AusNet Transmission Group Pty Ltd

Transmission Revenue Review 2017-2022

Appendix 10G: Key Issues in Estimating the Return on Equity for the Benchmark Efficient Entity (Frontier Economics)

Submitted: 30 October 2015

Key issues in estimating the return on equity for the benchmark efficient entity

REPORT PREPARED FOR ACTEWAGL DISTRIBUTION, AGN, AUSNET SERVICES, CITIPOWER, ERGON, ENERGEX, JEMENA ELECTRICITY NETWORKS, POWERCOR, SA POWER NETWORKS AND UNITED ENERGY

June 2015

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1 Executive Summary

1.1 Instructions

1 Frontier Economics (**Frontier**) has been retained by ActewAGL Distribution, AGN, AusNet Services, Citipower, Ergon, Energex, Jemena Electricity Networks, Powercor, SA Power Networks and United Energy to provide our opinions in relation to the recent decisions of the Australian Energy Regulator (**AER**) insofar as they relate to the allowed return on equity.

2 Specifically, we have been asked to provide a report that addresses the following issues:

a. The AER's determination makes reference to the breadth of inputs provided to it by the network businesses. Please analyse what the AER's decision does with the various inputs and whether the way in which the inputs are treated accords with the economic concepts advanced in the rate of return objective.

b. Which of the inputs are given weight in the decision and are there ways in which some inputs affect the extent to which other inputs contribute to the rate of return decision and is the framework economically sensible.

c. The Sharpe-Lintner CAPM is given a more prominent role than the other models because it is used as the "standard bearer" and "foundation model". You, and other consultants retained by the network businesses and in some respects even the AER's consultants, have previously expressed significant reservations about the empirical performance of this model. The materials released by the AER respond to a number of those criticisms. Please provide your views on those criticisms.

d. Please also note any other key observations you have in response to the AER's decisions on equity and the materials it relies on.

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

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

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

6 Jason Hall is Lecturer in Finance at the Ross School of Business, University of Michigan and Director of Frontier Economics. 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.

7 Copies of our curriculum vitas are attached as Appendix 2 to this report.

8 We have previously provided two reports in relation to the allowed return on equity as part of the current round of regulatory determinations, which we reference in a number of places throughout this report:

a. SFG Consulting, 2014, *The required return on equity for regulated gas and electricity network businesses*, 6 June; and

b. SFG Consulting, 2015, *The required return on equity for the benchmark efficient entity*, 25 February.

9 We have also prepared a number of other reports on issues relating to the required return on equity throughout the AER's Guideline process. Since preparing those reports, we have joined Frontier Economics and provide this report on that basis.

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

1.2 Context

11 In April 2015, the Australian Energy Regulator (AER) released a final decision for TransGrid Transmission relating to the regulatory period 2014-15 to 2018-19.[1] This decision is the culmination of three years of debate between regulated energy networks and the AER over the manner in which the cost of equity is best estimated, and the computation of that cost of equity. Over this three year period there has been substantial disagreement between the AER and energy networks over the manner in which the cost of equity is estimated.

12 In reaching this final decision the AER has relied upon recent reports by Partington (2015), and Handley (2015 Imputation, and 2015 Cost of equity). The AER also relies upon previous advice to the AER provided by the same authors.

13 Throughout the AER's determination there are many topics on which we strenuously disagree with the AER's rationale and conclusions. There are also

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1 *Final decision for TransGrid Transmission 2014-15 to 2018-19, Attachment 3 – Rate of return,* April. We note that the AER's other recent final decisions for Ausgrid, Directlink, Essential Energy, Endeavour Energy, ActewAGL Distribution, TasNetworks and Jemena Gas Networks (NSW) contain the same or similar wording as is referenced from the TransGrid Final Decision in this report.

many topics on which we strenuously disagree with the advice provided to the AER. However, in this report we only consider the most fundamental issues of disagreement between our views, those of the AER, and the views of the AER's advisors.

14 In our view, the AER's decisions on these cost of equity issues mean that the AER's allowed return is less than the prevailing cost of funds for a benchmark energy network and does not reflect the best estimate.

1.3 Summary of conclusions

15 Our primary conclusions in this report are summarised below.

Inappropriate reliance on the Sharpe-Lintner CAPM

16 There is no proper basis for the AER's "foundation model" approach. There is no need to select one primary model and no benefit from doing so in terms of improving the quality of the estimate of the required return on equity.

17 The AER applies different standards to its assessment of the Sharpe-Lintner CAPM relative to other models. By way of some examples:

a. The AER rejects other models on the basis that the outputs are potentially sensitive to different estimation methods, when the same is true of the Sharpe-Lintner CAPM. In its recent final decisions, the AER's own range for the allowed return on equity from the Sharpe-Lintner CAPM is 4.6%[2] to 8.6%.[3]

b. The AER cites certain empirical studies to support its rejection of other models. However, the only reasonable interpretation is that the body of available evidence supports the empirical performance of other models over the Sharpe-Lintner CAPM. In some case, papers that the AER cites as supporting the Sharpe-Lintner CAPM actually do the opposite.

c. The AER rejects *all* estimates for other models on the basis that it finds *some* of them to be implausible.

18 It is not possible to have proper regard to the Black CAPM without ever estimating it. It is not possible to know whether the AER's adjustments in relation to the Black CAPM are adequate or appropriate when the AER presents no estimate of the Black CAPM and no quantification of the adjustments it has made in relation to it.

19 In relation to the Fama-French model, the AER has never explained whether it considers that the well-documented systematic bias in relation to high book-to-market stocks exists, and why that systematic bias is not relevant evidence.

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2 2.55+0.4×5.1=4.59%.

3 2.55+0.7×8.6=8.57%.

There has been no real change in the AER's approach under the new Rules

20 In its Guideline materials, the AER indicated that its consideration of a wider range of relevant evidence may produce a more stable allowed return on equity. However, the AER's process results in primary weight being applied to the same subset of the relevant evidence that they used under the previous Rules, and immaterial weight being applied to the other relevant evidence. The result is that there is no difference between the AER's 2009 WACC Review and its current practice in that:

a. The Sharpe-Lintner CAPM is the only model that is estimated;

b. The risk-free rate is set to the yield on 10-year government bonds;

c. Beta is selected from a range of 0.4 to 0.7, which is determined by applying regression analysis to a small sample of domestic comparators (with the point estimate reduced from 0.8 to 0.7); and

d. The market risk premium is set to 6.5%.

21 In its recent final decisions, the AER's allowed return on equity is 7.1%. Relative to this benchmark, the AER's allowed return on equity was:

a. 44% higher at the time of its 2009 WACC Review;

b. 23% higher at the time of its Guideline; and

c. 14% higher at the time of its November 2014 draft decisions.

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

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

b. 7.1% for a firm regulated in February 2015;

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

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

23 That is, the AER's approach produces a "lucky dip" for regulated businesses whereby two identical businesses regulated a month apart could have materially different allowances for the return on equity locked in for an almost identical five-year regulatory period.

24 The reason for this volatility is that, under the AER's approach, the allowed return on equity still varies one-for-one with every change in government bond yields.

25 The AER does not accept that the recent dramatic declines in the risk free rate might have been at least partially offset by an increase in the MRP even though that is precisely the view of the Reserve Bank of Australia:

> …post-crisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero (Graph 2). This seems to imply that the equity risk

premium observed *ex post* has risen even as the risk-free rate has fallen and by about an offsetting amount.[4]

The imposition of arbitrary binding constraints

26 Under its "foundation model approach" the AER estimates the parameters of only one model, the Sharpe-Lintner CAPM. This model requires estimates of three parameters. There is no contention about the risk-free rate, but there is dispute about the estimation of equity beta and the market risk premium (MRP). The AER's approach for estimating these two parameters is to:

a. Predetermine a preferred "primary" subset of the relevant evidence which is used to determine an immutable range for the parameter; and

b. Limit the use of all other relevant evidence to the role of informing the selection of a point estimate from within the primary range.

27 For example, the effect of the AER's approach is to apply a fixed upper bound of 6.5% to its estimate of the MRP. Even as the AER's own other estimates indicate that the MRP is moving more and more materially above 6.5%, the AER maintains a fixed MRP of 6.5% -- the same figure it adopted in its 2009 WACC Review. The 6.5% figure is the upper bound of a range that reflects the statistical uncertainty of the AER's estimates of the MRP in *average* market conditions. To use that figure as an upper bound for what the MRP could be in *any* market conditions has no logic to it.

28 Similarly, the effect of the AER's approach is to apply a fixed upper bound of 0.7 to its beta estimate, based on evidence from four domestic companies and five companies that no longer exist – even though the weight of other relevant evidence suggests materially higher estimates. Moreover, the AER's 0.7 upper bound is inconsistent with the 0.8 recommendation from the AER's own consultant's assessment of the same evidence.

The inappropriate widening of ranges dilutes some relevant evidence

29 Through its Guideline process and recent draft and final decisions, the AER has adopted the practice of:

a. Selecting a point estimate from within a range determined by its favoured "primary" subset of the relevant evidence; and

b. Concluding that "other" relevant evidence supports a range that includes the AER's initial point estimate, and therefore confirms that initial point estimate.

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4 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015. Emphasis added.

30 When considering the "other" relevant evidence, the AER's approach results in a widening of the range of estimates that it says is supported by that other relevant evidence. This has the effect of neutralising the impact of all evidence after the primary point estimate has been set, in that the "other" evidence is considered to support such a wide range of estimates that it is effectively uninformative and can never overturn the initial estimate from the "primary" subset of the relevant evidence.

31 We provide five examples in this report:

a. **International comparators for beta**: When estimating beta, the weight of evidence from international comparators supports an equity beta materially above the AER's beta of 0.7. The AER combines this evidence with a small number of low quality estimates (which were not relied on by the firm that estimated them or the regulator that considered them) and raw beta estimates (that had not been re-levered and which are therefore not comparable).

b. **Wright approach**: The Wright approach produces an estimate of the MRP that is materially above the AER's estimate. However, the AER combines the Wright approach with beta estimates that are materially below its own estimate of 0.7, even though the AER had already rejected those lower estimates in a previous step of its estimation process.

c. **Independent expert reports**: The AER compares its own *with-imputation* estimates of required returns with *ex-imputation* estimates from independent experts. It also ignores all "uplifts" that independent experts apply, so never considers the *actual* return on equity adopted by independent experts.

d. **Broker reports**: The AER again compares its own *with-imputation* estimates of required returns with *ex-imputation* estimates from broker research reports. In addition, the AER never compares the actual return on equity adopted by brokers with its own estimate. The AER only compares its estimates against broker estimates that have been adjusted by the AER (by subtracting the difference between the base rate that was actually used by the broker and the contemporaneous government bond yield).

e. **Market value estimates of theta**: In its Guideline, the AER considered a number of market value estimates of theta. It rejected a number of them as being outdated, poor-quality, and unreliable. This led the AER to conclude that the studies supported a range of 0 to 0.5. In its recent decisions, the AER has reintroduced the studies that it had previously rejected and now concludes that this evidence supports a range of 0 to 1.

Recent AER expert reports

Handley (2015 JGN)

32 Handley (2015 JGN) accepts that there are two "well known"[5] systematic biases in the Sharpe-Lintner CAPM relative to observed stock returns:

a. The Sharpe-Lintner CAPM underestimates the returns on stocks with low betas; and

b. The Sharpe-Lintner CAPM underestimates the returns on stocks with high book-to market ratios.

33 In our view, these systematic biases are evidence that is relevant to the question of whether it is appropriate to rely exclusively on the Sharpe-Lintner CAPM for the purpose of estimating the required return on equity.

34 Handley (2015 JGN) rules out having regard to the models that have been developed specifically to address the "well known" systematic biases. His reason for doing so is couched in his own legal interpretation of the reference in the Rules to a "similar degree of risk."

35 We do not consider legal interpretation in this report. We simply conclude that the well-known systematic biases and the models that have been developed to address them would be relevant evidence if the objective of the exercise is to produce the best possible estimate of the required return on equity.

Partington and Satchell (2015)

36 A number of proposals have been made which suggest that, when estimating the required return on equity, the AER should have regard to evidence beyond the estimation of three Sharpe-Lintner CAPM parameters. Partington and Satchell (2015) consider some aspects of these proposals. Their general approach is to:

a. Raise potential conceptual problems that might occur with the implementation of the proposal under some conditions;

b. Provide no evidence that the problem arises in the specific case of the benchmark efficient firm and/or the contemporaneous market conditions;

c. Provide no solutions for how the potential problem might be addressed if it should arise; and

d. Provide no consideration of any problems that might arise in relation to the AER's Sharpe-Lintner CAPM approach.

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5 Handley (2015), pp. 5-6.

2 Issue 1: Inappropriate reliance on the Sharpe-Lintner CAPM

2.1 Overview

37 The AER determines the allowed return on equity by inserting three parameters into the Sharpe-Lintner formula.[6] The AER does not estimate any parameter for, or calculate the required return on equity from, any other financial model. In this section, we consider the AER's reliance on the Sharpe-Lintner Capital Asset Pricing Model (**CAPM**) and conclude that:

a. There is no proper basis for the AER's "foundation model" approach. There is no need to select one primary model and no benefit from doing so in terms of improving the quality of the estimate of the required return on equity.

b. The AER applies different standards to its assessment of the Sharpe-Lintner CAPM relative to other models. By way of some examples:

   i. The AER rejects other models on the basis that the outputs are potentially sensitive to different estimation methods, when the same is true of the Sharpe-Lintner CAPM. In its recent final decisions, the AER's own range for the allowed return on equity from the Sharpe-Lintner CAPM is 4.6%[7] to 8.6%.[8]

   ii. The AER cites certain empirical studies to support its rejection of other models. However, the only reasonable interpretation is that the body of available evidence supports the empirical performance of other models over the Sharpe-Lintner CAPM. In some case, papers that the AER cites as supporting the Sharpe-Lintner CAPM actually do the opposite.

   iii. The AER rejects *all* estimates for other models on the basis that it finds *some* of them to be implausible.

c. It is not possible to have proper regard to the Black CAPM[9] without ever estimating it. It is not possible to know whether the AER's adjustments in relation to the Black CAPM are adequate or appropriate when the AER presents no estimate of the Black

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6 Sharpe (1964) and Lintner (1965).

7 2.55+0.4×5.1=4.59%.

8 2.55+0.7×8.6=8.57%.

9 Black (1972).

CAPM and no quantification of the adjustments it has made in relation to it.

d. In relation to the Fama-French model,[10] the AER has never explained whether it considers that the well-documented systematic bias in relation to high book-to-market stocks exists, and why that systematic bias is not relevant evidence.

2.2 Problems with the foundation model concept

38 The AER describes the Sharpe-Lintner CAPM as its *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, equity beta and the market risk premium (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.

39 The Guideline materials set out the AER's reasons for adopting its foundation model approach.[11] These reasons include the simplicity and predictability of the approach and the opportunity to apply regulatory judgment.[12] However, our view is that the only valid reason for adopting the foundation model approach would be if that approach provides the best estimate of the required return on equity for the benchmark efficient firm in the prevailing conditions in the market for equity funds. However, there is no reference to the quality of the estimate in any of the AER's reasons. Our view is in alignment with the view of the Australian Energy Market Commission (AEMC) that:

> 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.[13]

40 Having determined that it will adopt a single "foundation" model, the AER then goes about selecting that single model. This involves a comparison of each alternative model against the default Sharpe-Lintner CAPM according to a set of criteria that the AER has developed. In our view this is the wrong approach. Rather than comparing individual models against the Sharpe-Lintner CAPM across its own criteria, the AER should be considering how the estimates from the various relevant models can be used to produce the best possible estimate of the required return on equity for the benchmark efficient entity.

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10 Fama and French (1993).

11 AER Rate of Return Guideline, Explanatory Statement, p. 55.

12 AER Rate of Return Guideline, Explanatory Statement, p. 55.

13 AEMC Final Determination, p. 43.

41 The AER states that it has had appropriate regard to other relevant financial models, but it never even proceeds to estimating any parameter for any other model. Rather, the AER "has regard to" the other relevant financial models by simply referring to them when applying its judgment to the selection of point estimates to be inserted into the Sharpe-Lintner CAPM formula. The obvious problem with this approach is that it is impossible to know whether any adjustment that the AER might make to its Sharpe-Lintner CAPM parameters, to account for evidence from other financial models, is appropriate. If the other financial models are never estimated, there is no way of knowing whether or not any particular Sharpe-Lintner CAPM adjustment is adequate.

2.3 The empirical performance of the Sharpe-Lintner CAPM

42 Throughout the Guideline process, and since, there has been much discussion about the performance of the Sharpe-Lintner CAPM. In the words of the AER, the model has "limitations" and "empirical shortcomings."[14] Indeed, it is the failings of the Sharpe-Lintner CAPM that have led to the development of other financial models that address the main limitations and empirical shortcomings. That is, because the Sharpe-Lintner CAPM does not work very well in practice, researchers have sought to produce new models that work better.

