta estimate from Table 7.

Adjustment for "low-beta bias" and the Black CAPM evidence

147 There is strong evidence that the SL-CAPM systematically underestimates the required return on equity for low-beta stocks. This evidence is set out in some detail in Section 2 of SFG (2014 Black), in NERA (2015 Lit Rev) and in HoustonKemp (2016). This evidence shows that, relative to the SL-CAPM prediction, the observable relationship between beta and returns has a higher intercept and a flatter slope. This evidence is so well accepted that it now appears in standard finance textbooks, as illustrated in Figure 5 below.

Figure 5. The relationship between excess returns and beta



Source: Brealey, Myers, and Allen (2011), p. 197.

148 We also note that Handley (2015) has advised the AER that the evidence of low-beta bias is "nothing new" but rather "[i]t is well known that an apparent weakness of the Sharpe-CAPM is the empirical finding…that the relation between beta and average stock returns is too flat compared to what would otherwise be predicted by the Sharpe-CAPM – a result often referred to as the low beta bias."

149 Handley (2015) goes on to advise the AER that it is possible that the systematic low-beta bias might arise for reasons unrelated to risk. He provides some possible reasons why investors would systematically require returns that differ from the SL-

[110] We apply twice as much weight to each domestic comparator as to each international comparator to reflect the fact that the domestic firms are more directly comparable. We note that the selection of relative weights is necessarily a matter of judgment. We show in the table above that even if we apply five times as much weight to each domestic comparator, the starting-point beta estimate remains materially above 0.7.

CAPM predictions.[111] However, these reasons all relate to the incompleteness of the SL-CAPM – they are all potential explanations for why the SL-CAPM fails in practice. He claims that some of these reasons are not risk-based, and then concludes, that because there might be a non-risk based explanation for the systematic empirical failing of the SL-CAPM, all other models should be rejected outright. He reaches this conclusion on the basis of his legal interpretation of the reference in the Rules to "a benchmark efficient entity with a similar degree of risk as the service provider."

150 However, our view is that this is a very straightforward economic point that should not be lost in Dr Handley's legal interpretation of the Rule requirements. The evidence is that the SL-CAPM does not work for firms that have the sort of beta estimate that the AER adopts for the benchmark efficient entity, and that an adjustment is required to correct for this low-beta bias. That is, an adjustment is required for firms with a similar beta, or "a similar degree of risk" as the service providers. The adjustment provides a mapping between risk (as measured by beta) and return that is consistent with the observed data – whereas the SL-CAPM provides a mapping between risk and return that is systematically inconsistent with the observed data.

151 It is important to note that the starting point SL-CAPM equity beta estimates have no regard to the evidence of low-beta bias – they must be adjusted to correct for this bias.

152 In its recent decisions, the AER appears to accept the evidence of a low-beta bias. The AER has attempted to account for using the "the theoretical principles underpinning the Black CAPM" to justify a point estimate at the top end of its range of starting point estimates from domestic comparators.[112] However, the AER performed no quantitative analysis to determine the size of the adjustment that would be required to correct for the low-beta bias of the SL-CAPM. The AER has not even stated what adjustment it did make to its beta estimate in relation to the low-beta bias. Consequently, it is impossible to determine whether any adjustment that may have been made was sufficient to correct for the low-beta bias and the evidence in relation to the Black CAPM.

153 Moreover, there is no reason whatsoever to conclude that the adjustment for low-beta bias must result in a corrected beta that lies within the AER's primary range of 0.4 to 0.7. That primary range reflects the precision with which the AER considers it is able to estimate an unadjusted SL-CAPM beta. There is no relationship at all between the precision of the SL-CAPM beta and the extent to which it is biased. By analogy, we might be able to quantify that a faulty watch runs between 52 and 53 seconds per minute. This does not imply that the systematic bias can be corrected by taking the upper bound and concluding that a minute runs for 53 seconds.

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111 Handley (2015), Footnote 6, p. 5.

112 JEN Preliminary Decision, p. 3-128.

154 By contrast, SFG (2014 Black) quantifies the low-beta bias by estimating the zero-beta premium in the Black CAPM to be 3.34%, which the AER and its consultants consider to be "plausible."[113] The zero-beta premium is the extent to which the intercept needs to be increased above the risk-free rate in order to fit the observed data, as illustrated in Figure 6 below.[114]

155 We note that the SFG estimate of the zero-beta premium of 3.34% is consistent with the estimates documented from the literature by Grundy (2010). Grundy reports an average estimate from the literature of:

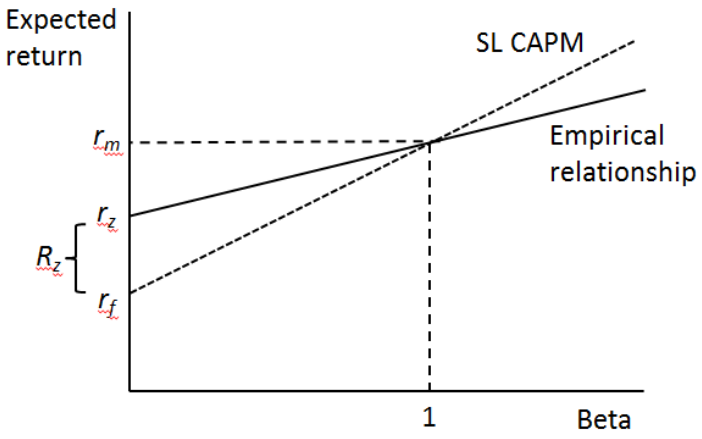
$$\frac{R_m - R_0}{R_m - R_f} = 0.511$$

which implies a zero-beta premium of:

$$R_0 - R_f = 0.489\left(R_m - R_f\right).$$

For a MRP estimate of 6.5%, these results imply a zero-beta premium of 3.18%[115] and for our preferred MRP estimate of 7.9%, the results imply a zero-beta premium of 3.86%.[116]

Figure 6. Sharpe-Lintner CAPM vs. empirical relationship.



Source: Frontier Economics

156 In its Guideline materials, the AER showed how the SL-CAPM equity beta can be adjusted to account for the Black CAPM evidence of a low-beta bias.[117]

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[113] JEN Preliminary Decision, p. 3-311.

[114] We note that this is a "pure" estimate of the low-beta bias in that the econometric technique that has been employed controls for size and book-to-market effects. In particular, low-beta firms tend to have higher than average book-to-market ratios. SFG control for the book-to-market effect to isolate the low-beta bias. That is, the 3.34% reflects only the bias associated with the fact that the stocks have a low beta – it does not reflect any aspect of book-to-market bias.

[115] 0.489×6.5%.

[116] 0.489×7.9%.

[117] AER Rate of Return Guideline, Explanatory Statement, Appendix C, Table C.11.

Specifically, the AER shows how an estimate of the zero-beta premium can be used to derive the adjusted SL-CAPM beta. The process is as follows:

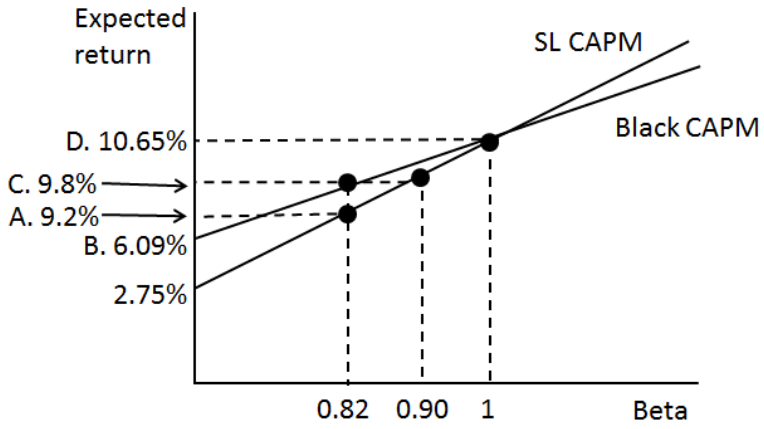
a. Estimate the SL-CAPM equity beta;

b. Estimate the required return on equity under the Black CAPM, using the equity beta from (a) above;

c. Derive the equity beta that would have to be inserted into the SL-CAPM to obtain an estimate of the required return on equity equal to that in (b) above.

157 Beginning with the starting point SL-CAPM equity beta of 0.82 and a MRP of 7.9% (from above) the adjustment to fully correct for the low-beta bias produces a revised beta of 0.90, as illustrated in Figure 7 below. In this case, the unadjusted equity beta is 0.82. When that beta is inserted into the Black CAPM, the resulting estimate of the required return on equity is 9.8%. To obtain the same estimate of the required return from the SL-CAPM would require a beta of 0.90. Thus, the adjusted estimate, fully corrected for low-beta bias is 0.90.

Figure 7. Derivation of adjusted equity beta.



A. 9.2% = 2.75% + 0.82 × 7.9%
B. 6.09% = 2.75% + 3.34%
C. 9.8% = 6.09% + 0.82 × (7.9%-3.34%)
C. 9.8% = 2.75% + 0.90 × 7.9%
D. 10.65% = 2.75% + 1 × 7.9%

Source: Frontier Economics

158 In our view, the evidence of low-beta bias is very strong[118] and the regard had to that evidence should be commensurate with the strength of the evidence. We apply a 75% weight to the correction for low-beta bias and a 25% weight to the uncorrected starting-point SL-CAPM estimate. This is consistent with it being three times more likely that the Black CAPM evidence is real and systematic than a statistical artefact. Our estimate of the equity beta adjusted for low-beta bias is

[118] For the reasons set out in SFG (2014 Black) and SFG (2015 Beta).

0.88. We recognise that this weight involves the exercise of judgment, so we set out the adjusted beta estimates for a range of weights in Table 8 below.

