Response to the Equity Beta Issues Paper of the Australian Energy Regulator

28 October 2013

Contents

1. Executive summary

The rate of return guideline under the *National Electricity Rules* and *National Gas Rules* is intended to outline how the Australian Energy Regulator (AER) will apply new rules for estimating the cost of capital for energy network firms. The AER's recently released *Equity Beta Issues Paper* (Issues Paper) sets outs the AER's views on the estimation of a range for equity beta and the selection of a point value.

Significance of equity beta parameter under current AER approaches

Under the AER's current foundation model approach, the equity beta is one of the most significant determinants of final estimates of the required return on equity of the benchmark efficient entity. This makes the AER's view on risk estimation a critical long-term signal for investment.

The AER proposes to reduce its estimate of equity beta from 0.8 to 0.7.[1] The proposed move by the AER has the effect of reducing returns on approximately $75 billion of existing regulated energy network assets by approximately $180 million per annum, using the AER's current approaches as a benchmark.

The preferred beta estimate has been announced with a very short timeframe for stakeholders to respond, in the absence of the AER's commissioned expert empirical evidence. Networks will have no opportunity to assess or respond to this empirical information prior to the AER finalising its guideline. It is a matter of regret that at no point in the draft guideline process has the AER set out in full how it intends to apply its proposed approach. Consequently, stakeholders have not been given the opportunity to properly consider the AER's practical implementation of the foundation model approach or to properly respond to it. No worked example of how the beta will be then used with other inputs into the foundation model has been provided.

Effectively, this means that the earliest point at which stakeholders will have a complete opportunity to understand how the AER proposes make revenue and pricing determinations on rate of return estimation is the final guideline and, even then, interested parties will only gain an understanding of the AER's approach assuming that final decision sets out a number of elements of the approach that are currently unknown.

It must therefore be recognised that each network service provider's first real opportunity for comment on the full approach in practice will be in its individual revenue and pricing determination process. Given the above circumstances, the AER should expect to receive further substantive responses to its commissioned empirical work and its approach in individual network determinations.

Beta estimation under the new regulatory framework

The Issues Paper draws significantly upon evidence collected under the previous regulatory rules in setting a preferred beta range and point estimate. While this may contain relevant evidence for the AER's current task, it is important that the Rule framework is adhered to in the way in which this and other relevant evidence is considered.

AER's approach to estimating the equity beta takes too narrow a frame of evidence

The AER's approach considers a narrow subset of the available evidence that could assist it in its task of estimating an equity beta which, when applied to its foundation model, produces an estimate

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[1] AER (2013), *Equity Beta Issues Paper*, p. 6.

that meets the allowed rate of return objective. The only quantitative information used to determine the AER's range for equity beta is the regression of stock returns on market returns for nine firms, four of which were previously listed in Australia and five of which are currently listed in Australia.

The range derived from this one small sample of firms and one dataset then, in combination with the AER's foundation model, restricts the consideration that can be given to all other evidence. The AER has fixed the 0.4 to 0.7 range for beta and adopted a point estimate of 0.7 while it remains yet to fully consider a large body of relevant evidence submitted by the ENA. This relevant evidence can have no incremental consideration on the final outcome because of the AER's reliance on an equity beta range.

There is no element in the Rules that suggests that the narrow approach used by the AER (which is based on just one small set of firms, using one set of data) should dominate the estimation process or constrain the ability of other evidence to have an effect. Rather, the revised National Gas and Electricity Rules explicitly encourage approaches that use a range of sources to identify sound parameter estimates.

There is no barrier, except from those arising from the artificial confines of the AER's 'foundation model', to the AER considering a wider set of market evidence. ENA considers that the AER should, in this regard, consider:

- beta estimates derived by reference to the dividend discount model (which the AER considers sufficiently robust to inform its market risk premium estimates); and

- the consistency of regression-based estimates with implied betas arising from Fama-French derived return on equity estimates.

Taking into account a wider set of relevant evidence increases the potential for the beta estimate to be robust, and result in an outcome consistent with the Rules, when applied in the rate of return estimation process.

Sample considered by the AER in its regression-based estimates is arbitrarily narrow

The AER has considered a very narrow sample of regression-based estimates which, by its own admission, will lead to a high likelihood of statistical reliability problems.

These statistical reliability problems derive from a range of issues. These include the small sample size, the fact no listed company in the sample aligns to the definition of the benchmark firm, significant changes in the market portfolio sample over the period of observation, significant changes in market conditions over the sampling period, significant actual and speculated mergers and acquisitions in the sample firms over the period, and the large standard errors inherent in beta estimation approaches.

