The required return on equity for the benchmark efficient entity

Report for Ausgrid, Endeavour Energy and Essential Energy

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SFG CONSULTING

Level 1, South Bank House
Cnr. Ernest and Little Stanley St
South Bank, QLD 4101

PO Box 29
South Bank, QLD 4101

Email: s.gray@sfgconsulting.com.au
Office: +61 7 3844 0684
Phone: +61 419 752 260

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1. Executive summary

Context

SFG Consulting has been retained by a number of energy distribution businesses[1] to comment on a range of issues relating to the cost of equity in recent draft decisions published by the Australian Energy Regulator (AER).

Preparation of this report

1. This report has been authored by Professor Stephen Gray and Dr Jason Hall.

2. Stephen Gray is Professor of Finance at the UQ Business School, University of Queensland and Director of SFG Consulting, 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.

3. Jason Hall is Lecturer in Finance at the Ross School of Business, The University of Michigan and Director of SFG Consulting. He has an Honours degree in Commerce and a PhD in finance from The University of Queensland. He teaches graduate level courses with a focus on valuation, has published 15 research papers in academic journals and has 17 years practical experience in valuation and corporate finance.

4. Our opinions set out in this report are based on the specialist knowledge acquired from our training and experience set out above.

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

6. Copies of our curriculum vitas are attached as an appendix to this report.

Primary conclusions

Consideration of relevant models

7. Under the previous versions of the National Electricity Rules and National Gas Rules (**Rules**), the AER's approach was to determine the allowed return on equity by inserting three parameter estimates into the Sharpe-Lintner CAPM[2] formula and adopting the output. Under the new Rules, the AER has again inserted three parameter estimates into the Sharpe-Lintner CAPM formula and has adopted the output as the allowed return on equity.[3] Under the new Rules, the AER has recognised that the Black CAPM[4], Fama-French three-factor[5] (**Fama-French**), and dividend growth models are all

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[1] The businesses are Ausgrid, Endeavour Energy, and Essential Energy.
[2] Sharpe (1964) and Lintner (1965).
[3] Although the AER states that it has had regard to other models when estimating the parameters of the Sharpe-Lintner CAPM, it has adopted the same 6.5% estimate of MRP and the same 0.4 to 0.7 range for beta as in its 2009 WACC Review under the previous Rules.
[4] Black (1972).
[5] Fama and French (1993).

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"relevant models," but it does not even proceed to the stage of estimating the required return on equity from any model other than the Sharpe-Lintner CAPM.

8. For the reasons set out in this report, we consider that estimates of the required return on equity from other models would provide relevant evidence and should have been considered.

9. We also consider that the primary reasons that the AER has provided for rejecting models (in the sense that it determines the allowed return on equity by inserting three parameter estimates into the Sharpe-Lintner CAPM formula) do not support the conclusion that the Sharpe-Lintner CAPM should be estimated to the exclusion of all other models. In this report, we respond to each of the reasons set out in the AER's cost of capital Attachment 3 of the draft decision for Jemena Gas Networks (**JGN**), which is almost identical to the equivalent attachments included with the recent draft decisions for ActewAGL, Ausgrid, Endeavour Energy, and Essential Energy.[6]

Consideration of relevant evidence

10. In its recent draft decisions the AER does not estimate any model other than the Sharpe-Lintner CAPM for the purpose of estimating the required return on equity for the benchmark efficient entity. Under this approach, the only task required of the AER is to produce estimates of each of the three Sharpe-Lintner CAPM parameters. To do this, the AER develops the notion of "primary" and "secondary" evidence. The Rules now specify that the regulator must have regard to all of the relevant evidence, but they do not specify *how* the regulator must have regard to that relevant evidence. The AER's approach is to define some of the relevant evidence as being primary evidence and to relegate other relevant evidence to the secondary category.

11. The evidence that the AER now adopts as its "primary evidence" is the same evidence that the AER used under the previous Rules, as summarised in Table 1 below.

12. The AER then comes to the secondary class of relevant evidence that it must have regard to under the new Rules. However, the AER "has regard to" the secondary evidence in such a way that it has no material effect on the primary parameter estimates. That is, the primary estimates (that are based on the same subset of relevant evidence that would have been used under the previous Rules) are preserved intact after having regard to the secondary evidence.

13. The way the AER has regard to the secondary evidence effectively guarantees that it will have no effect. That is, the estimation process neuters all but the AER's favoured subset of "primary" evidence – effectively producing the same outcome that would have been obtained under the previous Rules.

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[6] JGN Draft Decision, Attachment 3, pp. 76-77. Throughout this report we cite references to the JGN Draft Decision. The AER adopts identical or similar wording in its other recent draft decisions.

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Table 1
AER Sharpe-Lintner CAPM parameter estimation methods

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.	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 normal market conditions.
	The AER states that some weight is given to dividend discount model analysis and survey evidence.	The AER states that some weight is given to dividend discount model 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 normal market conditions and a range appropriate for current market conditions.
	The final MRP estimate is **6.5%**.	The final MRP estimate is **6.5% which is the upper bound of the range for MRP in normal market conditions.**

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

Conclusions

14. We note that the AER's recent draft decisions have not led us to change our views on how the relevant evidence should be distilled into an estimate of the required return on equity for the benchmark efficient entity. In our view the most reliable estimate of the cost of equity for a benchmark energy network will result from consideration of cost of equity estimates from a number of models, with parameters estimated using large datasets.

15. In reaching our conclusions we apply specific weights to the cost of equity estimates from these models. These weights reflect our assessment of the relative reliability of each cost of capital estimate. We do not disagree that judgement is required to arrive at a set of weights. Our point is that applying judgement to determine a weighted average cost of equity estimate is a transparent means of applying judgement, and leads to all relevant evidence having an impact on the conclusion. In contrast, the sequential manner in which the AER applies judgement to reach a conclusion means that evidence categorised as secondary evidence has almost no bearing on the conclusion.

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2. Having regard to the relevant evidence

The role of the allowed return on equity

16. Under the Australian regulatory framework, allowed revenues are set using a building block approach, which is designed to calculate the required regulated revenues over the relevant regulatory period. Specifically, revenues are set at a level to provide an allowance for:

    a) Efficient operating costs;

    b) Taxes;

    c) Efficient depreciation (return of capital);

    d) Interest (return on debt capital);

    e) A return on equity capital; and

    f) Incentive mechanisms (e.g., efficiency sharing mechanisms such as the EBSS).

17. The Rules provide that the allowed return on equity is designed to provide a fair return to the providers of equity capital, commensurate with the risk of owning shares in a benchmark efficient firm with a similar degree of risk to that which applies to the relevant service provider for which regulatory revenue requirements are being determined. Combined with the return on debt, it should provide for a rate of return that is commensurate with the efficient financing costs that the benchmark efficient entity would incur over the relevant regulatory period.[7]

18. Some guidance on how the allowed return on equity should be determined is provided in the National Electricity Objective (**NEO**), National Gas Objective (**NGO**) and the Revenue and Pricing Principles (**RPP**). For example, a key part of the NEO is to:

    > promote efficient investment in…electricity services…for the long term interests of consumers."[8]

19. An allowed return on equity that is materially above (below) the efficient financing costs of the benchmark efficient entity will create incentives for over (under) investment, neither of which are in the long-term interests of consumers.

20. Similarly, the RPP require that:

    > A regulated network service provider should be provided with a reasonable opportunity to recover at least the efficient costs the operator incurs in providing direct control network services and complying with a regulatory obligation or requirement or making a regulatory payment[9]

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[7] NER 6.5.2(f) / 6A.6.2(f); NGR rule 87(6).
[8] National Electricity Law, s. 7. An equivalent statement is made in the National Gas Law, s. 23.
[9] National Electricity Law, s. 7A(2). An equivalent statement is made in the National Gas Law, s. 24.

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and that:

> …regard should be had to the economic costs and risks of the potential for under and over investment, [10]

and:

> A price or charge for the provision of a direct control network service should allow for a return commensurate with the regulatory and commercial risks involved in providing the direct control network service to which that price or charge relates.[11]

21. It is difficult to see how these principles can be complied with if the allowed return does not properly reflect the efficient financing costs of the benchmark efficient entity.

Recent AEMC Rule changes

22. Under the previous NGR, the Australian Competition Tribunal held that if a regulator or regulated business (a) was using a well-accepted financial model such as the CAPM, and (b) had a reasonable basis for each of its parameter estimates, then it must automatically be the case that the resulting estimate of the required return on equity was reasonable and commensurate with the prevailing conditions in the market.[12] That position was the primary driver for the 2012 return on equity rule change made by the Australian Energy Market Commission (**AEMC**).[13]

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

> The Commission considered that this conclusion presupposes the ability of a single model, by itself, to achieve all that is required by the objective. The Commission is of the view that any relevant evidence on estimation methods, including that from a range of financial models, should be considered to determine whether the overall rate of return objective is satisfied.[14]

24. The AEMC went on to state that:

> The Commission considered that no one method can be relied upon in isolation to estimate an allowed return on capital that best reflects benchmark efficient financing costs [15]

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[10] National Electricity Law, s. 7A(6). An equivalent statement is made in the National Gas Law, s. 24(6).
[11] National Electricity Law, s. 7A(5). An equivalent statement is made in the National Gas Law, s. 24(5).
[12] *Application by WA Gas Networks Pty Ltd (No 3)* [2012] ACompT 12; *Application by DBNGP (WA) Transmission Pty Ltd (No 3)* [2012] ACompT 14.
[13] AEMC Final Determination, p. 48.
[14] AEMC Final Determination, p. 48.
[15] AEMC Final Determination, p. 49.

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25. 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 NGO, NEO and RPP:

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[16]

26. That is, the AEMC has concluded that the NEO, NGO and RPP require the regulator to produce the best possible estimate of the required return on equity,[17] which in turn requires the consideration of a range of financial models.

27. The new Rules require that regard must be had to:

> relevant estimation methods, financial models, market data and other evidence.[18]

and that the allowed rate of return must achieve the **allowed rate of return objective**:

> 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.[19]

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

> the prevailing conditions in the market for equity funds.[20]

29. In summary, our understanding of the Rules, informed by the AEMC Determination, is that when estimating the required return on equity:

a) A range of models should be employed – to meet the allowed rate of return objective, and to ensure that the estimate best meets the NEO, NGO and the RPP;

b) All relevant estimation methods, financial models, market data and other evidence should be considered; and

c) Regard must be had to the prevailing conditions in the market, including contemporaneous data and estimation methods that reflect prevailing conditions rather than average historical conditions.

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[16] AEMC Final Determination, p. 43.
[17] The required return on equity is a key component of the efficient financing costs.
[18] NER 6.5.2(e)(1) and 6A.6.2(e)(1); NGR rule 87(5)(a).
[19] NER 6.5.2(c) and 6A.6.2(c); NGR rule 87(3).
[20] NER 6.5.2(g) and 6A.6.2(g); NGR rule 87(7).

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The AER's approach under the previous Rules

30. Under the previous Rules, the AER estimated the required return on equity using the Sharpe-Lintner CAPM exclusively and a favoured subset of the relevant evidence to estimate each of the three parameters. For example, in its 2009 WACC Review Final Decision, the AER stated that:

   a) The review was being conducted under the assumption that the Sharpe-Lintner CAPM would be used as the sole model for determining the required return on equity. In this case, the purpose of the review was to estimate the parameters of the Sharpe-Lintner CAPM and not to consider other models. Indeed, the previous National Electricity Rules mandated the use of the Sharpe-Lintner CAPM. [21]

   b) The risk-free rate would be estimated as the contemporaneous yield on 10-year government bonds. [22]

   c) The equity beta would be estimated using regression analysis applied to a set of domestic comparators and concluded that the domestic evidence supported a range for the equity beta of 0.41 to 0.68.[23] The AER stated that it placed a limited amount of weight on evidence from foreign comparators:

      > the AER continues to place a limited amount of weight upon the United States equity beta estimates (i.e treating the estimates as a check on the adopted beta estimate). [24]

      The AER did not report an estimate or range in relation to the overseas evidence and did not revise the 0.41 to 0.68 range in relation to it. The AER then selected a final equity beta estimate from outside its 0.41 to 0.68 range on the basis of regulatory stability and the asymmetry of the risks of over- and under-investment:

      > Market data suggests a value lower than 0.8. However, the AER has given consideration to other factors, such as the need to achieve an outcome that is consistent with the NEO (in particular the need for the efficient investment in electricity services for the long term interests of consumers of electricity), the revenue and pricing principles (in particular providing the service providers with a reasonable opportunity to recover at least efficient costs, providing service providers with efficient incentives for efficient investment, and having regard to the economic costs and risks of the potential for under and over investment), the importance of regulatory stability. Having taken a broad view, the AER considers the value of 0.8 is appropriate. [25]

   d) The market risk premium would be estimated using the Ibbotson approach (mean of historical excess stock returns), dividend growth model and surveys, with most weight applied to the Ibbotson approach:

      > In assessing the MRP, the AER had regard to historical estimates, cash flow measures using variants of the dividend growth model (DGM), and surveys of market practitioners.