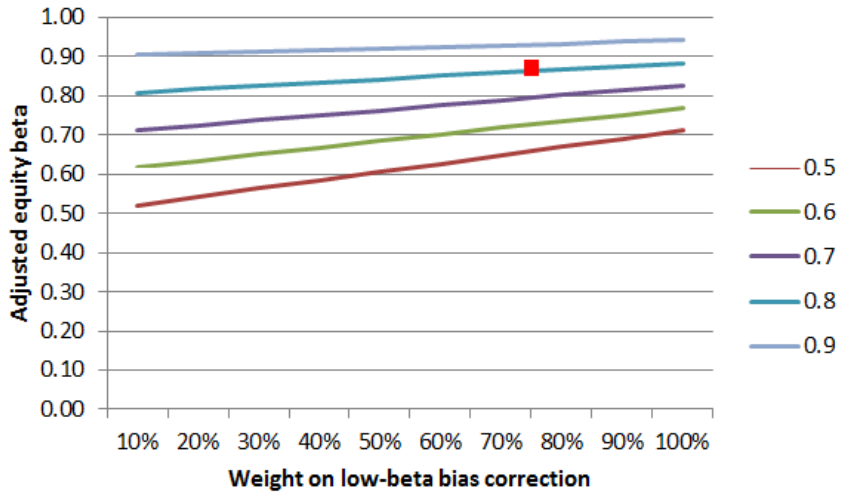
Table 8: Sensitivity of adjusted equity beta estimates to the weight applied to low-beta bias correction

Weight applied to correction for low-beta bias	Adjusted equity beta estimate Starting beta of 0.7	Adjusted equity beta estimate Starting beta of 0.82	Adjusted equity beta estimate Starting beta of 0.9
10%	0.71	0.83	0.90
20%	0.73	0.83	0.91
30%	0.74	0.84	0.91
40%	0.75	0.85	0.92
50%	0.76	0.86	0.92
60%	0.78	0.86	0.93
70%	0.79	0.87	0.93
75%	0.80	**0.88**	0.93
80%	0.80	0.88	0.93
90%	0.81	0.89	0.94
100%	0.83	0.90	0.94

Source: Frontier calculations using estimates reported in SFG (2014 Black).

159 The equity beta adjusted for low-beta bias also depends on the starting point SL-CAPM beta that has been adopted. Figure 8 below shows how the adjusted equity beta varies according to the starting point beta and the weight applied to the low-beta correction. Our preferred estimate of 0.88 (based on a starting point estimate of 0.82 and a 75% weight on the correction for low-beta bias) is highlighted in red.

Figure 8. Sensitivity analysis for equity beta adjusted to correct low-beta bias.



Source: Frontier calculations

160 We also note that the adjustment is relatively insensitive to a range of plausible estimates of the zero-beta premium. Table 9 below shows how the adjusted beta varies according to different estimates of the zero-beta premium. We consider a range of starting-point beta estimates and apply a 75% weight to the low-beta bias correction in each case. The table shows that the adjusted beta estimates are relatively insensitive to a wide range of estimates of the zero-beta premium. Our selected estimate of 0.88 is highlighted in red.

Table 9: Sensitivity of adjusted equity beta estimates to the estimate of the zero-beta premium

Zero-beta premium	Starting beta of 0.7	Starting beta of 0.82	Starting beta of 0.9
2.00%	0.76	0.85	0.92
2.50%	0.77	0.86	0.92
3.00%	0.79	0.87	0.93
3.34%	0.80	**0.88**	0.93
3.50%	0.80	0.88	0.93
4.00%	0.81	0.89	0.94

Source: Frontier calculations, 75% weight applied to low-beta bias correction.

Adjustment for book-to-market bias and the Fama-French model

161 Just as the Black CAPM overcomes one of the systematic biases that have been documented for the SL-CAPM, the Fama-French model overcomes another systematic bias. The SL-CAPM has been shown to systematically under-estimate the required return on "value" stocks – those that have a high book-to-market value, such as regulated energy distribution networks. More specifically, the FFM does not apply a premium to stocks that have the characteristic of a high book-to-

market ratio, but rather stocks that have a high sensitivity to the book-to-market factor.[119]

162 In its Guideline, the AER concludes that the Fama-French model is a relevant financial model that it must have regard to. However, the AER concludes that it will not apply any weight to that model.

163 The arguments for assigning at least some weight to the Fama French model have been set out at length in SFG (2014 FFM) and SFG (2015 FFM). The main reasons are the following:

a. Professor Fama was awarded the 2013 Nobel Prize in Economics. The Prize Committee stated that:

> …the classical Capital Asset Pricing Model (CAPM) – for which the 1990 prize was given to William Sharpe – for a long time provided a basic framework. It asserts that assets that correlate more strongly with the market as a whole carry more risk and thus require a higher return in compensation. In a large number of studies, researchers have attempted to test this proposition. Here, Fama provided seminal methodological insights and carried out a number of tests. It has been found that an extended model with three factors – adding a stock's market value and its ratio of book value to market value – greatly improves the explanatory power relative to the single-factor CAPM model.[120]

and:

> …following the work of Fama and French, it has become standard to evaluate performance relative to "size" and "value" benchmarks, rather than simply controlling for overall market returns.[121]

b. The leading Australian study, Brailsford, Gaunt and O'Brien (2012) conclude that:

> Our study provides two advances. Firstly, the study utilizes a purpose-built dataset spanning 25 years and 98% of all listed firms. Secondly, the study employs a more appropriate portfolio construction method than that employed in prior studies. With these advances, the study is more able to test the three-factor model against the capital asset-pricing model (CAPM). The findings support the superiority of the Fama–French model, and for the first time align the research in this area between Australia and the USA.[122]

and:

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[119] Fama and French compile a book-to-market factor that plays the same role as the market factor in the SL-CAPM. Just as the CAPM beta is computed by regressing the returns of a particular stock on the returns of the market factor, a book-to-market beta is computed by regressing stock returns on the returns of the book-to-market factor. It is firms with a high book-to-market beta (i.e., high exposure to that factor) that require higher returns under the Fama-French model.

[120] Economic Sciences Prize Committee, 2013, Understanding Asset Prices, p. 3.

[121] Economic Sciences Prize Committee, 2013, Understanding Asset Prices, p. 44.

[122] Brailsford, Gaunt and O'Brien (2012 AJM), p. 261.

> This evidence is important for a number of reasons. Firstly, the findings appear to settle the disputed question as to whether the value premium is indeed a positive and significant factor in the Australian market. Given the growing trend to utilize the three-factor model in asset-pricing tests and in practical strategies of portfolio formation in the funds management industry, these findings provide direction. Secondly, the evidence continues the decline of the single-factor model, which has obvious implications for future research. This future research should include the added benefits of using a multifactor model to estimate cost of capital for firms.[123]

c. NERA (2015 Emp) consider the assessment of the relevant empirical evidence by the AER and its advisers. NERA concludes that:

> A recurring theme is that the AER's advisers cite selectively from the work that they discuss.[124]

For example, NERA notes that papers that actually provide evidence against the Sharpe-Lintner CAPM have been interpreted by the AER's advisers as supporting the AER's implementation of the Sharpe-Lintner CAPM:

> …while Davis (2011), Handley (2014) and McKenzie and Partington (2014), in reports written for the AER, endorse the use of the Sharpe-Lintner CAPM and review, favourably, the work of Lewellen, Nagel and Shanken [LNS],[125] the evidence that Lewellen, Nagel and Shanken provide indicates that the Sharpe-Lintner CAPM does not generate unbiased estimates of the cost of equity.[126]

Specifically, NERA demonstrates that the LNS data supports no relation at all between beta estimates and stock returns, as summarised in Figure 9 below.

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[123] Brailsford, Gaunt and O'Brien (2012 AJM), p. 279.

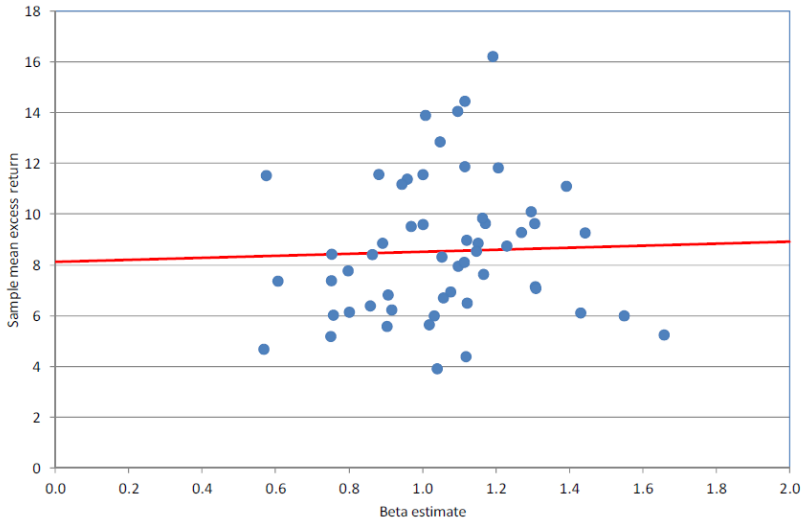
[124] NERA (2015 Emp), p. iv.

[125] Lewellen, Nagel and Shanken (2010).

[126] NERA (2015 Lit), p. iv.

Figure 9: Lewellen, Nagel and Shanken (2010) analysis of Sharpe-Lintner CAPM

Sample mean excess return against beta estimate for 25 US size and book-to-market sorted portfolios and 30 US industry portfolios: Quarterly data from 1963 to 2004



Notes: Data are from Ken French's web site and are those used by Lewellen, Nagel and Shanken (2010). The red line plots Lewellen, Nagel and Shanken's estimate of the relation between mean return and beta constructed from the 25 portfolios formed on the basis of size and book-to-market and the 30 industry portfolios.

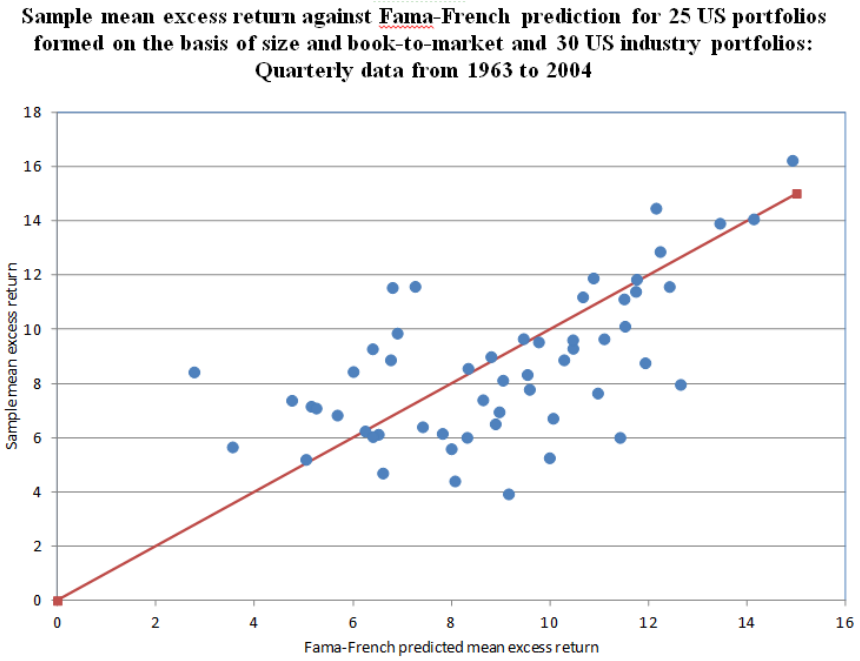
Sources: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Lewellen, J., S. Nagel and J. Shanken, A skeptical appraisal of asset pricing tests, Journal of Financial Economics, 2010, Table 1, pages 188.