43 NERA (2015 Lit) surveys the relevant literature relating to the Sharpe-Lintner CAPM and other financial models, and evaluates the AER's analysis and use of this literature. The main conclusions are:

a. **Roll's critique**:[15] Technically, the Sharpe-Lintner CAPM theory can never be tested. This is because the CAPM is based on a market portfolio that includes all assets in the economy and it is impossible to simultaneously observe prices for all assets (e.g., property, private firms, intangibles, etc.). This is known as "Roll's critique." NERA notes that the AER uses this technical argument to "shield the version of the model that it employs from scrutiny."[16] That is, the AER claims that any evidence of the empirical failings of the CAPM can be dismissed as not being a true test of the CAPM because a proxy (e.g., stock market index) was used, whereas the CAPM requires the market portfolio to consist of all assets. However, the AER employs a particular implementation of the Sharpe-Lintner CAPM – using a stock market proxy for the market portfolio when estimating beta and MRP. While it may not be possible to test a theoretical version of the CAPM, it is certainly possible to test the performance of the

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14 TransGrid Final Decision, Attachment 3, pp. 61, 218, 228, 234.

15 Roll (1977).

16 NERA (2015 Lit), p. ii.

practical implementation that the AER adopts. And the AER's implementation performs so poorly that it explains virtually none of the variation in returns across stocks.

b. **The Sharpe-Lintner CAPM is rejected in empirical tests**. The literature shows that the Sharpe-Lintner CAPM, when implemented using a stock market index as a proxy for the market portfolio (i.e., as implemented by the AER), is systematically rejected in empirical tests. NERA concludes that the evidence establishes that there is little or no relation between beta estimates and subsequent stock returns.[17]

c. **Low beta bias**. The literature shows that the Sharpe-Lintner CAPM systematically underestimates the return on equity for stocks with low beta estimates.[18]

d. **High book to market bias**. The literature shows that the Sharpe-Lintner CAPM systematically underestimates the return on equity for stocks with high book to market ratios.[19]

44 NERA (2015 Emp) presents the results of a number of empirical tests of the Sharpe-Lintner CAPM (and particularly the AER's implementation of that model) and other financial models. Their primary conclusion is that the Sharpe-Lintner CAPM produces biased estimates:

> The central empirical result is that models like the Sharpe-Lintner CAPM and AER CAPM that use market beta as a measure of risk and a restriction that a zero-beta portfolio earn either the risk-free rate or a rate that sits only a small distance above the risk-free rate provide poor estimates of the return required on equity. In particular, the models tend to underestimate the returns required on low-beta equity portfolios,[20]

and:

> The Sharpe-Lintner CAPM and the AER CAPM perform so badly that even a naïve model that states that the mean returns to all equities are identical performs better.[21]

45 The NERA reports also consider the assessment of the relevant empirical evidence by the AER and its advisors. NERA concludes that:

> A recurring theme is that the AER's advisers cite selectively from the work that they discuss.[22]

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17 NERA (2015 Lit), pp. iii-iv.

18 NERA (2015 Lit), pp. iii-iv.

19 NERA (2015 Lit), Section 3.1, p. 25.

20 NERA (2015 Emp), p. v.

21 NERA (2015 Emp), p. v.

22 NERA (2015 Emp), p. iv.

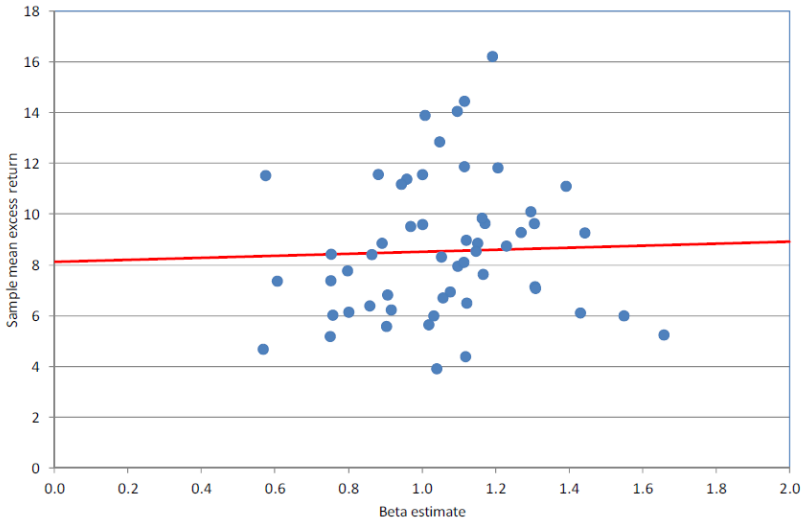
46 For example, NERA notes that papers that actually provide evidence against the Sharpe-Lintner CAPM have been interpreted by the AER's advisors as supporting the AER's implementation of the Sharpe-Lintner CAPM:

> …while Davis (2011), Handley (2014) and McKenzie and Partington (2014), in reports written for the AER, endorse the use of the Sharpe-Lintner CAPM and review, favourably, the work of Lewellen, Nagel and Shanken [LNS],[23] the evidence that Lewellen, Nagel and Shanken provide indicates that the Sharpe-Lintner CAPM does not generate unbiased estimates of the cost of equity.[24]

47 Specifically, NERA demonstrates that the LNS data supports no relation at all between beta estimates and stock returns, as summarised in Figure 1 below.

Figure 1: Lewellen, Nagel and Shanken (2010) analysis of Sharpe-Lintner CAPM

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



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

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

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

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

48 Moreover, the LNS data supports a strong relationship between the predictions of the Fama-French 3-factor model and subsequent stock returns, as summarised in Figure 2 below.

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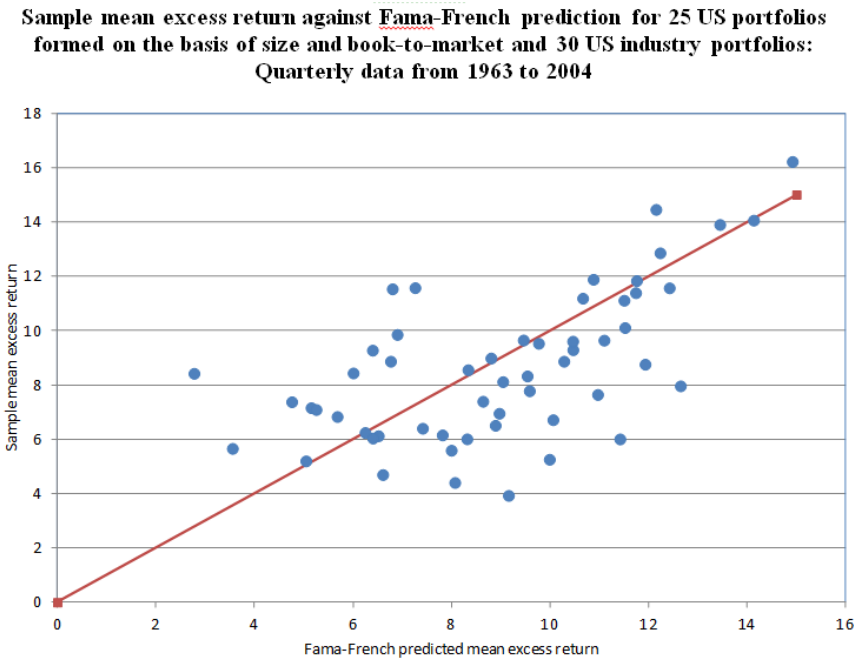
23 Lewellen, Nagel and Shanken (2010).

24 NERA (2015 Lit), p. iv.

Figure 2: Lewellen, Nagel and Shanken (2010) analysis of Fama-French three factor model



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

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

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

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

49 In the context of its recent Jemena Gas Networks Final Decision, the AER commissioned further work by Handley (2015 JGN) and Partington and Satchell (2015). These are follow on reports from earlier papers.[25] Throughout these reports the authors have relied upon the commentary of LNS to dismiss the empirical evidence in favour of the Fama-French model. However, the authors consider it unimportant to make any direct comparison of the Sharpe-Lintner CAPM and the Fama-French model on the basis of the evidence. Across the six reports, the authors have never stated that, on balance, the weight of empirical evidence lies in favour of one model or the other. The authors apply an empirical threshold for acceptance of the Fama-French model that they do not apply to the Sharpe-Lintner CAPM:

a. Handley (2014) endorses the use of the AER's foundation model approach,[26] and has not altered this view in subsequent reports. He relies upon the evidence presented by LNS to reject the use of

25 Handley (2014), Handley (2015 Cost of equity), McKenzie and Partington (2014), and Partington (2015).

26 Handley (2014), p. 4.

the Fama-French model,[27] despite this evidence being even more compelling in its rejection of the use of the Sharpe-Lintner CAPM. His support for the Sharpe-Lintner CAPM as the sole asset pricing model is based entirely upon theoretical grounds.[28] He presents no empirical support for the Sharpe-Lintner CAPM and the main empirical result from LNS used to reject the Fama-French model would certainly rule out the use of the Sharpe-Lintner CAPM.

b. McKenzie and Partington (2014) and Partington (2015) were asked the direct question as to whether the use of models other than the Sharpe-Lintner CAPM would result in a materially better estimate of the return on equity. The authors state that the answer to this question is unclear.[29] They are also asked the direct question as to whether the Fama-French model could be used, in part, to improve the return on equity estimate. The authors state that the answer to this question is also unclear.[30] Despite this lack of clarity, the authors unequivocally reject the use of the Fama-French model.[31] In the most recent paper by Partington and Satchell (2015) the authors provide more detail on their interpretation of LNS. The authors rely upon the work of LNS to make the point that we should be sceptical about the results of asset pricing tests,[32] but avoid making any inference from those tests about the relative performance of the Sharpe-Lintner CAPM and the Fama-French model.

50 LNS consider a number of different metrics by which one might test or rank the performance of a number of asset pricing models. They develop one metric under which no models receive a high absolute score. This leads Handley (2105 JGN) and Partington and Satchell (2015) to conclude that models other than the Sharpe-Lintner CAPM should not be used. However, there are two problems with this conclusion:

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

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27 Handley (2014), p. 7; Handley (2015 Cost of equity), p. 4; Handley (2015 JGN), pp. 9–10.

28 Handley (2014), p. 4.

29 McKenzie and Partington (2014), p. 14; and Partington (2015), p. 34.

30 McKenzie and Partington (2014), p. 19; and Partington (2015), p. 38.

31 McKenzie and Partington (2014), p. 19; and Partington (2015), p. 39.

32 Partington and Satchell (2015), p. 8.

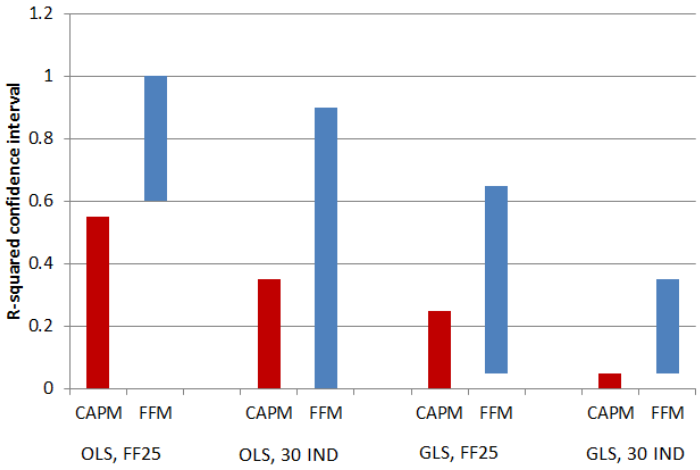
Lewellen, Nagel and Shanken (2010) show that the CAPM has zero explanatory power.[33]

> Similarly, SFG (2015 FFM, Figure 1, p. 23) summarise the LNS test results in the figure that is reproduced below. In every case, the performance statistic for the Fama-French model is materially superior to that of the Sharpe-Lintner CAPM. This leads Lewellen, Nagel and Shanken (2010) to conclude that:

The confidence interval provides a good summary measure of just how poorly the CAPM works.[34]

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

Figure 3. Sharpe-Lintner and Fama-French explanatory power



Source: Lewellen, Nagel and Shanken (2010), Table 1, p. 188.
OLS=Ordinary least squares; GLS=Generalised least squares.
FF25=The Fama and French size and book-to-market portfolios.
30 IND=The 25 FF portfolios plus 30 industry portfolios.

b. Handley (2015 JGN) and Partington and Satchell (2015) both seem to have interpreted the LNS paper from the perspective of whether it provides evidence that is compelling enough to overturn the Sharpe-Lintner CAPM as the default model. There are two problems with this perspective:

   i. There is no reason to consider that the Sharpe-Lintner CAPM has any special position or role as the default

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33 Handley (2015 JGN), p. 10.

34 Lewellen, Nagel and Shanken (2010), p. 187.

model. There is no persuasive evidence test under the current Rules, but rather a requirement to obtain the best estimate of the required return on equity.

ii. There is no reason to select a single model – the current Rules require that regard must be had to all relevant models. Unless the performance of one model so clearly dominated all others, it would be illogical to rely on a single model.

iii. Even if there was some sort of persuasive evidence test and even if a single model had to be selected, the results presented by Lewellen, Nagel and Shanken (2010) suggest that the Sharpe-Lintner CAPM would rank last of all – in their tests, no other model performs as poorly as the Sharpe-Lintner CAPM.

2.4 Empirical shortcomings of the Sharpe-Lintner CAPM and how they are addressed

51 The AER has adopted the Sharpe-Lintner CAPM as its "foundation" model for estimating the cost of equity, and determined that:

> [O]ther relevant material can inform the SLCAPM parameter estimates. We consider this may mitigate limitations of the model.[35]

52 The AER has acknowledged there is a problem with the Sharpe-Lintner CAPM in terms of its limitations and empirical shortcomings.[36] However, the AER has never made a clear statement about what it considers the limitations and empirical shortcomings of the Sharpe-Lintner CAPM to be. Rather, having recognised that the Sharpe-Lintner CAPM has some failings, the AER simply asserts that all of those failings will be exactly accounted for by adopting a beta estimate of 0.7 at the upper end of its range.

53 The range for equity beta adopted by the AER merely represents the statistical imprecision associated with regression-based estimates of beta for a small sample of Australian-listed stocks. This beta range has nothing at all to do with the limitations or empirical shortcomings of the Sharpe-Lintner CAPM. There is no reason to believe that the AER's approach, of merely selecting a beta at the upper end of the AER's defined range, will lead to an appropriate estimate of the required return on equity for the benchmark efficient entity.

54 Whereas the AER has never been precise about which limitations are mitigated by which other information, or about the process by which that mitigation occurs, service providers have made two very explicit statements regarding the

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35 TransGrid Final Decision, Attachment 3, p. 61.

36 TransGrid Final Decision, Attachment 3, p. 62.

limitations and empirical shortcomings of the Sharpe-Lintner CAPM, and have proposed explicit ways to deal with those limitations and shortcomings:

a. **Low beta bias.** The Sharpe-Lintner CAPM systematically underestimates the required return for stocks with beta estimates less than one. This issue can be specifically addressed by using the Black CAPM, via an estimate of the zero beta premium. SFG (2014 Black) provided a direct estimate of the zero beta premium and of the cost of equity using the Black CAPM.

b. **High book to market bias.** The returns on stocks with high book to market ratios are systematically higher than predicted by the Sharpe-Lintner CAPM. This can be addressed by using the Fama-French model, which requires estimation of risk coefficients and risk premiums. SFG (2014 FFM) provides the relevant parameter estimates using the best available methods for estimating risk coefficients and risk premiums.

55 The AER has rejected placing any reliance on cost of equity estimates compiled using the Black CAPM and the Fama-French model, giving them zero weight. The reasons for rejecting these approaches are primarily based upon the imprecision associated with cost of equity estimates from the models and varying approaches to estimation techniques that service providers and advisors could adopt.[37]

56 In the AER's justification for rejecting direct cost of equity estimates from these two models, it refers to a section of Partington (2015) which talks about the challenges in implementing models other than the Sharpe-Lintner CAPM.[38] In their recent report, Partington and Satchell (2015) make it clear that "our main concern with the zero beta CAPM lies in its implementation."[39] With reference to the Fama-French model, they point to the potential for different consultants to arrive at different estimates of the cost of equity, and raise the concern that service providers will advocate for higher allowed returns.[40] In short, different assumptions in estimation could lead to different estimates of the cost of equity.

57 However, Partington (2015) is also asked the direct question as to whether using more additional models to the Sharpe-Lintner CAPM would lead to a better estimate of the cost of equity. In reply, Partington says that the answer is unclear.[41] Partington does not say that the AER should rely solely on the Sharpe-Lintner CAPM. His answer is that he does not know whether using more models would lead to a better answer, and makes no statement as to the best way to

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37 We summarise the currently unresolved issues in relation to the Black CAPM and FFM (i.e., the AER's reasons for not estimating them and our responses) in Section 6 of this report.

38 Partington (2015), p. 67.

39 Partington and Satchell (2015), p. 10.

40 Partington and Satchell (2015), p. 14.

41 Partington (2015), p. 44.

estimate the cost of equity using the Sharpe-Lintner CAPM or any other model. All Partington (2015) says is that he does not accept the implementations of the Black CAPM and the Fama-French model as proposed by service providers.