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[21] AER 2009 WACC Review Final Decision, p. ii, 2.
[22] AER 2009 WACC Review Final Decision, Table A.1, p. v.
[23] AER 2009 WACC Review Final Decision, p. iv.
[24] AER 2009 WACC Review Final Decision, p. 264.
[25] AER 2009 WACC Review Final Decision, p. xvii.

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> Consistent with past regulatory practice, rather than placing sole weight on any particular measure of the MRP, the AER had regard to each measure, tempered by an understanding of the strengths and weaknesses of each measure. This led to the AER placing primary weight on historical estimates, but also having regard to cash flow measures and surveys. [26]

31. We note that, under the previous Rules, the AER applied the same approach to gas and electricity even though more flexibility was available under the NGR.

The AER's approach under the new Rules

32. During the AEMC's rule change process, the AER submitted that both the Gas and Electricity Rules should require that the allowed return on equity must be estimated using nothing other than the Sharpe-Lintner CAPM:

> The AER proposes that the NGR require that the cost of equity be calculated using the CAPM (similar to the current provisions in the NER) [27]

on the basis that:

> It appears unlikely that there would be a justifiable departure from the CAPM over the medium to long term. [28]

33. However, as set out above, the AEMC took a very different view and in fact moved in the opposite direction. The AEMC was clearly concerned about the ability of the Sharpe-Lintner CAPM (as implemented by the AER) to produce sensible estimates of the required return on equity in all market conditions. For example, the AER's implementation of the Sharpe-Lintner CAPM suggested that the peak of the GFC resulted in a *fall* in the cost of equity capital – as a consequence of the precipitous fall in government bond yields. This led the AEMC to require that regulators must now have regard to all relevant estimation methods, financial models, market data and other evidence in both electricity determinations and gas reviews,[29] not just selective subsets of the evidence.

34. The AER's approach under the new Rules is to continue to estimate the required return on equity using the Sharpe-Lintner CAPM exclusively. The AER describes the Sharpe-Lintner CAPM as the *foundation* model, but it is in fact the *only* model that it uses to estimate the required return on equity. No other model for the required return on equity is estimated – the allowed return on equity is computed by inserting point estimates for the risk-free rate, beta and MRP into the Sharpe-Lintner formula. The resulting point estimate of the required return on equity is then adopted as the allowed return on equity.

35. The AER persists with its exclusive reliance on the Sharpe-Lintner CAPM as the only model for estimating the required return on equity for the benchmark efficient entity by concluding that no other relevant financial model is sufficiently reliable to even warrant estimation. The AER concludes

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[26] AER 2009 WACC Review Final Decision, p. 177.
[27] AER's proposed changes to the rate of return provisions of the NGR, p. 11.
[28] AER's proposed changes to the rate of return provisions of the NGR, p. 11.
[29] For example, see NGR 87(2)(5); NER 6.5.2(e)(1); NER 6A.6.2(e)(1).

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that the Black CAPM[30], Fama-French model and dividend discount models are all relevant models for estimating the required return on equity for the benchmark efficient firm, but that none of them should even be estimated. We consider the reasons that the AER presents for this conclusion in Section 3 of this report.

36. The AER also effectively continues to estimate each of the three Sharpe-Lintner CAPM parameters in the same way as under the previous Rules. It does this by classifying the evidence that it has previously relied on as "primary" evidence and relegating the other relevant evidence to be secondary or to be suitable only for the purpose of a final cross-check. In relation to beta, the AER uses the same small primary data set of domestic comparators and concludes that the range of 0.4 to 0.7 remains unchanged. In relation to MRP, the AER states that it continues to use an approach that is "similar"[31] to that adopted under the previous Rules.

37. Moreover, in its recent draft decisions, the AER adopts the approach of grouping pieces of secondary evidence together without any regard to the differential quality of those pieces of evidence, stating that the combined group of secondary evidence supports a wide range that includes the primary evidence, and then concluding that the secondary evidence is not inconsistent with its conclusions from the primary evidence. We provide a number of examples of this approach in Sections 3 and 4 of this report.

The AER's continued reliance on the Sharpe-Lintner CAPM and the AER's implementation of the Sharpe-Lintner CAPM

38. In its recent draft decisions, the AER provides the following justification for its continued use of the Sharpe-Lintner CAPM:

> We consider the regime has been highly supportive of investment and the NSPs we regulate appear to have raised capital to support their investment programs. This suggests the continued use of the SLCAPM in our framework would be expected to be consistent with achieving the allowed rate of return objective and will continue to support efficient investment and use of regulated infrastructure. [32]

39. In our view, this comment encapsulates the AER's misunderstanding of what the AEMC is trying to achieve with its fundamental changes to the Rules. What led the AEMC to revise the Rules is the failure of the Sharpe-Lintner CAPM, in the manner implemented by the AER, to produce reasonable estimates in non-normal market conditions – such as a global financial crisis or risk-free rates that are at unprecedented lows. In this regard, 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.[33]

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[30] With respect to the Black CAPM, the AER states that it relies upon the theory of the Black CAPM in order to inform its estimate of beta of 0.7, from within a range of 0.4 to 0.7. However, the AER does not make a clear statement as to what the beta estimate would be with, and without, consideration of the Black CAPM. So there is no clarity regarding the AER's reliance on the Black CAPM. In addition, there is a logical flaw in the notion that the Black CAPM can be used to quantify an adjustment to the beta estimate, but cannot be used to estimate the cost of equity.

[31] JGN Draft Decision, Attachment 3, pp. 76-77. Throughout this report we cite references to the JGN Draft Decision. The AER adopts identical or similar wording in its other recent draft decisions.

[32] JGN Draft Decision, Attachment 3, p. 50.

[33] AEMC Final Determination, p. 40.

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40. There are two reasons why the AER's approach to estimating the allowed return on equity leads to an under-estimate of the allowed return on equity in current market conditions.

   a) The AER adopts a model that does not fully account for factors that are associated with stock returns. The AER's use of the Sharpe-Lintner CAPM, without giving consideration to the Fama-French model, means that it places sole reliance on a model that has been shown to have less ability to explain stock returns.

   b) The AER implements its preferred model in a manner that places undue emphasis on particular sources of data. The AER places high reliance on the historical difference between market returns and government bond yields (that is, historical excess returns) which leads to the cost of equity being under-stated at present, with government bond yields being at historic lows. In addition, the AER places undue weight on beta estimates formed on the basis of regressions of stock returns on market returns for Australian-listed stocks. The result is an upper bound to the beta estimate that does not account for all relevant evidence.

41. So there are two problems to address – model selection and model implementation. The rule change of the AEMC was designed to address both of these problems. The rule change provided the AER with the flexibility to make inferences from all relevant models. And the rule change required the AER to have regard to all relevant evidence in selecting parameter inputs into those models. The undue weight placed upon historical excess returns by the AER (documented elsewhere in this report) is an important reason why the AER's process will be useful in *prevailing* conditions and not just average market conditions. In its Final Determination, the AEMC refers to the need to have regard to the prevailing conditions no fewer than 15 times.

Balance of report

42. In the remainder of this report, we consider the AER's reasons for its "continued use of the Sharpe-Lintner CAPM"[34] and for its continued use of the same estimation methods and data sources as its primary evidence. In particular, in Section 3 we consider the AER's reasons for rejecting all financial models other than the Sharpe-Lintner CAPM for the purpose of estimating the required return on equity for the benchmark efficient entity. In Section 4 we consider the estimation of the parameters for the Sharpe-Lintner CAPM. We specifically consider the AER's approach of allocating relevant evidence to "primary" and "other" categories and we demonstrate how non-primary evidence has no realistic opportunity of having any material effect.

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[34] JGN Draft Decision, Attachment 3, p. 50.

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3. The AER's rejection of all other financial models

The AER uses the Sharpe-Lintner CAPM to the exclusion of all other models

43. In its Guideline and its recent draft decisions, the AER determines the allowed return on equity by inserting its estimates of:

    a) The risk-free rate;

    b) The equity beta; and

    c) The market risk premium

    into the Sharpe-Lintner CAPM formula.

44. The output from the Sharpe-Lintner CAPM formula is then adopted as the allowed return on equity.

45. A number of stakeholders have proposed, and the AER has accepted, that three other models for estimating the required return on equity are relevant:

    a) The Black CAPM (or "empirical CAPM" as it is known in US regulation cases);

    b) The Fama-French model; and

    c) The dividend discount model (or "industry dividend growth model" in the AER's terminology).

46. The AER does not use any of these models to provide an estimate of the required return on equity for the benchmark efficient entity at any point in its estimation process.

47. Rather, the AER produces a single point estimate for the required return on equity – produced by inserting its three parameter estimates into the Sharpe-Lintner CAPM. This single point estimate for the required return on equity of the benchmark efficient entity is never compared with or assessed against an estimate from the Black CAPM, Fama-French model, or dividend discount model. The point estimate from inserting its three parameter estimates into the Sharpe-Lintner CAPM is adopted as the allowed return on equity.

48. In the remainder of this section, we consider the primary reasons for the AER's rejection of the three other relevant models for estimating the required return on equity.

The Black CAPM

49. The AER has decided that it will not use the Black CAPM to estimate the required return on equity for the benchmark efficient firm. Instead, it will use the "theoretical principles underpinning the Black CAPM"[35] to inform the estimate of one of the parameters (equity beta) that is required for a different model (the Sharpe-Lintner model).

50. We consider this issue at length in our companion report, SFG (2015 Beta). Our conclusion is that if a model is relevant it should be estimated. The estimate from that model can then be compared with

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[35] JGN Draft Decision, Attachment 3, p. 265.

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the estimates from other relevant models. All of the relevant estimates can then be compared and weighted according to the relative strengths and weaknesses of each.

51. We do not see how it is possible to have proper regard to a relevant model by not estimating it and instead using the theoretical principles underpinning it to adjust the estimate of a parameter in a different model. Moreover, the AER provides no information about the extent to which its consideration of the theoretical underpinnings of the Black model have affected its estimate of the equity beta in the Sharpe-Lintner model (if at all), so it is impossible to determine whether the AER has had appropriate regard to the Black CAPM evidence.

52. We note that the AER's primary reason for not estimating the Black CAPM is its concern about the estimation of the zero-beta premium parameter. In this regard, the AER states that it considers the SFG (2014 Black) estimate to be plausible, but does not adopt it due to the existence of other estimates (using different approaches) that the AER considers to be implausible.[36] In our companion report, SFG (2015 Beta), we show that the "plausible" estimate of the Black CAPM produces estimates of the required return on equity for the benchmark efficient entity that are uniformly higher than the AER's allowed return.

53. We present our Black CAPM estimates of the required return on equity of the benchmark efficient entity in Section 5 of this report.