Source: NERA (2015 Lit), Figure 1, p. v.

Moreover, the LNS data supports a strong relationship between the predictions of the Fama-French 3-factor model and subsequent stock returns, as summarised in Figure 10 below.

Figure 10: Lewellen, Nagel and Shanken (2010) analysis of Fama-French three factor model



Notes: Data are from Ken French's web site and are those used by Lewellen, Nagel and Shanken (2010). The red line plots a line with slope one that passes through the origin. Sample mean excess returns and the Fama-French predictions have been annualised by multiplying the quarterly returns by four and are in per cent per annum.

Sources: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Lewellen, J., S. Nagel and J. Shanken, A skeptical appraisal of asset pricing tests, Journal of Financial Economics, 2010, Table 1, pages 188.

Source: NERA (2015 Lit), Figure 2, p. vii.

d. LNS consider a number of different metrics by which one might test or rank the performance of a number of asset pricing models. They develop one metric under which no models receive a high absolute score. This leads Handley (2015 JGN) and Partington and Satchell (2015) to conclude that models other than the Sharpe-Lintner CAPM should not be used. However, there are two problems with this conclusion:

Under every single metric that LNS examine, the SL-CAPM finishes last. Indeed there is no evidence of the SL-CAPM providing any explanatory power whatsoever. Indeed Handley (2015 JGN) recognises that:

> Lewellen, Nagel and Shanken (2010) show that the CAPM has zero explanatory power.[127]

Similarly, SFG (2015 FFM, Figure 1, p. 23) summarise the LNS test results in the figure that is reproduced below. In every case, the performance statistic for the Fama-French model is materially

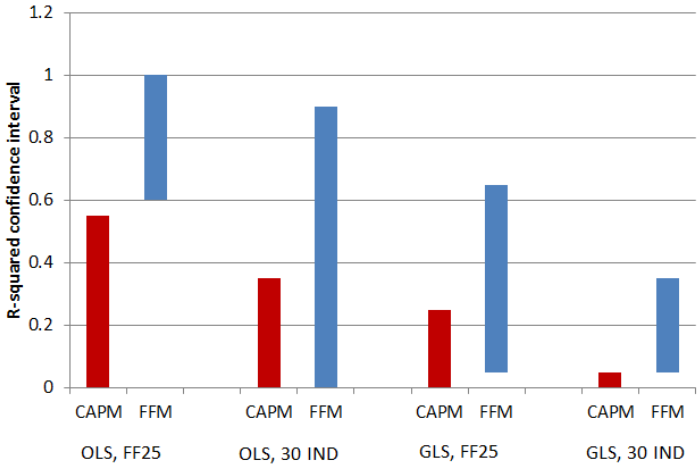
[127] Handley (2015 JGN), p. 10.

superior to that of the SL-CAPM. This leads Lewellen, Nagel and Shanken (2010) to conclude that:

> The confidence interval provides a good summary measure of just how poorly the CAPM works.[128]

In our view, it is quite unreasonable to rely upon the work of LNS to reject the Fama-French model, and then retain the exclusive use of the SL-CAPM. The selective focus on one aspect of one paper is no substitute for a reasoned, holistic consideration of the relevant literature. A holistic consideration of just this *one paper* would have led the AER to a very different conclusion.

Figure 11. SL-CAPM and Fama-French explanatory power



Source: Lewellen, Nagel and Shanken (2010), Table 1, p. 188.

Notes: OLS=Ordinary least squares; GLS=Generalised least squares; FF25=The Fama and French size and book-to-market portfolios; 30 IND=The 25 FF portfolios plus 30 industry portfolios.

164 We note that Handley (2015) advises the AER that, for the benchmark efficient entity, SL-CAPM estimates of the required return on equity are downwardly biased in relation to the Fama-French factors is "nothing new" and a "well-known…apparent weakness of the Sharpe-CAPM."[129]

165 For the reasons set out above, and in SFG (2014 FFM) and SFG (2015 FFM), our view is that the Fama-French model should be afforded real weight in the process of estimating the required return on equity. Under the AER's foundation model approach, the only way that the Fama-French model can have any real weight is via an adjustment to the equity beta that is used in the SL-CAPM.[130]

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[128] Lewellen, Nagel and Shanken (2010), p. 187.

[129] Handley (2015), p. 6. Again Handley advises the AER that they may not have to address this systematic empirical bias on the basis of his legal interpretation of the NER.

[130] The objective here is to have proper regard to the relevant Fama-French evidence within the constraints of the SL-CAPM foundation model approach. Under the multi-model approach, we have regard to the Fama-French evidence by simply estimating the Fama-French model and giving it some weight.

166 Thus, we begin with an equity beta estimate of 0.88 (the starting point SL-CAPM estimate adjusted for low-beta bias) and then determine the adjustment to the equity beta that would be required to capture the Fama-French evidence summarised in SFG (2014 Beta) and SFG (2014 FFM).[131] Since the size factor is immaterial in the Australian data, the adjustment is effectively a correction for book-to-market bias. SFG (2014 FFM) estimate that an adjustment of 1.06% to the required return on equity is needed fully account for the Fama-French evidence.[132]

167 We recognise that the AER has expressed a number of reservations about the use of Fama-French evidence. Whereas we consider that many of the AER's objections are overstated (as set out above) we have considered the points that the AER has raised and do not propose a full correction for book-to-market bias at this stage of the regulatory process. For this reason we propose to apply a 25% weight to the correction for book-to-market bias, which produces an adjusted equity beta estimate of 0.91. This adjustment reflects the fact that the evidence of the book-to-market bias is more recent than the low-beta bias.

168 Table 10 and Figure 12 below shows how the adjusted equity beta varies according to the starting point beta and the weight applied to the low-beta correction. Our preferred estimate of 0.91 (based on a pre-adjustment estimate of 0.88 and a 25% weight on the correction for book-to-market bias) is highlighted in red.

Under the foundation model approach, the only way to have regard to that evidence is by making an adjustment to the equity beta in relation to it.

[131] As noted above, the SFG estimation approach controls for the book-to-market effect to isolate the low-beta bias. That is, the 3.34% reflects only the bias associated with the fact that the stocks have a low beta – it does not reflect any aspect of book-to-market bias. Thus, we begin with a beta estimate that has been corrected for low-beta bias only and then we apply a correction for book-to-market bias.

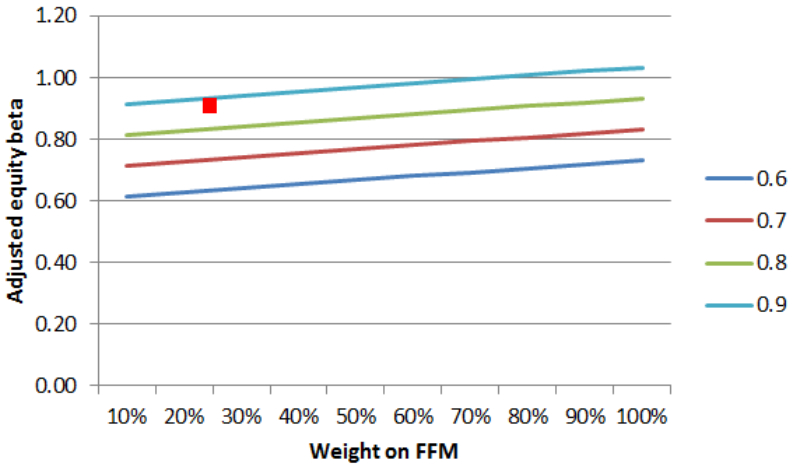
[132] SFG (2014 FFM) estimate a premium in relation to the SMB factor of -0.19% and a premium in relation to the HML factor of 1.15% – a net premium of 1.06%.

Table 10: Sensitivity of adjusted equity beta estimates to the weight applied to the book-to-market bias correction

Weight applied to correction for book-to-market bias	Adjusted equity beta estimate Starting beta of 0.8	Adjusted equity beta estimate Starting beta of 0.88	Adjusted equity beta estimate Starting beta of 0.9
10%	0.81	0.89	0.91
20%	0.82	0.90	0.92
25%	0.83	**0.91**	0.93
30%	0.84	0.91	0.94
40%	0.85	0.93	0.95
50%	0.86	0.94	0.96
60%	0.87	0.95	0.97
70%	0.89	0.96	0.99
80%	0.90	0.99	1.00
90%	0.91	0.99	1.01
100%	0.92	1.00	1.02

Source: Frontier calculations using estimates reported in SFG (2014 Black).

Figure 12. Sensitivity analysis for equity beta adjusted to correct book-to-market bias.



Source: Frontier calculations

The DGM

169 The AER uses DGMs to estimate the required return on the broad market, but does not use these models to estimate the required return for the benchmark efficient entity. We have previously provided DGM estimates of the required return on equity for the benchmark efficient entity in SFG (2014 DDM) and SFG

(2015 DDM), and we apply some weight to those estimates in our multi-model approach.

170 Under the SL-CAPM foundation model approach, we begin with a starting-point beta estimate and make adjustments to correct for known biases in the SL-CAPM. The Black and Fama-French evidence are used to correct for these known biases in the SL-CAPM. By contrast, the DGM evidence is not used as a correction for known biases in the SL-CAPM; it is an independent approach for estimating the required return on equity that is not affected by the biases that have been documented for the SL-CAPM. Consequently, we do not use our DGM evidence to make a further adjustment to the SL-CAPM equity beta. Rather, we use the implied beta from our DGM approach as a check of the SL-CAPM equity beta, corrected for known biases.

171 In our previous reports,[133] we concluded that an equity beta of 0.94 (when inserted into the SL-CAPM) would produce an estimate of the required return on equity that is commensurate with the evidence from dividend growth models. Thus, the DGM estimate of the implied equity beta of 0.94 is comparable to our final (corrected) estimate of 0.91.