58 The key point is that neither the AER, nor Partington as the AER's advisor, has ever made a direct statement addressing the two key empirical limitations of the Sharpe-Lintner CAPM.

a. **Low beta bias.** The AER has never accepted the statement that the expected returns on low beta stocks using the Sharpe-Lintner CAPM are too low. In fact the AER makes it very clear that its use of the Black CAPM to estimate the cost of equity does not incorporate any specific uplift to the equity beta,[42] but rather a general consideration of the theoretical underpinnings of that model.[43] So the AER says there are limitations and empirical shortcomings to the Sharpe-Lintner CAPM, but does not accept there is a low beta bias and does not accept that a way to correct for low beta bias, if it exists, is to use the Black CAPM. The AER merely writes down a beta estimate of 0.7 and says that it has given appropriate regard to the Black CAPM.

b. **High book to market bias.** The AER has never (a) accepted or rejected that the empirical regularity of high book to market stocks systematically generating returns in excess of the Sharpe-Lintner CAPM prediction is likely to persist, (b) reached the conclusion that the past performance of high book to market stocks is due to something other than risk, or (c) made a statement that even if the returns to high book to market stocks are due to risk, this risk is somehow different to that which energy networks are exposed to.

59 Equally as important, the AER's advisors have never reached a conclusion on these issues either, as demonstrated by the discussion put forward by Partington (2015). Partington is asked the specific question as to whether the addition of direct cost of equity estimates from models other than the Sharpe-Lintner CAPM would be expected to result in a materially better estimate of the return on equity.[44] Partington's response is that the answer to this question is unclear. He considers that triangulation from a range of sources in useful but he expresses reservations about the implementation of the models by network service providers. Partington is silent about what would be an improvement on the implementation of the models, compared to what has been submitted by network service providers. With reference to the specific empirical shortcomings of the Sharpe-Lintner CAPM that are our focus, we have the following commentary in Partington's report.

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42 TransGrid Final Decision, Attachment 3, p. 73.

43 JGN Final Decision, p. 38.

44 Partington (2015), p. 34.

a. **Low beta bias.** The specific discussion by Partington (2015) of the Black CAPM reaches no conclusions on the low beta bias, nor the most appropriate role for the Black CAPM.[45] Partington (2015) makes four statements that provide no assistance to the AER in determining how to estimate the cost of equity to account for the empirical shortcomings of the Sharpe-Lintner CAPM. Partington says that (1) the theory of the Black CAPM may have a role to play in estimating the equity beta (although that role is unclear), (2) the theory of the Black CAPM does not necessarily support an estimate of the equity beta, (3) it is unclear whether using the Black CAPM in combination with any other model will lead to a better cost of equity estimate, and (4) that "in principle" the Black CAPM might be used for estimating the cost of equity but that there is a problem in estimating the zero beta premium (the estimation of which is sensitive to the choices made in its estimation).

   In later discussion, Partington comments on the specific application of the Black CAPM proposed by service providers.[46] He makes the statement that there should be no specific estimate of the zero beta return, that the AER's solution of adjusting the equity beta estimate is reasonable, but there is no objective basis to determine what that adjustment to beta should be. Partington's conclusion is that the service providers' estimation of the Black CAPM should not be used to estimate the magnitude of the beta adjustment. But he provides no estimate himself, and he is silent as to what adjustment should be made, and provides no guidance about how the AER or a service provider, should go about making any adjustment to beta.

   In short, while Partington (2015) rejects what the service providers have submitted with respect to low beta bias and the Black CAPM, he makes no statement as to whether the AER approach – of writing down a beta estimate – is better or worse than what has been submitted by the service providers.

b. **High book to market bias.** Partington (2015) discusses the Fama-French model in the context of alternative factors that are supported by some empirical evidence.[47] This discussion serves to illustrate that there are many factors that have been identified by researchers as possibly being able to explain why some stocks earn higher returns than other stocks. Yet Partington has never reached a conclusion on whether the book to market factor in the

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45 Partington (2015), pp. 40-45,

46 Partington (2015), p. 71.

47 Partington (2015), pp. 35-37.

Fama-French model is likely to be a proxy for risk, and if it is a proxy for risk how it should be measured. Partington's discussion of the Fama-French model makes two points: (1) that other researchers disagree on what factors are relevant; and (2) that some factors identified by researchers might be a spurious artefact of the data analysed or the research method adopted. But Partington does not make the statement that, in his view, some factor other than the book-to-market factor should be used instead, and he does not make the statement that, in his view, the book-to-market factor is a spurious artefact of the data analysed or the research method adopted.

Most importantly, Partington (2015) is silent on the best way to estimate the cost of capital. He says that the parameter estimates in the Fama-French model are unstable, and that this represents a reason not to adopt the model. But he does not proceed to reach a conclusion as to why high book to market stocks have earned persistently high returns. The use of the Fama-French model addresses this particular empirical shortcoming of the Sharpe-Lintner CAPM, but Partington does not reach a conclusion as to the most likely explanation for this result, nor how the empirical evidence should be accounted for in estimating the cost of equity.

Partington (2015) is asked the direct question as to whether "the use of the FFM, either alone or in combination with other asset pricing models, would be expected to result in a materially better allowed return on equity estimate."[48] In response, Partington states that "We would view the answer to this question as unclear given the state of the literature and the issues that are yet to be resolved … it is clear that the use of this model alone would not result in a better estimate of the return on equity."[49]

Partington is then asked whether the Fama-French model should be used for estimating the return on equity of a benchmark regulated network service provider, either alone or in combination with other models. He says that the answer is "undoubtedly no."[50]

These two answers are difficult to reconcile. In our view, there is no basis for the conclusion that a more reliable estimate of the required return on equity for the benchmark efficient entity is likely to be obtained by *not* estimating the Fama-French model. Such an outright rejection would only be appropriate if there was evidence that the Fama-French model was systematically biased,

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48 Partington (2015), p. 38.

49 Partington (2015).

50 Partington (2015).

or otherwise erroneous, and therefore likely to mislead. But neither Partington nor the AER present any such evidence.

2.5 Conclusion with respect to model selection

60 The AER has concluded that there are limitations and empirical shortcomings of the Sharpe-Lintner CAPM, without specifying what those limitations and empirical shortcomings are. This weakness of the Sharpe-Lintner CAPM is one reason for the AER to adopt a beta estimate of 0.7, at the upper end of the beta range of 0.4 to 0.7, determined by the AER. The information used to estimate the beta range is entirely independent of limitations and empirical shortcomings of the Sharpe-Lintner CAPM.

61 In contrast, energy networks have specifically addressed the two main empirical shortcomings of the Sharpe-Lintner CAPM (low beta bias and the returns to high book to market stocks). The cost of capital was directly estimated using the Black CAPM and the Fama-French model using all available returns data for Australian-listed stocks, and explicit weights placed on the cost of equity estimates from these two models. While rejecting in its entirety the quantitative analysis submitted by energy networks, the AER instead adopted the approach of writing down a beta estimate of 0.7. This conclusion is informed by no quantitative analysis and there is no basis for using a figure of 0.7 simply because it is at the upper end of the beta range.[51]

62 Our view is that the AER has unreasonably rejected the use of models other than the Sharpe-Lintner CAPM. The AER has adopted a de facto persuasive evidence test whereby other models can only be used, in part, to estimate the cost of equity, if there is persuasive evidence to overturn the AER's default position in favour of the Sharpe-Lintner CAPM.

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51 We summarise the currently unresolved issues in relation to the estimation of beta in Section 6 of this report.

3 Issue 2: No change of approach under the new Rules

3.1 The AER's approach under the previous Rules

63 Under the previous National Electricity Rules (**NER**) and National Gas Rules (**NGR**), the approach of the AER was to estimate the required return on equity using the Sharpe-Lintner CAPM only. This involved estimating the three parameters and inserting them into the Sharpe-Lintner CAPM formula – the result being used as the allowed return on equity.

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

65 This approach created a form of "lucky dip" for regulated businesses. Those businesses that were lucky enough to have prices reset when government bond yields were high were allowed a high return on equity, and other businesses received low returns for their five-year regulatory periods because government bond yields happened to be low at the wrong time (for them). The impact of this approach becomes more extreme during periods of volatility whereby government bond yields move to extreme levels in one direction or the other.

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

3.2 The AEMC rule change process

67 During the 2012 rule change process, the AER submitted that the 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) [52]

on the basis that:

> It appears unlikely that there would be a justifiable departure from the CAPM over the medium to long term. [53]

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52 AER's proposed changes to the rate of return provisions of the NGR, p. 11.

53 AER's proposed changes to the rate of return provisions of the NGR, p. 11.

68 However, the AEMC rejected that approach. After considering the approach of sole reliance on the Sharpe-Lintner CAPM (or any other single model), 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.[54]

69 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.[55]

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

> Achieving the NEO, the NGO, and the RPP requires the best possible estimate of the benchmark efficient financing costs. The Commission stated that this can only be achieved when the estimation process is of the highest possible quality. The draft rule determination stated that this meant that a range of estimation methods, financial models, market data and other evidence must be considered.[56]

71 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 (**GFC**) or when risk-free rates 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.[57]

72 We agree with the AEMC that:

a. The Sharpe-Lintner CAPM cannot be relied upon alone to provide the best possible estimate of the required return on equity for the benchmark efficient firm, particularly if it is implemented in a mechanistic way by adding an effectively fixed risk premium to the contemporaneous government bond yield;

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54 AEMC Final Determination, p. 48.

55 AEMC Final Determination, p. 49.

56 AEMC Final Determination, p. 43, emphasis added.

57 AEMC Final Determination, p. 40.

b. Proper regard should be had to all relevant financial models. In our view it is necessary to estimate a model to have proper regard to it.

c. The quality of the final estimate cannot possibly be improved by disregarding relevant evidence.

d. An estimate of the highest quality can only be produced by considering all relevant estimation methods, financial models, market data and other evidence.

e. The importance of considering a range of financial models is most acute when financial market conditions are different from the long-term average. This was the case during the GFC and European debt crises, and it is the case now when government bond yields are at historically low levels.

3.3 The prospect of change under the new Rules

73 In its Guideline materials, the AER raised the possibility that its approach under the new Rules might lead to more stable estimates of the allowed return on equity. However (as set out below) the AER's implementation of its approach under the new Rules is the same as under the previous Rules in that the allowed return on equity moves one-for-one with changes in the risk-free rate. In this section, we review the AER's statements about the benefits of a more stable allowed return on equity and the process by which that might be achieved.

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

> In our consultation paper, we stated that a relatively stable regulatory return on equity would have two effects:
>
> - It would smooth prices faced by consumers.
> - It would provide greater certainty to investors about the outcome of the regulatory process.[58]

75 The AER also noted that:

> Submissions in response to our draft guideline were also broadly supportive of stability.[59]

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

> …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

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58 AER Rate of Return Guideline, Explanatory Statement, pp. 65-66.

59 AER Rate of Return Guideline, Explanatory Statement, pp. 65-66.

> 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). [60]

3.4 The AER's approach under the new Rules

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

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

79 In relation to the equity beta parameter, under the previous Rules the AER primarily considered regression estimates from a set of domestic comparators and concluded that the evidence supported a range of 0.4 to 0.7. Under the new Rules, the AER primarily considers regression estimates from the same set of comparators (even though some of them no longer exist) and concludes that the evidence supports a range of 0.4 to 0.7. Under the previous Rules, the AER adopted a point estimate of 0.8 after weighing up issues such as the reliability of its empirical evidence and the prior regulatory estimates of 0.9 to 1.0. Under the current Rules, the AER adopts an estimate of 0.7 on the basis that there is an additional 5 years of data since its 2009 WACC Review, which justifies additional weight being applied to its empirical estimates.[61]

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

> The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.[62]

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

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60 AER Rate of Return Guideline, Explanatory Statement, p. 66.

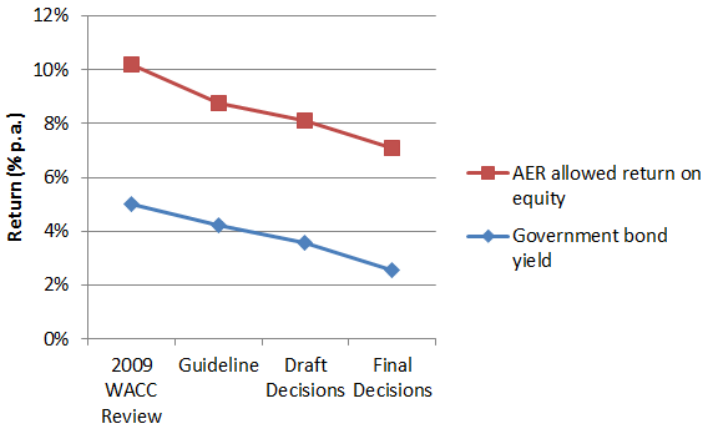
61 AER Rate of Return Guideline, Equity beta issues paper, p. 8.

62 AER Rate of Return Guideline, Explanatory Statement, p. 110.

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

81 Under the new Rules, the AER has adopted the practice of setting the allowed return on equity to be equal to the contemporaneous 10-year government bond yield plus a fixed premium of 4.55%.[63] Thus, as government bond yields rise and fall, the allowed return on equity rises and falls in one-for-one alignment. Since government bond yields have generally fallen since the AER's 2009 WACC Review, the AER's allowed return on equity has fallen commensurately, as illustrated in Figure 4 below.

Figure 4: Government bond yields and the AER's allowed return on equity



Source: AER decisions.

82 In its recent final decisions, the AER's allowed return on equity is 7.1%. Relative to this benchmark, the AER's allowed return on equity was:

a. 44% higher at the time of its 2009 WACC Review;

b. 23% higher at the time of its Guideline; and

c. 14% higher at the time of its November 2014 draft decisions.

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

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

b. 7.1% for a firm regulated in February 2015;

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

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

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

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63 Equity risk premium = Equity beta × market risk premium = 0.7 × 6.5% = 4.55%.

85 The reason that the prospect of some stability was not delivered is that the means of delivering that stability (the dividend discount model and the Wright approach for estimating the MRP) have had no perceptible effect on the AER's decision-making process:

a. The AER's own dividend discount estimates indicate that the MRP is now materially higher – which would offset much of the effect of falling government bond yields and produce some stability in the allowed return on equity.[64] However, the AER discounts that evidence, concluding that it will have much less regard to its own dividend discount evidence when government bond yields are very low or very high.[65] That is, in just the scenarios where the dividend discount evidence could have a stabilising effect on the allowed return on equity, the AER will have less regard to it.

b. Despite its comments about the Wright approach in the Guideline, in practice the AER has had no real regard to that approach.[66]

3.6 The AER's justification of its approach under the new Rules

AER analysis and conclusions

86 The means by which the dividend discount and Wright approaches could have had a stabilising effect on the allowed return on equity is via the MRP estimate. These approaches use market data to provide a direct estimate of the required return on equity for the average firm, and they tend to indicate that investors' required returns are much more stable than the AER's estimates would suggest. If these approaches were given some weight in the AER's decision-making process, they would result in MRP estimates being somewhat higher when government bond yields are low, and somewhat lower when government bond yields are high. This offsetting effect would have brought some stability to the allowed return on equity.

87 However, the AER's process is to apply a fixed premium that is independent of whether the government bond yield is high or low. The basis for this approach is that:

> We note that there is mixed evidence of any relationship between risk free rate and equity risk premium. However, we do not consider that the current available

64 See Subsection 4.3.1 below.

65 TransGrid Final Decision, Attachment 3, Appendix B, Section B.5.

66 See Subsection 5.2 below.

> evidence supports the view that there is any clear relationship between the risk free rate and risk premiums.[67]

88 That is, the AER's conclusion is that there is no clear-cut support for either:

a. Its own approach of assuming that the MRP is fixed and independent of the risk-free rate; or

b. The approach at the other end of the theoretical spectrum, which assumes that the MRP adjusts to perfectly offset any variation in the risk-free rate.

89 This would seem to support the adoption of a middle-of-the-road approach somewhere between the two extreme end points. However, the AER continues to adopt its own approach at one end of the spectrum.

Other relevant evidence

90 Whereas we note that other regulators have concluded that the balance of the evidence supports the existence of an offsetting relationship between the MRP and the risk-free rate, over time and on average,[68] [69] we consider that this is the wrong question to ask. Rather than evaluating whether a low risk-free rate is associated with a higher MRP *on average*, the more relevant question is whether there is such a relationship in the *prevailing* market conditions.

91 Incenta (2015) provides evidence that, in recent reports, independent expert reports adopt higher risk premiums when risk-free rates are low, thus producing more stable estimates of the required return on equity.[70] NERA (2105 IER) implement a number of formal statistical tests and conclude that there is a negative relationship between risk-free rates and the market risk premiums adopted in recent independent expert valuation reports.

92 Thus, the AER's position of assuming that the MRP is entirely independent and will take the same value whether the risk-free rate is at extreme high or low levels is at odds with this evidence and with accepted practice.