The narrowing of the sample from which regression-based estimates are derived compounds the first identified issue of the scope of information taken into account in setting the point value and range; it represents a risky form of the AER 'doubling down' on a narrow class of evidence.

Despite the reliability problems with the narrow Australian sample, the AER has given no material weight to the US beta estimates provided by the ENA which are based on a significantly larger sample. The AER's reasons for giving little consideration to these estimates do not support its use of a small sample of Australian listed firms with diverse operating environments and characteristics.

The AER's approach to dealing with statistical reliability and the potential for errors is inconsistent and flawed. The Issues Paper identifies reliability as an issue, but does not propose any concrete transparent means of addressing it. A standard approach when faced with the issues the AER confronts is to report confidence intervals – the AER appears to both place some weight on the concept of confidence intervals (by lowering its point estimate from 0.8 to 0.7 on the basis of lower standard errors)[2] while elsewhere citing advice from Henry (2009)[3] in their rejection.[4]

The AER indicates that it draws confidence from the falling standard errors when a longer time series than was previously available is considered.[5] The provision of evidence of falling standard errors from an expanded time series data set is, however, statistically no surprise. It does not, though, justify the almost exclusive consideration given to this narrow set of information in setting a binding constraint on equity beta estimates.

There is no clear or consistent criteria applied to derive the beta range

The ENA is unable to understand the basis of the 0.4 to 0.7 beta range established in the Issues Paper. The ENA understands the mean firm and portfolio estimates which approximate the boundaries to this range. However, the ENA does not understand the basis upon which these mean firm and portfolio estimates should constitute a binding constraint on the beta, to be determined in light of all other evidence.

Most importantly, the AER has not provided any rationale for what the range is intended to capture. The AER has stated that the range is not meant to be the high and low values for individual firm estimates, and it is not a confidence interval around a mean estimate. The range is far narrower than what represents plausible outcomes for beta estimates, given that a number of firms listed in both Australia and overseas have beta estimates greater than 0.7. So while participants can understand the numbers the AER refers to in setting the range, they have no understanding of what the range is intended to capture.

The range is based on historical estimates produced by Henry (2009)[6], combined with estimates from the ERA (2012, 2013)[7], SFG Consulting (2013)[8] and a conceptual assertion that the correct value should be below 1.0. The reason this is a conceptual assertion, rather than evidence, is that the only technique adopted by the AER to estimate equity beta is regressions of stock returns on market returns, so it has no quantitative measurement to suggest that below-average business risk of energy networks offsets their above-average finance risk. Other evidence discussed by the AER suggests that the upper bound of the range could, with similar validity, be extended to above 1.0.[9]

The ENA continues to seek clarification on what the AER considers to be the significance and utility of individual parameter ranges. The current use of ranges by the AER in the Issues Paper does not provide any additional level of certainty because there appears to be no coherent logic behind, particularly, the upper boundary. Significant numbers of estimates drawn from work relied upon by the AER fall outside the upper bound of the range, but are dismissed from consideration for no apparent reason.

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[2] AER (2013), *Equity Beta Issues Paper*, p. 41.

[3] Henry, O.T. (2009), *Estimating β*, April.

[4] AER (2013), *Equity Beta Issues Paper*, p. 44.

[5] AER (2013), *Equity Beta Issues Paper*, p. 40.

[6] Henry, O.T. (2009), *Estimating β*, April.

[7] Economic Regulation Authority (2012) *Draft decision: Western Power access arrangement*, March; Economic Regulation Authority (2013), *Explanatory statement: Draft rate of return guidelines*, August.

[8] SFG Consulting (2013), *Regression-based estimates of risk paramaters for the benchmark firm*, June.

[9] The ENA does not propose a range for the AER to use because there is no conceptual basis for which the ENA is able to support a range. If the AER were to state a conceptual basis for the equity beta range, the ENA would be able to assess relevant evidence to estimate a range that aligns with this concept.

AER is at risk of giving significant weight to demonstrably irrelevant evidence

The ENA is concerned that the Issues Paper indicated that the AER is attributing inappropriate weight to some classes of evidence. For example, the AER appears to place more weight on beta estimates for foreign water networks as a cross check than on beta estimates for US energy networks. It is difficult for participants to determine whether any particular piece of evidence was more or less relevant. However, the AER refers to a mean beta estimate for international-listed water utilities of 0.55,[10] and a range of beta estimates for international-listed energy utilities between "0.5 and 0.9 (although, some estimates exceed 1.0)"[11] but both sets of information are relied upon to confirm the initial range of 0.4 to 0.7.