3.3.4 Summary and conclusions in relation to equity beta

172 Our conclusions in relation to the equity beta are:

a. The best available estimate of the "starting point" SL-CAPM equity beta is 0.82. This reflects all of the evidence relating to the "pure" SL-CAPM beta and none of the evidence relating to corrections for known biases in the SL-CAPM. Specifically, the 0.82 estimate reflects the statistical regression evidence from domestic and international comparators where the domestic comparators each receive twice as much weight as each international comparator;

b. The adjustment for low-beta bias increases the equity beta to 0.88. This reflects the SFG (2014 Black) estimate of the zero-beta premium (3.34%) and the estimate of the MRP from the previous sub-section of this report (7.9%). We have applied a 75% weighting to the adjustment for low-beta bias,[134] commensurate with the strong and consistent evidence of low-beta bias. This is also consistent with the AER's apparent acceptance of low-beta bias in the SL-CAPM, which has led the AER to adjust its beta estimates in relation to it;

c. The adjustment for book-to-market bias increases the equity beta further to 0.91. This reflects the SFG (2014 FFM) estimate of the premiums from the Fama-French model. We have applied a 25%

[133] SFG (2014 DDM) and SFG (2015 DDM).

[134] That is, the adjustment that we have applied is 75% of the adjustment that would be required to fully offset the low-beta bias.

weighting to the adjustment for book-to-market bias.[135] This adjustment reflects the fact that the evidence of the book-to-market bias is more recent than the low-beta bias.

d. Our final estimate of the equity beta for the benchmark efficient entity is 0.91.

173 We note that we have applied a sequential adjustment approach here because the SFG estimates of the effect of low-beta bias and book-to-market bias are independent of each other. SFG (2014 Black) explains, in some detail, that they have adopted an approach to isolate the effect of low-beta bias by controlling out any effect from the Fama-French factors. Thus, the SFG estimate of 3.34% for the zero-beta premium is a pure estimate of the low-beta bias – it reflects only the effect of low-beta bias – it does not reflect the fact that high book-to-market stocks also tend to have low betas.

174 Consequently, our approach is to apply a correction for low-beta bias only, and then to apply a subsequent correction for book-to-market bias in a way that involves no overlap and no double counting.

175 We note that if we had applied 100% weight to both corrections, the resulting estimate of beta would be 1.03. This implies that the benchmark firm would have a required return approximately equal to that for the average firm in the market. We note that this result is consistent with the finding of NERA (2013) that the empirical data in Australia is consistent with the required return of the benchmark firm being approximately equal to the required return on the market portfolio.

176 The benefit of our sequential approach set out above is that the adjustments for low-beta bias and book-to-market bias are separated, and different weights can be applied to each.

3.4 Conclusions on the required return on equity

177 Our implementation of the SL-CAPM foundation model is as follows:

a. We adopt a risk-free rate of 2.75%, based on the yield of 10-year government bonds;

b. We adopt an equity beta of 0.91, which reflects evidence from domestic and international comparators, and adjustments for low-beta bias and book-to-market bias; and

c. We adopt a market risk premium of 7.9%, which reflects the AER's estimate of historical excess returns, the AER's estimate of historical real returns, the AER's estimate using the DGM

[135] That is, the adjustment that we have applied is 25% of the adjustment that would be required to fully offset the estimated book-to-market bias. This weighting has been determined independently of the adjustment for low-beta bias. Different weights are applied to the two adjustments to reflect the strength and consistency of the relevant evidence.

approach, and a conservative estimate from independent expert valuation reports.

178 These parameters jointly produce an estimate of the required return on equity of 9.9%.[136]

[136] 2.75% + 0.91 × 7.9%.

4 Consideration of the AER's cross checks

4.1 Overview

179 In its October and November 2015 decisions, the AER conducts a number of cross checks to determine the reasonableness of its allowed return on equity. In our view, the AER's allowed return on equity fails every one of its own cross checks and this should have led the AER to revisit the parameter estimates used in its implementation of the SL-CAPM. As we demonstrate below, had the AER estimated the equity beta and MRP for its foundation model in the manner proposed in this report, the allowed return on equity would have passed these cross checks.

4.2 Consideration of MRP estimates derived using historical real returns

180 As noted above, the historical real returns (Wright) approach is a method for estimating the MRP that is based on the mean of real returns on the market portfolio. In its Guideline materials and subsequent draft, preliminary and final decisions, the AER has indicated that the historical real returns approach (referred to as the Wright approach by the AER) produces relevant evidence and that it will have some regard to that evidence. However, the AER does not use the historical real returns approach to inform its estimate of the MRP, but rather uses it as a cross-check on its final estimate of the allowed return on equity.

181 In Step 3 of its estimation approach in the October and November 2015 decisions, the AER concludes that the appropriate equity beta is 0.7 and the appropriate MRP is 6.5%. This leads the AER to set the allowed return on equity to 7.3%.[137] In Step 4 of its approach, the AER considers what the return on equity would be if it had used the historical real returns approach (rather than the approach it actually used) to estimate the MRP. The AER concludes that using its:

> …beta point estimate, the return on equity estimates fall within a range of 7.8 to 9.7 per cent.[138]

182 That is, the AER's calculations suggest that if the historical real returns approach is used to estimate the MRP, the estimate of the required return on equity will be materially above its allowed return of 7.3%.

183 However, in Step 4 of its estimation approach, the AER reintroduces an equity beta range of 0.4 to 0.7 for the sole purpose of evaluating the historical real returns approach. The only way the AER can obtain a range for the historical real returns approach that includes its proposed allowed return on equity is to combine the

[137] JEN Preliminary Decision, p. 3-12.

[138] JEN Preliminary Decision, p. 3-513.

historical real returns estimate of MRP with a beta of 0.4, which the AER has already discarded in the previous step of its estimation process. This enables the AER to conclude that:

> Our foundation model return on equity estimate falls within the range of estimates derived from the Wright approach.[139]

184 However, the historical real returns approach has nothing at all to do with beta – it is used only for estimating the MRP. That is, the Wright approach is nothing more than one of the relevant estimation methods for estimating the MRP. The AER's historical real returns estimate of the MRP is 7.2%[140] to 9.9%,[141] with a mid-point of 8.6%. This can be compared directly with the AER's allowed MRP of 6.5%.

185 Thus, whether one considers the Wright method cross check at the return on equity level or the MRP level, the only reasonable conclusion is that the AER's allowance fails this cross check, as summarised in Table 11 below.

Table 11: AER Wright method cross check

	AER allowance	AER Wright method cross check
Return on equity	7.3%	7.8% to 9.7%
Market risk premium	6.5%	7.2% to 9.9%

Source: JEN Preliminary Decision, p. 3-512-513.

186 In our view, the AER is wrong to conclude that its proposed return on equity passes its Wright method cross check based on a comparison of:

a. The AER's allowed MRP (6.5%) multiplied by the AER's allowed beta (0.7); with

b. The AER's historical real returns estimate of MRP (7.2% to 9.9%) multiplied by an estimate of beta that the AER has already rejected in a previous step of its estimation process (0.4).

187 The outcome of such a comparison is that the AER says that it has had regard to the historical real returns approach, but regard is given to the historical real returns approach in such a manner as to ensure that it cannot have any effect on the allowed return.

188 By contrast, we note that our final estimate of the MRP is 7.8%, which falls within the AER's cross-check range of 7.2% to 9.9%.

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[139] JEN Preliminary Decision, p. 3-138.

[140] 10.0% - 2.76%.

[141] 12.7% - 2.76%.

4.3 Consideration of independent expert estimates of the return on equity

The required return on the market

189 In another return on equity cross-check, the AER compares estimates of the required return on the market from independent expert reports with the allowed return on the market from its approach of adding a fixed 6.5% MRP to the prevailing risk-free rate.

190 All of the AER's estimates include its assumed value of imputation credits. However, it combines *with-imputation* and *ex-imputation* estimates from independent experts to form a combined range. The AER then concludes that this combined range spans (and therefore supports) its own estimates:

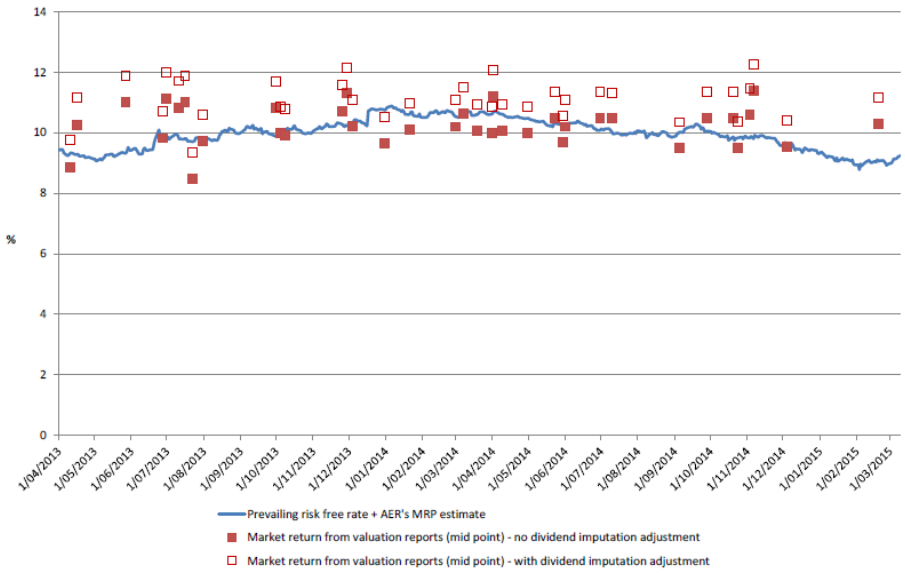
> Overall, the market return estimated by the SLCAPM using the AER's point estimate of the market risk premium is not inconsistent with the market returns estimated in valuation reports. [142]

191 However, the comparison of with-imputation and ex-imputation returns is a clear error. It is equivalent to comparing pre-tax and post-tax returns as though they are like-with-like.

192 The AER's own analysis, reproduced in Figure 13 below, shows that the vast majority of independent expert with-imputation estimates are materially above its own with-imputation estimates. Moreover, these estimates do not reflect certain "uplifts" that independent experts expressly apply to their estimates of the required return on equity. If any part of these uplifts were included, the independent expert estimates would be even further above the AER's allowed return. Thus, the AER's allowed return fails this cross check, especially over the last few years.

142 JEN Preliminary Decision, p. 3-460; 535.

Figure 13: AER comparison of independent expert estimates of the return on equity



Source: JEN Preliminary Decision, Attachment 3, Figure 3-33, p. 3-535.