The Fama-French model

54. In its recent draft decisions, the AER states that it considers the Fama-French model to be a relevant financial model, but that it will not use that model for any purpose in any part of its regulatory process. Thus, the AER has concluded that giving any consideration to the Fama-French model would produce an inferior estimate of the required return on equity for the benchmark efficient entity, relative to an estimate that gives no consideration to the Fama-French model. Consequently, the AER does not even proceed to the point of considering estimates of the Fama-French model. That is, the AER concludes that estimating the Fama-French model and giving any consideration to that estimate would contaminate the estimate of the required return on equity that is produced by its Sharpe-Lintner CAPM foundation model.

55. We consider this issue at length in our companion report, SFG (2015 FFM). As for the Black CAPM above, our conclusion is that if a model is relevant it should be estimated. The estimate from that model can then be compared with the estimates from other relevant models. All of the relevant estimates can then be compared and weighted according to the relative strengths and weaknesses of each.

56. Our companion report, SFG (2015 FFM), considers in detail each of the AER's reasons for rejecting the Fama-French model. We conclude that none of these reasons justifies the conclusion that giving any consideration at all to an estimate from the Fama-French model is bound to reduce the quality of the overall estimate of the required return on equity for the benchmark efficient entity.

57. We present our Fama-French estimates of the required return on equity of the benchmark efficient entity in Section 5 of this report.

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[36] JGN Draft Decision, Attachment 3, p. 182.

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The dividend discount model

58. In its recent draft decisions, the AER states that its reasons for disregarding dividend discount models, for the purpose of estimating the required return on equity for the benchmark efficient firm, are as follows:

> …we remain of the view DGM based empirical estimates of the return on equity for our benchmark efficient entity are not suitable for any regulatory use for the following reasons:
>
> • The models are not robust given they are highly sensitive to input assumption in relation to the short term and long term growth rate of dividends. This makes the models highly sensitive to potential error in inputs.
>
> • The models are highly sensitive to changes in the risk free interest rate.
>
> • The models may generate volatile and conflicting results.[37]

59. We address each of the AER's reasons below.

Sensitivity to input assumptions

60. Like all financial models, the dividend discount model requires a number of parameters to be estimated and, like all financial models, the final estimate that is produced is sensitive to the estimates that are inserted for each parameter. However, this does not justify disregarding the dividend discount model from consideration even before it has been estimated.

61. Having determined that the dividend discount model is relevant to the task, our view is that a better approach would be to compute the best possible estimates for the model. The resulting estimate of the required return on equity could then be compared with estimates from other financial models. The AER could then consider the relative strengths and weaknesses of each estimate, including the extent to which each estimate was sensitive to input assumptions/parameter estimates.

62. By way of comparison, in its recent draft decisions, the AER concludes that the reasonable range for beta is 0.4 to 0.7 and that the reasonable range for the MRP is 5.1% to 7.8%. For a risk-free rate of 3.55%, these estimates imply a range for the required return on equity of 5.59%[38] to 9.01%.[39] Thus, according to the AER's own estimates, the Sharpe-Lintner CAPM is also very sensitive to input assumptions. This sensitivity might then be one of the relevant matters in the AER's consideration of the estimates from the financial models that it considers to be relevant.

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[37] JGN Draft Decision, Attachment 3, p. 228.
[38] 3.55+0.4×5.1.
[39] 3.55+0.7×7.8.

Sensitivity to changes in the risk-free rate

63. Dividend discount models produce an estimate of the required return on equity for the firm in question. The approach is to estimate the overall discount rate that equates the current stock value to the present value of expected future dividends. Reasonable specifications of the dividend discount model produce estimates of the overall required return on equity that are more stable than the risk-free rate. That is, these estimates imply a risk premium that tends to partially offset changes in the risk-free rate, so that the estimate of the overall required return does not rise and fall one-for-one with changes in the risk-free rate.

64. That is, the use of dividend discount models tends to *reduce* the sensitivity of the allowed return to changes in risk-free rates relative to the method employed by the AER. Indeed the AER makes this very point itself in its Guideline materials:

> …our implementation of the Sharpe–Lintner CAPM will result in estimates of the return on equity that may vary over time. Alternatively, 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.[40]

Models may generate volatile and conflicting results

65. In the regulatory setting, various stakeholders have proposed a range of different specifications of dividend discount models for the benchmark efficient entity. Some of these specifications are sensible and internally consistent and produce relatively stable estimates over time and plausible relativities between industries. Other specifications are internally inconsistent, some specifications produce volatile estimates over time, and some specifications produce implausible relativities between industries.

66. For example, SFG (2014 DDM) note that the industry dividend discount model that was examined by the AER in its Guideline analysis assumes that all firms will grow at the same rate, regardless of whether they reinvest a high or low proportion of their earnings. This specification is clearly nonsensical and inevitably produces the implausible implication that firms with the highest dividend yields uniformly have higher required returns than firms with low dividend yields and non-dividend-paying firms.

67. Logically, the fact that some dividend discount model specifications are internally inconsistent and produce volatile and implausible results is not a reason for rejecting *all* dividend discount models. In our view, each specification should be considered on its own merits. If a particular specification can be shown to be internally inconsistent or to produce implausible results, there would be a basis for disregarding *that* specification. Problems with *one* specification, however, do not provide a valid reason for rejecting *all other* specifications.

68. As a concrete example of this issue, the AER notes that the dividend discount model estimates from the SFG approach vary between 9.5% and 11% over a ten year period, peaking at the time of the GFC, and with required returns for the benchmark entity being uniformly lower than the required

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

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return on the market.[41] This would all seem to be entirely plausible. However, rather than recognising the stability and plausibility of the SFG estimates over time, the AER notes that a different approach, which has not been submitted by SFG or any network business, produces more volatile results. The AER concludes from this that:

> this perception of stability is subjective and we do not agree with it. [42]

The AER's use of preconceived views

69. During the AER's Guideline process, SFG (2013 DDM a) proposed the use of a dividend discount model for the purpose of estimating the required return on equity for the benchmark efficient firm. SFG (2013 DDM b) showed that the SFG version of the industry DDM does not suffer from the key problems that the AER has identified with its own version of the industry DDM. In particular, the AER version of the model embeds the assumption that all firms grow at the same rate irrespective of whether they reinvest a small or large proportion of their earnings. Such an assumption is implausible and unsurprisingly leads to implausible results. By contrast, the SFG approach allows for firms with higher reinvestment rates to have commensurately higher growth rates.

70. The estimates presented in SFG (2014 DDM) were submitted by a number of service providers in the current round of AER reviews. The AER has rejected this evidence, affording it no weight. One of the reasons for the AER's rejection of industry dividend discount models is as follows:

> The very high RoE estimates from SFG's DGM model, equating to an equity beta of 0.94 in the SLCAPM, appear inconsistent with the low risk nature of regulated natural monopoly businesses with very low elasticity of demand for their services, and the results in Professor Olan Henry's 2014 report.[43]

71. In our view, there are a number of fundamental problems with the AER's reasoning set out above:

a) The AER begins its reasoning with the claim that the return on equity estimates from the SFG DDM are "very high," but the AER does not say what this is relative to. The AER presents no basis or explanation for its claim that the return on equity estimates are "very high." The return on equity estimates from the SFG DDM are in fact lower for the benchmark firm than for the average firm – they are equivalent to the use of an equity beta of 0.94 in the Sharpe-Lintner CAPM;

b) The AER proposes that the SFG DDM can be rejected because it produces outcomes that are equivalent to the use of an equity beta of 0.94 which is "inconsistent with the low risk nature of regulated natural monopoly businesses." This seems to suggest that the AER has some preconceived notion of what the equity beta should be, and that any evidence that is inconsistent with this preconceived notion can be rejected for no other reason than that. The equivalent beta of 0.94 implies that the benchmark firm has lower than average equity risk (even though it has double the average level of gearing) – but this is apparently not commensurate with the AER's preconceived views about the risk of regulated natural monopoly businesses.

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[41] JGN Draft Decision, Attachment 3, Figure 3-18, p. 230.
[42] JGN Draft Decision, Attachment 3, p. 230.
[43] JGN Draft Decision, Attachment 3, p. 230.

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If it is the case that any piece of evidence can be dismissed if it is inconsistent with the AER's preconceived notion of what is reasonable, there would be no point in gathering any evidence at all because the evidence would either support the preconceived position or be dismissed.

c) The AER also proposes that the SFG DDM can be rejected because it produces outcomes that are equivalent to the use of an equity beta of 0.94 which is inconsistent with "the results in Professor Olan Henry's 2014 report."

This is similar to the previous point. If any evidence that is inconsistent with the Henry beta estimates is to be dismissed for the reason that it is inconsistent with the Henry estimates, there would appear to be no point in gathering any other evidence.

72. That is, the AER disregards the SFG DDM evidence on the basis that it is inconsistent with the AER's favoured subset of relevant evidence. This approach would appear to be inconsistent with the Rules requirement to have regard to all relevant evidence. Indeed, the whole point of the requirement to have regard to the whole range of relevant evidence is to ensure that parameters are *not* estimated on the basis of only a subset of the relevant evidence. We consider this point in more detail in our companion report, SFG (2015 DDM).

SFG approach

73. Our view is that if a model is relevant it should be estimated. The estimate from that model can then be compared with the estimates from other relevant models. All of the relevant estimates can then be compared and weighted according to the relative strengths and weaknesses of each. This approach is clear, reasoned and transparent. In our view, this approach should be used to produce the best estimate of the required return on equity for the benchmark efficient entity, in preference to a convoluted approach whereby the theoretical principles underpinning one model are used to inform (in an unspecified way) the estimate of one of the parameters that is required for a different model.

The evolution of the AER's approach

74. As set out above, in its recent draft decisions the AER does not estimate any model other than the Sharpe-Lintner CAPM for the purpose of estimating the required return on equity for the benchmark efficient entity. Under this approach, the only task required of the AER is to produce estimates of each of the three Sharpe-Lintner CAPM parameters. To do this, the AER develops the notion of "primary" and "secondary" evidence. The Rules now specify that the regulator must have regard to all of the relevant evidence, but they do not specify *how* the regulator must have regard to that relevant evidence. The AER's approach is to define some of the relevant evidence as being primary evidence and to relegate other relevant evidence to the secondary category.

75. The primary evidence consists of the same subset of evidence that the AER used to estimate the Sharpe-Lintner CAPM parameters under the previous Rules:

    a) The risk-free rate is estimated using the contemporaneous yield on 10-year government bonds;

    b) The equity beta is primarily estimated by applying regression analysis to the set of domestic comparators, with secondary consideration given to international comparators and the theoretical underpinnings of the Black CAPM; and

    c) The market risk premium is estimated with regard primarily to mean historical excess returns (the Ibbotson approach to analysing historical stock returns) with secondary consideration given to the AER's dividend growth model and surveys and conditioning variables.

76. These same primary estimation methods applied to the same data sources produce the same estimates as would have been the case under the previous Rules, as set out in Table 2 below.

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Table 2
AER Sharpe-Lintner CAPM parameter estimation methods

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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**. A point estimate of 0.8 was adopted.	Regression analysis applied to domestic comparators leads to a **range of 0.4 to 0.7**. A point estimate of 0.7 was adopted.
Market risk premium	Primary evidence is the mean of historical excess returns.	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 normal market conditions.
	The AER states that some weight is given to dividend discount model analysis and survey evidence.	The AER states that some weight is given to dividend discount model 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 normal market conditions and a range appropriate for current market conditions.
	The final MRP estimate is **6.5%**.	The final MRP estimate is **6.5%** which is the upper bound of the range for MRP in normal market conditions.

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

The risk-free rate

77. Throughout this report we consider:

   a) A risk-free rate of 3.55% based on the yield on 10-year government bonds at the time of the recent draft decisions (using the AER's indicative averaging period ending in mid-October 2004); and

   b) A risk-free rate of 2.64% based on the average 10-year government bond yield over the month of January 2015.

Equity beta

SFG approach

78. Our overall approach to estimating the cost of equity is to estimate the cost of equity for different models, and have consideration of the cost of equity estimate from each model. So in making our estimate of beta for implementation in the Sharpe-Lintner CAPM we do not account for the empirical result that low beta stocks earn higher returns than predicted by the Sharpe-Lintner CAPM, or that other risk factors explain stock returns. These latter considerations are accounted for in our use of the Black CAPM, Fama-French model and dividend discount model. So our equity beta estimate in the Sharpe-Lintner CAPM is made by regressing stock returns on market returns for a large sample of Australian- and U.S.-listed stocks.