The AER has requested an econometrician to compute updated beta estimates using the most recent data, for the sample of firms relied upon by the AER in 2009. In its instructions, the AER requires the econometrician to use a very specific (and narrow) approach to estimate beta and then asks the expert to identify the best estimate of beta. Constructing the terms of reference this way appears to have constrained the econometrician's response to the specific methodologies prescribed by the AER. This has the potential to conflate two distinct questions – what is the experts' 'best view' of an estimate of beta if they were to rely on their expertise and the relevant evidence, and what is the estimate which results from the methodological choices and instructions already made and provided under the AER's proposed terms of reference.

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[10] AER (2013), *Equity Beta Issues Paper*, p. 42.
[11] AER (2013), *Equity Beta Issues Paper*, p. 32.

Next steps

To address the issues discussed above the ENA recommends the AER undertake the following steps in finalising the equity beta estimate:

1. Adopt the 'multi model' approach recommended in the ENA's recent response to the draft guideline.

2. If the AER continues to adopt the foundation model approach, rather than the multi-model approach, adopt an equity beta estimation approach recommended by the ENA in Sub-section 3.4, which is consistent with the assignment of weight and importance to all relevant models, data and evidence. Under the foundation model approach, using the Sharpe-Lintner CAPM, the only mechanism by which the relevant risks of the benchmark firm can be incorporated into the cost of equity is via the equity beta input.

3. Assign zero weight to its conceptual analysis from which it concluded that the beta estimate should be less than one, given that the AER has advanced no computation to reach this conclusion.

4. Assign no weight to conceptually based comparisons between the systematic risk of energy and water networks, unless there is a transparent quantification of what those comparisons imply for equity beta.

5. Estimate equity beta without first assigning a range, by giving relative consideration or weight to beta estimates from relevant models, data and evidence, on the basis of their relevance and reliability.

6. If the AER intends to form a range for the estimate of beta, describe the concept the range is meant to capture, and form a range that is consistent with both the concept and relevant evidence.

7. Use all relevant evidence to determine the range. At present the AER uses one set of evidence to define the range (regression-based estimates of beta from Australian-listed firms) and all other evidence to select a value within this range. This classification of evidence into first-tier and second-tier evidence places unreasonably low weight on all evidence not used to define the range.

8. If the AER intends to continue to adopt the foundation model approach, select a point value of 0.94. This beta estimate is based upon estimates from regression analysis of Australian- and US-listed firms (0.82), the evidence that regression-based estimates of beta have little or no association with realised returns (1.00), dividend discount model analysis of the same Australian-listed firms relied upon by the AER in regression analysis (0.96) and the expected return which accounts for the relationship between size, book-to-market ratio and returns (0.91).[12]

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[12] The point value is computed as 1/6 × 0.82 + 1/3 × 1.00 + 1/3 × 0.96 + 1/6 × 0.91 = 0.94. The weights are the same as those adopted by the ENA (2013), *Response to AER rate of return guideline consultation paper*, p. 76.

2. Background

2.1.   Energy Networks Association

The Energy Networks Association (ENA) is the peak national body representing gas distribution and electricity transmission and distribution businesses throughout Australia.

Energy networks are the lower pressure gas pipes and low, medium and high voltage electricity lines that transmit and distribute gas and electricity from energy transmission systems directly to the doorsteps of energy customers.

Twenty-six electricity and gas network companies are members of ENA, providing governments, policy-makers and the community with a single point of reference for major energy network issues in Australia.

With more than $75 billion in assets and more than 13 million customer connections, Australia's energy networks provide the final step in the safe and reliable delivery of gas and electricity to households, businesses and industries.

On 11 October 2013 the AER released its Issues Paper relating to the estimation of equity beta under the draft rate of return guideline and explanatory statement.[13] Stakeholders were given two weeks to respond. This submission by the ENA is a response to that Issues Paper.

2.2.   Structure of response

The remainder of the submission is structured as follows:

Section 3	discusses the definition of beta and the task of the regulator under the new rules.
Section 4	considers the reliability of the domestic beta estimates that the AER has used as its "primary determinant".
Section 5	considers the interpretation and use of relevant international evidence.
Section 6	outlines concerns regarding the derivation of the AER's equity beta range.

The submission should be read together with the attachments. These are:

Attachment A	Competition Economists Group Report *AER equity beta issues paper: international comparators*
Attachment B	SFG Consulting Letter *Clarification of evidence on empirical estimates of beta for Australian water utilities*

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[13] AER (2013), *Explanatory statement - Draft Rate of Return Guideline*, August.