193 In justifying a comparison to the return on equity estimates that do not include an adjustment for imputation, the AER cites a lack of transparency in valuation reports.[143] The AER is effectively suggesting that the independent experts might have already incorporated an adjustment for imputation into their return on equity estimates, thereby allowing the AER to consider the red points in the figure above. The AER makes this suggestion despite the clear statement from Grant Samuel that it has:

> …never made any adjustment for imputation (in either the cash flows or the discount rate) in any of our 500 plus public valuation reports.[144]

194 The AER then questions whether this statement might imply (a) a belief that investors place no value on franking credits or (b) the value cannot be reliably determined. However, in our view this question is a distraction. The clear message from the 500 plus valuation reports, and from Grant Samuel (2014), is that Grant Samuel is of the view that the required return on equity is best estimated by making no adjustment to the cash flows or the discount rate in relation to imputation credits – that is the relevant evidence.

195 It is also abundantly clear that Grant Samuel has, in fact, made no adjustment in relation to imputation credits: it has set out an ex-imputation estimate of the required return on equity. The independent expert estimate of the ex-imputation required return on equity would need to be adjusted for the assumed value of imputation credits before it would be comparable to the AER's with-imputation estimate.

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[143] JEN Preliminary Decision, p. 3-517.

[144] JEN Preliminary Decision, p. 3-530. Moreover, none of the reports prepared by any of the other independent experts have made any adjustment for imputation.

The required return on equity for the benchmark firm

196 The AER also compares its allowed return on equity with the return on equity adopted in independent expert valuation reports for companies that are comparable to the benchmark efficient entity. The results in Table 12 below show that the AER's allowed return on equity is materially below the return on equity adopted in independent expert reports. That is, the AER's allowed return on equity fails this cross check as well.

Table 12: AER independent expert cross check

	AER allowance	AER independent expert report cross check
Return on equity (total)	7.3%	8.9% to 14.7%
Return on equity (ex-imputation)	N/A	7.5% to 11.5%

Source: JEN Preliminary Decision, p. 3-518.

197 We note that our proposed (with-imputation) return on equity of 9.8% falls squarely within the range that the AER has compiled from independent expert valuation reports.

The required equity risk premium for the benchmark firm

198 The AER also compares its allowed equity risk premium (the product of equity beta and the MRP) with that adopted in independent expert reports. For example, in its JEN Preliminary Decision the AER compares its allowed equity risk premium of 4.55% with a range from independent expert reports of 3.72% to 11.67%.[145]

199 The first point to consider is whether the AER's allowed premium passes this cross check, taking these numbers at their face value. If the independent expert range were divided into 100 segments, the AER's allowed premium would sit at the 10th percentile. That is, the AER's allowed premium is within the range, but towards the very bottom of it.

200 In any event, our view is that the AER's comparison of equity risk premiums is inappropriate. This is because it is common for independent expert valuation reports to make an adjustment to the risk-free rate to redress certain biases in the estimate of the equity risk premium. As one example, in its 2014 independent expert valuation report for Envestra Ltd, Grant Samuel used the CAPM to estimate the required return on equity, arriving at an estimate of 7.8% to 8.4%. This figure was combined with an estimate of the required return on debt to produce a WACC estimate of 5.9% to 6.5%. It is these figures that are used in the AER's cross checks above.

[145] JEN Preliminary Decision, p. 3-518. This is a like-with-like comparison of with-imputation equity risk premiums.

201 However, Grant Samuel states that:

> ..we determined that the calculated rate of 5.9-6.5% was not a realistic overall WACC having regard to rates suggested by the DGM, the repricing of risk in the aftermath of the global financial crisis and other factors.[146]

202 This led Grant Samuel to conclude that:

> …reasonable discount rates (WACC) would fall in the range 6.5-8.0%,[147]

which is uniformly higher than its CAPM estimate.

203 Grant Samuel concluded that:

> This process reflects our approach which is to form an overall judgement as to a reasonable discount rate rather than mechanistically applying a formula. The fact is that, particularly in some market circumstances, the CAPM produces a result that is not commercially realistic. When this occurs it is necessary and appropriate to step away from the methodology and use alternative sources of information to provide insight as to what is, after all, an unobservable number that can only be inferred.[148]

204 In our view, it is clear from this commentary, and from the fact that Grant Samuel use a single point estimate for the required return on debt throughout their report, that the adjustment that Grant Samuel has made is to correct what it considers to be an implausibly low estimate of the required return on equity. In this case, it is possible to derive the adjusted return on equity that would be commensurate with the WACC range of 6.5% to 8.0%. The resulting estimate of the required return on equity is a range of 8.9%[149] to 12.7%.[150] This corresponds to an estimate of the equity risk premium of 4.7% to 8.5%, as summarised in Table 13 below.

Table 13: AER independent expert cross check

	Before correction (not used by Grant Samuel)	After correction (actually used in the Grant Samuel valuation)
Return on equity	7.8% to 8.4%	8.9% to 12.7%
Equity risk premium	3.6% to 4.2%	4.7% to 8.5%

Source: Grant Samuel independent expert report re Envestra Ltd.

205 Table 13 shows that the AER's allowed return on equity of 7.3% is materially lower than even the uncorrected Grant Samuel estimate – and this is exacerbated by the fact that the AER estimate includes an assumed value of imputation credits whereas the Grant Samuel estimate does not. We note that our estimate of the required return on equity is 9.8%, which is close to the mid-point of the corrected Grant Samuel range.

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[146] Grant Samuel (2015 TransGrid), p. 4.

[147] Grant Samuel (2015 TransGrid), p. 4.

[148] Grant Samuel (2015 TransGrid), p. 4.

[149] [6.5% - (4.2%+2.8%)×0.7×0.6]/0.4.

[150] [8.0% - (4.2%+2.8%)×0.7×0.6]/0.4.

206 In relation to the equity risk premium, the AER estimate of 4.55% is materially below the corrected Grant Samuel range – again made worse by the fact that the AER estimate includes its assumed value of imputation credits. We note that our estimate of the equity risk premium is 7.1%, again close to the mid-point of the range actually used by Grant Samuel in its valuation of Envestra.

4.4 Consideration of broker reports

207 In its recent decisions, the AER presents estimates of the required return on equity from broker reports for the four Australian-listed energy network businesses (AusNet Services, Spark Infrastructure, APA Group and DUET Group) as issued by Credit Suisse, JP Morgan, Morgan Stanley and Macquarie Bank. The AER sets out the most recent estimates in its Table 3-63 and the estimates from its April and June 2015 decisions in its Table 3-64. The (with-imputation) broker estimates of the required return on equity are uniformly higher than the AER's (with-imputation) allowed return on equity.

Table 14: AER broker report cross checks

Source	AER allowed return on equity	Broker required return on equity with imputation
AER Table 3-63	7.3%	7.3% to 9.3%
AER Table 3-64	7.1%	7.3% to 12.0%

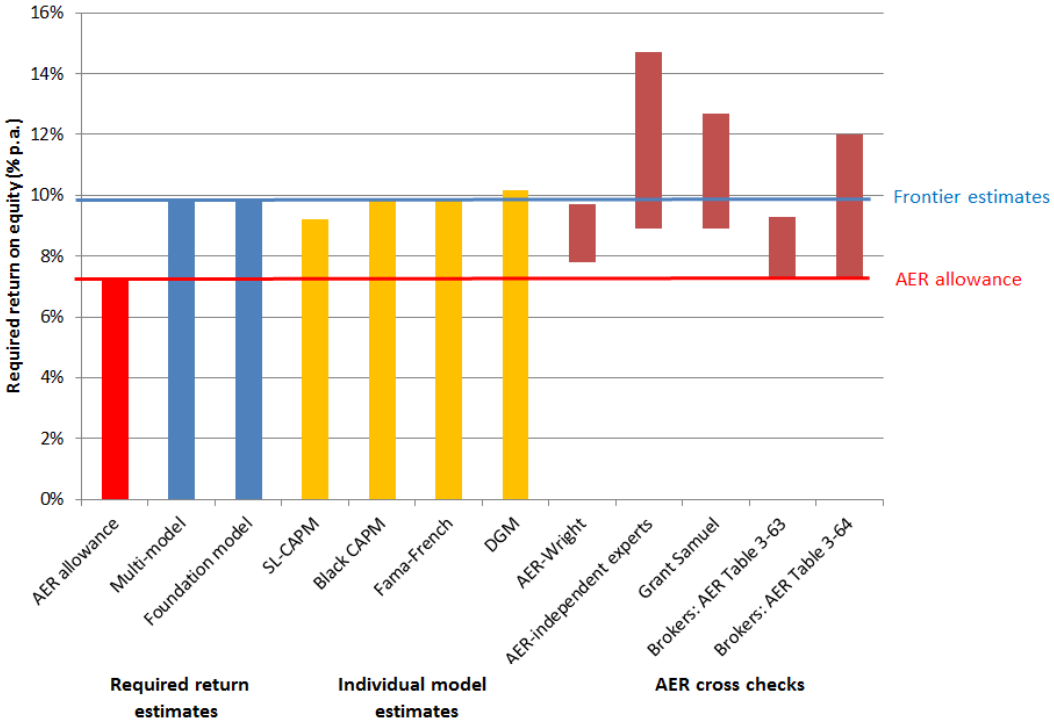
Source: JEN Preliminary Decision, Tables 3-63 and 3-64.

4.5 Conclusions in relation to cross checks

208 In its October and November 2015 decisions, the AER conducted a number of cross checks to determine the reasonableness of its allowed return on equity. In our view, the AER's allowed return on equity fails every one of its own cross checks and this should have led the AER to revisit the parameter estimates used in its implementation of the SL-CAPM.

209 Had the AER estimated the equity beta and MRP in the manner proposed in this report, the allowed return on equity would have passed the cross checks, as illustrated in Figure 14 below. Figure 14 shows that the AER's allowed return on equity of 7.3% is materially below the estimates from all of the individual models. It also falls below the range of all of the AER's cross checks. By contrast, our multi-model and foundation model estimates are consistent with the AER's cross checks.

Figure 14: Comparison of estimates of the required return on equity and AER cross checks



Source: JEN Preliminary Decision, Attachment 3 and Frontier calculations.

5 Declaration

210 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.

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7 Appendix 1: Instructions

Expert Terms of Reference

Estimating the return on equity for the benchmark efficient entity

Jemena Electricity Networks (Vic) Limited
2016-20 Electricity Distribution Price Review

EDPR-5700-0012

Version B – 5 January 2016

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A	Draft	9/11/15	E Grace-Webb		
B	Final	5/1/16	E Grace-Webb	G+T	E Grace-Webb

Contents

1 Background

Jemena Electricity Networks (**JEN**) is an electricity distribution network service provider in Victoria. JEN supplies electricity to approximately 300,000 homes and businesses through its 10,285 kilometres of distribution system. JEN's electricity distribution system services 950 square kilometres of northwest greater Melbourne. JEN's electricity network is maintained by infrastructure management and services company, Jemena Asset Management (**JAM**).