Analysis in prevailing market conditions

93 The AER's own dividend discount evidence shows that since the Guideline, there has been a material decline in the risk-free rate which has been offset by an increase in the MRP.[71]

94 That is, in the prevailing market conditions there is a strong offsetting relationship between the risk-free rate and the MRP. Thus, it would seem to be

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67 TransGrid Final Decision, Attachment 3, p. 458.

68 ERA Rate of Return Guideline, Appendices, p. 117.

69 ERA ATCO Gas Draft Decision, p. 163, Paragraph 712.

70 TransGrid Final Decision, Attachment 3, p. 459.

71 See Subsection 4.3.1 below.

illogical to estimate the MRP primarily on the basis of an estimation technique that assumes the opposite. However, this is precisely what the AER has done.

95 The proposition that there is a strong offsetting relationship between the risk-free rate and the MRP in the prevailing market conditions was also recently endorsed by Reserve Bank Governor Glenn Stevens. In a speech in New York on 21 April 2015, Governor Stevens stated that the equity risk premium appears to have risen to offset the recent falls in the risk-free rate such that the required return on equity has not fallen:

> …post-crisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero (Graph 2). **This seems to imply that the equity risk premium observed *ex post* has risen even as the risk-free rate has fallen and by about an offsetting amount**.[72]

Graph 2

Earnings and Sovereign Bond Yields

* Trailing earnings-to-price ratio for the MSCI Australia and S&P 500 indices

** Prior to 1996 for Australia and 2000 for the United States, 10-year sovereign yields are deflated using underlying inflation

Sources: ABS; Bloomberg; Board of Governors of the Federal Reserve System; MSCI; RBA; Thomson Reuters; Yieldbroker

96 Governor Stevens went on to note that the returns on equity required by investors have not shifted even though risk-free rates have fallen to exceptionally low levels:

> …it might be explained simply by stickiness in the sorts of 'hurdle rates' that decision makers expect investments to clear. I cannot speak about US corporates, but this would seem to be consistent with the observation that we tend to hear from Australian liaison contacts that **the hurdle rates of return that boards of directors**

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72 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015. Emphasis added.

> **apply to investment propositions have not shifted, despite the exceptionally low returns available on low-risk assets**.[73]

97 He goes on to further consider the explanation that:

> …the risk premium being required by those who make decisions about real capital investment has risen by the same amount that the riskless rates affected by central banks have fallen.[74]

3.7 The AER's claims about its approach under the new Rules

98 In its recent final decisions, the AER purports to illustrate what its allowed return on equity would have been under the previous Rules.[75] The AER contends that, but for the AEMC's 2012 rule changes, it would have set the equity risk premium for the benchmark efficient entity to 3%.[76] This would correspond to an allowed return on equity of 5.55% in its recent final decisions.[77] This implies an unlevered return on equity of 3.75%.[78] That is, the AER contends that it would have set the allowed return on equity on the basis that shareholders in a benchmark firm with no debt would require an expected nominal return of only 3.75%. For the reasons set out below, we consider this contention to be implausible.

99 Moreover, the AER states that if it had been "still applying the old approach"[79] under the previous Rules:

> …this would have produced an indicative return on equity of 6.55 per cent at the time of our draft decision.[80]

100 This is also implausible, given that the AER's own allowed return on debt in its draft decisions was 6.67%,[81] and it makes no sense for the allowed return on first-ranking debt to exceed the allowed return on residual equity in the same firm.

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73 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015. Emphasis added.

74 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015.

75 TransGrid Final Decision, Attachment 3, Appendix A, Section A.2, p. 216.

76 Beta of 0.5 and MRP of 6%; TransGrid Final Decision, Attachment 3, Appendix A, Section A.2, p. 216.

77 That is, cost of equity = risk free rate + equity beta × market risk premium = 2.55% + 0.50 × 6.00% = 2.55% + 3.00% = 5.55%.

78 The asset beta, using the AER's preferred specification, is Asset beta = Equity beta ÷ (1 + Debt/Equity) = 0.50 ÷ (1 + 60/40) = 0.50 ÷ 2.50 = 0.2, then Cost of equity = Risk free rate + Equity beta × Market risk premium = 2.55% + 0.2 × 6% = 2.55% + 1.20% = 3.75%.

79 TransGrid Final Decision, Attachment 3, p. 216.

80 TransGrid Final Decision, Attachment 3, p. 216.

81 TransGrid Draft Decision, Attachment 3, p. 11.

101 For the reasons set out below, our contention is that the evidence suggests that the AER would not have set such an implausibly low allowed return on equity under the previous Rules, but rather that the AER's approach to the return on equity under the previous and current Rules is substantively the same.

102 The primary difference between the previous Rules and the current Rules, in relation to the allowed return on equity, is that the current Rules require the AER to have regard to all relevant methods, models, data, and other evidence, whereas the previous Rules did not spell out any such requirement.[82]

103 The AER's claim that its implementation of the Sharpe-Lintner CAPM under the previous Rules would be materially different from its implementation under the current Rules is implausible. In our view, the best indication of what the AER might have done under the previous Rules is to observe what the AER actually did under the previous Rules.

104 In its 2009 WACC Review, the AER adopted a beta of 0.8[83] based on:

a. Estimates from domestic comparators, which the AER took as supporting a range of 0.41 to 0.68;[84]

b. Estimates from international comparators, which the AER took as supporting a range of 0.47 to 0.71;[85] and

c. Considerations of regulatory stability, relative to the precedent of adopting an equity beta of 0.9.[86]

105 The AER also stated that if it had considered only the empirical estimates of beta, and not issues of regulatory stability, it would have adopted an equity beta of 0.7.[87]

106 If the same approach had been applied using current data, the AER would consider:

a. Estimates from domestic comparators, which the AER takes as supporting a range of 0.4 to 0.7;

b. Estimates from international comparators, which currently support an equity beta materially above 0.7 (as set out in Subsection 4.4.1 of this report); and

c. Considerations of regulatory stability, relative to the precedent of adopting an equity beta of 0.8.

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82 The NER required the AER to use the CAPM and the NGR required the AER to use a well-accepted model such as the CAPM.

83 AER 2009 WACC Review, Final Decision, pp. iv to v, xv, xvii, 13, 30, 48, 244 and 307.

84 AER 2009 WACC Review, Final Decision, pp. iv, xvi, 244, 302, 307 and 326.

85 AER 2009 WACC Review, Final Decision, pp. 331 to 332.

86 AER 2009 WACC Review, Final Decision, pp. iv, xvii and 344.

87 AER 2009 WACC Review, Final Decision, p. 332.

107 It seems highly likely that if this evidence was assessed in the same way as it was assessed in the 2009 WACC Review, the outcome would be an equity beta of 0.7 or above. Any suggestion that this set of evidence, assessed in accordance with the 2009 WACC Review, would have produced an equity beta of 0.5 is implausible.

108 In its 2009 WACC Review, the AER adopted a market risk premium of 6.5% based on:[88]

a. Mean historical excess returns, which the AER took as supporting a range of 5.7 to 6.2%;

b. Survey measures, which the AER took as supporting an estimate of 6%; and

c. Dividend discount model estimates,[89] which the AER took as supporting an MRP "well above 6%".[90] The most contemporaneous estimate considered by the AER was the Bloomberg 2009 estimate of 8.0%.[91]

109 If the same approach had been applied using current data, the AER would consider:

a. Mean historical excess returns, which the AER now takes as supporting a range of 5.1 to 6.5%;[92]

b. Survey measures, which the AER now takes as supporting an estimate of 6%;[93] and

c. Dividend discount model estimates, which according to the AER's own analysis support a range for the MRP of 7.8% to 8.6%.[94]

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88 AER 2009 WACC Review Final Decision, p. 237.

89 Which the AER then referred to as "cash flow based measures."

90 AER 2009 WACC Review Final Decision, p. 237.

91 AER 2009 WACC Review Final Decision, p. 220.

92 TransGrid Final Decision, Attachment 3, pp. 35, 109, 306 and 347.

93 TransGrid Final Decision, Attachment 3, pp. 109, 118 and 319.

94 The AER's preferred approach to the dividend discount model analysis implies a range for the market risk premium of 7.8% to 8.6% (TransGrid Final Decision, Attachment 3, p. 301). This approach has a transition to long term growth over forecast years three to 10 and is referred by the AER as a "three stage model." The AER presents an alternative model in which long term growth is achieved in year three, which the AER refers to as a "two stage model." This alternative approach results in an estimate of the MRP of 7.4% to 8.4% (TransGrid Final Decision, Attachment 3, p. 301). The AER states that the two stage approach is meant to be a "cross check" on the three stage approach (TransGrid Final Decision, Attachment 3, p. 301). However, the AER then writes down a range of 7.4% to 8.6% which gives equal consideration to both approaches, despite the AER's view that a transition to long term growth over years three to 10 is likely to result in a better estimate of the MRP.

110 That is, for the relevant considerations, the current data supports, if anything, a higher MRP.

111 The AER makes the claim that:

> The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.[95]

112 The AER's claim that the AER has changed its approach to the treatment of dividend discount model estimates of the MRP is implausible. There is no indication that the AER has treated dividend discount model estimates of the MRP any differently under its old approach versus the new approach, despite re-labelling its analysis from a "cross check" to the approach "given the second most reliance."[96]

113 In summary, our view is that the weight of evidence supports the contention that, the AEMC's fundamental revision of the Rules in 2012 has had no substantive effect on the AER's approach to determining the allowed return on equity.

3.8 Conclusions

114 The AER's approach of setting the allowed return on equity by adding a fixed premium to the government bond yield is the same as its approach under the previous Rules. This approach produces the same outcomes as under the previous Rules – the allowed return on equity is a lucky dip for regulated firms that depends entirely on the level of government bond yields over 20 days at the beginning of their regulatory period.

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

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

b. 7.1% for a firm regulated in February 2015;

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

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

116 The evidence suggests that:

a. Investors' required returns are more stable than the AER's estimates would suggest; and

b. The AER's position of assuming that the MRP will take the same value whether the risk-free rate is at extreme high or low levels is at odds with this evidence and with accepted practice.

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95 TransGrid Final Decision, Attachment 3, p. 110.

96 TransGrid Final Decision, Attachment 3, p. 87.

117 The view of the Governor of the Reserve Bank is that "the hurdle rates of return that boards of directors apply to investment propositions have not shifted, despite the exceptionally low returns available on low-risk assets"[97] and "…the risk premium being required by those who make decisions about real capital investment has risen by the same amount that the riskless rates affected by central banks have fallen."[98] The AER's approach is the polar opposite of these views.

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97 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015. Emphasis added.

98 Glenn Stevens, Speech to the Australian American Association, New York, 21 April 2015.

4 Issue 3: The imposition of arbitrary binding constraints

4.1 Summary of the issue

118 The AER's consideration of parameter inputs for beta and the market risk premium results from the application of binding constraints, despite the AER's statements to the contrary. Throughout the AER's Guideline process, and since, we have objected to the AER's use of a "primary" subset of the relevant evidence to produce apparently immutable ranges for parameter estimates, with all other relevant evidence relegated to the role of (at most) informing the selection of a point estimate from within the primary range.

119 In our view, all relevant evidence should be considered taking into account the relative strengths and weaknesses. No relevant evidence should have its potential impact enhanced or constrained by the ex-ante allocation of it to the "primary" or "other" subsets. No purpose is achieved by such an allocation process, other than to, at the very beginning of the analysis, reduce or eliminate the effect of a subset of the relevant evidence.

4.2 The AER's use of binding constraints

120 Under its "foundation model approach" the AER estimates the parameters of only one model, the Sharpe-Lintner CAPM. This model requires estimates of three parameters. There is no contention about the risk-free rate, but there is dispute about the estimation of equity beta and the market risk premium (MRP). The AER's approach for estimating these two parameters is to:

a. Predetermine a preferred "primary" subset of the relevant evidence which is used to determine an immutable range for the parameter; and

b. Limit the use of all other relevant evidence to the role of informing the selection of a point estimate from within the primary range.

121 We have previously submitted[99] that:

a. There is no proper basis for the AER's ex ante allocation of different subsets of relevant evidence into its "primary" and "other" subsets;

b. The process of making such an ex ante allocation is unique to the AER and is inconsistent with financial economics theory and practice;

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99 SFG (2015 ROE), Section 4.

c. The allocation process:

   i. Materially increases the effective weight applied to evidence that the AER defines to be "primary"; and

   ii. Materially limits (ex-ante) the ability of any non-primary evidence to have its proper effect, consistent with its relative strengths and weaknesses; and

d. The AER performs no calculations, and therefore has no basis for concluding that its selection of a particular point estimate within its primary range has afforded the appropriate weight to the relevant non-primary evidence.

122 The AER claims that its sequential consideration of material does not, simply by occurring earlier, limit the weight on material subsequently considered, nor does it bound the manner in which material can be considered.[100] The AER's point is that there needs to be a first step in any process. However, in our view this does not justify a process that places ex ante constraints on relevant evidence.

123 We explain this point with reference to the market risk premium and the equity beta. In the current section we only consider the evidence actually relied upon by the AER in reaching its conclusions.

4.3 Constraints imposed on the market risk premium

4.3.1 Evidence of a fixed upper bound

124 When estimating the MRP, the AER adopts historical excess returns as its primary subset of relevant evidence, and concludes that this evidence supports a primary range of 5.1% to 6.5%.[101] The effect of the AER's process is that this primary range is immutable such that all other relevant evidence can, at most, inform the AER's selection of a point estimate from within that range.

125 There are four pieces of information that imply that the AER's 6.5% point estimate of the MRP is, in practice, the result of the 6.5% figure being a binding upper bound. We consider each of these below.

Historical excess returns are stated to be the primary evidence

126 The AER makes the unambiguous statement that its analysis of historical excess returns forms the primary evidence for estimating the market risk premium:

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100 TransGrid Final Decision, Attachment 3, pp. 57 and 215.

101 We disagree that this range is supported by historical excess returns data. However, in this section we consider the *process* by which the AER filters the relevant evidence. We consider the substance of the evidence itself later in this report.

> Historical excess returns provide our baseline estimate and indicate an MRP of approximately 6.0 per cent from a range of 5.1 to 6.5 per cent,[102]

and:

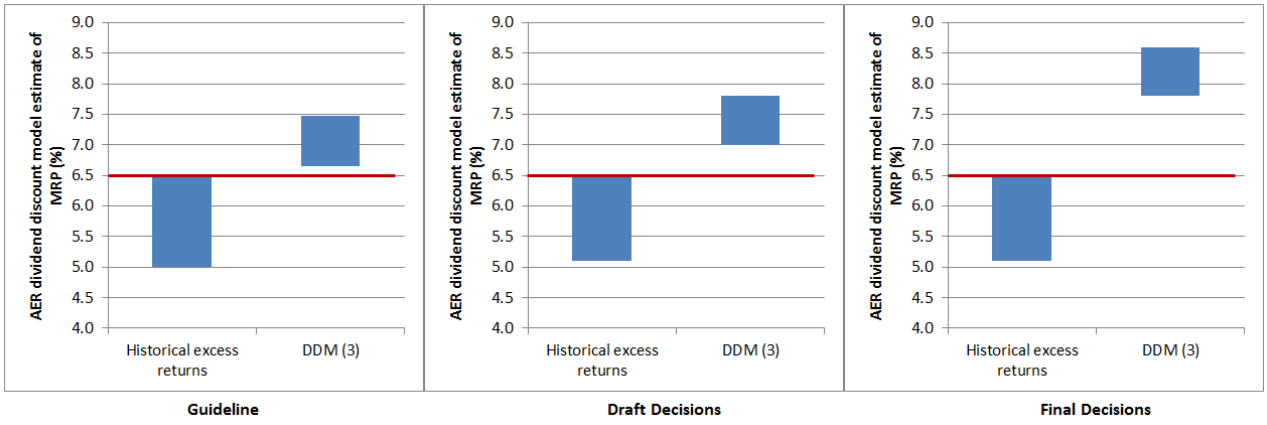
> We place most reliance on historical excess returns.[103]

The evolving dividend discount model evidence has no impact on the AER's MRP point estimate

127 The AER states that its dividend discount model analysis is the second most reliable source of information for estimating the MRP.[104] The dividend discount model is used to estimate the required market return and market risk premium from contemporaneous share prices, and analyst earnings and dividend forecasts. The implied market risk premium from the dividend discount model is a contemporaneous estimate of the market risk premium because it is based upon contemporaneous equity prices rather than prices observed over the last 50 or more years.

128 The evolution of the AER's dividend discount estimates of the MRP are summarised in Figure 5 below.

Figure 5: AER estimates of MRP from historical excess returns and the dividend discount model



Source: AER Rate of Return Guideline, AER draft decisions, AER final decisions.

129 Figure 5 shows that:

a. The AER's primary range from historical excess returns has remained relatively stable, as would be expected for a long-term historical average;[105]

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102 TransGrid Final Decision, Attachment 3, p. 35.