2.3.   Context for response

The response presented in this submission has been developed on a collaborative basis and represents the views of the network sector collectively.

In this regard, ENA notes that the preferred beta estimate has been announced with a very short timeframe for stakeholders to respond, in the absence of the AER's commissioned expert empirical evidence.

It is our understanding that stakeholders will have no opportunity to assess or respond to this empirical information prior to the AER finalising its guideline. It is a matter of regret that at no point in the draft guideline process has the AER set out in full how it intends to apply its proposed approach. Consequently, stakeholders have not been given the opportunity to properly consider the AER's implementation of the foundation model approach or to properly respond to it. No worked example of how the beta will be then used with other inputs into the foundation model has been provided.

Effectively, this means that the earliest point at which interested parties will have a complete opportunity to understand how the AER proposes make revenue and pricing determinations on rate of return estimation issues is the final guideline and, even then, interested parties will only gain an understanding of the AER's approach assuming that final decision sets out a number of elements of the approach that are currently unknown. Thus, the AER should expect to receive further substantive responses to its commissioned empirical work and its approach in individual network determinations.

It must therefore be recognised that each network service provider's first real opportunity for comment on the full approach in practice will be in its individual revenue and pricing determination process. In large part the full application and scope of the guidelines will not have been subject to consultation which means that to accord fairness, the AER must be prepared to depart from the guideline in response to submissions in the individual revenue and price setting processes.

3. Definition of beta

3.1.   AER approach to the estimation of beta

3.1.1.   Approach under the previous Rules

In its 2009 WACC review process, the AER concluded that the empirical evidence supported a range of 0.4 to 0.7 for equity beta.[14] The AER adopted a point estimate of 0.8 on the basis that:

> …the AER has given consideration to other factors, such as the need to achieve an outcome that is consistent with the NEO (in particular the need for the efficient investment in electricity services for the long term interests of consumers of electricity), the revenue and pricing principles (in particular providing the service providers with a reasonable opportunity to recover at least efficient costs, providing service providers with efficient incentives for efficient investment, and having regard to the economic costs and risks of the potential for under and over investment), the importance of regulatory stability. [15]

In selecting its range, the AER placed a limited amount of weight on equity beta estimates from US-listed firms, using that evidence only as a cross-check:

> …the AER continues to place a limited amount of weight upon the United States equity beta estimates (treating the estimates as a check on the reasonableness of the Australian equity beta estimates). [16]

The AER applied no weight at all to the Black CAPM evidence on the basis that the rules at the time required the use of the Sharpe-Lintner (SL CAPM) only:

> …as the NER mandates the use of the Sharpe CAPM in determining the cost of equity, the use of alternative asset pricing models, such as the Black CAPM, is not permissible under the NER.[17]

The AER also placed no weight on the Blume or Vasicek statistical bias corrections.[18]

3.1.2.   Approach under the new Rules

The approach that the AER intends to adopt under the new Rules, set out in the Issues Paper appears to be almost identical to the approach that the AER adopted under the previous Rules:

- The range for equity beta is based on historical regression analysis applied to a small (and shrinking) set of domestic firms. The AER has stated that the same range of 0.4 to 0.7 from its last WACC review five years ago remains the best estimate today;

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[14] AER (2009), *WACC Review Final Determination*, p. xvi. In fact, the range was specified to two decimal places as 0.41 to 0.68.
[15] AER (2009), *WACC Review Final Determination*, p. xvii.
[16] AER (2009), *WACC Review Final Determination*, p. xvii.
[17] AER (2009), *WACC Review Final Determination*, p. xvii.
[18] AER (2009), *WACC Review Final Determination*, p. xvi.

- Overseas evidence does not inform the range, but is used only as a cross-check. The AER has stated that the overseas evidence is consistent with a range of 0.5 to 0.9 (although some estimates are above 1) – identical to its conclusion from the last WACC review five years ago; and

- Raw beta estimates are preferred to Blume and Vasicek beta estimates.

Relative to its previous WACC review process, the AER applies the *same* estimation techniques to the *same* subset of firms and concludes that the results are unchanged – the domestic evidence supports a range of 0.4 to 0.7 and the overseas evidence supports a range of 0.5 to 0.9. The AER's reasons for selecting a point estimate of 0.8 at the last WACC review process were based on the NEO and RPP, as set out above. Since then, there have been no changes to the NEO or RPP.