JEN submitted its initial regulatory proposal with supporting information for the consideration of the Australian Energy Regulator (**AER**) on 30 April 2015. This proposal covers the period 2016-2020 (calendar years). The AER published its preliminary determination on 29 October 2015. JEN is currently preparing its submission in response to the preliminary decision, to be submitted to the AER by 6 January 2016.

As with all of its economic regulatory functions and powers, when making the distribution determination to apply to JEN under the National Electricity Rules and National Electricity Law, the AER is required to do so in a manner that will or is likely to contribute to the achievement of the National Electricity Objective, which is:

> *to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:*
>
> *(a) price, quality, safety, reliability and security of supply of electricity; and*
>
> *(b) the reliability, safety and security of the national electricity system.*

The equivalent National Gas Objective is set out in section 23 of the National Gas Law.

Where the AER is making a distribution determination and there are two or more possible decisions that will or are likely to contribute to the achievement of the National Electricity Objective, the AER is required to make the decision that the AER is satisfied will or is likely to contribute to the achievement of the National Electricity Objective to the greatest degree.

The AER must also take into account the revenue and pricing principles in section 7A of the National Electricity Law when exercising its discretion in making those parts of a distribution determination relating to direct control network services. The revenue and pricing principles include the following:

> *A regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs in:*
>
> *(a) providing direct control network services; and*
>
> *(b) complying with a regulatory obligation or requirement or making a regulatory payment.*

The equivalent revenue and pricing principles for gas network regulation are set out in section 24 of the National Gas Law.

Some of the key rules governing the making of a distribution determination are set out below.

Clause 6.4.3(a) of the National Electricity Rules provides that revenue for a regulated service provider is to be calculated adopting a "building block approach". It provides:

> *The annual revenue requirement for a Distribution Network Service Provider for each regulatory year of a regulatory control period must be determined using a building block approach, under which the building blocks are:*
>
> *(1) indexation of the regulatory asset base – see paragraph (b)(1);*
>
> *(2) a return on capital for that year – see paragraph (b)(2);*
>
> *(3) the depreciation for that year – see paragraph (b)(3);*
>
> *(4) the estimated cost of corporate income tax of the Distribution Network Service Provider for that year – see paragraph (b)(4);*
>
> *(5) the revenue increments or decrements (if any) for that year arising from the application of any efficiency benefit sharing scheme, capital expenditure sharing scheme, service target performance incentive scheme, demand management and embedded generation connection incentive scheme or small-scale incentive scheme – see subparagraph (b)(5);*
>
> *(6) the other revenue increments or decrements (if any) for that year arising from the application of a control mechanism in the previous regulatory control period – see paragraph (b)(6);*
>
> *(6A) the revenue decrements (if any) for that year arising from the use of assets that provide standard control services to provide certain other services – see subparagraph (b)(6A); and*
>
> *(7) the forecast operating expenditure for that year – see paragraph (b)(7).*

Clause 6.5.2 of the National Electricity Rules, relating to the allowed rate of return, states:

> *Calculation of return on capital*
>
> *(a) The return on capital for each regulatory year must be calculated by applying a rate of return for the relevant Distribution Network Service Provider for that regulatory year that is determined in accordance with this clause 6.5.2 (the allowed rate of return) to the value of the regulatory asset base for the relevant distribution system as at the beginning of that regulatory year (as established in accordance with clause 6.5.1 and schedule 6.2).*
>
> *Allowed rate of return*
>
> *(b) The allowed rate of return is to be determined such that it achieves the allowed rate of return objective.*
>
> *(c) The allowed rate of return objective is that the rate of return for a Distribution Network Service Provider is to be commensurate with the efficient financing costs of a*

benchmark efficient entity with a similar degree of risk as that which applies to the Distribution Network Service Provider in respect of the provision of standard control services (the allowed rate of return objective).

(d) Subject to paragraph (b), the allowed rate of return for a regulatory year must be:

(1) a weighted average of the return on equity for the regulatory control period in which that regulatory year occurs (as estimated under paragraph (f)) and the return on debt for that regulatory year (as estimated under paragraph (h)); and

(2) determined on a nominal vanilla basis that is consistent with the estimate of the value of imputation credits referred to in clause 6.5.3.

(e) 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

(3) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.

Return on equity

(f) The return on equity for a regulatory control period must be estimated such that it contributes to the achievement of the allowed rate of return objective.

(g) In estimating the return on equity under paragraph (f), regard must be had to the prevailing conditions in the market for equity funds.

Return on debt

(h) The return on debt for a regulatory year must be estimated such that it contributes to the achievement of the allowed rate of return objective.

(i) The return on debt may be estimated using a methodology which results in either:

(1) the return on debt for each regulatory year in the regulatory control period being the same; or

(2) the return on debt (and consequently the allowed rate of return) being, or potentially being, different for different regulatory years in the regulatory control period.

(j) Subject to paragraph (h), the methodology adopted to estimate the return on debt may, without limitation, be designed to result in the return on debt reflecting:

(1) the return that would be required by debt investors in a benchmark efficient entity if it raised debt at the time or shortly before the making of the distribution determination for the regulatory control period;

(2) the average return that would have been required by debt investors in a benchmark efficient entity if it raised debt over an historical period prior to the commencement of a regulatory year in the regulatory control period; or

(3) some combination of the returns referred to in subparagraphs (1) and (2).

(k) In estimating the return on debt under paragraph (h), regard must be had to the following factors:

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

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

(3) the incentives that the return on debt may provide in relation to capital expenditure over the regulatory control period, including as to the timing of any capital expenditure; and

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

(l) If the return on debt is to be estimated using a methodology of the type referred to in paragraph (i)(2) then a resulting change to the Distribution Network Service Provider's annual revenue requirement must be effected through the automatic application of a formula that is specified in the distribution determination."

[Subclauses (m)–(q) omitted].

The equivalent National Gas Rules are set out in rule 87.

Clause 6.5.3 of the National Electricity Rules, relating to the estimated cost of corporate income tax, states:

The estimated cost of corporate income tax of a Distribution Network Service Provider for each regulatory year (ETCt) must be estimated in accordance with the following formula:

$$ETCt = (ETIt \times rt)(1 - \gamma)$$

where:

ETIt is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of standard control services if such an entity, rather than the Distribution Network Service Provider, operated the business of the Distribution Network Service Provider, such estimate being determined in accordance with the post-tax revenue model;

rt is the expected statutory income tax rate for that regulatory year as determined by the AER; and

γ is the value of imputation credits.

The equivalent National Gas Rule is in rule 87A.

In its initial proposal, JEN submitted several expert reports from SFG (the **Earlier Reports**) on the appropriate approach to be adopted in estimating the return on equity for the benchmark efficient entity.[1] The AER preliminary decision considered these reports.

In this context, JEN seeks a report from Frontier Economics, as a suitably qualified independent expert (**Expert**), that reviews and, where appropriate, responds to matters raised in the preliminary decision on the return on equity. JEN seeks this report on behalf of itself, ActewAGL Distribution, Ausnet Services, Australian Gas Networks, Citipower, Powercor, and United Energy.

2 Scope of Work

In its preliminary determination, the AER estimated a return on equity of 7.3% for the benchmark efficient entity (**BEE**) using the Sharpe-Lintner Capital Asset Pricing Model (**SLCAPM**) with a 6.5% market risk premium (**MRP**), a 0.7 equity beta, and a 2.76% risk-free rate.

The AER defined the BEE as:

a pure play, regulated energy network business operating within Australia.

The Expert will provide an opinion report that:

Part A – estimate of the return on equity

1. Reviews the AER's concerns as to the use of dividend growth model (**DGM**) estimates to inform the MRP, including that the estimates are (or are likely to be) upwardly biased and that there may be some delay in DGM estimates reflecting changing market conditions. Do you agree with these

[1] *SFG*, 25 February 2015, *The required return on equity for the benchmark efficient entity*; *SFG*, 13 February 2015, *Beta and Black CAPM Asset Pricing Model*; *SFG*, 27 March 2015, *The foundation model approach of the Australian Energy Regulator to estimating the cost of equity*; *SFG*,13 February 2015, *Using the Fama-French model to estimate the required return on equity*; *SFG*, 18 February 2015, *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network*.

concerns and, if so, how do those concerns impact on your opinion on whether, and if so, how DGM estimates should be used to inform the market risk premium?

2. Considers the criticism—that is made in the context of adjusting the SLCAPM for low beta bias and use of the Black CAPM—that it is not clear whether the low beta bias reflects risk and, therefore, it is unclear if any adjustment should be made for the bias. What, if any, is the relevance of risk in this context?

3. Reviews and critically analyses the AER's selection, analysis, and interpretation of conditioning variables.

4. Determines, in the expert's opinion, the best estimate or estimates of the forward-looking MRP, assuming a 10 year term.

5. Considers whether the estimate of the MRP given in response to (4) would be different if the AER's definition of the BEE did not refer to the entity being regulated, but rather an unregulated entity that supplies services of an analogous kind to standard control services.

6. In light of the Expert's opinion on the above matters, and any other matters the Expert considers relevant, and the Earlier Reports, sets out the Expert's best estimate of the required return on equity for the BEE where that return is estimated using:

   (a) the SLCAPM, applied to overcome any bias the expert considers exists in the model; and

   (b) multiple return on equity models, using any models the expert considers are relevant to estimating a return on equity that is commensurate with the efficient financing costs of a BEE with a similar degree of risk as that which applies to a DNSP in respect of the provision of standard control services and which has regard to:

      i. prevailing conditions in the market for equity funds;

      ii. 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

      iii. any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.

7. Compares the estimate or estimates from (6) above against other relevant information, including (but not limited to) estimates from:

   (a) broker reports;

   (b) independent expert reports; and

   (c) other relevant return on equity models not used to derive the original estimate.