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79. The AER applies a complex multi-stage approach for estimating beta in which different subsets of relevant evidence are used in different ways in different stages of the estimation approach.

80. The AER begins by defining the set of domestic comparators to be its primary evidence. This set consists of four listed firms and five firms that were previously listed on the ASX. By the end of the current Guideline period, three of those firms will have been delisted for over 10 years. The AER directed Henry (2014) to estimate betas for these nine domestic firms and Henry concluded that the evidence supported a range of 0.3 to 0.8.[44] In its Guideline the AER rejected that advice and adopted a range of 0.4 to 0.7.[45]

81. The AER also states that evidence from international comparators and evidence from the Black CAPM is also relevant to the estimation of equity beta. For the reasons set out in our companion report, SFG (2015 Beta), we consider that both of these sources of evidence support equity beta estimates above 0.7. However, at no stage of its estimation process does the AER ever estimate what estimate of beta would be supported by either of these pieces of relevant evidence.

82. In relation to the international comparators, the AER sets out a list of estimates from different sources and concludes that the range of estimates spans 0.7. The AER gives no consideration to the possibility that different estimates may be of different quality and reliability. For example, the AER does not consider that one of the estimates that it reports was dismissed by the consultant that compiled it and by the regulator that commissioned it – in favour of an estimate above 0.9.

83. In relation to the Black CAPM, the AER performs no calculations, but states that it has used the theoretical principles underpinning the Black model to inform its estimate of equity beta for the Sharpe-Lintner model.[46] The AER does not explain (a) how one goes about using the theoretical underpinnings of one model to adjust a parameter estimate for another model or (b) the magnitude of the adjustment (if any) that was made.

84. The AER concludes that the evidence from the international comparators and the Black CAPM jointly supports an estimate at the top of the primary range – 0.7. This illustrates the importance of the specification of the top end of the primary range in the AER's estimation process. That upper bound caps the AER's beta estimate. Regardless of how much "secondary" evidence there is to support a beta estimate materially higher than the upper bound, the final beta estimate can be no higher than the upper bound from the primary evidence. With this in mind, it is useful to recall that the 0.7 upper bound is (a) based on estimates from a sample of four companies (plus five companies that no longer exist, some of which have not existed for nearly 10 years), and (b) inconsistent with the advice from the AER's consultant, who recommended an upper bound of 0.8.

85. In our view, the AER's approach for estimating beta is highly problematic for all of the reasons set out above. We consider these issues in more detail in our companion report, SFG (2015 Beta).

86. In its 2009 WACC Review, the AER adopted a beta point estimate of 0.8 from its range of 0.4 to 0.7 on the basis of:

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[44] JGN Draft Decision, Attachment 3, p. 267.
[45] JGN Draft Decision, Attachment 3, p. 30.
[46] JGN Draft Decision, Attachment 3, p. 265.

a) The need to achieve an outcome that is consistent with the NEO;

b) The need for efficient investment in electricity services;

c) The need to provide service providers with a reasonable opportunity to recover at least their efficient costs;

d) The asymmetry in the economic costs and risks of the potential for under and over investment; and

e) The importance of regulatory stability.[47]

87. All of these reasons would seem to apply equally today, however the AER has not referred to them in its Guideline or in its recent draft decisions. Rather, the AER proposes to adopt a point estimate of 0.7 from the same range of 0.4 to 0.7 on the basis of:

a) The theoretical underpinnings of the Black CAPM; and

b) Evidence from international comparators.

88. That is, relative to the 2009 WACC Review:

a) The AER has adopted the same range of 0.4 to 0.7;

b) All of the reasons that were used to justify a point estimate of 0.8 still apply; and

c) The AER has identified additional reasons to support a higher estimate.

89. In our view, transparency requires the AER to state:

a) Whether it considers the reasons it used to support its 2009 beta estimate of 0.8 remain valid; and

b) Whether, and if so how, the AER has had regard to those reasons in arriving at its current beta estimate of 0.7.

90. In our view, if those reasons were sufficient to support a point estimate of 0.8 in 2009, they are at least sufficient to support a point estimate of 0.7 today. In this case, the international comparators and the theory of the Black CAPM would have had no effect on the estimate of beta. If this characterisation is incorrect, the AER should explain why. Otherwise, it is impossible for stakeholders to determine whether the weight that has been applied to the international comparators and to the theory of the Black CAPM is reasonable.

SFG beta estimates

91. We set out our preferred equity beta estimates in our companion report, SFG (2015 Beta). In our view, the best available estimate of the equity beta for the benchmark efficient entity is 0.82. This estimate is based on a consideration of domestic and international comparators, each weighted

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[47] AER 2009 WACC Review Final Decision, p. xvii.

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according to what we consider to be the relative strengths and weaknesses. We note that this estimate of beta does not reflect the evidence from any other relevant model.

The market risk premium

The AER's approach

92. In its recent draft decisions, the AER states that:

> 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.[48]

93. 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%.[49]

94. The AER also considers that its dividend discount model estimates support a range of 6.6% to 7.8% as at September 2014.[50]

95. The AER appears to place less weight on survey responses, conditioning variables, and past regulatory decisions.[51]

96. In summary, the approach of the AER is consistent with it:

   a) Adopting a primary range of 5.1% to 6.5% from the historical excess returns data; and

   b) Selecting a point at the top of that range based on its dividend discount model estimates.

97. The AER specifically notes that it has not made any material changes to its approach for estimating the MRP in response to the AEMC's 2013 rule changes. For example, in relation to the APA GasNet decision made under the previous Rules, the AER now states:

> The Australian Competition Tribunal upheld our approach to estimating the MRP when APA GasNet appealed our decision in 2013. The MRP approach brought before the Australian Competition Tribunal was similar to that applied in this decision.[52]

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[48] JGN Draft Decision, Attachment 3, p. 76.
[49] JGN Draft Decision, Attachment 3, p. 77.
[50] JGN Draft Decision, Attachment 3, p. 77.
[51] JGN Draft Decision, Attachment 3, p. 79.
[52] JGN Draft Decision, Attachment 3, pp. 76-77.

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The role of the primary range

98. We demonstrate below that the AER's approach appears to be to establish a primary range based on mean historical excess returns and to use the other relevant evidence only for the purpose of selecting a point estimate from within the range – the same general approach that the AER used when estimating beta. We explain below that, between the Guideline and the recent draft decisions, there was a material increase in the AER's dividend discount model estimates, yet the AER maintained the MRP at 6.5%. The AER does not suggest that it has reduced the weight that it applies to its dividend discount estimates, in which case the only other explanation is that the allowed MRP of 6.5% is already at the top of the allowable range and can therefore go no further. Consistent with this view, the AER has stated that its current approach is "similar" [53] to the approach that it adopted under the previous Rules where, even at the height of the GFC and European debt crises, the allowed MRP never exceeded 6.5%. All of this evidence suggests that the 6.5% figure is a "cap" for the allowed MRP.

99. As for equity beta, this illustrates the importance of the specification of the top end of the primary range in the AER's estimation process. The upper bound appears to cap the AER's MRP estimate, so that even as the "secondary" evidence moves to support higher and higher estimates, the final MRP estimate remains fixed at the upper bound from the "primary" evidence.

100. With this in mind, it is important to understand what the historical mean excess return estimates represent. In any long historical period it is likely that there will be a range of different market conditions and consequently the market risk premium will be higher in some market conditions and lower in other market conditions. In this regard, the Guideline materials note that:

> Evidence suggests the MRP may vary over time. In their advice to the AER, Professor Lally and Professor Mackenzie and Associate Professor Partington have expressed the view that the MRP likely varies over time.[54]

101. The historical mean excess return is, by definition, an estimate of the excess return in the average market conditions over the sampling period. That is, the 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%.

102. The AER must then consider two key pieces of evidence:

   a) Historical arithmetic mean returns suggest that the MRP in *long-run historical average* conditions is likely to be in the range of 5.9% to 6.5%; and

   b) The AER's dividend discount model suggests that the MRP in *prevailing* market conditions is within the range of 6.6% to 7.8%.

103. In our view, this suggests that the prevailing conditions differ from the historical average conditions (because government bond yields are at unprecedented lows), in which case one would be led to adopt a prevailing estimate of MRP that is above the long-run average estimate. However, the AER's

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[53] JGN Draft Decision, Attachment 3, pp. 76-77.
[54] AER Rate of Return Guideline, Explanatory Statement, p. 91.

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approach appears to fix the 6.5% estimate for *long-run historical average* conditions as an upper bound for *all* market conditions. In our view, such an approach has no logic to it. Our preferred approach is not to anoint any subset of the relevant evidence in a way that constrains the influence of all other evidence. Rather, our approach is to set out all of the relevant evidence and to assign weight to each piece based on our consideration of the relative strengths and weaknesses.

104. In the remainder of this subsection, we consider the various pieces of evidence that are relevant to the estimation of the MRP.

Historical excess returns

105. We agree with the AER that historical excess returns provide relevant evidence and should be considered. However, there remain two points of difference:

    a) We do not agree that the geometric mean return is relevant to the estimation of MRP. Our reasons for this are set out in SFG (2014 ROE, pp. 44-49). Nothing in the recent draft decisions leads us to change our view that (i) the geometric mean of historical excess returns is not an estimate of the MRP, (ii) the vast weight of market and regulatory practice is against the use of geometric means, and (iii) the vast weight of advice to the AER is against the use of geometric means.

    b) We do not agree that the corrections to the historical data identified by NERA (2013) should be set aside. Our reasons for this are set out in SFG (2014 ROE, pp. 49-52). Nothing in the recent draft decisions leads us to change our view that the historical estimate would be improved by making the NERA correction to the pre-1958 data.[55] We note that this point has only a small effect on the AER's estimation process in that it would increase the upper bound of the AER's range from 6.5% to 6.6%.[56]

106. For this report we adopt an estimate of the historical arithmetic mean return of 6.56%, as set out in NERA (2015).

Dividend discount models

107. We agree with the AER that dividend discount models provide relevant evidence and should be considered.

108. In its recent draft decisions, the AER notes that its dividend discount model "estimates k, the expected return on equity for the market portfolio."[57] The AER then subtracts the contemporaneous risk-free rate to obtain an estimate of the MRP. Although the AER does not report its estimates of the return on the market, those estimates can be easily constructed by adding the risk-free rate to the reported estimates of the MRP. We compare the AER's estimates of the required return on the market at the time of its Guideline (risk-free rate of 4.20%) and draft decisions (risk-free rate of 3.55%) in Table 3 and Figure 1 below.

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[55] We also note that NERA (2015) reach the same conclusion.
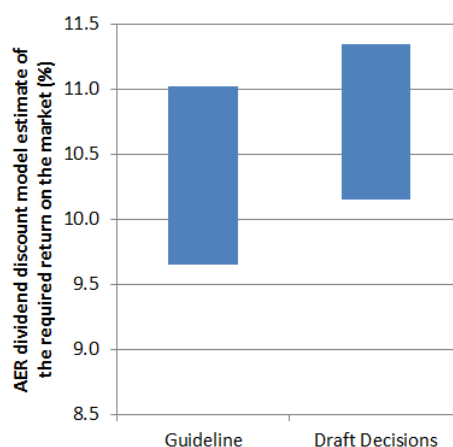[56] JGN Draft Decision, Attachment 3, p. 199.
[57] JGN Draft Decision, Attachment 3, p. 199.

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Table 3
AER dividend discount model estimates of the required return on the market

	Growth rate (%)	Two stage model (%)	Three stage model (%)
Guideline	4.0	9.65	10.20
	4.6	10.21	10.65
	5.1	10.68	11.02
Draft Decisions	4.0	10.15	10.55
	4.6	10.75	10.95
	5.1	11.25	11.35

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

Figure 1
Range of AER dividend discount model estimates
of the required return on the market

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

109. Table 3 and Figure 1 both show that the AER's dividend discount models indicate that the required return on equity for the average firm (market) increased materially between the time of the AER's Guideline and the recent draft decisions. The mean increase in the estimated required return is 0.43%.