103 TransGrid Final Decision, Attachment 3, pp. 108 and 112.

104 TransGrid Final Decision, Attachment 3, Table 3-12, p. 87 and Table 3-62, p. 464.

105 The AER increased the lower bound of its primary range from 5.0% to 5.1% between the Guideline and its draft decisions, reflecting the additional annual observation that became available. The upper bound has remained fixed at 6.5% throughout.

b. The AER's dividend discount estimate has increased materially from Guideline to draft decisions to final decisions;[106] and

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

130 The AER's preferred dividend discount estimate of MRP is based on its three-stage model and its mid-point 4.6% estimate of long term growth.[107] Using this approach, the AER's MRP estimates are:

a. 7.1% in its Rate of Return Guideline;[108]

b. 7.4% in its draft decisions in November 2014;[109] and

c. 8.2% in its recent final decisions.[110]

131 That is, the AER's dividend discount estimates of MRP have increased materially since the Guideline and are now well above the 6.5% upper bound of the AER's primary range. However, the AER has maintained its MRP point estimate at 6.5% throughout. This is consistent with the primary range from historical excess returns being treated as immutable – whereby the AER's 6.5% upper bound is apparently treated as a maximum that cannot be exceeded even as the weight of relevant evidence evolves.

The AER adopts the same approach to MRP as under the previous Rules

132 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.[111]

133 We note that the approach that the AER adopted under the previous Rules has never led to the AER ever adopting an MRP above 6.5%. Even at the height of the GFC and European debt crisis, the allowed MRP never exceeded 6.5%. This is consistent with the 6.5% figure being a "cap" for the allowed MRP under the

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106 Figure 5 shows the AER's range for its preferred three stage dividend discount model. The AER state that it has lesser regard to estimates from its two stage model (the AER states this is used as a cross check), which also increase materially between the Guideline and the recent final decisions.

107 TransGrid Final Decision, Attachment 3, Table 3-36, p. 301 and Table 3-40, p. 305.

108 AER Rate of Return Guideline, Appendix D, p. 87.

109 TransGrid Draft Decision, Attachment 3, p. 200.

110 TransGrid Final Decision, Attachment 3, p. 301.

111 JGN Draft Decision, Attachment 3, pp. 76-77.

previous Rules. If follows that if the approach under the current Rules is not materially different, the 6.5% cap would remain in place.

134 That is, if the AER's approach (which is substantially the same before and after the 2012 rule changes) does not produce an MRP above 6.5% during a once-in-a-generation financial crises, it is clear that it will *never* produce an MRP above 6.5%.

135 Moreover, the AER explains that the most significant development in its approach to the MRP under the current Rules relates to its dividend discount estimates:

> The most notable change to our approach is that we now place more reliance on DGMs than using them as a cross check.[112]

136 The fact that the AER has maintained its 6.5% estimate of the MRP, even as its own dividend discount estimates of the MRP have moved further and further above it, is a further indication that the 6.5% figure serves as an immutable upper bound that was set ex ante.

"Other" evidence indicates increased or stable MRP throughout the relevant period

137 When estimating the MRP, the AER also has some regard to survey responses and a set of conditioning variables that includes dividend yields, bond spreads, and implied volatility.

138 The AER states that survey evidence is given "some reliance"[113] and that they "have not found any new surveys since the publication of the November 2014 draft decisions."

139 The AER also states that it places "some reliance (directional information only)"[114] on its conditioning variables. The AER notes that "[w]e do not consider conditioning variables provide reliable estimates of the MRP on their own"[115] and that "we found there are some important limitations to this source of evidence."[116] Nevertheless, the AER also provides information about the evolution of its three conditioning variables between the November 2014 draft decisions and the recent final decisions:

a. **Dividend yields:** The AER concludes that dividend yields have not varied materially since their draft decisions, noting that they "have been relatively stable over the last 12 to 18 months."[117]

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112 AER Rate of Return Guideline, Explanatory Statement, p. 110.

113 TransGrid Final Decision, Attachment 3, p. 87.

114 TransGrid Final Decision, Attachment 3, p. 87.

115 TransGrid Final Decision, Attachment 3, p. 322.

116 TransGrid Final Decision, Attachment 3, p. 322.

117 TransGrid Final Decision, Attachment 3, p. 322.

b. **Credit spreads:** In its recent final decisions, the AER concludes that credit spreads "now appear to be widening slightly,"[118] which indicates higher risk premiums. The AER shows that the increase in credit spreads is common to corporate bonds[119] and state government bonds.[120]

c. **Implied volatility:** In its recent final decisions, the AER does not comment on the evolution of the implied volatility since its November 2014 draft decisions. However it presents a figure that shows that the implied volatility has been generally stable since early 2013 and rose slightly between mid-2014 and the drafting of the final decisions.[121]

140 In summary, the AER states or demonstrates (or both) that all of its conditioning variables either remained constant or increased between its November 2014 draft decisions and its recent final decisions. This all points towards, if anything, an increase in the MRP over the relevant period.

141 That is, between the draft and final decisions:

a. The mean historical excess return, on which the AER places most reliance, has remained constant, by construction;

b. The AER's dividend discount estimates, on which the AER places second most reliance, have increased materially;

c. The survey evidence, on which the AER places some limited reliance, has not changed at all (other than to have become more outdated with the passage of time); and

d. The conditioning variables, on which the AER places quite limited reliance, all point to either increases or stability in the MRP since the draft decisions.

142 In summary, between the draft and final decisions, the AER's dividend discount evidence indicates a material increase in the MRP and the only changes in the other relevant evidence are also consistent with an increase in the MRP. Consequently, the fact that the AER has maintained its MRP point estimate at 6.5% in the face of these changes in the evidence is consistent with the 6.5% figure serving as an immutable upper bound.

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118 TransGrid Final Decision, Attachment 3, p. 324.

119 TransGrid Final Decision, Attachment 3, Figure 3.20, p. 325.

120 TransGrid Final Decision, Attachment 3, Figure 3.21, p. 326.

121 TransGrid Final Decision, Attachment 3, Figure 3.22, p. 327.

4.3.2 The effect of bounding the MRP estimate

The problem with a fixed upper bound

143 The problem with the imposition of a fixed upper bound, based on a subset of the relevant evidence, is that it limits the impact of other relevant evidence that suggests that the estimate should be above the upper bound. In the case at hand:

a. When the AER's dividend discount evidence suggested an MRP of 7.1%, it was used to justify an MRP of 6.5% – the upper bound of the primary range;

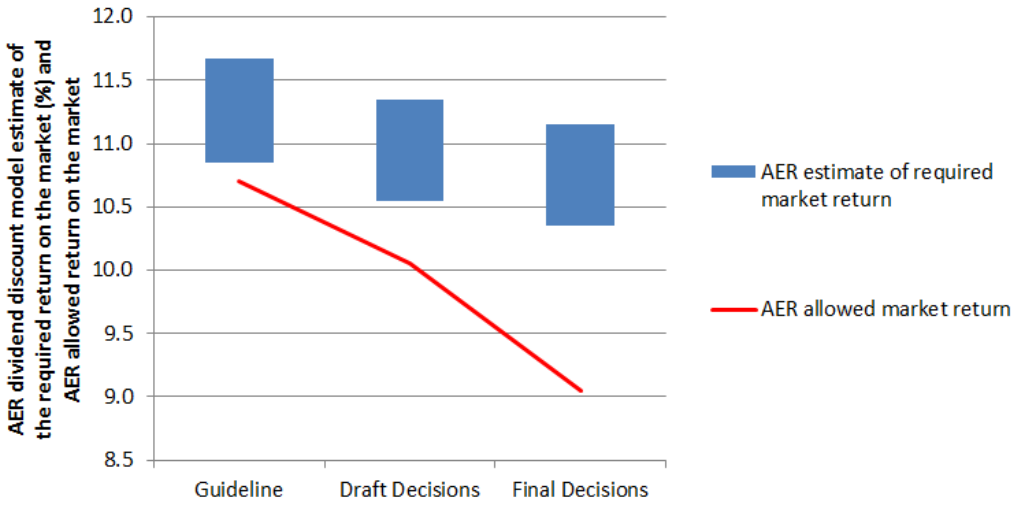
b. When the dividend discount evidence suggested an MRP of 7.4%, it was also used to justify an MRP of 6.5%; and

c. Now the AER's dividend discount evidence suggests an MRP of 8.4% and it is still used to justify an MRP of 6.5%.

144 That is, as the AER's dividend discount evidence gets stronger and stronger in support of higher and higher estimates of MRP it has no additional impact – the MRP is already fixed at the top of the primary range and can therefore go no higher. In our view, the dividend discount evidence should not be artificially constrained in this way.

145 The effect of capping the MRP at 6.5% is apparent when considering the AER's dividend discount estimates of the required return on the market portfolio. The AER estimates that, between the Guideline and the recent final decisions, the required return on the market portfolio fell slightly (about 50 basis points). However, the AER's allowed return on the same market portfolio has been reduced by more than 3 times that amount (165 basis points) due to the MRP being fixed to 6.5%. That is, the effect of fixing the MRP to a maximum of 6.5% is to cause a material deviation between the AER's allowed return on the market and its own estimates of the required return on the market.

Figure 6: AER estimates of MRP and the AER allowed market return



Source: AER Rate of Return Guideline, AER draft decisions, AER final decisions.

The problem with fixing a primary range on the basis of historical data

146 The historical mean excess return that forms the AER's primary range 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%.

147 That is, the range is not a range that encompasses the possible MRPs in different market conditions. Rather the range encompasses the statistical uncertainty about the MRP for long-run average market conditions. There is no basis at all for constraining an estimate of the MRP for the prevailing market conditions on the basis of statistical uncertainty about the estimate of the MRP for long-run average market conditions.

148 The AER's range from historical excess returns is conceptually equivalent to estimating how many runs a batsman will score on a given day, before consideration of the prevailing conditions: weather, pitch conditions and the quality of the bowlers. So we could say that our best estimate for the runs Michael Clarke will score on a given day is within the range of 45 to 55.[122] At the time of writing Clarke's test match batting average is 50.79, which reflects his performance in average market conditions.

149 Now suppose the prevailing market conditions are more favourable than average – the match is against a relatively weak bowling attack, the pitch is flat and the sun is shining. There is no reason we would cap our estimate of how many runs Clarke might score to 55 based on the historical average across all innings. For example in Australian conditions Clarke's average is 62.05; and in Brisbane conditions Clarke's average is 103.00.

150 In the case at hand, the AER has two key pieces of evidence to consider:

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 the *prevailing* market conditions is within the range of 7.8% to 8.6%.

151 In our view, this suggests that the prevailing conditions differ from the historical average conditions (because government bond yields are at unprecedented lows),

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122 At the time of writing, Michael Clarke's test batting average was 50.79 from 186 innings over 108 matches (cricinfo.com). Had there not been a handful of low scores in which the batsman was unlucky to get out and Clarke's average would be close to 55, and had there not been a handful of high scores on which the batsman was lucky not to lose his wicket early and the average would be close to 45.

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 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.

152 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.

4.4 Constraints imposed on the Equity beta

4.4.1 AER estimation process

153 When estimating equity beta, the AER also applies a two-step process whereby its favoured subset of the relevant evidence is used to determine a primary range and all other relevant evidence can, at most, be used to inform the selection of a point estimate from within that range. The AER's process is as follows:

a. First, the AER estimates a primary range for equity beta of 0.4 to 0.7 on the basis of analysis of four current Australian listed stocks and five stocks that have been delisted sometime in the past. The analysis relied upon by the AER is regressions of stock returns on market returns. The AER's view is that this information implies a point estimate for equity beta of 0.5.[123]

b. Second, the AER jointly considers the theory that underpins the Black CAPM, and regression-based beta estimates for firms listed outside Australia. On the basis of this information, the AER determines that a beta estimate of 0.7 is appropriate, as this is at the upper end of the AER's range of beta estimates derived from the primary evidence. As for the MRP above, the upper bound from the AER's primary range acts as a binding constraint on the point estimate for equity beta.

154 The AER states that beta estimates from the four current and five delisted domestic comparators form the:

> Primary determinant of equity beta range, with significant weight in determining the point estimate.[124]

155 The AER also states that two other pieces of evidence are used to inform the selection of a point estimate from within the primary range that is determined by this subset of the relevant evidence. These two pieces of evidence are:

a. Evidence from international comparators; [125] and

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123 TransGrid Final Decision, Attachment 3, p. 122.

124 TransGrid Final Decision, Attachment 3, p. 90.

b. The theoretical principles underpinning the Black CAPM (noting that no role at all is given to any empirical estimates of the Black CAPM).[126]

156 Our view is that the AER has imposed a constraint on the beta estimate that negates the impact of information classified as secondary by the AER. The AER's beta range of 0.4 to 0.7 is based entirely upon the variation of beta estimates across nine Australian-listed stocks, variation of averages across time periods, and consideration of different estimation approaches. The range has nothing to do with the theory behind the Black CAPM, and the analysis is entirely independent of the beta estimates from firms listed in other markets.

157 The AER is aware that:

a. computing a beta estimate of 0.5 from regression of stock returns on market returns in the Sharpe-Lintner CAPM is likely to lead to the cost of equity being understated – that is why the beta estimate is shifted upwards with reference to the theory of the Black CAPM; and

b. relying on a beta estimate from a small sample of firms is likely to involve estimation error – that is why the beta estimate is shifted upwards with reference to beta estimates from firms listed outside Australia.

158 Neither of these rationales for shifting the beta estimate upwards suggests that the range of 0.4 to 0.7 should constrain the beta estimate.

4.4.2 Consideration of the theory underpinning the Black CAPM

159 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.[127] 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.

160 Making an adjustment to a parameter of one model, in relation to evidence about a different parameter in a different model produces an implementation and an outcome that is not true to either model. In the case at hand, the AER notes that the Black CAPM suggests a higher intercept and flatter slope than the Sharpe-Lintner CAPM, and the AER proposes to accommodate this evidence by adjusting the beta of the Sharpe-Lintner CAPM. The AER makes an adjustment without quantifying the magnitude of the adjustment that would be required to

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125 TransGrid Final Decision, Attachment 3, p. 90.

126 TransGrid Final Decision, Attachment 3, p. 90.

127 TransGrid Final Decision, Attachment 3, p. 215.

have proper regard to the Black CAPM evidence. In addition, the AER does not even report the magnitude of the adjustment that was actually made. In our view, if two models are considered to provide relevant evidence, each should be estimated in a way that is true to that model – otherwise the outputs are effectively uninterpretable.

161 The fact that the AER makes no specific estimate of the cost of equity from the Black CAPM, and makes no specific uplift to the beta estimate because of the Black CAPM, is the very reason why the AER's figure of 0.7 has no relation at all to how the Black CAPM should be incorporated into the cost of equity.

162 To see this, first note that the AER's 0.4 to 0.7 range is determined by the AER's view about the precision of the beta estimates from the small domestic sample. For example, the AER's consultant, Henry (2014), suggested that the domestic evidence supported a range of 0.3 to 0.8, but the AER's view is that the domestic estimates supported the more precise range of 0.4 to 0.7.

163 Next, the AER has determined that the Black CAPM is a relevant financial model for estimating the return on equity, and that the AER will have regard to it. The AER then determines that it will not estimate the Black CAPM, so it has no estimate of the return on equity that would be produced by that model. The AER also determines that it will not seek to estimate, or quantify in any way, the adjustments to be made to its Sharpe-Lintner parameters in order to appropriately reflect the evidence from the Black CAPM. Rather, the AER only has regard to the theoretical principles underpinning the Black CAPM, which suggest that the Sharpe-Lintner CAPM systematically underestimates the required return for low-beta stocks. This leads the AER to select a beta estimate at the top of its primary range. Now consider the following two alternatives:

a. If the AER had followed the recommendation of its consultant, the top of its primary range would have been 0.8. A range of 0.3 to 0.8 was considered by the AER to be too wide to be useful, and so the range of 0.4 to 0.7 was adopted. But there is absolutely no reason why the selection of 0.7 or 0.8 to account for the Black CAPM would have anything to do with the selection of an upper bound of 0.7 or 0.8 on the basis of the small sample of Australian listed firms.

b. Suppose there was no imprecision in the beta estimates themselves, such that there is a very large sample of Australian listed comparable firms and they all have the same beta estimate. There would be no range and the Black CAPM would have no influence at all. This implies that the extent to which the Black CAPM affects the allowed return on equity depends on the statistical precision of the AER's estimates of Sharpe-Lintner CAPM parameters. However, the role of the Black CAPM is not to correct for imprecision in the Sharpe-Lintner CAPM estimates, but in the systematic bias of that model. The upper bound of the beta estimate – from regressions of stock returns on market returns for four stocks and five former stocks – has nothing to do

with whether the cost of equity from the Sharpe-Lintner CAPM will be systematically understated or with the quantum of that bias.

164 In summary, even if it were correct (or feasible) to adjust the parameters of one model to account for the theoretical underpinnings of another model, the quantum of the adjustment should not be constrained according to the statistical precision of the estimates from the first model. In the case at hand, the AER has simply asserted that setting the equity beta to the top end of its (statistical precision) range will exactly and appropriately account for the Black CAPM model – without providing a single calculation to support that assertion.

4.4.3 Consideration of the evidence from international comparators

165 The AER also considers beta estimates from various samples of international comparators. In Section 5 below we explain that the great preponderance of the international evidence suggests a beta estimate above 0.7. However, with a cap of 0.7 from the AER's primary range, this evidence can do no more than move the AER's point estimate to the top of its primary range – no matter how precise or compelling or relevant that evidence may be.