Part B – interrelationship between the return on equity and gamma

8. Identify the impact on the return on equity estimate or estimates from above of changing gamma from 0.4 to 0.25.

In preparing the report the Expert will:

A. consider any relevant comments raised by the AER and other regulators, and experts engaged by those regulators;

B. use robust methods and data in producing any statistical estimates; and

C. adopt a sample averaging period of the 20 business days to 30 September 2015 for any prevailing estimates.

3 Information to be Considered

The Expert is also expected to consider the following information:

- such information that, in Expert's opinion, should be taken into account to address the questions outlined above;
- relevant literature on estimating the return on equity;
- the AER's Rate of Return Guideline, including explanatory statements and supporting expert material;
- material submitted to the AER as part of its consultation on the Rate of Return Guidelines; and
- previous decisions of the AER, other relevant regulators and the Australian Competition Tribunal on the return on equity and any supporting expert material, including the recent final decisions for Jemena Gas Networks and electricity networks in ACT, NSW, Queensland, South Australia and Tasmania.

4 Deliverables

At the completion of its review the Expert will provide an independent expert report which:

- is of a professional standard capable of being submitted to the AER;
- is prepared in accordance with the Federal Court Practice Note on Expert Witnesses in Proceedings in the Federal Court of Australia (CM 7) set out in Attachment 1, and includes an acknowledgement that the Expert has read the guidelines [2];

[2] Available at: http://www.federalcourt.gov.au/law-and-practice/practice-documents/practice-notes/cm7.

- contains a section summarising the Expert's experience and qualifications, and attaches the Expert's curriculum vitae (preferably in a schedule or annexure);

- identifies any person and their qualifications, who assists the Expert in preparing the report or in carrying out any research or test for the purposes of the report;

- summarises JEN's instructions and attaches these term of reference;

- includes an executive summary which highlights key aspects of the Expert's work and conclusions; and

- (without limiting the points above) carefully sets out the facts that the Expert has assumed in putting together his or her report, as well as identifying any other assumptions made, and the basis for those assumptions.

The Expert's report will include the findings for each of the five parts defined in the scope of works (Section 2).

5 Timetable

The Expert will deliver the final report to Jemena Regulation by **6 January 2016**.

6 Terms of Engagement

The terms on which the Expert will be engaged to provide the requested advice shall be:

- as provided in accordance with the Jemena Regulatory Consultancy Services Panel arrangements applicable to the Expert.

ATTACHMENT 1: FEDERAL COURT PRACTICE NOTE

Practice Note CM 7

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

Commencement

1. This Practice Note commences on 4 June 2013.

Introduction

2. Rule 23.12 of the Federal Court Rules 2011 requires a party to give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).

3. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence[3], and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court[4]

1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.

1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential.

1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

2. The Form of the Expert's Report[5]

2.1 An expert's written report must comply with Rule 23.13 and therefore must

(a) be signed by the expert who prepared the report; and

(b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and

(c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and

(d) identify the questions that the expert was asked to address; and

(e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and

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[3] As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

[4] The "*Ikarian Reefer*" (1993) 20 FSR 563 at 565-566.

[5] Rule 23.13.

(f) set out separately from the factual findings or assumptions each of the expert's opinions; and

(g) set out the reasons for each of the expert's opinions; and

(ga) contain an acknowledgment that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c) above[6]; and

(h) comply with the Practice Note.

2.2 At the end of the report the expert should declare that "[the expert] has *made all the inquiries that* [the expert] *believes are desirable and appropriate and that no matters of significance that* [the expert] *regards as relevant have, to* [the expert's] *knowledge, been withheld from the Court*."

2.3 There should be included in or attached to the report the documents and other materials that the expert has been instructed to consider.

2.4 If, after exchange of reports or at any other stage, an expert witness changes the expert's opinion, having read another expert's report or for any other reason, the change should be communicated as soon as practicable (through the party's lawyers) to each party to whom the expert witness's report has been provided and, when appropriate, to the Court[7].

2.5 If an expert's opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.

2.6 The expert should make it clear if a particular question or issue falls outside the relevant field of expertise.

2.7 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports[8].

3. Experts' Conference

3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

J L B ALLSOP
Chief Justice
4 June 2013

[6] See also *Dasreef Pty Limited v Nawaf Hawchar* [2011] HCA 21.

[7] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565

[8] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565-566. See also Ormrod *"Scientific Evidence in Court"* [1968] Crim LR 240

8 Appendix 2: Curriculum vitae – Professor Stephen Gray

Stephen Gray is Professor of Finance at the University of Queensland Business School and Chairman of Frontier Economics (Australia). He has Honours degrees in Commerce and Law from the University of Queensland and a PhD in financial economics from the Graduate School of Business at Stanford University.

In his university role, he teaches a range of award and executive education courses in financial management, asset valuation, and corporate finance. He has received a number of teaching awards, including a national award for university teaching in the field of business and economics. He has published widely in highly-ranked journals and has received a number of manuscript awards, most notably at the *Journal of Financial Economics*.

Stephen is also an active consultant to industry on issues relating to valuation, cost of capital, and corporate financial strategy. He has acted as a consultant to many of Australia's leading companies, government-owned corporations, and regulatory bodies. His clients include the Independent Pricing and Regulatory Tribunal (IPART), Australian Competition and Consumer Commission (ACCC), Melbourne Water, Qantas, Telstra, Origin Energy, AGL, Foxtel, ENERGEX, Queensland Treasury Corporation, Rio Tinto Alcan and the Australian Securities and Investments Commission (ASIC). Projects include corporate cost of capital reviews, asset valuation, independent valuation of executive stock options, and the assessment of capital structure and financing strategies.

He has also appeared as an independent expert in several court proceedings relating to the valuation of assets and businesses and the quantification of damages.

Key experience

Cost of capital

Energy sector

- **TransGrid (2015) –** Advised the electricity transmission operator in NSW on the appropriateness of the Australian Energy Regulator's (AER's) proposed transitional arrangements before the full introduction of a trailing average approach to setting the cost of debt allowance for regulated networks. The AER recently revised its rate of return methodology. In doing so, the AER announced that it would adopt a trailing average approach to setting cost of debt allowances (similar to the approach used by Ofgem in Great Britain). However, the AER argued that it should phase this approach in to allow businesses sufficient time to align their debt management practices to the new methodology. Frontier prepared a report on behalf of TransGrid explaining the circumstances in which such transitional arrangements would not be appropriate.

- **Australian Energy Markets Commission (AEMC) (2012)** – The regulator (AER) and a group of large energy users (EURCC) proposed changes to the National Electricity Rules and National Gas Rules (Rules). The AEMC, which is the government agency that is responsible for maintaining the Rules, conducted a year-long review and consultation process in relation to the proposed rule changes. Stephen was appointed to advise the AEMC on rate of return issues. His role involved the provision of advice to the AEMC secretariat and board, the preparation of a number of public reports, the co-ordination and chairing of public hearings, and a series of one-on-one meetings with key stakeholders. The process resulted in material changes being made to the Rules, with revised Rules being published in November 2012.

- **Energy Networks Association (2013) –** The National Electricity Rules and National Gas Rules (Rules) require the regulator to publish a series of regulatory guidelines every three years. The Australian Energy Regulator (AER) conducted a year-long process in 2013 that ended with the publication of its first Rate of Return Guideline. Throughout this process, Stephen advised the Energy Networks Association (ENA) on rate of return issues. This involved working with the ENA's Regulatory Affairs Committee, specialist working groups, and legal advisors, preparing expert reports, drafting submissions, and representing the ENA at stakeholder forums.

- **TransGrid (2013) Return on Debt Analysis –** The 2012 changes to the National Electricity Rules included, inter alia, a provision that permitted the allowed return on debt to be set according to a trailing average approach. TransGrid sought an analysis of the effect that such a change would have on the residual cash flows that were available to its shareholders. Stephen developed a Monte Carlo simulation model that generated many scenarios for the possible future evolution of interest rates, incorporating empirical relationships between government bond yields, credit spreads, and inflation. His analysis quantified the extent to which the trailing average approach would better match the actual cost of servicing debt under TransGrid's longstanding debt management approach, thereby reducing the volatility of the cash flow to equity holders.

- **Aurizon Network (2014) Split Cost of Capital Analysis –** In a discussion paper, the Queensland Competition Authority advocated consideration of a split cost of capital regulatory approach. Under the proposed approach the regulator would allow a standard "debt and equity" regulated return on assets during their construction, but a "100% debt" return once the asset had been included in the firm's regulatory asset base. Stephen was retained by Aurizon (operator of a regulated coal rail network). His role was to prepare an expert

report that considered the economic and financial basis for the proposed approach, and which considered the likely consequences of such an approach. After his presentation to the QCA board, the proposal was shelved indefinitely.

- **Energy Networks (2014-15) Regulatory Reviews –** Stephen has prepared expert reports and submissions on behalf of all businesses that are in the current rounds of regulatory resets. These reports cover the whole range of regulatory cost of capital issues. Clients over the last year include ATCO Gas, DBP, ActewAGL, TransGrid, Jemena, United Energy, CitiPower, Powercor, SA Power Networks, Ausgrid, Essential Energy, Endeavour Energy, ENERGEX, and Ergon Energy.

- **Legal and Appeal Work –** Stephen has assisted a number of regulated business, and their legal teams, through merits review and appeal processes. One example is the 2011 *Gamma* case in the Australian Competition Tribunal. That case involved the "gamma" parameter, which quantifies the impact that dividend imputation tax credits have on the cost of capital. The regulator (AER) proposed an estimate that was based on (a) an assumption that was inconsistent with the observed empirical evidence, and (b) a point estimate that was based partly on a paper with questionable reliability and partly on data that was irrelevant to the task at hand. Stephen's role was to prepare a series of expert reports, to assist the legal team to understand the issues in detail, and to attend the hearings to advise as the matter was heard. The end result was that the Tribunal set aside the entire basis for the AER's proposed estimate and directed us to perform a "state of the art" empirical study. Stephen performed the required study and its results were accepted in full by the Tribunal, who set the estimate of gamma on the basis of it.

Water sector

- **Melbourne Water (2015) –** In preparation for the 2016 Victorian price review, Stephen is part of the Frontier team currently advising Melbourne Water on ways in which the rate of return methodology used by the Victorian regulator, the Essential Services Commission (ESC), could be improved, and the likely revenue impact of any methodological changes. At the last (i.e. 2013) price reset, the ESC indicated that it intended to review its rate of return methodology but to date has not done so. By comparison, most other major Australian regulators have revised their methodologies significantly, in part due to recognition of the need to make their estimation approaches more resilient to the effects of global financial crises. A comparison of the methodologies used by different regulators in Australia suggests that the ESC's methodology is out of line with best regulatory practice. Frontier's advice has focused on identifying the areas for improvement, and the development of the economic arguments that would support the case for change.