110. However, the AER's approach has been to maintain the 6.5% MRP estimate from its Guideline. The result is a material *decrease* in the allowed return on equity for the average firm from 4.2%+6.5%=10.7% to 3.55%+6.5%=10.05%. That is, the new evidence since the Guideline (according to the AER's own estimates) suggests a material *increase* in the required return on the market, whereas the AER has imposed a material *decrease* in the allowed return on the market.

111. Moreover, government bond yields have continued to fall since the recent draft decisions and averaged 2.64% over January 2015.[58] If the AER were to maintain a market risk premium of 6.5%,

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[58] In our report on the dividend discount model (SFG DDM 2015) a figure of 2.66% is used as the risk free rate. The figure used in the dividend discount model report is based upon the average yield on 10 year government bonds reported by the AER over January 2015, and then converted to an effective annual rate. This was done for consistency with all other government bond yields used in the dividend discount model analysis, as we compiled cost of equity estimates each month, and the averaged the cost of equity estimates over two month periods. The figure of 2.64% used in the current report is based upon daily yields on government bonds with maturities closest to 10 years, and applying linear interpolation to make an estimate of the 10 year

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there would be a further material fall in the allowed return on equity to 2.64%+6.5%=9.14%. This would represent a 14% fall in the allowed return on equity since the Guideline, when the only new evidence considered by the AER indicates that the required return on equity has *increased*. In our view, such an outcome would be devoid of all logic and is simply untenable. Indeed this highlights the fundamental problems with the mechanistic approach of adding a constant premium for risk to the contemporaneous risk-free rate that the AEMC sought to address with its rule changes.

112. Taking the AER's draft decision estimates from Table 3 above and subtracting the current risk-free rate of 2.64% produces an estimate of the current MRP. This current estimate of MRP is contrasted with the AER's prior estimates in Table 4 and Figure 2 below.

Table 4
AER dividend discount model estimates of the required return on the market

	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
Current	4.0	7.51	7.91
	4.6	8.11	8.31
	5.1	8.61	8.71

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

Figure 2
Range of AER dividend discount model estimates of MRP
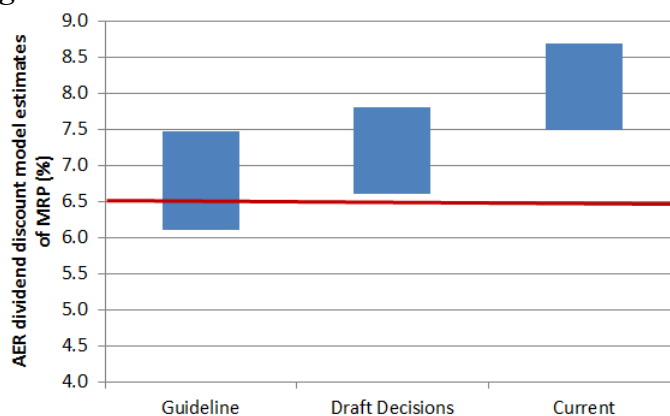
Source: AER Rate of Return Guideline Appendices, p. 87; JGN Draft Decision, Attachment 3, p. 200.

113. Table 4 and Figure 2 both show that the AER's own estimates of the contemporaneous MRP have risen materially since the publication of the Guideline. The AER's estimates of the contemporaneous MRP were uniformly above the allowed 6.5% at the time of the draft decisions and are even more materially above the 6.5% allowance now. In our view, there is no logic to an approach that would simply maintain a fixed 6.5% allowance that reflects the long-run historical average conditions (over

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bond yield. The difference of two basis points has no perceptible effect on our estimate of the required return on equity for the benchmark efficient entity.

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the long-run historical period that was used to estimate it) in the face of the mounting evidence from the AER's own estimates of the MRP in the prevailing market conditions. To do so would be an error.

114. In our companion report, SFG (2015 DDM), we consider a number of issues relating to dividend discount model estimation. In relation to MRP, our general conclusion is that the dividend discount model evidence supports a market risk premium materially above the AER's 6.5% allowance.

115. In our view the best estimate of the expected market return from dividend discount model analysis is 11.37%[59], which implies a market risk premium of 8.73% compared to the risk free rate of 2.64%. Our market return estimate is based upon consideration of a more extensive dataset and an estimation technique that is not constrained by a pre-determined view on the correct long term growth rate in earnings per share of listed companies. Our market return estimate also includes an adjustment for dividend imputation that reflects the imputation adjustment in the AER's post-tax revenue model.

Survey responses

116. Our view is that survey responses do not provide relevant evidence for the purpose of estimating MRP. Our reasons for this view are set out in SFG (2014 ROE, pp. 64-71). Nothing in the recent draft decisions leads us to change our view that (i) the surveys on which the AER relies do not satisfy the criteria set out by the Tribunal (e.g., some are two-page magazine articles that were completed by audiences that had been "primed" by the author) and (ii) the evidence suggests that participants are simply regurgitating the historical excess return estimates.

117. In our view, if survey responses are to be used to inform the estimate of MRP, they should be grossed-up to incorporate the assumed value of imputation credits, as set in SFG (2014 ROE, pp. 71-73). We deal with the grossing-up for imputation credits in some detail in our companion report in relation to the dividend discount model, SFG (2015 DDM). This is a broad issue that also affects survey responses. Our view is that a specific formula is embedded into the AER's PTRM and that the grossing-up for imputation credits should be consistent with that formula. This is the approach adopted by IPART. As explained in detail in SFG (2015 DDM, Section 4), we remain of the view that the AER's approach embeds a systematic internal inconsistency that must be corrected.

118. Moreover, nothing in the recent draft decisions leads us to change our view that the only reasonable interpretation of the survey data is that responses have not already been grossed-up for imputation credits.

Conditioning variables

119. The AER's recent draft decisions indicate that it has some regard to a set of "conditioning variables" when estimating the MRP.[60] These conditioning variables are variables that have been identified in the literature as having an empirical association with future stock returns. In particular, the AER considers dividend yields, credit spreads and implied volatilities. The AER concludes that dividend yields and implied volatilities are currently not materially different from their average levels, whereas the credit spread remains at elevated levels, although not as high as during the peak of the GFC. The AER does not translate this evidence into an estimate of the MRP nor does it quantify the extent to which this evidence affects the AER's final estimate of MRP.

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[59] SFG (DDM 2015).
[60] JGN Draft Decision, Attachment 3, p. 77.

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120. In our view, if conditioning variables are to be used, the risk-free rate should be included among them. This is a standard variable that is almost always included in any set of conditioning variables.[61] At present, Australian government bond yields are at extreme lows, which is consistent with very high risk premiums. In our view, an analysis of conditioning variables that does not include the contemporaneous government bond yield is necessarily incomplete.

121. In summary, it appears that in aggregate the conditioning variables do not provide a clear signal. The government bond yield and credit spreads would indicate elevated risk premiums, whereas the dividend yield and implied volatility do not. We note that the conditioning variables do not appear to have been influential in the AER's estimation approach.

Independent expert reports

122. In our previous report to the AER,[62] we gave a small 10% weighting to estimates of the MRP from recent independent expert reports. We remain of the view that independent expert reports provide relevant evidence for the purpose of estimating MRP.

123. In our previous report, we noted that the evidence from independent expert reports overwhelmingly indicated that independent experts adopt estimates of the required return on equity that are materially above the estimates that would be obtained from the adoption of the AER's approach that deliberately limits the impact that contemporaneous evidence can have on the estimates of beta and MRP.[63][64]

124. In its recent draft decisions, the AER concludes that it will not consider the level of independent expert estimates, but rather "we only use independent valuation reports to compare current estimates to a baseline value (directional information)."[65] Consequently, the AER does not need to consider the evidence that independent experts uniformly adopt estimates of the required return on equity that are materially above the AER's estimates. Our view is that this is relevant evidence of the required return on equity in the prevailing conditions in the market for funds that should be considered.

125. Our previous report also noted that the uniform practice of independent experts is to state that their estimates have made no adjustment in relation to imputation credits. Consequently, the estimates must be adjusted to incorporate the assumed value of imputation credits, as explained in SFG (2013 ROE, pp. 78-79).

126. In this report, we follow the approach of SFG (2014 ROE) of adopting an independent expert report estimate of 6%, ex-imputation credits. We consider that to be a conservative estimate for the reasons set out in SFG (2014 ROE). Our conclusion that this is a conservative estimate is also consistent with the recent report of Incenta (2015). Our ex-imputation estimate of 6% is grossed-up to reflect imputation credits, with gamma set to 0.25. This produces a with-imputation estimate of 6.93%.

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[61] See, for example, Petkova and Zhang (2005), who trace the use of government bond yields as conditioning variables back to Fama and Schwert (1977) and Fama (1981).
[62] SFG (2014 ROE), pp. 74-79.
[63] SFG (2014 ROE), pp. 74-79.
[64] Our conclusion on this issue is consistent with the conclusions reached by Incenta (2015).
[65] JGN Draft Decision, Attachment 3, pp. 209-210.

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Two end points of a theoretical spectrum

127. One source of data for estimating the market risk premium is historical stock returns. There are two ways to process the historical returns data:

   a) The *Ibbotson* 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; and

   b) The *Wright* 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.

128. These two approaches are the end points of the theoretical spectrum. At one extreme is the Ibbotson 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 Wright 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.

Regulatory views

129. The AER has stated that its view, and the view of its consultants, is that the MRP is not stable over time (as would be implied by the Ibbotson approach) but varies over time:

> Evidence suggests the MRP may vary over time. In their advice to the AER, Professor (sic) Lally and Professor Mackenzie and Associate Professor Partington have expressed the view that the MRP likely varies over time.[66]

130. The AER has also expressed the view that there is no consensus about which of the two assumptions is more reasonable:

   a) The Ibbotson assumption that MRP does not vary over time at all; or

   b) The Wright assumption that MRP varies inversely with the risk-free rate.

131. In this regard, the AER stated that:

> …there is no consensus in the academic literature on the direction, magnitude or stability of the relationship between the risk free rate and the MRP.[67]

132. The AER view on the relationship between the risk free rate and the MRP is based upon historical movements in bond yields and stock prices. The reason for the lack of consensus referred to by the AER is that in some circumstances we could see government bond yields and the cost of equity fall at the same time (if there was just a reduction in inflation, for example), and in other circumstances we could see government bond yields and the cost of equity move in the opposite direction (if investors buy government bonds and sell stocks because investor are more concerned about equity risk, for

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[66] AER Rate of Return Guideline, Explanatory Statement, p. 91.
[67] AER Rate of Return Guideline, Appendix B, p. 26.

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example). This is important because it means that both historical real returns and historical excess premiums are both likely to be informative about the expected return on the market.

133. Put simply, it is entirely reasonable to consider that equity investors will expect to earn the same real returns in the future as they have in the past in normal market conditions. This reasonable possibility is not accounted for in the AER's exclusive reliance on excess market returns to estimate the market return in normal market conditions.

134. The AER goes on to state that it will use both approaches:

> …it should not be interpreted that we necessarily consider the relationship between the MRP and the risk free rate will remain stable through different market circumstances. Instead, our approach to estimating the expected return on equity will consider estimates of the Sharpe–Lintner CAPM that assume both no consistent relationship, and a negative relationship between the MRP and risk free rate. This recognises the varied academic literature.[68]

135. We agree that neither of the end-point approaches is likely to provide a perfect description of reality. Rather, it is likely that reality lies somewhere between the assumptions on which each of the end point approaches is based. For this reason, we consider that both approaches for analysing the historical stock return data provide relevant evidence and that, when estimating the MRP, regard should be had to both approaches.