166 As with the Black CAPM above, the AER simply asserts that its final point estimate of 0.7 will exactly and appropriately account for all of the relevant international evidence.

167 In its recent final decisions, the AER disagrees with our assessment of its decision-making process. The AER states that it has not imposed a binding constraint on the equity beta point estimate. The AER also says that

> …it is reasonable to suspect that if there was a substantial and sustained increase in the equity beta for the benchmark efficient entity, then this would be reflected in the Australian empirical estimates we consider.[128]

168 The first statement above – that the AER has not imposed a binding constraint on the beta estimate – is inconsistent with the evidence and the rationale the AER has relied upon. There has been no argument put to the AER that the regression-based beta estimates on which the AER relies are incorrect or erroneous. What has been put to the AER is that there is no logical reason that the outcome of considering other evidence (the Black CAPM and firms listed in other markets) would lead to the beta estimate only just reaching the figure of 0.7 at the top of the AER's range. If the figure of 0.7 was not a cap on beta, then it would be possible for the AER to write down what the beta estimate would be if the Black CAPM, or firms listed in other markets, were considered separately.

169 The second statement above – that an increase in the beta estimate for a benchmark firm would be reflected in the Australian empirical estimates – runs

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128 TransGrid Final Decision, Attachment 3, p. 432.

counter to the logic of considering evidence from firms listed in other markets. There is one small sample of firms which, if considered in isolation, leads to a beta estimate of 0.4 to 0.7 according to the AER. There is a considerably larger set of firms, analysed in the reports referred to by the AER, that imply systematic risk is higher than suggested by the first small sample of firms.

170 The AER considers that the small sample is more relevant – they are Australian-listed firms with assets regulated by the AER – but the AER agrees that it would be unreasonable to rely upon this small sample alone. The AER considers that the larger sample increases reliability but it is less relevant. This relevance versus reliability trade-off is the basis for consideration of firms listed in other markets.

171 This basic explanation for consideration of firms listed in other markets is at odds with the AER's statement that a substantial and sustained increase in the equity beta for a benchmark efficient entity would be reflected in the Australian empirical estimates. If we could reliably measure equity beta using just Australian listed firms we would do so. But the AER has already acknowledged, correctly, that we cannot arrive at a reliable beta estimate for the benchmark entity with reference to just four active firms (and five which no longer exist). We do not see how the AER can claim that the range of 0.4 to 0.7 does not represent a binding constraint, but then contend that if beta was something higher we would expect to see higher beta estimates from the sample of Australian-listed firms.

5 Issue 4: The inappropriate widening of ranges dilutes some relevant evidence

5.1 Summary of the issue

172 Through its Guideline process and recent draft and final decisions, the AER has adopted the practice of:

a. Selecting a point estimate from within a range determined by its favoured "primary" subset of the relevant evidence; and

b. Concluding that "other" relevant evidence supports a range that includes the AER's initial point estimate, and therefore confirms that initial point estimate.

173 When considering the "other" relevant evidence, the AER's approach results in a widening of the range of estimates that it says is supported by that other relevant evidence. This has the effect of neutralising the impact of all evidence after the primary point estimate has been set, in that the "other" evidence is considered to support such a wide range of estimates that it is effectively uninformative and can never overturn the initial estimate from the "primary" subset of the relevant evidence.

174 The AER's approach results in the widening of these ranges by combining high-quality, reliable, directly-relevant evidence with weak and unreliable evidence to produce a wide range. Once the range has been established, no consideration is given to any differences in terms of quality, reliability or relevance. Rather, the entire range is shown to include the primary point estimate and *all* of the evidence that contributed to that range is not considered further.

175 To illustrate the conceptual point, suppose that we begin with a favoured estimate for a parameter, where that estimate is based on a particular subset of the relevant evidence. Also suppose that there are two additional pieces of relevant evidence: a high-quality, reliable, timely, directly relevant piece of evidence that supports an estimate materially above the primary estimate; and a low-quality, unreliable, out-dated, tangentially-relevant estimate that supports an estimate slightly below the primary estimate. In our view, it would be inappropriate to combine these two pieces of information into a range, and then to conclude that the primary estimate is supported by the other evidence because it falls within the range of the other evidence.

5.2 Examples of range widening

176 In the remainder of this section, we set out a number of examples of the AER's approach in relation to the construction of ranges for evidence outside the AER's primary subset.

International comparators for estimating equity beta

177 In its recent final decisions, the AER concludes that the evidence from international comparators supports an equity beta estimate in the range of 0.3 to either 1.0 or 1.3. The AER concludes that this evidence is effectively uninformative since it spans the AER's point estimate of 0.7.

> We maintain our view that international empirical estimates support an equity beta range from 0.3 to 1.0 (or 0.3 to 1.3 if SFG's re-levered European and global estimates are included). These estimates span across a wide range. We do not consider this evidence implies an equity beta estimate materially above 0.7 for the benchmark efficient entity.[129]

178 However, the great preponderance of this evidence supports an estimate materially above 0.7 and the more reliable and relevant evidence supports an estimate materially above 0.7. Specifically, the AER has reduced the lower bound of the range by:

a. Including estimates that are not comparable (e.g., raw beta estimates are interpreted as though they were comparable with re-levered equity beta estimates); and

b. Including unreliable estimates (e.g., estimates that are based on a single year of data for two firms, and which were given little or no weight by the firm that estimated them or by the regulator that considered them).

179 In our previous report, SFG (2015 Beta) we explain why it is inappropriate to expand the range via the inclusion of unreliable and incomparable evidence.[130] For example, it is inappropriate to compare raw equity beta estimates with re-levered equity beta estimates as they are clearly not estimates of the same thing. Evidence about the beta of a moderately geared network business cannot be directly compared with the equity beta for the highly geared benchmark efficient entity, without making the appropriate adjustments. This point is explained in more detail by Frontier Economics (2015). We show in our previous report that, if the appropriate adjustments are made to enable a like-with-like comparison, the international evidence strongly supports an equity beta materially above 0.7.

180 By way of one further example, we also noted in our previous report, SFG (2015 Beta)[131], that the AER considers FTI estimates of 0.45 and 0.48 that were prepared for Ofgem. These estimates were based on two or three companies and used data for only one or two years. In our view, it is not statistically possible to obtain reliable beta estimates from such a tiny amount of data. We have previously noted that FTI itself recommended that Ofgem should not rely on these beta estimates:

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129 TransGrid Final Decision, Attachment 3, p. 415.

130 SFG (2015 Beta), pp. 17 to 22.

131 SFG (2015 Beta), pp. 17 to 22.

> We have not identified any evidence to suggest that Ofgem should update its range for beta in light of either recent regulatory precedent or recent market conditions.[132]

and that Ofgem has subsequently adopted equity betas of 0.95 for NGET[133] (with 60% gearing) and 0.91 for NGGT[134] (with 62.5% gearing) after considering the FTI (2012) study.[135] In its recent final decisions, the AER does not address these points, but simply states that:

> ...we are not satisfied that SFG has provided sufficient evidence to suggest estimation periods of 1–3 years or daily return intervals necessarily produce unreliable equity beta estimates.[136]

181 In our view, the AER's conclusion that the international evidence supports a range of 0.3 to 1.0 or 1.3 is not well founded. As we explained in SFG (2015 Beta)[137], when we:

a. Remove estimates that were so unreliable that they were not given weight by the estimators or the regulatory authority to which they were submitted; and

b. Make the standard and appropriate re-levering calculations to ensure a like-with-like comparison,

the great preponderance of the evidence suggests an equity beta estimate above the AER's primary estimate of 0.7.

Consideration of the Wright approach for setting the MRP

182 The so-called Wright approach is a method for estimating the MRP that is based on the mean of real returns on the market portfolio. In its Guideline materials and recent draft and final decisions, the AER has indicated that the Wright approach produces relevant evidence and that it will have some regard to that evidence. However, the AER does not use the Wright approach to inform its estimate of the MRP, but rather uses the Wright approach as a cross-check on its final estimate of the allowed return on equity.

183 In Step 3 of its estimation approach in its recent final decisions, the AER concludes that the appropriate equity beta is 0.7 and the appropriate MRP is 6.5%. This leads the AER to set the allowed return on equity to 7.1%. In Step 4 of its approach, the AER considers what the return on equity would be if it had used the Wright approach (rather than its excess returns approach) to estimate the MRP. The AER concludes that using its:

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132 FTI (2012), Paragraph 4.57.

133 National Grid Electricity Transmission.

134 National Grid Gas Transmission.

135 Ofgem (2012) Paragraphs 3.45 and 3.47.

136 TransGrid Final Decision, Attachment 3, pp. 414-415.

137 SFG (2015 Beta), pp. 17 to 22.

> …beta point estimate, the return on equity estimates fall within a range of 7.77 to 9.66 per cent.[138]

184 That is, the AER's calculations suggest that if the Wright approach is used to estimate the MRP, the estimate of the required return on equity will be materially above its allowed return of 7.1%.

185 However, in Step 4 of its estimation approach, the AER reintroduces an equity beta range of 0.4 to 0.7 for the sole purpose of evaluating the Wright 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. This enables the AER to conclude that:

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

186 The Wright approach has nothing at all to do with beta – it is used only for estimating the MRP. The AER's own Wright estimate of MRP (7.5% to 10.2%) 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 (7.5% to 10.2%) multiplied by an estimate of beta that the AER has already rejected in a previous step of its estimation process (0.4).

187 The outcome of such a comparison is that the AER says that it has had regard to the 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.

Consideration of independent expert estimates of the return on equity

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

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

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138 TransGrid Final Decision, Attachment 3, p. 437.

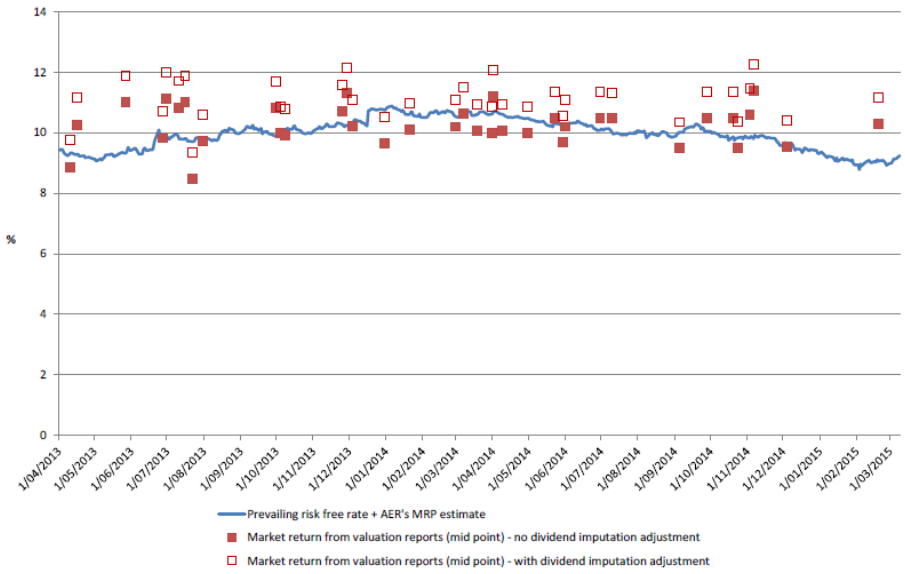
139 TransGrid Final Decision, Attachment 3, p. 133.

> Overall, Figure 3.32 shows that the market return estimated by the SLCAPM using the AER's point estimate of the market risk premium is not inconsistent with the market returns estimated in valuation reports. [140]

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

191 The AER's own analysis, reproduced in Figure 7 below, shows that the vast majority of independent expert with-imputation estimates are materially above its own with-imputation estimates.

Figure 7: AER comparison of independent expert estimates of the return on equity



Source: TransGrid Final Decision, Attachment 3, Figure 3.32, p. 461.

192 In justifying a comparison to the return on equity estimates that do not include an adjustment for imputation, the AER cites a lack of transparency in valuation reports.[141] The AER is making the suggestion that the independent experts might have already incorporated an adjustment for imputation into their return on equity estimates, thereby allowing the AER to consider the red points in the figure. The AER makes this suggestion despite the clear statement from Grant Samuel that it has:

> ...never made any adjustment for imputation (in either the cash flows or the discount rate) in any of our 500 plus public valuation reports.[142]

193 The AER interprets the earlier statement of Grant Samuel that it does not "incorporate any particular value for franking credits" as an indication that Grant Samuel might consider a value for franking credits cannot be reliably

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140 TransGrid Final Decision, Attachment 3, p. 460.

141 TransGrid Final Decision, Attachment 3, p. 439.

142 TransGrid Final Decision, Attachment 3, p. 453.

determined.[143] This interpretation of the approach taken by Grant Samuel has no reasonable basis. And in any event there is no doubt that the discount rate adopted by Grant Samuel can only be compared to the AER's discount rates if it is altered to include a value for imputation credits.

194 Moreover, in performing this comparison, the AER notes the common practice of independent experts to apply an "uplift" in using a return on equity above the estimate that would be obtained from the CAPM.[144] However, the AER ignores all uplifts in its comparison above. That is, the estimates ultimately adopted by the independent experts were generally materially higher than those included in the AER's comparison above. In our view, these uplifts are relevant evidence because (a) they contribute to the return on equity that was adopted by the independent expert, and (b) they illustrate that independent experts do not implement the CAPM in the mechanistic approach employed by the AER.

195 To make the consideration of uplifts clear, consider the following two situations.

a. The AER has acknowledged that the Sharpe-Lintner CAPM has "shortcomings" and "empirical limitations." Exactly what the AER considers these shortcomings and empirical limitations to be is unclear, but nevertheless this is the rationale for giving some consideration to the Black CAPM. Further, the AER states that it uses this as a basis for determining equity beta (although as stated earlier we question whether the AER has, in effect, applied a process any different to what it adopted under the old Rules).

b. Independent experts have acknowledged that if they merely apply the Sharpe-Lintner CAPM the discount rate will often be understated, and so apply an uplift to their estimate of the cost of equity, rather than make an adjustment to the equity beta estimate.

c. Having observed this uplift the AER says that it should be ignored because the uplift reflects something other than the estimate of systematic risk. Then, the AER compares the AER's estimate of the cost of equity (which includes the beta estimate of 0.7, formed on the basis of the limitations of the Sharpe-Lintner CAPM) to the independent experts' estimates of the cost of equity after stripping out the uplifts used by the experts to account for what is missing from the discount rate.

Consideration of broker reports

196 In its recent final decisions, the AER presents estimates of the cost of equity from broker reports issued over the period 1 October 2014 to 6 March 2015. The reports cover the four Australian-listed energy network businesses (AusNet

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143 TransGrid Final Decision, Attachment 3, p. 453.

144 TransGrid Final Decision, Attachment 3, p. 460.

Services, Spark Infrastructure, APA Group and DUET Group) and are issued by Credit Suisse, JP Morgan, Morgan Stanley and Macquarie Bank.

197 The AER notes that the broker estimates that are adjusted for imputation are uniformly higher than its own allowed return on equity – indeed the broker estimates are up to 12% compared with the AER's allowed return of 7.1%.[145]

198 The AER then makes two adjustments. First, it includes *ex-imputation* broker estimates in the comparison with its own *with-imputation* estimates. We have discussed above why this is clearly an invalid comparison.

199 The second adjustment the AER makes is to subtract the contemporaneous risk-free rate from its own estimate and to compare the result with "risk premium" estimates that the AER derives from the broker reports. That is, the AER and broker estimates of the required return on equity can be disaggregated into a risk premium component and a "balance" component. The AER concludes that its risk premium component is broadly commensurate with its derivation of the risk premiums from the broker reports:

> The equity risk premium from the AER's foundation model of 4.55 per cent is within the range of premiums recently estimated by brokers.[146]

200 However, the broker reports uniformly use higher "balance" components relative to the AER. For its "balance" component the AER uses the contemporaneous risk-free rate. The broker reports uniformly adopt a higher number, reflecting the fact that they do not use a mechanistic implementation of the Sharpe-Lintner CAPM the way the AER does.

201 In summary, the broker estimates of the return on equity are materially higher than the AER's estimates. Whereas the AER's derivation of the risk premium component is commensurate with its own risk premium, the other component is materially higher than the AER's estimate. The AER only compares the risk premium components.

202 In our view this produces a misleading picture of the relevant evidence. The broker reports are for the AER's set of domestic comparator firms and are current and timely. They adopt a return on equity that is materially higher than the AER's estimate. Yet the AER concludes that this evidence provides support for its own estimate.

Market value estimates for theta

203 In the regulatory framework, the gamma parameter has the effect of lowering the return that is available to equity holders, so we also consider that parameter in the context of the AER's approach to the assessment of the relevant evidence.

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145 TransGrid Final Decision, Attachment 3, Table 3.58, p. 444.

146 TransGrid Final Decision, Attachment 3, p. 444.

204 In its Guideline, the AER arrived at a point estimate of 0.7 for theta (the value of distributed imputation credits), based on its primary subset of evidence. It then considered two other pieces of evidence, which it combined into a range:

a. The AER considered that market value studies using post-2000 data supported an estimate of 0 to 0.5; and

b. The AER considered that the so-called "conceptual goalposts" approach supported an estimate of 0.8 to 1.0.