- **Unity Water, SEQ Water, Gladstone Area Water Board (2013-14) –** Stephen has prepared a series of reports for a number of Queensland water utilities. These reports include (a) a response to the QCA's (Queensland regulator) proposed split cost of capital approach (which has now been shelved indefinitely), and (b) a response to the QCA's proposed cost of capital estimates.

Telecommunications sector

- **NBN Co (2012-13) –** Stephen advised NBN Co on a range of cost of capital issues in relation to their proposed special access undertaking. This work included the drafting of expert reports, meetings with and presentations to various NBN Co committees and working groups, and representing NBN Co in discussions with the regulator (ACCC). Key issues included the length of the proposed access arrangement, the extent to which higher risk during the construction and proof-of-concept phases justified a higher allowed return, and the process by which early year losses might be capitalized into the regulatory asset base.

- **C7 Case (2006-07), Federal Court of Australia**

  The Seven Network brought an action against a number of Australian media and entertainment firms in relation to the abandonment of its cable TV business, C7. Seven alleged that the respondents colluded to prevent C7 from securing the rights to broadcast AFL and NRL matches and that this prevented its C7 business from being economically viable.

  Stephen was retained by a group of respondents including PBL, Telstra, and News Corporation. His role was to address various matters relating the quantification of damages. He prepared several reports, was involved in several discussions with other valuation expert witnesses, and was cross examined in the Federal Court.

  The Court found in favour of the respondents.

Transport sector

- **CBH Group (2015) –** Stephen was part of the Frontier team that developed, on behalf of CBH (a major Australian grain producer and access seeker to rail infrastructure in Western Australia) and its legal counsel, a submission to the Economic Regulation Authority (ERA) of Western Australia on the regulator's approach to estimating WACC. The submission focused on, amongst other issues, the ERA's approach to estimating the market risk premium, the estimation approach to beta, and the way in which the WACC

ought to be used within the negotiate-arbitrate arrangements within the rail access regime.

- **Brockman Mining Australia (2015) –** Stephen was part of the Frontier team that advised Brockman, a potential access seeker to rail infrastructure in Western Australia, on its submission to the Economic Regulation Authority (ERA) of Western Australia in relation to the ERA's approach to WACC under the Railways (Access) Code 2000. Subsequently, the ERA released a Revised Draft Decision on its proposed WACC methodology. Frontier was engaged again by Brockman to help develop its submission to the ERA on the Revised Draft Decision. The submissions focused on the appropriateness of the beta estimates proposed by the ERA, the methodology used to estimate the market risk premium (and consistency between the methodologies used by the ERA in different sectors), the appropriateness of the ERA's credit rating assumption for the benchmark efficient entity (which affects the cost of debt allowance under the ERA's methodology).

- **Brookfield Rail (2014) –** The WA Railways (Access) Code requires railway operators to provide certain information to access seekers to enable them to compute "floor" and "ceiling" prices as defined in the Code. Brookfield provided access seekers with certain information and other relevant information was available from public sources. Stephen prepared an expert report that considered whether the information available to an access seeker, together with specialist assistance from relevant experts, would be sufficient to compute floor and ceiling prices.

- **Brisbane Airport Corporation (2013-14) –** Stephen was engaged by Brisbane Airport Corporation (BAC) to advise on a range of regulatory and cost of capital issues in relation to the development of the airport's new parallel runway (NPR). BAC identified the need for an additional runway to accommodate steadily increasing demand. The development of a new runway required a large capital commitment ($1.5 billion) and would take approximately eight years to complete. BAC proposed that the airlines would contribute to the financing of the NPR during construction – the alternative being the capitalisation of a return on capital expenditure until completion and a sharp spike in landing fees when the NPR become operational. One of the key issues in the negotiations with airlines was the WACC that would be used to determine the return on capital. Stephen's role was twofold. He produced an expert report providing a strong basis for BAC's proposed WACC. He also advised BAC on the likely approach of the ACCC (the regulator in question) should they become involved – the regulatory arrangements provide for the parties to negotiate a commercial outcome and for the regulator to become involved if they are unable to do so. BAC was successful in their negotiations with the relevant airlines and the NPR is now under construction.

- **Abbott Point Coal Terminal (2014) –** Stephen was engaged by a consortium of mining companies in relation to arbitration with Adani, the owner and

operator of the Abbott Point Coal Terminal. The parties had in place a user agreement that was similar to a regulatory-style building block model. Stephen advised on a range of cost of capital and other issues including detailed reports on the cost of debt and the level of corporate costs.

Financial litigation support

- **APLNG (2014-15)**
  The Australia-Pacific LNG (APLNG) project is a joint venture between Origin Energy, ConocoPhillips and Sinopec that involves the extraction of coal seam methane and processing into liquefied natural gas (LNG) for export. The relevant Queensland royalties legislation provides that a 10% royalty is to be levied on the value of the gas at the first point of disposal. Since the project is integrated from end-to-end, there is no arm's length price at the relevant point. Stephen was retained by APLNG to prepare an expert report on the process for determining what the arm's length price at the first point of disposal would be if such a thing existed. This involves estimating the costs, including a fair return on capital, for a hypothetical upstream gas producer and a hypothetical downstream LNG operator, and allocating any excess profit between the parties.

- **CDO Case (2013)**
  This case involved a class action against the Australian distributor of collateralised debt obligations (CDOs) and the international credit ratings agency that assigned credit ratings to them. The CDOs in question were financial products with a payoff that depended on the number of defaults (or "credit events") among a reference set of 150 different corporate bonds issued by companies in different industries and different geographical locations. A typical CDO structure would involve the investor being repaid all of their initial investment plus an attractive rate of interest so long as there were less than say 7 defaults out of the reference set of 150 bonds during the five-year life of the CDO. However, if there were say 11 or more defaults, the investor would lose their entire investment. If the number of defaults was between 7 and 11, the return to the investor would be proportional (e.g., 8 defaults would involve a 25% loss of principal).

  The CDOs in question were created by US investment banks and were distributed in Australia by a large Australian commercial bank. One of the key issues in the case was whether the Australian distributor made proper disclosures about risk to investors, which included individuals, self-managed superannuation funds, and local councils. The CDOs in question were assigned strong investment grade credit ratings by an international ratings agency. The process used to assign those ratings did not properly take into

account the correlation between defaults – the empirical fact that during recessions and financial crises many bonds default at the same time.

Stephen's role was to prepare an expert report that explained to the Court how CDOs were structured, how they operated, and what risks were involved. His report also examined the risk disclosures that were contained in the materials that were provided to potential investors and the process by which the credit rating agency assigned ratings.

- **Wright Prospecting litigation (2012-14)**
  Wright Prospecting Pty Ltd (WPPL) is involved in several legal disputes about the payment of royalty streams in relation to iron ore and coal mining operations. WPPL had assigned various rights and licenses in relation to iron ore mines in WA and coal mines in Queensland to other parties, in return for royalties on the revenues received from the sale of the ore. Stephen's role was to prepare a series of expert reports quantifying the present value of the royalty streams.

- **Public Trustee of QLD v. Octaviar Ltd (2009), Supreme Court of Queensland**
  The Octaviar Group (formerly the MFS Group) is a Gold Coast based group of listed companies with funds management and leisure services businesses. Octaviar was unable to refinance a loan in early 2008 and sought to raise equity via a rights issue as part of a substantial corporate restructure. The stock price fell some 70% on this announcement and Octaviar subsequently sold a 65% interest in its leisure business known as Stella. Octaviar then sought to make arrangements with its creditors, including the Public Trustee, as trustee for note holders.

  Stephen was retained by the Public Trustee. His role was to prepare several reports on (a) whether the companies in the Octaviar Group were insolvent, (b) the date the companies became insolvent, and (c) whether the note holders would be made better or worse off by the proposed arrangement, relative to a liquidation. He was cross examined by four parties with an interest in these proceedings on issues relating to the date of the insolvency.

- **Telstra v. ACCC (2008), Federal Court of Australia**
  Telstra brought an action against the ACCC in relation to access charges that Telstra was allowed to charge its retail competitors for access to its fixed line and broadband networks – arguing that the return on capital allowed by the ACCC was unreasonably low.

Stephen was retained by Telstra. His role was to prepare several reports on the issue of whether the ACCC has been inconsistent in its application of valuation methods – in a way that reduced Telstra's allowed return. He was also involved in several discussions with other valuation expert witnesses, prepared a joint statement of experts, and was cross examined in the Federal Court individually and in a "hot tub" setting.

- **Alcan Northern Territory Alumina Pty Ltd v. Commissioner of Taxes (2006-07), Supreme Court of Northern Territory**
  First Engagement: Consulting Expert

Alcan bought out the equity of its joint venture partner in a combined bauxite mine and alumina refinery in the Northern Territory. The NT Revenue Authority claimed that the transaction was caught by the NT "land rich" provision, under which the transaction would be subject to stamp duty if more than 60% of the consideration was attributable to land assets.

The key economic issue is the apportionment of value between the mine (predominately land assets) and the refinery (substantially intangible assets arising out of intellectual property and expertise).

Stephen was retained by Alcan as consulting experts. Their role was to prepare a range of financial models and analysis to support the view that a substantial portion of the value of the transaction was attributable to non-land assets in the refinery. This involved complex financial modelling and market analysis. A full integrated model was produced, allowing users to select whether they preferred the appellant's or respondent's submission on each input parameter, and automatically re-calculating the land-rich ratio.

Stephen worked closely with Alcan's legal team, Counsel, and various independent experts. Stephen assisted the legal team during the trial and in preparing sections of final submissions.

Second Engagement: Independent Expert

The initial judgment contained findings about certain matters and was sent back to the Commissioner for re-assessment. A dispute arose between the parties about the effect of the judgment. In particular, the value of a primary 10-year lease had to be disaggregated from the value of an option to continue the project.

Stephen was retained by Alcan to produce an expert valuation report that addressed the matters in dispute. Two expert reports were prepared and Stephen was cross-examined on this material. Stephen prepared an easy to use spreadsheet calculator to assist the Court in testing how different input assumptions (where the experts could not agree) affected the bottom line. This was used by His Honour as an *aide memoire* and was considered to be particularly helpful in the case in terms of simplifying the effects of a number of complex matters.

Judgment was in favour of Alcan. Stephen's evidence was accepted and endorsed by the Court.

Career: Professional

2014-Present	Chair, Frontier Economics
1997-2014	Director, SFG Consulting

Career: Academic

2000 - Present	Professor of Finance, UQ Business School, University of Queensland
1997-1999	Associate Professor of Finance, UQ Business School, University of Queensland
1997-2001	Research Associate Professor of Finance, Fuqua School of Business, Duke University
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