136. In his recent advice to the QCA, Lally (2013 QCA) reached the same conclusion, advising that:

> I consider that the set of methodologies considered by the QCA should be augmented by one involving estimating the expected real market cost of equity from the historical average actual real return and then deducting the current real risk free rate (or converting the estimate of the expected real market cost of capital to its nominal counterpart and then deducting the current nominal risk free rate).[69]

137. In recommending that the QCA should use the Wright approach to inform its estimate of the MRP, Lally (2013 QCA) concluded that:

> estimating the expected real market cost of equity from the historical average real market return, converting this to nominal terms using prevailing expected inflation and then deducting the prevailing nominal risk free rate…Relative to the Ibbotson methodology, this approach assumes that the expected real market cost of equity rather than the MRP is constant over time, and therefore will be superior to the Ibbotson approach if the expected real market cost of equity is more stable over time than the MRP.[70]

138. Similarly, in its recent ATCO Gas Draft Decision, the ERA concludes that:

> …consistent with the evidence, the Authority's view is that the return on equity is more stable than the MRP, over the longer term.[71]

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[68] AER Rate of Return Guideline, Appendix B, p. 26.
[69] Lally (2013 QCA), p. 3.
[70] Lally (2013 QCA), p. 6.
[71] ERA ATCO Gas Draft Decision, p. 163, Paragraph 712.

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and consequently that:

> …the approach to determining the MRP, is informed by the Wright approach.[72]

139. In summary, it appears that the consensus view is that the Wright approach for analysing the historical stock return data should be used to inform the estimate of the market risk premium.

AER Guideline

140. In its Guideline, the AER discusses, at some length, how having regard to the Wright approach is likely to result in more stable estimates of the allowed return on equity, relative to the AER's previous estimation approach which used the Ibbotson approach as the only method of analysing the historical stock returns data. In this regard, the AER stated that:

> …our implementation of the Sharpe–Lintner CAPM will result in estimates of the return on equity that may vary over time. Alternatively, 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
> - the informative value provided by the DGM and Wright approach (and other information that provides relatively stable estimates of the return on equity).[73]

and further that:

> …we consider submissions that suggest our implementation of the Sharpe–Lintner CAPM leads to equity returns that are too variable may be addressed through the consideration of other information. For example, as discussed in appendix E, we propose to have regard to DGM estimates when estimating the MRP. As discussed in appendix B, we also propose to consider an alternative implementation of the Sharpe–Lintner CAPM—that proposed by Professor Stephen Wright. Both the Wright approach and the DGM (when used to provide an estimate of the MRP) assume a perfectly negative relationship between the MRP and the risk free rate. Having regard to these estimates, therefore, may lead to more stable returns.[74]

AER estimates of the MRP

141. In its recent Draft Decisions, the AER does not use the Wright approach to inform its estimate of the MRP. Rather, it uses the Ibbotson approach to analysing historical stock return data to inform its estimate of the MRP, but it relegates the Wright approach to the final cross check stage of its estimation approach. As we explain below, this is done in a way that has the effect of neutralising the evidence from the Wright approach such that it can have no impact on the allowed return on equity.

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[72] ERA ATCO Gas Draft Decision, p. 156, Paragraph 674.
[73] AER Rate of Return Guideline, Explanatory Statement, p. 66.
[74] AER Rate of Return Guideline, Appendix A, p. 12.

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142. In Step 4 of the estimation process in its recent draft decisions, the AER states that its Wright approach estimate of the required return on the market is 10.1% to 12.8%, with a mid-point of 11.45%.[75] We concur that this is a reasonable estimate of the required return on the market using the Wright approach.[76] For its recent draft decisions, the AER adopts a (then contemporaneous) risk-free rate of 3.55%.[77] These estimates imply a market risk premium estimate of 7.9% (11.45%-3.55%) based upon the former 3.55% risk free rate.

143. In its recent draft decisions the AER also concludes that the Ibbotson method of analysing the historical stock returns data yields an MRP estimate of 6%.[78]

144. Thus, by the AER's figures, the two methods of analysing the historical stock returns data produce a mid-point MRP estimate of 7%. That is, if, when estimating the MRP, equal regard is had to the Ibbotson and Wright approaches, the conclusion is that the historical stock returns data supports an MRP estimate of 7%.

145. However, the AER uses the Ibbotson approach to inform its estimate of MRP, and effectively relegates the Wright approach in the manner described below. The result is that:

   a) The AER concludes that the historical stock returns data supports an MRP estimate of 6% – based on the Ibbotson approach exclusively; and

   b) The Wright approach has no impact on the allowed return on equity whatsoever – it has effectively been disregarded.

146. The AER achieves this outcome by:

   a) Using the Ibbotson approach to inform its estimate of the MRP in Step 3 of its estimation approach; and

   b) Relegating the Wright estimate of MRP to a return on equity cross check in Step 4 of its estimation approach.

147. As set out above, the AER's Wright estimate of MRP is 7.9%. In Step 3 of its estimation process, the AER had already concluded that 0.7 is the appropriate equity beta estimate for the benchmark efficient entity. Thus, the AER's estimate of the required return on equity for the benchmark efficient entity using the Wright approach is:

$$r_e = r_f + \beta_e (r_m - r_f)$$
$$= 3.55\% + 0.7(11.45\% - 3.55\%) = 9.08\%$$

(1)

which is materially higher than the AER's draft decision allowed return on equity of 8.1%. This evidence, which the AER considers to be relevant, materially contradicts the AER's allowed return on equity of 8.1%.

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[75] JGN Draft Decision, Attachment 3, p. 86.

[76] NERA (2015) reports a mean estimate of historical real returns of 8.92% over the period 1883 to 2013. If the inflation expectation is 2.50%, as assumed by the AER, the expected market return would be 11.64% (computed as 1.0892 × 1.0250 – 1 = 11.64).

[77] JGN Draft Decision, Attachment 3, p. 10.

[78] In our view, the historical stock returns data supports an Ibbotson estimate above 6.0%. However, in this section of the report we consider the AER's estimates and focus on the estimation process and the way in which relevant evidence is effectively disregarded. We consider the basis of the individual estimates themselves elsewhere in this report.

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148. This highlights the problem of using one subset of relevant evidence when estimating the original MRP parameter while relegating another subset of the relevant evidence to the role of "cross checks." Having determined that the Wright approach for estimating the MRP is relevant evidence, and having obtained a Wright estimate of the return on equity that is materially inconsistent with the AER's proposed estimate, there are two possible courses of action. Either:

   a) The AER would retain its original estimate – in which case the cross check has no effect and there seems to be no point performing it; or

   b) The AER would revise its original estimate to make it consistent with the cross-check estimate – in which case the original evidence has effectively been discarded in favour of the cross check evidence.

149. In our view, a better approach is to set out all evidence that informs the estimate of MRP in the same stage of the estimation process and to select a single estimate of the MRP that is informed by all of that relevant evidence. This avoids the problems that arise where different pieces of evidence are assigned to different points in the contrived multi-staged approach that the AER proposes.

150. Of course no problem arises under the AER approach if the cross check evidence happens to be consistent with the AER's original estimate. In that case, the cross check confirms the original estimate.

151. However, in the case at hand, the AER's original estimate of the MRP is 6.5% (using evidence that excludes the Wright approach), whereas the AER's estimate of MRP using the Wright approach is 7.9%. These estimates are materially different. When these estimates of MRP are inserted into the CAPM, together with the AER's estimates of the risk-free rate (3.55% in the JGN Draft Decision) and beta (0.7), they produce estimates of the required return on equity of 8.1% and 9.1%, respectively.

152. But what the AER then does is to compare its proposed return on equity (8.1%) with a range for the return on equity when the Wright approach is used to estimate the MRP. To obtain this range, the AER resurrects its range for beta (0.4 to 0.7) from the previous step of its estimation process. That is, the bottom of the "Wright range" is obtained by inserting the AER's Wright estimate of MRP (7.9%) and a beta of 0.4 into the CAPM equation. The top end of the range is obtained by inserting the AER's Wright estimate of MRP (7.9%) and a beta of 0.7 into the CAPM equation. The result is a range for the return on equity of 6.7%[79] to 9.1%[80] that includes the AER's proposed allowed return on equity of 8.1%, leading the AER to conclude that its proposed estimate is reasonable and not in need of any further consideration.[81]

153. That is, having previously concluded (in Step 3 of its estimation approach) that the appropriate equity beta is 0.7, the AER reintroduces an equity beta range of 0.4 to 0.7 for the sole purpose of evaluating the Wright approach (in Step 4 of its estimation approach). The only way the AER can obtain a range for the Wright approach that includes its proposed allowed return on equity is to combine the Wright estimate of MRP with a beta of 0.4, which the AER has already discarded in the previous step of its estimation process. The Wright approach has nothing at all to do with beta – it is used only for

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[79] 3.55+0.4×7.9=6.7.

[80] 3.55+0.7×7.9=9.1.

[81] Since the risk-free rate of 3.55% is common to all of these calculations, it can be omitted from all allowing a comparison of risk premiums (the product of beta and market risk premium). This approach of comparing risk premiums has been adopted by the AER in its Figure 3-4, p. 32 of Attachment 3 to its JGN Draft Decision.

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estimating the MRP. The AER's own Wright estimate of MRP (7.9%) is unambiguously higher than its proposed estimate of 6.5%. It makes no sense whatsoever for the AER to conclude that its proposed return on equity is consistent with the Wright evidence based on a comparison of:

    a) The AER's proposed estimate of MRP (6.5%) multiplied by the AER's proposed estimate of beta (0.7); with

    b) The AER's Wright estimate of MRP (7.9%) multiplied by an estimate of beta that the AER has already rejected in a previous step of its estimation process (0.4).

154. The outcome of such a comparison is that the AER says that it has had regard to the Wright approach, but regard is given to the Wright approach in such a manner as to ensure that it cannot possibly have any effect at all on the allowed return.

SFG estimate

155. Our estimate of the average historical real return on the market is 8.92%, as set out in NERA (2015). This estimate is consistent with gamma set to 0.25 and theta set to 0.35. This implies a forward-looking nominal market return of 11.64% with expected inflation set to 2.5% p.a. This, in turn, implies an MRP of 9.00% for a risk-free rate of 2.64%.

5. Declaration

156. We confirm that we have made all the inquiries that we believe are desirable and appropriate and no matters of significance that we regard as relevant have, to our knowledge, been withheld from the Court.

_____   _____
Professor Stephen Gray.   Dr Jason Hall.

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Appendix 1: CV of Prof Stephen Gray and Dr Jason Hall

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Stephen F. Gray

University of Queensland
Business School
Brisbane 4072
AUSTRALIA
Office: +61-7-3346 8032
Email: s.gray@business.uq.edu.au

Academic Qualifications

1995 Ph.D. (Finance), Graduate School of Business, Stanford University.
Dissertation Title: Essays in Empirical Finance
Committee Chairman: Ken Singleton
1989 LL.B. (Hons), Bachelor of Laws with Honours, University of Queensland.
1986 B.Com. (Hons), Bachelor of Commerce with Honours, University of Queensland.

Employment History

2000-Present Professor of Finance, UQ Business School, University of Queensland.
1997-2000 Associate Professor of Finance, Department of Commerce, University of Queensland and Research Associate Professor of Finance, Fuqua School of Business, Duke University.
1994-1997 Assistant Professor of Finance, Fuqua School of Business, Duke University.
1990-1993 Research Assistant, Graduate School of Business, Stanford University.
1988-1990 Assistant Professor of Finance, Department of Commerce, University of Queensland.
1987 Specialist Tutor in Finance, Queensland University of Technology.
1986 Teaching Assistant in Finance, Department of Commerce, University of Queensland.

Academic Awards

2006 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
2002 Journal of Financial Economics, All-Star Paper Award, for Modeling the Conditional Distribution of Interest Rates as a Regime-Switching Process, JFE, 1996, 42, 27-62.
2002 Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000 University of Queensland Award for Excellence in Teaching (a University-wide award).
1999 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
1999 KPMG Teaching Prize, Department of Commerce, University of Queensland.
1998 Faculty Teaching Prize (Business, Economics, and Law), University of Queensland.
1991 Jaedicke Fellow in Finance, Doctoral Program, Graduate School of Business, Stanford University.
1989 Touche Ross Teaching Prize, Department of Commerce, University of Queensland.
1986 University Medal in Commerce, University of Queensland.