205 The AER then combined these two pieces of evidence into a range that spanned its preferred estimate. The AER did this, even though the two estimates are of very different things – one is an estimate of the market value of imputation credits and the other is a theoretical conceptualisation of what theta might be under various assumptions. Ultimately, the AER concluded that these two pieces of evidence neutralised each other, leaving the primary estimate of 0.7 intact:

> We have less regard to implied market value studies and the conceptual goalposts approach. However, the former suggests the utilisation rate might be lower than 0.7, and the latter suggests it might be higher than 0.7. In view of the limitations of these final two approaches, and the offsetting directional implications, we consider our estimate is reasonable.[147]

206 In its November 2014 draft decisions, the AER departed from its Guideline in deciding that it should place no reliance on the conceptual goalposts approach. This leaves the market value studies as the only piece of "other" evidence. However, the AER reintroduced a number of pre-2000 market value studies that were rejected in the Guideline because:

a. They used a small sample of data; or

b. They related to a different tax regime; or

c. They examined a small sample of firms (for one study, a single firm); or

d. The econometric treatments were not reasonable and robust.[148]

207 The reintroduction of these studies has led the AER to revise its range of estimates of the market value of distributed credits from 0.0 to 0.5 (mid-point of 0.25) to 0.0 to 1.0 (mid-point of 0.50). That is, the top half of the range that has been proposed in the recent decisions is due entirely to evidence that the AER had already considered and rejected in its Guideline.

208 In its recent draft and final decisions, the AER concludes that, because the range supported by market value studies, 0 to 1, spans the AER's preferred estimate, it provides no reason to consider departing from the preferred estimate.

209 Under this approach, every study that contributes to the 0 to 1 range is treated equally, even though:

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147 AER Rate of Return Guideline, Explanatory Statement, p. 160.

148 JGN Draft Decision, Attachment 4, p. 23.

a. The bottom half of that range includes comprehensive up-to-date studies that have been subjected to detailed scrutiny by the AER and the Tribunal; and

b. The entire top half of the range was previously rejected by the AER on the basis of its lack of reliability and relevance.

6 Unresolved issues in relation to the return on equity

6.1 Issues previously raised

210 In addition to the issues raised above, there are a number of issues where there remains disagreement between the AER and us. In this section of the report, we identify the unresolved issues in relation to the return on equity and document where each has been discussed by us and the AER.

211 In relation to the estimation of the risk-free rate, we disagree with the AER's contention that:[149]

a. Government bond yields are *not* at historically low levels in the prevailing market conditions.

212 In relation to the estimation of equity beta, we disagree with the AER's contentions that:[150]

a. A reliable estimate can be obtained from an analysis of four domestic comparators and five delisted firms;

b. That the domestic evidence supports a range of 0.4 to 0.7, in light of the fact that the AER's expert recommended a different range;

c. The AER's conceptual analysis is valid, and that it properly supports an equity beta less than one;

d. That it is proper, or even possible, to adjust the equity beta in the Sharpe-Lintner CAPM to properly account for evidence from the Black CAPM; and that this process can be performed without estimating the Black CAPM or specifying what adjustment was made in relation to it;

e. That all estimates from international comparators should be treated equally, irrespective of quality, sample size, comparability, whether or not the proponents of those estimates recommended against adopting them, and whether or not the estimates are properly re-levered to be comparable with the equity beta for the benchmark firm; and

f. That the evidence from international comparators can be properly accounted for without specifying what estimate that evidence supports or what impact it has had on the final equity beta estimate.

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149 SFG (2014 ROE), Appendix 3.

150 SFG (2015 ROE), Section 4; SFG (2015 Beta); SFG (2014 ROE), Section 4; SFG (2014 Beta).

213 In relation to the estimation of the market risk premium, we disagree with the AER's contentions that:[151]

a. Reliance should be placed on the geometric mean of historical excess returns, and (in any event) that the appropriate quantum of reliance is obtained by estimating the geometric mean over five different historical periods, taking the maximum of those five numbers, adding 20 basis points, and then interpreting the result as a lower bound for the MRP. In the absence of any other information about market conditions, including the risk free rate, the best estimate of the market risk premium in 2015 would be equal to the arithmetic average MRP. The same would be true for an estimate of the MRP in 2016, 2017 and in each subsequent year. The more volatile the historical time series the lower will be the geometric mean return – for the same arithmetic average – but the best estimate of the MRP in any year will still be equal to the arithmetic mean.

b. The data of Brailsford, Handley and Maheswaran (2012) should be used, even though NERA (2015 MRP) has identified and corrected measurement problems with that data. The research by Brailsford, Handley and Maheswaran was useful, but NERA (2015 MRP) performed analysis to make this historical information even more useful, and this analysis has been disregarded by the AER.

c. A range that reflects the statistical uncertainty of historical mean excess return estimates should be used as a primary range, with other relevant evidence relegated to informing the selecting of a point estimate from within that range. There is no reason why the estimate of the MRP at one point in time should be constrained by the estimate of the average MRP across time.

d. That reliance should be placed on survey responses to estimate the MRP but no reliance should be placed on independent expert reports in estimating the MRP. The issues the AER raises with respect to transparency are far greater with respect to survey responses. Further, it is not reasonable for the AER to simply compare ex-imputation estimates of the MRP from independent experts to the AER's with-imputation estimate of the MRP.

e. The Wright approach should not be used to inform the estimate of MRP, even though it is designed for precisely that purpose. The AER's relegation of the Wright approach to the final stage of consideration of the overall cost of equity was entirely a choice made by the AER and there is no logical reason for this choice,

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151 SFG (2015 ROE), Section 4; SFG (2014 ROE), Section 3;

instead of using historical real returns to make an estimate of the MRP; and

f. The risk-free rate should not be included among the set of conditioning variables.

214 In relation to the Black CAPM, we disagree with the AER's contentions that:[152]

a. A more reliable estimate of the required return on equity for the benchmark efficient entity is likely to be obtained by *not* estimating the Black CAPM;

b. It is possible to properly have regard to the Black CAPM without ever estimating it;

c. The "plausible" SFG estimate of the zero-beta premium should be rejected on the basis that some other estimates are considered to be implausible. The recent paper by Partington and Satchell (2015) now goes further to contend that our estimate of the zero beta return is unreasonable as it exceeds the rate on BBB debt.[153] Neither the AER, nor Partington, nor Satchell, have ever made an estimate of the zero beta return that is appropriate to account for the shortcomings and empirical limitations of the Sharpe-Lintner CAPM that have been acknowledged by the AER. Yet an estimate of the zero beta premium (3.34%) formed with respect to returns on all Australian listed stocks over 20 years is rejected because it is higher than the most recent estimate of the debt premium. There is no basis for the implication by Partington and Satchell that they know the proposed upper bound on the zero beta return without providing any estimate or method for estimating the zero beta return.

d. The Black CAPM is not commonly used in practice. The AER has acknowledged the adjustments to the cost of equity estimate generated by the Sharpe-Lintner CAPM (the uplifts) but excludes from consideration all of these adjustments. Then the AER rejects the use of the Black CAPM (which gives higher cost of equity estimates) because practitioners use the Sharpe-Lintner CAPM. The AER has also presented evidence of equity risk premiums from brokers to support the AER's preferred equity risk premium, despite this showing the risk free rate component used by those brokers was well above the yield on government bonds. The AER itself makes an adjustment to the equity beta estimate on the basis of the directional implication of the Black CAPM. By directly estimating the cost of equity using the Black CAPM, all that is being proposed by the network service

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152 SFG (2015), Section 3; SFG (2014 ROE), Sections 2 and 5; SFG (2014 Black).

153 Partington and Satchell (2015), p. 10.

providers is to make an explicit, transparent adjustment to the Sharpe-Lintner cost of equity, rather than an implicit, ambiguous adjustment that is used by independent experts, brokers and the AER itself.

215 In relation to the Fama-French model, we disagree with the AER's contentions that:[154]

a. A more reliable estimate of the required return on equity for the benchmark efficient entity is likely to be obtained by *not* estimating the Fama-French model;

b. The Fama-French model should be rejected on the basis that the results might be sensitive to the estimation approaches, when precisely the same issue applies to the Sharpe-Lintner CAPM;

c. The Fama-French model should be rejected on the basis that "it is not clearly estimating ex ante returns" when its purpose of explaining the cross section of stock returns is precisely the same as every other asset pricing model;

d. The Fama-French model should be rejected, in favour of the Sharpe-Lintner CAPM, on the basis that it was first developed to address the empirical failings of the Sharpe-Lintner CAPM;

e. The Fama-French model should be rejected on the basis that it is more complex than the Sharpe-Lintner CAPM;

f. The Fama-French model should be rejected because there exist other multi-factor models (none of which have been deemed to be relevant and none of which have been proposed by any stakeholder);

g. The Fama-French model should be compared with the Sharpe-Lintner CAPM in an either/or manner; and

h. The Fama-French model should be rejected on the basis of Handley's (2014) mistaken interpretation of Lewellen, Nagel and Shanken (2010).

216 In relation to the dividend discount model (for the purposes of estimating the return on equity for the benchmark firm), we disagree with the AER's contentions that:[155]

a. A more reliable estimate of the required return on equity for the benchmark efficient entity is likely to be obtained by *not* estimating the dividend discount model;

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154 SFG (2015 ROE), Section 3; SFG (2015 FFM); SFG (2014 ROE), Sections 2 and 5; SFG (2014 FFM).

155 SFG (2015 ROE), Section 3; SFG (2015 DDM); SFG (2014 ROE), Sections 2 and 5; SFG (2014 DDM).

b. The dividend discount model should be rejected because it is sensitive to estimation methods and parameter estimates, when precisely the same issue applies to the Sharpe-Lintner CAPM;

c. The dividend discount model should be rejected on the basis that it produces estimates of the return on equity that are overly sensitive to movements in the risk-free rate, when precisely the opposite it true;

d. All specifications of the dividend discount model should be rejected on the basis that some of them may produce volatile and conflicting results; and

e. The SFG dividend discount model estimates should be rejected because they differ from the AER's preconceived views and from its Sharpe-Lintner CAPM estimates.

6.2 Recent AER expert reports

217 For its recent JGN Final Decision, the AER has commissioned two new reports relating to the required return on equity. We provide some brief responses to those reports below.

6.2.1 Partington and Satchell (2015)

218 A number of proposals have been made which suggest that, when estimating the required return on equity, the AER should have regard to evidence beyond the estimation of three Sharpe-Lintner CAPM parameters. Partington and Satchell (2015) consider some aspects of these proposals and raise potential conceptual problems that might occur with the implementation of the proposal under some conditions. However that paper:

a. Does not consider whether there is evidence that the problem arises in the specific case of the benchmark efficient firm and/or the contemporaneous market conditions;

b. Does not provide any solutions for how the potential problem would be best addressed if it should arise; and

c. Does not consider any of the problems that might arise in relation to the AER's Sharpe-Lintner CAPM approach.

219 We provide several examples below.

Arithmetic vs. geometric mean returns

220 The appropriate use of arithmetic and geometric means is as follows:

a. The geometric mean is the appropriate way of measuring the average historical return because there is only one possible sequence – that which actually occurred; and

b. The arithmetic mean is the appropriate way of estimating the expected future return because there are many possible future

realisations. The arithmetic mean encapsulates the relative probabilities of obtaining a very high return every year over the future period, a very low return every year, and every possible combination of returns in between these two extremes.

221 Partington and Satchell (2015, p. 17) provide an example that relates to a single sequence of historical returns. We agree that the geometric mean is the appropriate statistic in this case. However, any suggestion that this has anything at all to do with estimating the expected future return would be disingenuous. Partington and Satchell appear to recognise this:

> Assuming returns over time follow independent identical distributions with a finite variance, then it is widely accepted that the arithmetic average is the appropriate estimator of expected returns.[156]

222 Partington and Satchell then suggest that returns might not be independently and identically distributed (iid) over time. However:

a. They provide no evidence that this issue affects the historical returns on which the AER relies;

b. They provide no guidance about what should be done if there was some evidence that returns were not iid, other than to state that the geometric mean would have "a role to play;" [157]

c. They do not cite the advice from McKenzie and Partington (2011) that, even if returns were not iid, the arithmetic mean should still receive a weight above 90%;[158] and

d. They provide no endorsement whatsoever of the AER's approach of setting a range for MRP where the lower bound is set by adding 20 basis points to the geometric mean estimate.

The risk-free rate and the market risk premium

223 As set out in the body of this report, one of the issues that the AER must consider is whether the dramatic fall in government bond yields from the Guideline to the draft decisions to the final decisions produces a one-for-one fall in the required return on equity

224 Partington and Satchell (2015, p. 18) state that:

a. There are some theoretical models in which a fall in risk-free rates would be (at least partially) offset by an increase in the MRP;

b. They are "not convinced that the claims for a negative relationship have a compelling quality about them"[159];

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156 Partington and Satchell (2015), p. 17.

157 Partington and Satchell (2015), p. 17.

158 McKenzie and Partington (2012), p. 8.

159 Partington and Satchell (2015), p. 18.

c. They do not believe that there is always a perfectly offsetting relationship (such that the required return on equity is always constant).

225 However, they:

a. Provide no indication of whether they think that it is possible that some of the dramatic decline in the government bond yield since the Guideline might have been offset by an increase in the MRP. That is, they give no consideration at all to the prevailing conditions in the market for equity funds; and

b. They provide no endorsement whatsoever of the AER's approach of applying a fixed premium to the contemporaneous government bond yield, with the result that the allowed return on equity has fallen one-for-one with the 39%[160] decline in the government bond yield since the Guideline.

Consideration of more than one model

226 In relation to the use of multiple models, Partington and Satchell (2015) raise the possibilities that:

a. One of the estimates might have an infinite mean; and

b. The mean squared error of the final (weighted) estimate will be higher if the weights are not chosen in a statistically optimal way, or if one of the estimates is biased and/or volatile.

227 However, they:

a. Provide no evidence of any of these problems in relation to the model estimates that have been submitted in the case at hand;

b. Provide no guidance about what would be done if one of the potential problems did arise;

c. Do not suggest that the approach of selecting one model and disregarding all others would be superior to a proper consideration of all relevant models;

d. Provide no endorsement whatsoever of the AER's approach of estimating only the Sharpe-Lintner CAPM, or of using the theoretical underpinnings of one model to inform the selection of parameter point estimates in another model.

Estimation issues in other models

228 Partington and Satchell (2015) consider the approaches that might be used to estimate the Black CAPM and the Fama-French model. They note that there are different estimation methods, data, and other evidence that might be used to

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160 (4.2%-2.55%)/4.2%.

inform parameter estimates. They express their concern that different stakeholders might engage in "potential acts of manipulation" in order to "further [their] commercial interests"[161] and that service providers might have proposed the Black CAPM because "it is quite possible to throw up a favourable result."[162]

229 In our view, the possibility that a regulator may disagree with the way in which a parameter was estimated in a particular stakeholder's submission does not justify the outright exclusion of that model. A better approach would be for the regulator to state its concern about that estimate and to provide what it considers to be a superior estimate.

230 Moreover, the objective should be to obtain the best possible estimate of the required return on equity for the benchmark efficient entity, having regard to all relevant financial models, estimation methods, data and evidence. It is not clear how this can be achieved if relevant models are not considered – for whatever reason.

231 Finally, we note that Partington and Satchell do not consider the prospect that different Sharpe-Lintner CAPM parameters will be obtained using different estimation methods, data and evidence. For example, the range of the allowed return on equity from the AER's own estimates of the Sharpe-Lintner CAPM is 4.6%[163] to 8.6%.[164]

232 Partington and Satchell do not state what approach they think should be used to estimate the required return on equity for the benchmark efficient firm in the prevailing market conditions, they do not provide any estimate of the required return on equity, and they do not endorse the AER's approach as providing the best possible estimate.

Selective interpretation of the relevant research

233 As set out in 2.3 above, Partington and Satchell (2015) continue to interpret Lewellen, Nagel, and Shanken (2010) as providing some support for the continued use of the Sharpe-Lintner CAPM, when that paper supports the opposite.

234 They also note that McKenzie and Partington (2014) considered Da, Guo, and Jagannathan (2012) and concluded that "their findings justify the continued use of the CAPM."[165] They now clarify that this paper requires that returns and betas must be interpreted and estimated in an entirely different manner, that it is not feasible to implement this model in the case at hand, and that it does not provide any support for the AER's implementation of the CAPM.

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161 Partington and Satchell (2015), p. 14.

162 Partington and Satchell (2015), p. 14.

163 2.55+0.4×5.1=4.59%.

164 2.55+0.7×8.6=8.57%.

165 Partington and Stachell (2015), p. 9.

235 To explain this more clearly, Da, Guo and Jagannathan (2012) perform a test in which they strip out the part of the beta estimate that is not explained by the book to market ratio, return on assets and company-specific equity volatility; and strip out the part of the excess stock returns that is not explained by the book to market ratio, return on assets and company-specific equity volatility. Then, they show that this residual estimate of equity beta is able to explain some of the cross-sectional variation in the residual excess returns.