The AER's conclusion that an equity beta of 0.7 is appropriate is based upon the conclusion that it "now has greater confidence in the reliability of the empirical evidence."[19] The data used in support of this conclusion is that the standard errors of the regression-based estimates have declined, given the longer time series of data that is available.[20]

This, of course, begs the question of what the AER means by the term "range." It cannot mean a confidence interval (or a range of estimates that contains the true beta with a particular probability) because its range is independent of the standard errors of the estimates available to it.[21] It is clearly not a maximum and minimum possible value since the majority of the individual estimates considered by the AER fall outside of the range. The ENA is unsure of precisely what the AER intends the range to mean. Nevertheless, the ENA notes that under the AER's foundation model approach the specified range is determined by a small subset of the available evidence and then serves to restrict or eliminate the effect of all other evidence. For this reason, the concept of the range is addressed in detail below.

The new Rules require the cost of equity to be estimated using all relevant evidence. The manner in which the AER has implemented the Rules is to use both a foundation model (SL CAPM) and a *foundation implementation* to estimating beta (regression-based estimates of beta for a small sample of Australian-listed firms). The foundation implementation does not consider all of the relevant evidence and the ENA does not see how else the relevant evidence can be incorporated into the cost of equity under the foundation model, unless it is incorporated into the beta estimate.

In contrast, the ENA submits that less weight should be given to the AER's foundation implementation, in comparison to the last WACC review, due to the substantial body of evidence submitted by the ENA in relation to beta estimation. In particular, the ENA has already submitted earlier in the draft guideline evidence that:

- Regression-based estimates of beta have little or no reliable association with historical returns.[22]

- Regression-based estimates of beta derived from least absolute deviation (LAD) analysis exhibit a material downward bias.[23]

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[19] AER (2013), *Equity Beta Issues Paper*, p. 40.
[20] AER (2013), *Equity Beta Issues Paper*, p. 41.
[21] See also AER (2013), *Equity Beta Issues Paper*, p. 39.
[22] NERA Economic Consulting (2013), *Review of cost of equity models*, June, Figure 6 and Figure 7, pp. 6-7; NERA Economic Consulting (2013), *Estimates of the zero beta premium*, June, Table 5.1 and Figure 15, pp.14–15.
[23] Gray, Hall, Diamond and Brooks (2013), *Comparison of OLS and LAD regression techniques for estimating beta*, June.

- Regression-based estimates of beta, especially in samples as small as that relied upon by the AER, are highly unstable across samples and over time.[24]

- A detailed compilation of beta estimates from 56 US-listed firms implied a beta estimate of 0.89, with lower standard errors than estimated from a sample of 6 to 9 Australian-listed firms.[25] There is no reason that the AER should now place more weight on Australian-listed firms relative to US-listed firms, than in the 2009 WACC review. The ENA submits that the analysis of US listed firms should carry greater relative weight than four years ago because of the thorough and transparent way in which the sample was compiled.[26]

- Regression-based estimates have beta do not explain returns to Australian-listed stocks, but the book-to-market effect *does* explain returns to Australian-listed stocks.[27] While the AER has stated that it will not use the Fama-French Model to estimate the cost of equity, the AER has not reached a conclusion on this empirical regularity. In the absence of the use of the Fama-French Model itself, the only mechanism by which this result can be incorporated into the regulated cost of equity is in the beta estimate. If the evidence on the book-to-market effect is incorporated into the beta estimate, the result is a beta estimate of 0.91.

- Dividend discount model analysis using all Australian-listed firms, is consistent with a beta estimate of 0.96 for the same set of Australian-listed firms relied upon by the AER.[28]

Key position 1

The AER has altered its point estimate of beta from 0.8 to 0.7 on the basis that it now has more confidence in regression-based estimates of beta for a small sample of Australian-listed firms. The AER has implemented not just a foundation model (SL CAPM) but a foundation implementation to estimating beta. That approach does not take account of all relevant evidence. The ENA submits that the relevant evidence implies that less weight should be placed on this one estimation technique,[29] one set of data and one small sample. Rather, in contrast to 2009, more weight should be placed on evidence from US-listed firms and estimates compiled from alternative estimation techniques and data sources.

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[24] Gray, Hall, Diamond and Brooks (2013), *Assessing the reliability of regression-based estimates of risk*, June.
[25] SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, June; Competition Economists Group (2013), *Information on equity betas for US comparables*, June.
[26] The sample of US-listed firms relied upon by the ENA was constructed after a detailed consideration of industry classifications, regulatory regimes, proportion of regulated assets, firm size, liquidity, firms used in other regulatory determinations and the relationship between industry beta estimates for Australian- and US-listed firms in the same industry.
[27] NERA Economic Consulting (2013), *The Fama-French three-factor model*, Table 5.3, p.30.
[28] SFG Consulting (2013), *Dividend discount model estimates of the cost of equity*, June; SFG Consulting (2013), *Reconciliation of dividend discount model estimates with those compiled by the AER*, October.
[29] Compiling different lines of best fit through the same set of stock and market returns, using different weighting schemes, does not represent fundamentally different estimation techniques. The ENA has already submitted that a line of best fit through this series of historical returns can be estimated at 0.55, using an equal-weighted index, and 0.60, using an average of individual firm estimates.