Large Grants (over $100, 000)

- Australian Research Council Linkage Grant, 2008—2010, Managing Asymmetry Risk ($320,000), with T. Brailsford, J.Alcock, and Tactical Global Management.
- Intelligent Grid Cluster, Distributed Energy – CSIRO Energy Transformed Flagship Collaboration Cluster Grant, 2008-2010 ($552,000)
- Australian Research Council Research Infrastructure Block Grant, 2007—2008, Australian Financial Information Database ($279,754).
- Australian Research Council Discovery Grant, 2006—2008, Capital Management in a Stochastic Earnings Environment ($270,000).
- Australian Research Council Discovery Grant, 2005—2007, Australian Cost of Equity.
- Australian Research Council Discovery Grant, 2002—2004, Quantification Issues in Corporate Valuation, the Cost of Capital, and Optimal Capital Structure.

- Australian Research Council Strategic Partnership Grant, 1997—2000, Electricity Contracts and Securities in a Deregulated Market: Valuation and Risk Management for Market Participants.

Current Research Interests

Benchmark returns and the cost of capital. Corporate Finance. Capital structure. Real and strategic options and corporate valuation. Financial and credit risk management. Empirical finance and asset pricing.

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Gray, S., T. Smith and R. Whaley, (2003), "Stock Splits: Implications for Investor Trading Costs," *Journal of Empirical Finance*, 10, 271-303.

Gray, S. and S. Treepongkaruna, (2003), "On the Robustness of Short-term Interest Rate Models," *Accounting and Finance*, 43(1), 87-121.

Gray, S. and S. Treepongkaruna, (2002), "How to Value Interest Rate Derivatives in a No-Arbitrage Setting," *Accounting Research Journal* (15), 1.

Gray, P. and S. Gray, (2001), "A Framework for Valuing Derivative Securities," *Financial Markets Institutions & Instruments*, 10(5), 253-276.

Gray, P. and S. Gray, (2001), "Option Pricing: A Synthesis of Alternate Approaches," *Accounting Research Journal*, 14(1), 75-83.

Dahlquist, M. and S. Gray, (2000), "Regime-Switching and Interest Rates in the European Monetary System," *Journal of International Economics*, 50(2), 399-419.

Bollen, N., S. Gray and R. Whaley, (2000), "Regime-Switching in Foreign Exchange Rates: Evidence from Currency Options," *Journal of Econometrics*, 94, 239-276.

Duffie, D., S. Gray and P. Hoang, (1999), "Volatility in Energy Prices. In R. Jameson," (Ed.), *Managing Energy Price Risk* (2nd ed.). London: Risk Publications.

Gray, S. and R. Whaley, (1999), "Reset Put Options: Valuation, Risk Characteristics, and an Example," *Australian Journal of Management*, 24(1), 1-21.

Bekaert, G. and S. Gray, (1998), "Target Zones and Exchange Rates: An Empirical Investigation," *Journal of International Economics*, 45(1), 1-35.

Gray, S. and R. Whaley, (1997), "Valuing S&P 500 Bear Market Warrants with a Periodic Reset," *Journal of Derivatives*, 5(1), 99-106.

Gray, S. and P. Gray, (1997), "Testing Market Efficiency: Evidence from the NFL Sports Betting Market," *The Journal of Finance*, 52(4), 1725-1737.

Gray, S. (1996), "Modeling the Conditional Distribution of Interest Rates as a Regime- Switching Process," *Journal of Financial Economics*, 42, 27-62.

Gray, S. (1996), "Regime-Switching in Australian Interest Rates," *Accounting and Finance*, 36(1), 65-88.

Brailsford, T., S. Easton, P.Gray and S. Gray, (1995), "The Efficiency of Australian Football Betting Markets," *Australian Journal of Management*, 20(2), 167-196.

Duffie, D. and S. Gray, (1995), "Volatility in Energy Prices," In R. Jameson (Ed.), *Managing Energy Price Risk,* London: Risk Publications.

Gray, S. and A. Lynch, (1990), "An Alternative Explanation of the January Anomaly," *Accounting Research Journal*, 3(1), 19-27.

Gray, S. (1989), "Put Call Parity: An Extension of Boundary Conditions," *Australian Journal of Management*, 14(2), 151-170.

Gray, S. (1988), "The Straddle and the Efficiency of the Australian Exchange Traded Options Market," *Accounting Research Journal*, 1(2), 15-27.

Teaching

Fuqua School of Business, Duke University, Student Evaluations (0-7 scale):

- Financial Management (MBA Core): Average 6.5 over 7 years.
- Advanced Derivatives: Average 6.6 over 4 years.
- Empirical Issues in Asset Pricing: Ph.D. Class

1999, 2006   Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.

UQ Business School, University of Queensland, Student Evaluations (0-7 scale):

- Finance (MBA Core): Average 6.6 over 10 years.
- Corporate Finance Honours: Average 6.9 over 10 years.

2002   Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000   University of Queensland Award for Excellence in Teaching.
1999   Department of Commerce KPMG Teaching Prize, University of Queensland.
1998   Faculty Teaching Prize, Faculty of Business Economics and Law, University of Queensland.
1998   Commendation for Excellence in Teaching, University-wide Teaching Awards, University of Queensland.
1989   Touche Ross Teaching Prize, Department of Commerce, University of Queensland.

Board Positions

2002 - Present: Director, Financial Management Association of Australia Ltd.
2003 - Present: Director, Moreton Bay Boys College Ltd. (Chairman since 2007).
2002 - 2007: External Risk Advisor to Board of Enertrade (Queensland Power Trading Corporation Ltd.)

Consulting

Managing Director, Strategic Finance Group: www.sfgconsulting.com.au.

Consulting interests and specialties, with recent examples, include:

- **Corporate finance**
    - ⇒ **Listed multi-business corporation:** Detailed financial modeling of each business unit, analysis of corporate strategy, estimation of effects of alternate strategies, development of capital allocation framework.

- **Capital management and optimal capital structure**
    - ⇒ **State-owned electricity generator:** Built detailed financial model to analyze effects of increased leverage on cost of capital, entity value, credit rating, and stability of dividends. Debt of $500 million issued.

- **Cost of capital**
    - ⇒ **Cost of Capital in the Public Sector:** Provided advice to a government enterprise on how to estimate an appropriate cost of capital and benchmark return for Government-owned enterprises. Appearance as **expert witness** in legal proceedings that followed a regulatory determination.
    - ⇒ **Expert Witness:** Produced a written report and provided court testimony on issues relating to the cost of capital of a cable TV business.
    - ⇒ **Regulatory Cost of Capital:** Extensive work for regulators and regulated entities on all matters relating to estimation of weighted-average cost of capital.

- **Valuation**

- ⇒ **Expert Witness:** Produced a written report and provided court testimony. The issue was whether, during a takeover offer, the shares of the bidding firm were affected by a liquidity premium due to its incorporation in the major stock market index.
- ⇒ **Expert Witness:** Produced a written report and provided court testimony in relation to valuation issues involving an integrated mine and refinery.

- **Capital Raising**
  - ⇒ Produced comprehensive valuation models in the context of capital raisings for a range of businesses in a range of industries including manufacturing, film production, and biotechnology.

- **Asset pricing and empirical finance**
  - ⇒ **Expert Witness:** Produced a written report on whether the client's arbitrage-driven trading strategy caused undue movements in the prices of certain shares.

- **Application of econometric techniques to applied problems in finance**
  - ⇒ **Debt Structure Review:** Provided advice to a large City Council on restructuring their debt portfolio. The issues involved optimisation of a range of performance measures for each business unit in the Council while simultaneously minimizing the volatility of the Council's equity in each business unit.
  - ⇒ **Superannuation Fund Performance Benchmarking:** Conducted an analysis of the techniques used by a large superannuation fund to benchmark its performance against competing funds.

- **Valuation of derivative securities**
  - ⇒ **Stochastic Volatility Models in Interest Rate Futures Markets:** Estimated and implemented a number of models designed to predict volatility in interest rate futures markets.

- **Application of option-pricing techniques to real project evaluation**
  - ⇒ **Real Option Valuation:** Developed a framework for valuing an option on a large office building. Acted as arbitrator between the various parties involved and reached a consensus valuation.
  - ⇒ **Real Option Valuation:** Used real options framework in the valuation of a bio-tech company in the context of an M&A transaction.

Jason Hall, PhD BCom(Hons) CFA

Lecturer in Finance
Ross School of Business
The University of Michigan (Room 4443)
701 Tappan Avenue
Ann Arbor, Michigan, USA 48104
Phone: +1 734 926 6989
Email: uqjhall@umich.edu
Research: http://ssrn.com/author=114606

Director
Frontier Economics and SFG Consulting
Level 1, South Bank House, Stanley Street Plaza
South Bank, Queensland, Australia 4101
Phone: +61 419 120 348
Email: jason.hall@frontier-economics.com.au
Website: frontier-economics.com.au
Skype: jason.lance.hall

Experience

2013-15	Ross School of Business, The University of Michigan (Lecturer in Finance)
2008	Ross School of Business, The University of Michigan (Visiting Assistant Professor in Finance)
2014-15	Frontier Economics (Director)
2000-15	SFG Consulting (Director)
2000-12	University of Queensland Business School, The University of Queensland (Senior Lecturer)
1997-99	Credit Suisse First Boston (Equities analyst)

Education

2005	PhD in finance from The University of Queensland
2003	Chartered Financial Analyst designation by the CFA Institute
1996	Bachelor of Commerce with First Class Honours from The University of Queensland

Research

Journal articles

Impact of sector versus security choice on equity portfolios, with Ben McVicar, *Applied Financial Economics*, 2013, 23 (12), 991 – 1004.

Unconstrained estimates of the equity risk premium, with Stephen Gray, Tristan Fitzgerald and Ravi Jeyaraj, *Review of Accounting Studies*, 2013, 18 (2), 560 – 639.

Market risk exposure of merger arbitrage in Australia, with Matthew Pinnuck and Matthew Thorne, *Accounting and Finance,* 2013, 53 (1), 185 – 215.

The value of imputation credits on hybrid securities, with Clinton Feuerherdt and Stephen Gray, *International Review of Finance,* 2010, 10 (3), 365 – 401.

Forecast accuracy and stock recommendations, with Paul Tacon, *Journal of Contemporary Accounting and Economics,* 2010, 6 (1), 18 – 33.

Speculation and e-commerce: The long and the short of IT, with Colin Ferguson, Matthew Pinnuck and Frank Finn, *International Journal of Accounting Information Systems,* 2010, 11 (2), 79 – 104.

Bias, stability and predictive ability in the measurement of systematic risk, with Stephen Gray, Drew Klease and Alan McCrystal, *Accounting Research Journal,* 2009, 22 (3), 220 – 236.

Leveraged superannuation, with Peter Dunn and Scott Francis, *Accounting and Finance,* 2009, 49 (3), 505 – 529.

Persistence in growth versus market expectations, with Matthew Tochterman, *Australian Journal of Management,* 2008, 33 (1), 169 – 199.

Relationship between franking credits and the market risk premium: A reply, with Stephen Gray, *Accounting and Finance,* 2008, 48 (1), 133 – 142.

Comment on 'Regulation and the term of the risk free rate: Implications of corporate debt', *Accounting Research Journal,* 2007, 20 (2), 81 – 86.

Valuation of mining projects using option pricing techniques, with Shannon Nicholls, *JASSA,* 2007, Issue 4 (Summer), 22 – 29.

Relationship between franking credits and the market risk premium, with Stephen Gray, *Accounting and Finance,* 2006, 46 (3), 405 – 428.

Electronic commerce investments, the resource-based view of the firm, and firm market value, with Colin Ferguson and Frank Finn, *International Journal of Accounting Information Systems*, 2005, 6 (1), 5 – 29.

Auditor conservatism and voluntary disclosure: Evidence from the Year 2000 systems issue, with Peter Clarkson and Colin Ferguson, *Accounting and Finance*, 2003, 43 (1), 21 – 40.