236 So on the one hand Partington and Satchell (2015) use the analysis of Lewellen, Nagel and Shanken (2010) to contend that it is difficult to justify the use of the Fama-French on its ability to explain realised returns. Yet they find it pertinent to support the Sharpe-Lintner CAPM on the basis of a different type of beta estimate being able to explain the part of returns that cannot be explained by some other characteristics. This is a clear illustration that Partington and Satchell have selectively interpreted the empirical evidence in favour of the Sharpe-Lintner CAPM, and against the Fama-French model.

237 Partington and Satchell also cite Levy and Roll (2012) who conclude that the CAPM cannot be empirically rejected.[166] Levy and Roll show that the CAPM can be made to fit observed returns by making ex post adjustments to CAPM parameters and to estimated returns to line them up. In particular, the returns are moved towards the CAPM line and the CAPM line is moved towards the observed returns – ex post. Thus, the Levy and Roll approach supports the Black CAPM not the Sharpe-Lintner CAPM (since the CAPM line is shifted to have a higher intercept and a lower slope).

238 SFG (2014 Black) have already addressed the lack of practical application of the Levy and Roll approach to practical cost of equity estimation, concluding that Levy and Roll (2010, 2012) provide no support at all for the practical use of the Sharpe-Lintner CAPM implemented in the way the AER implements it:

> It is possible that the Sharpe-Lintner CAPM would provide a perfect description of the observed data if only we were able to properly measure the input parameters. In this regard Levy and Roll (2010) note that the empirical implementation of the Sharpe-Lintner CAPM provides a poor fit to observed stock returns. They then look at how much they would have to change the Sharpe-Lintner CAPM input parameters and the observed stock returns to have a reasonable fit between the two. They conclude that it may be the inability to reliably and precisely estimate the various input parameters that is responsible for the poor performance of the Sharpe-Lintner CAPM.
>
> This is an interesting theoretical idea, but does nothing to change the fact that the empirical implementation of the Sharpe-Lintner CAPM provides a poor fit to the data. Levy and Roll (2010) can only conclude that the poor performance of the Sharpe-Lintner CAPM may be due to the inability to reliably estimate the parameters – unfortunately, their approach cannot help at all in actually improving the reliability of those parameter estimates. That is, their work provides a potential explanation, rather than a solution, for the poor performance of the model. Consequently, this branch of the literature is of no use to anyone seeking to estimate required returns in

166 Partington and Satchell (2015), p. 9.

practice. The Sharpe-Lintner CAPM, as best as we can estimate it with all of the data and techniques available to us, provides a very poor fit to the observed data. Fama and French (2004) make the same point when they state that:

"…this possibility cannot be used to justify the way the CAPM is currently applied. The problem is that applications typically use the same market proxies, like the value-weight portfolio of U.S. stocks, that lead to rejections of the model in empirical tests. The contradictions of the CAPM observed when such proxies are used in tests of the model show up as bad estimates of expected returns in applications ... in short, if a market proxy does not work in tests of the CAPM, it does not work in applications."[167]

6.2.2 Handley (2015)

239 As set out in Section 2.3 above, Handley (2015) continues to interpret Lewellen, Nagel, and Shanken (2010) as providing some support for the continued use of the Sharpe-Lintner CAPM, when that paper supports the opposite.

240 Handley (2015) accepts that there are two "well known"[168] systematic biases in the Sharpe-Lintner CAPM relative to observed stock returns:

a. The Sharpe-Lintner CAPM underestimates the returns on stocks with low betas; and

b. The Sharpe-Lintner CAPM underestimates the returns on stocks with high book-to market ratios.

241 He correctly notes that one of the potential explanations for these empirical regularities is that the Sharpe-Lintner CAPM is an incomplete model – the single factor does not perfectly encapsulate all aspects of risk that investors consider when determining what returns they might require.

242 He then suggests that it is possible that the systematic biases might arise for reasons unrelated to risk. He provides some possible reasons why investors would systematically require returns that differ from the Sharpe-Lintner CAPM predictions.[169] However, these reasons all relate to the incompleteness of the Sharpe-Lintner CAPM – they are all potential explanations for why the Sharpe-Lintner CAPM fails in practice. He claims that some of these reasons are not risk-based, and then concludes, that because there might be a non-risk based explanation for the systematic empirical failing of the Sharpe-Lintner CAPM, all other models should be rejected outright. He reaches this conclusion on the basis of his legal interpretation of the reference in the Rules to "a benchmark efficient entity with a similar degree of risk as the service provider."

243 In our view, this conclusion has no logic to it. How can papers that purport to address the empirical failings of the Sharpe-Lintner CAPM be used to support its retention? All of the models that Handley considers have been created to fit the data better than the Sharpe-Lintner CAPM – they are all risk-based models that

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167 SFG (2014 Black), p. 13.

168 Handley (2015), pp. 5-6.

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

simply provide a somewhat different characterisation of the relationship between risk and return to better fit the observed data.

244 Also, having accepted that firms with the features of the benchmark efficient entity (beta less than one and high book-to-market) have systematically earned returns above the Sharpe-Lintner CAPM estimate for decades, and having accepted that this could have a risk-based explanation, why would it be appropriate to entirely disregard models that are consistent with that risk-based explanation – surely they would be of at least some relevance?

245 Moreover, if there is consistent evidence that investors require a higher-than-Sharpe-Lintner CAPM return for stocks with the features of the benchmark firm, that evidence would have to be considered if the goal was to produce the best possible estimate of the required return on equity. The best possible estimate could not be achieved if that evidence was disregarded due to Dr Handley's interpretation of the legal effect of the reference in the Rules to a "similar degree of risk."

7 Declaration

246 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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9 Appendix 1: Instructions

JONES DAY

AURORA PLACE • LEVEL 41, 88 PHILLIP STREET • SYDNEY NSW 2000

TELEPHONE: +61.2.8272.0500 • FACSIMILE: +61.2.8272.0599

12 June 2015

Partner
Nicolas Taylor
Telephone: +61 2 8272 0715
Email: NJTaylor@JonesDay.com

Professor Stephen Gray
Frontier Economics

TERMS OF REFERENCE

You are engaged by Jones Day on behalf of SA Power Networks (SAPN).

As you know, the National Electricity Rules and the National Gas Rules were changed in 2012 by the introduction of a rate of return objective. The rules required the AER to have regard to a broader range of inputs than was previously the case in reaching a decision concerning the allowed rate of return for equity.

You have written several reports concerning the allowed rate of return for equity and in that context you have been briefed with the text of the allowed rate of return objective, the National Electricity Objective and Revenue and Pricing Principles. You have also previously reviewed the AER's Rate of Return Guidelines.

As you know, SAPN (and that of a number of other businesses) used your reports as support for their regulatory proposals and, in particular, they departed from the Rate of Return Guideline by proposing that:

- the AER's foundation model not be used;
- a weighted average of four models be used to directly estimate the cost of equity and that the SL-CAPM be implemented using both the Ibbotson and Wright methods; and
- the market risk and beta parameters used in the SL-CAPM each be higher than proposed by the AER.

The AER has effectively rejected all these submissions in its Preliminary Determination for SAPN (and the Preliminary and Final Determinations released on the same day). The AER has commissioned several expert reports in connection with those determinations.

Since that the release of those decisions, the AER has made a further Final Determination in relation to Jemena Gas Networks and published additional expert reports that it procured in connection with that decision.

Please review the above material and provide a report addressing the following issues:

1. The AER's determination makes reference to the breadth of inputs provided to it by the network businesses. Please analyse what the AER's decision does with the various inputs and whether the way in which the inputs are treated accords with the economic concepts advanced in the rate of return objective.

2. Which inputs of the inputs are given weight in the decision and are there ways in which some inputs affect the extent to which other inputs contribute to the rate of return decision and is the framework economically sensible.

3. The SL-CAPM is given a more prominent role than the other models because it is used as the "standard bearer" and "foundation model". You, and other consultants retained by the network businesses and in some respects even the AER's consultants, have previously expressed significant reservations about the empirical performance of this model. The materials released by the AER respond to a number of those criticisms. Please provide your views on those criticisms.

4. Please also note any other key observations you have in response to the AER's decisions on equity and the materials it relies on.

Compliance with the Code of Conduct for Expert Witnesses

Attached as **Annexure 1** is a copy of the Federal Court's Practice Note CM 7, entitled "Expert Witnesses in Proceedings in the Federal Court of Australia", which comprises the guidelines for expert witnesses in the Federal Court of Australia (Expert Witness Guidelines).

Please read and familiarise yourself with the Expert Witness Guidelines, and comply with them at all times over the course of your engagement.

In particular, your report prepared should contain a statement at the beginning of the report to the effect that the author of the report has read, understood and complied with the Expert Witness Guidelines.

Your report must also:

1. contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;

2. identify the questions that the expert has been asked to address;

3. set out separately each of the factual findings or assumptions on which the expert's opinion is based;

4. set out each of the expert's opinions separately from the factual findings or assumptions;

5. set out the reasons for each of the expert's opinions; and

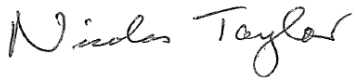
6. otherwise comply with the Expert Witness Guidelines.

The expert is also required to state that each of the expert's opinions is wholly or substantially based on the expert's specialised knowledge.

The declaration contained within the report should be that "[the expert] has made all the inquiries that [the expert] believes are desirable and appropriate and that no matters of significance that [the expert] regards as relevant have, to [the expert's] knowledge, been withheld from the report".

Please also attach a copy of these terms of reference to the report.

Kind regards



Nicolas Taylor

Partner

10 Appendix 2: Curriculum vitas of Professor Stephen Gray and Dr Jason Hall

Stephen F. Gray

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

Director
Frontier Economics
Email: Stephen.Gray@frontier-economics.com.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.

Publications

Gray, S. and J. Nowland, 2015, "The Diversity of Expertise on Corporate Boards in Australia," *Accounting and Finance*, forthcoming.

Darat, A., S. Gray, J. C. Park and S. Wu, (2014), "Corporate governance and bankruptcy risk" *Journal of Accounting, Auditing and Finance*, forthcoming.

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Gray, S., C. Gaunt and Y. Wu, (2010), "A comparison of alternative bankruptcy prediction models," *Journal of Contemporary Accounting and Economics*, 6, 1, 34-45.

Feuerherdt, C., S. Gray and J. Hall, (2010), "The Value of Imputation Tax Credits on Australian Hybrid Securities," *International Review of Finance*, 10, 3, 365-401.

Gray, S., J. Hall, D. Klease and A. McCrystal, (2009), "Bias, stability and predictive ability in the measurement of systematic risk," *Accounting Research Journal*, 22, 3, 220-236.

Treepongkaruna, S. and S. Gray, (2009), "Information volatility links in the foreign exchange market," *Accounting and Finance*, 49, 2, 385-405.

Costello, D., S. Gray, and A. McCrystal, (2008), "The diversification benefits of Australian equities," *JASSA*, 2008, 4, 31-35.

Gray, S. and J. Hall, (2008), "The Relationship Between Franking Credits and the Market Risk Premium: A Reply," *Accounting and Finance*, 48, 1, 133-142.

Gray, S., A. Mirkovic and V. Ragunathan, (2006), "The Determinants of Credit Ratings: Australian Evidence," *Australian Journal of Management*, 31(2), 333-354.

Choy, E., S. Gray and V. Ragunathan, (2006), "The Effect of Credit Rating Changes on Australian Stock Returns," *Accounting and Finance*, 46(5), 755-769.

Gray, S. and J. Hall, (2006), "The Relationship Between Franking Credits and the Market Risk Premium," *Accounting and Finance*, 46(3), 405-428.

Gray, S. and S. Treepongkaruna, (2006), "Are there non-linearities in short-term interest rates?" *Accounting and Finance*, 46(1), 149-167.

Gray, P., S. Gray and T. Roche, (2005), "A Note on the Efficiency in Football Betting Markets: The Economic Significance of Trading Strategies," *Accounting and Finance*, 45(2) 269-281.

Duffie, D., S. Gray and P. Hoang, (2004), "Volatility in Energy Prices. In V. Kaminski," (Ed.), *Managing Energy Price Risk: The New Challenges and Solutions* (3rd ed.). London: Risk Books.

Cannavan, D., F. Finn and S. Gray, (2004), "The Value of Dividend Imputation Tax Credits in Australia," *Journal of Financial Economics*, 73, 167-197.

Gray, S. and S. Treepongkaruna, (2003), "Valuing Interest Rate Derivatives Using a Monte-Carlo Approach," *Accounting and Finance*, 43(2), 231-259.

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

2012 - Present: Director, Children's Hospital Foundation, Queensland.
2002 - Present: Director, Financial Management Association of Australia Ltd.
2003 - 2012: Director, Moreton Bay Boys College Ltd. (Chairman from 2007).
2002 - 2007: External Risk Advisor to Board of Enertrade (Queensland Power Trading Corporation Ltd.)

Consulting

SFG Consulting: 1997-2014.
Frontier Economics: 2014-Present.

Twenty years' experience in consulting to companies, government-owned corporations, government and regulatory agencies. Examples include:

- *Regulatory cost of capital*: Preparation of submissions in regulatory determinations. Clients include all Australian energy transmission and distribution businesses, FOXTEL, Telstra, BBI, ACCC, IPART, ERA.

- *Corporate cost of capital reviews*: Review of cost of capital estimates for project evaluation and impairment testing purposes. Clients include QANTAS, Stanwell Corporation, Ecowise.

- *Executive stock option valuation*: Clients include Collins Foods Group, Ground Probe, Crater Gold Mining, Beach Petroleum.

- *New Project Evaluation*: Assisting companies and GOCs to evaluate proposed new projects. Particular focus is on quantifying risk and uncertainty and presenting possible outcomes in a probabilistic framework. Clients include Queensland Treasury Corporation, Queensland Accommodation Group, Stanwell, EnerTrade.

- *Financial modelling and forecasting*: Clients include ATO (forecasting delinquent payments), ASX (forecasting trading volumes), Compass Resources (integrated mine valuation model).

Retained as a valuation expert in many litigation cases; produced many expert witness reports; appeared in Court for cross examination many times including:

- *Macquarie Generation*: Witness for AGL in competition case.
- *Telstra v. ACCC*: Witness for Telstra in rate of return regulation case.
- *C7 Case*: Witness for PBL, Newscorp, Telstra re valuation of Seven's failed cable TV network.
- *Alcan v. NT Commissioner of Revenue*: Witness for Alcan re valuation of combined bauxite mine and alumina refinery for stamp duty purposes.

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
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)
2015	Frontier Economics (Director)
2000-14	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 3.9)
Corporate Investing Decisions (2014; BBA students avg. rating 4.2)
Corporate Financing Decisions (2015; BBA students avg. rating 3.0)
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.

Energy network businesses (2014-2015)
In December 2014 the Australian Energy Regulator (AER) released a set of draft determinations for electricity and gas networks. This was the first set of draft determinations since the publication of the AER's rate of return guidelines in December 2013. It was also the first set of draft determinations since the publication of new rules by the Australian Energy Market Commission (AEMC). I co-authored a series of expert reports addressing almost all aspects of the regulated rate of return. The reports related to (1) estimation of the cost of equity using the Black Capital Asset Pricing Model (CAPM), (2) interpretation of empirical evidence on the beta estimate for use in the Sharpe-Lintner CAPM, (3) the merits of estimating the cost of equity using the Fama-French model, (4) the application of the dividend discount model for estimating the cost of equity, both at the firm and market levels, (5) the distinction between the redemption rate and the market value of imputation credits, and (6) the manner in which the AER has evaluated evidence in reaching conclusions on the allowed return on equity. The reports were commissioned by Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, APA, Ausgrid, Ausnet Services, CitiPower, Endeavour, Energex, Ergon, Essential Energy, Powercor, SA PowerNetworks and United Energy.

Retail electricity and gas margins in NSW (Independent Pricing and Regulatory Tribunal 2006-13)

In 2006-7, 2009-10 and 2012-13 I acted as part of a team which was engaged to estimate electricity costs and margins for electricity and gas retailers in NSW. My role related to the estimation of a profit margin which would allow the retailer to earn a return commensurate with 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)

In 2012 the AEMC made changes to the rules relating to regulation of electricity and gas networks. Independent rule change proposals were forward by the Australian Energy Regulator and the Energy Users Association of Australia. Both groups argued 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 provided advice to the commission on whether the rule change proposals provide evidence on an upward bias, and if so, whether the proposed amendments were likely to reduce the extent of any bias. The rules themselves did not create any bias, but did unnecessarily exacerbate the variation of electricity prices from one five year period to the next. The rules have now been amended to mitigate this variation.

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 & 2015, 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 22 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.

FRONTIER ECONOMICS | MELBOURNE | SYDNEY | BRISBANE
Frontier Economics Pty Ltd 395 Collins Street Melbourne Victoria 3000
Tel: +61 (0)3 9620 4488 Fax: +61 (0)3 9620 4499 www.frontier-economics.com.au
ACN: 087 553 124 ABN: 13 087 553 124