3.2.   Regulatory task in the estimation of beta

3.2.1.   Applying the previous Rules

Under the previous Rules, the practice of the AER was to compute the allowed return on equity using only the SL CAPM. The previous Electricity Rules specified that only the SL CAPM must be used and under the previous Gas Rules the AER determined that the SL CAPM was the only well-accepted financial model that it would use.

Under the previous Rules, the AER's implementation of the SL CAPM was mechanistic. In relation to beta, the AER commissioned certain regression analyses for a specified set of comparable companies. The AER gave no material weight to estimates relating to overseas comparables, to estimates based on techniques other than the regression analysis that it instructed its consultant to perform, or to estimates designed to correct for the documented systematic biases in SL CAPM estimates.

In the *DBP* and *ATCO Gas* cases, the Australian Competition Tribunal (the Tribunal) applied the previous *National Gas Rules*. Previous rule 87(1) required that the allowed return on equity must be commensurate with the prevailing conditions in the market and previous rule 87(2) required that a well-accepted financial model such as the CAPM must be used. In separate cases, DBP and ATCO Gas submitted that, having applied a well-accepted financial model such as the CAPM, the regulator must then determine whether or not the output of that model (an estimate of the required return on equity) was commensurate with the prevailing conditions in the market. DBP and ATCO Gas submitted that the application of 87(1) required the regulator to consider a range of evidence beyond that which was used to parameterise the model under 87(2), including (but not limited to) evidence from other models.

However, the Tribunal ruled that, under the previous rules, 87(1) did not require the regulator to examine any evidence beyond that which it used to parameterise the SL CAPM. In particular, the Tribunal held that the proper interpretation of the previous rules was that 87(1) set out an objective and 87(2) set out how that objective was to be fulfilled. The Tribunal went on to conclude that, given a well-accepted financial model must be used "it is almost inherently contradictory to then say that the approach or the model is not likely to produce a reliable output."[30]

In summary, under the previous rules, the regulatory approach to determining the allowed return on equity was to obtain estimates for the three SL CAPM parameters, insert them into the SL CAPM formula, and to adopt the resulting output as the allowed return on equity without any further consideration of whether the output produced by that model with those parameters was commensurate with the prevailing conditions in the market.

3.2.2.   Regulatory task under the new Rules

The AEMC has recently made fundamental changes to the Rules. In its recent determination, the AEMC specifically addressed the Tribunal decisions in the *DBP* and *ATCO Gas* cases. The AEMC noted that it saw a clear need to change the previous gas rules because of the Tribunal decisions in those cases:

> *The Commission also provided reasons for why it had not adopted the broad*
> *architecture of the NGR rate of return framework given it exhibited a number of*

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[30] Dampier Bunbury Pipeline matter, 2012, Paragraph 84.

the identified key features of a good rate of return framework. The Commission was not convinced that the existing NGR rate of return framework would best meet its proposed approach in light of the recent decisions of the Tribunal in the ATCO Gas and DBP merits reviews and their implications for how the Commission intends its framework to be interpreted.

In both the ATCO Gas and DBP cases, the Tribunal rejected the contention of the applicants that giving primary emphasis to rule 87(1) would reflect the NGO and the RPP. Such a conclusion does not reflect the approach of the Commission to determining an appropriate rate of return. The Commission considers that the primary consideration should be whether or not the overall allowed rate of return reflects benchmark efficient financing costs. A focus on the overall estimate of the rate of return is the key objective of the new framework.[31]

The AEMC determined that the regulatory approach of inserting three parameter estimates into the SL CAPM formula and adopting the resulting output as the allowed return on equity without any further consideration of whether the output produced by that model with those parameters was commensurate with the prevailing conditions in the market was unacceptable and inconsistent with its proposed approach:

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.[32]

The new rules require the regulator to have regard to all relevant approaches and evidence – eliminating the focus on a single model (SL CAPM) that could be used without having regard to a weight of evidence suggesting that the way the regulator implemented that model produced an estimate of the required return on equity that was implausible in the circumstances.