Working papers

Portfolio rebalancing and mutual fund tournament behavior, with Paul Tacon, Finance and Corporate Governance Conference 2011, FIRN Frontiers in Finance Conference 2011, Financial Management Association Annual Meeting 2012.

The impact of security analyst recommendations on the trading of mutual funds, with David Costello, AFAANZ Conference 2010 (Winner Best Paper in Finance), Australasian Finance and Banking Conference 2010.

Forecasting stock returns using investor flows under short-sales constraints, with Paul Tacon, Australasian Finance and Banking Conference 2011, Finance and Corporate Governance Conference 2012, AFAANZ Conference 2012, Financial Management Association Annual Meeting 2012, Southern Finance Association Annual Meeting 2012.

Presentations

Accounting and Finance Association of Australia and New Zealand Conference (5) 2005, 2007, 2009-10, 2012
Asian Finance Association Conference 2009
Australasian Finance and Banking Conference (2) 2008, 2010
Australian National University Seminar Series 2012
Coal Trade, hosted by AIC Worldwide 1999
Coaltrans Asia, hosted by Coaltrans Conference Limited 1999
Contemporary Accounting Research/Journal of Contemporary Accounting and Economics Joint Symposium 2009
CPA Mining and Energy Conference 2006
Financial Management Association 2012
First Annual Private Equity Conference, hosted by Television Education Network 2007
JBWere Family Business Conference 2010
Melbourne Centre for Consumer Finance Investment & Regulatory Symposium 2008
PhD Conference in Economics and Business, hosted by University of Western Australia 2003
Southern Finance Association 2012
University of Melbourne Seminar Series (2) 2005, 2010
University of Queensland Seminar Series 2008

Referee activity

Accounting and Finance (8 reviews) 2003, 2005, 2009-13
Accounting Research Journal (3 reviews) 2002, 2006, 2010
Applied Financial Economics (3 reviews) 2012-13
Australian Journal of Management 2012
Contemporary Economic Policy 2011
European Financial Management 2014
Financial Review 2013
International Journal of Emerging Markets 2013
International Review of Finance 2012
MIS Quarterly 2003
Quarterly Journal of Finance and Accounting 2010
Quarterly Review of Economics and Finance 2012

Research grants

PricewaterhouseCoopers/Accounting and Finance Association of Australia and New Zealand 2006: Returns, tax and volatility – Superannuation choice with a complete information set ($8,500)

Australian Research Council Discovery Grant 2002-4: Quantification issues in corporate valuation, the cost of capital and optimal capital structure ($126,000)

UQ New Staff Research Start-up Fund: The competitive advantage of investments in electronic commerce ($10,000)

Research students

PhD (1 student)
2012 – Paul Tacon

Honours (20 students)
2012 – Edward Parslow (Carnegie Wylie)
2011 – James Lamb (Port Jackson Partners)
2010 – Jeremy Evans (JP Morgan), Sarah Thorne (JP Morgan), Alexandra Dwyer (Reserve Bank of Australia)
2009 – Tristan Fitzgerald (UNSW), David Costello (National Australia Bank), William Toe (Ernst & Young)
2008 – Ben McVicar (Credit Suisse), Matthew Thorne (Credit Suisse)
2007 – Sam Turner (ABN Amro Morgans)
2006 – Paul Tacon (PhD, UQ), Ravi Jeyaraj (Navis Capital), Thomas Green (Crescent Capital), Alexander Pascal-Bossy (Macquarie)
2005 – Angela Gill (Wilson HTM), Andrew Wagner (Macquarie)
2004 – Matthew Tochterman (M. Fin. Eng., UC Berkeley), Justyna Lewandowska (JP Morgan), An Pham (UBS)

Masters (2 students)
2003 – Scott Francis (A Clear Direction Financial Planning), Hernando Barrero (PricewaterhouseCoopers)

PhD reader

Damien Cannavan 2012

Teaching

Ross School of Business, The University of Michigan

Valuation (2014-2015; MBA students; avg. rating 4.0)

Corporate Investing Decisions (2014; BBA students avg. rating 4.2)

Corporate Financing Decisions (2015; BBA students)

Corporate Financial Policy (2008; MBA students; avg. rating 4.3)

UQ Business School, The University of Queensland (Mean teacher ratings out of a possible 5.0)

Awarded undergraduate teaching prize 2009

Empirical Finance Honours (2009-12; PhD and Honours students; avg. rating 4.1)

Corporate Finance Honours (2005 & 2011; PhD and Honours students; avg. rating 4.7)

Investments & Portfolio Management (2002-7, 2009-10 & 2012; B.Com, MBA & M.Com students; avg. rating 3.8)

Corporate Finance (2002-4, 2006-10 & 2012; B.Com, MBA and M.Com students; avg. rating 3.8)

Finance (2005-6; M.Com students; avg. rating 3.7)

Corporate Finance and Investments (Mt Eliza Business School, Beijing 2003; MBA students)

Technology Valuation and Project Evaluation (Singapore 2004; Masters of Technology Management students)

Auditing (Summer 2000/1-2001/2; B.Com, MBA and M.Com students; avg. rating 3.8)

Executive education

Risk Management and Financial Analysis (Rabobank 2000-10)

Financial Analysis of Innovative Investments (UQ Business School 2007)

Credit Analysis (Queensland Treasury Corporation 2005)

Capital Management (UQ Business School 2004)

Making Critical Financial Decisions (UQ Business School 2003)

Business Valuation and Analysis (UQ Business School 2003)

Cost of Capital Estimation (UQ Business School 2003)

Analysis of Real Options (Queensland Treasury 2003)

Student competitions

Rotman International Trading Competition

Manager of the UQ Business School trading team (2007 & 2009-12) which competes annually at the University of Toronto amongst 50 teams. UQ is the 9th most successful entrant from 66 schools which have competed in any of the same years, finishing 3rd in 2010, 6th in 2007, 11th in 2009, 14th in 2011 and 18th in 2012.

UBS Investment Banking Competition

Judge for the UQ section 2006-7 & 2009-12. Faculty representative at the national section 2008.

JP Morgan Deal Competition

Judge for the UQ section 2007-8.

Wilson HTM Research Report Competition

Delivered two workshops as part of the 2006 competition and was one of three judges.

Industry engagement

From 2000-15, I have provided consulting services as a director of SFG Consulting and Frontier Economics (from November 2014). A selection of projects is listed below.

Retail electricity and gas margins in NSW (Independent Pricing and Regulatory Tribunal 2012)

In 2006-7 and 2009-10 I acted as part of a team which was engaged to estimate electricity costs and margins for electricity and gas retailers in NSW. We have been reappointed for 2012-13. My role related to the estimation of a profit margin which would allow the retailer to earn a return commensurate its systematic risk. The approach developed was novel in that the margin was derived without reference to any pre-defined estimate of the asset base. Rather, the margin was a function of the potential increases or decreases in cash flows which would result from changes in economic conditions. Reports are available from IPART.

Advice on rules to determine regulated rates of return (Australian Energy Markets Commission 2012)

The AEMC is considering changes to the rules relating to regulation of electricity and gas networks. Independent rule change proposals have been put forward by the Australian Energy Regulator and the Energy Users Association of Australia. Both groups argue that application of the existing rules by the regulator generate upwardly-biased estimates of the regulated rate of return. As part of a team I am currently providing advice to the commission on whether the rule change proposals provide evidence on an upward bias, and if so, whether the proposed amendments are likely to reduce the extent of any bias.

Expert evidence relating to regulated rates of return (Electricity network businesses 2011)

In April 2011 the Australian Competition Tribunal heard an appeal by electricity networks on the regulated rate of return set by the Australian Energy Regulator. The issue was the value of dividend imputation tax credits. The Tribunal directed us to perform a dividend drop-off study to estimate the value of a distributed credit. Largely on the basis of our evidence the Tribunal determined that an appropriate value for a distributed credit was 35 per cent of face value. The Tribunal determination is available on its website and our expert report is available on request.

Estimation of risks associated with long-term generation contracts (New South Wales Treasury 2010)

In 2010 the NSW Government privatised a segment of its electricity industry, by selling three electricity retailers and entering into two generation agreements termed GenTrader contracts. The state-owned generators agreed to provide generation capacity in exchange for a charge. The generators also agreed to pay penalties in the event that their availability was less than agreed. As part of a team, I provided advice to NSW Treasury on the risks associated with the contracts. The estimated penalties resulting from this analysis are used by NSW Treasury in their budgeting role and in providing forward-looking analysis to the Government.

Litigation support relating to asset valuation (Alcan 2006-7)

In 2006-7 I acted as part of a team which provided litigation support to Alcan in a dispute with the taxation authority in the Northern Territory. The dispute related to whether Alcan was required to pay stamp duty as a result of its acquisition of an additional 30 per cent interest in Gove Alumina Limited. One issue was whether the acquisition was land-rich, meaning that the proportion of the asset considered to be land exceeded a threshold triggering stamp duty.

Methodology for evaluating public-private partnerships (Queensland Treasury Corporation 2005)

In 2005 I acted as part of a team which advised QTC on evaluating public-private partnerships, which typically require subsidies to appeal to the private sector. We rebutted the conventional wisdom, adopted in NSW and Victoria, that the standard valuation approach is flawed for negative-NPV projects. Furthermore, we developed a technique to incorporate systematic risk directly into expected cash flows, which are then discounted at the risk-free rate.

Litigation support

Insolvency proceedings relating to the collapse of Octaviar (Public Trustee of Queensland 2008-9)

Valuation of resource assets (Compass Resources 2007-8, Westpac Banking Corporation 2007)

Appeals against regulatory determinations (Envestra 2007-8, Telstra 2008)

Advice on whether loan repayments correspond to contract terms (Qld Dept. of Fair Trading 2005)

Advice on whether port and channel assets were contributed and hence not part of regulated assets (Comalco 2004-5)

Valuation

Management performance securities (Collins Foods Group 2006-11, GroundProbe 2008-9)

Ordinary shares in the context of an equity raising (Auscript 2007-8)

Intangible assets (Inbartec 2007)

Resources assets (Senex Energy 2012, Chalco 2007, Bank of Queensland 2007)

Cost of capital estimation, advice and regulatory submissions

Transport (Qantas 2008, QR National 2005 & 2012)

Water (Essential Services Commission of South Australia 2012, ActewAGL 2012, IPART 2011, Metropolitan utilities in Victoria 2004 & 2006-7, QCA 2002-3)

Energy networks (Economic Regulation Authority in Western Australia 2009, Hong Kong Electric 2007, Envestra 2006-7 & 2012, Powercor 2005, AGL 2004, Energex 2003-4, Ergon Energy 2003-4)

Local government networks (Queensland Competition Authority 2009)

Electricity generation (National Generators Forum 2008)

Environmental consulting (Ecowise 2007)

Listed vs unlisted infrastructure funds across alternative European equity markets (ABN AMRO Rothschild 2007)

Forestry assets (Queensland Department of Natural Resources 2004)

Portfolio performance measurement

Performance evaluation and benchmark derivation (Friday Investments 2010-12, Zupp Property Group 2011-12)

Corporate finance

Economic impact assessment of a proposed development of a retail shopping complex (Lend Lease 2006)

Impact of an acquisition on dividend growth, earnings per share and share price (AGL 2003-4)

Estimation of the optimal capital structure for electricity generation and distribution (NSW Treasury 2001-2)

Review of the debt valuation model used by the Snowy Hydroelectric Authority (NSW Treasury 2002)

Estimation of the optimal contract terms for coal sales to an electricity generator (NSW Treasury 2001-2)

Econometrics

Scoping study into the determinants of changes in tax debt in Australia (Australian Taxation Office 2007)

Interests

I am interested in sport as a participant and spectator. I finished 3rd on three occasions in the Brisbane Half Marathon (2005 & 2009-10), 8th in the Toronto Half Marathon (2002) and 3rd in the Australian Universities Marathon Championships (2003). I have finished 21 marathons, recording a best time of 2:47:54 in the Chicago Marathon 2011. From 1994-96 I was a member of The University of Queensland tennis team, which placed 1st at the Australian University Games in 1994.