The new rules require the AER to have regard to all relevant estimation methods, financial models, market data and other evidence and to the prevailing conditions in the market for equity funds when setting an allowed return on equity that best meets the allowed rate of return objective. The new rules do not specify *what* evidence the regulator must have regard to or *how* it is to have regard to it. That is, the new rules do not specify any particular method for distilling the range of evidence into a single allowed return on equity.

One approach for distilling an allowed return on equity from the broader range of evidence under the new rules is the multi-model approach submitted by the ENA. The AER has rejected that approach in favour of its foundation model approach whereby all relevant evidence is effectively filtered through the SL CAPM or only able to influence where within a range defined by the implementation of the SL CAPM a final value can be selected. The ENA has already submitted its concerns with the use of a single primary model in light of the fact that the AEMC has indicated that the new rules are designed to move regulatory practice away from any approach that "presupposes the ability of a single model, by itself, to achieve all that is required by the objective." [33] In its submission of 11 October 2013, the ENA affirmed its support for the multi-model approach, but also set out how it

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[31] AEMC Final Determination *Economic Regulation of Network Service Providers*, p. 48.
[32] AEMC Final Determination *Economic Regulation of Network Service Providers*, p. 48.
[33] AEMC Final Determination *Economic Regulation of Network Service Providers*, p. 48.

believes a foundation model approach would be best implemented under the new rules. This submission provides further detail on the best implementation under the new rules in relation to equity beta and discusses the effect that the AEMC's rule change had on the regulatory task in relation to the estimation of beta.

Under the previous rules (and the Tribunal's interpretation of them) the regulatory task was simply to populate the SL CAPM. That is, the Tribunal was satisfied that, under the previous rules, the regulator only needed to consider the sub-set of relevant evidence that was required to produce its estimates of the three SL CAPM parameters. There was no need to consider other models that are known to provide a better empirical fit to the data. There was no need to consider other evidence suggesting that the resulting cost of equity was not commensurate with the prevailing conditions in the market. And there was no need to consider evidence suggesting that the regulator's implementation of the CAPM was inconsistent with professional practice. In relation to beta, the Tribunal was satisfied that the regulatory task had been met by setting out historical regression estimates for a small sample of Australian firms and selecting a point estimate.

The ENA submits that the regulatory task under the new rules is quite different. The new rules require the AER to have regard to all relevant estimation methods, financial models, market data and other evidence and to the prevailing conditions in the market for equity funds when setting an allowed return on equity that best meets the allowed rate of return objective. Under the new rules, *if* all evidence is to be filtered through the lens of the SL CAPM, the relevant regulatory task is to determine the estimate of beta that, when inserted into the SL CAPM, is most likely to produce an estimate of the required return on equity that is most consistent with the allowed rate or return objective. In determining that value of beta the regulator must have regard to all relevant estimation methods, financial models, market data and other evidence. When applying a foundation model approach under the new rules, the relevant goal is *not* to simply estimate the historical covariance between stock and market returns for a particular small sample of companies.

The AER appears to have accepted this point when it says that it will consider evidence relating to the Black CAPM when selecting a beta estimate for its foundation model.[34]

> **Key position 2**
>
> In summary, the ENA submits that the regulatory task, in relation to beta estimation, has changed under the new Rules and that it is no longer appropriate for the AER to persist with its previous approach. Rather, if the AER continues with its implementation of the Rules using a foundation model, the AER should select a value of beta that, when inserted into its foundation model, produces an allowed return on equity that is most consistent with the allowed rate of return objective. In performing this task, the AER should have regard to all relevant estimation methods, financial models, market data and other evidence and to the prevailing conditions in the market for equity funds.

The ENA further submits that the regulatory task is not met by:

- having regard to one estimation method (regression) and by limiting the scope of consultants to apply other relevant estimation methods.

- having regard to one financial model to the exclusion of others.

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[34] AER (2013), *Equity Beta Issues Paper*, pp. 7, 38–40, 42, 49–53.

- restricting the analysis to a limited subset of market data and not providing clear scope to examine broader samples of relevant market data.

- excluding other relevant evidence from consideration.

3.3.   Primary determinants and cross-checks

The Issues Paper distinguishes between "primary sources of evidence" or "primary determinants" and evidence to be used only as a cross check.[35] That is, the AER appears to not only be using a foundation model, but also a foundation implementation of that model. The subset of evidence that the AER classifies as "primary" specifies the range and the evidence that is relegated to being used only as a cross-check appears in reality to carry no weight in practice.

3.3.1.   Conceptual analysis

The AER refers to two primary sources of evidence, conceptual analysis and empirical analysis for Australian-listed firms.[36] According to the conceptual analysis, the AER reaches a conclusion that the equity beta estimate would be low, but the AER makes no assessment of the magnitude of beta on the basis of this conceptual analysis. The AER states that:

> …there are reasonable conceptual grounds to expect that the equity beta of a benchmark efficient regulated energy network will be below 1.0. However, we recognise the limits of this type of approach, and use it to inform our assessment with regard to these limitations. Further, conceptual analysis does not indicate the magnitude of the difference between the benchmark efficient entity and the market average (1.0), and we propose to rely on empirical estimates for this assessment.[37]

The AER has specified a foundation model approach to estimating the cost of equity which gives a primary role to the SL CAPM. As a result, from a cost of equity perspective, the AER has effectively defined the term "risk" in Rule 87(3) as "systematic risk".

The systematic risk of an asset is a reflection of its exposure to economic events, relative to the total risk of the market portfolio. It is therefore a relative concept which must be considered in light of the riskiness of an asset with "average" risk at a particular point in time. Defining the various systematic risks of an asset as "low", "medium" or "high" require an established point of reference.

Neither the Issues Paper, nor the expert reports relied upon, provide such a reference point. The conclusions appear to be drawn largely from preconceived notions regarding the risk profile of energy networks, rather than first starting with a clear view on what constitutes systematic risk and ensuring that conclusions are drawn only on evidence relevant to systematic risk, and not on evidence that may be relevant to non-systematic risk.

The conclusion of the AER hinges entirely on the view that the business risk of an energy network is so much lower than the business risk of the average firm as to offset the positive impact of financial leverage that is double that of the average firm. The AER notes that:

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[35] AER (2013), *Equity Beta Issues Paper*, pp. 6, 7, 19, 32, 33, 42, 43.
[36] AER (2013), *Equity Beta Issues Paper*, p. 6.
[37] AER (2013), *Equity Beta Issues Paper*, p. 18.

> *Conventional finance theory states that greater leverage increases financial risk which in turn increases systematic risk, although the relationship is contentious.[38]*

and, in relation to financial risk, cites work performed for the AER by McKenzie and Partington (2012):

> *They consider that, overall, increased financial leverage increases financial risk, but caution against any claim that the exact nature of this relationship might be known.[39]*

Having identified that financial leverage is associated with an increase in beta, and that "the financial leverage of the benchmark efficient entity is (approximately) double the financial leverage of the market average firm"[40] the AER concludes that, on the basis of conceptual analysis alone, beta is less than one. The conclusion that business risk is low and more than offsets financial risk can only be drawn on a conceptual basis if:

- only systematic risks are assessed, and there is no conflation of systematic and non-systematic risks. This is acknowledged as important in the statement that "Frontier's assessment was concerned with both systematic and non-systematic risk; and only the former is relevant to the estimation of equity beta.";[41] and

- the consequential 'summation' of business systematic risks and the effect of leverage result in a conceptual assessment that systematic risk is less than the market average (that is, in CAPM terms, beta is less than one).

On the first point, a critical shortcoming of any conceptual analysis is the inability to partition systematic and non-systematic risks using a qualitative assessment. Frontier Economics did not undertake such an exercise, stating:

> *"…it is not feasible to assess every risk one at a time to determine if and by how much it should be reflected in the rate of return. We have no framework to translate each individual risk into a discrete component of the rate of return."[42]*

This immediately calls into question the role of conceptual analysis in reaching a conclusion on beta, in the absence of a quantitative assessment. This has previously been indicated by the ENA:

> *"…as it currently stands, the [Frontier Economics (2013)] draft report is written at a wholly conceptual or qualitative level. The AER's ultimate task in reaching estimate of required returns, however, is a quantitative one…For the final [Frontier Economics (2013)] report to be useful it needs to be further developed to the point where its conclusions can be applied in a clear manner to inform quantitative analysis.*

It is therefore not surprising that the Issues Paper does not delineate systematic risks from non-systematic risks at a conceptual level. The Issues Paper attempts to address this shortcoming by

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[38] AER (2013), *Equity Beta issues paper*, p. 36.
[39] AER (2013), *Equity Beta Issues Paper*, p. 16.
[40] AER (2013), *Equity Beta Issues Paper*, p. 16.
[41] AER (2013), *Equity Beta Issues Paper*, p. 15.
[42] Frontier Economics (2013), *Assessing risk when determining the appropriate rate of return for regulated energy networks in Australia*, July, p. 108.

claiming that the benchmark firm's systematic risk must be conceptually low because all business risks (regardless of being systematic or not) are assessed by Frontier Economics as "low" or "medium" risk.[43]

However, the risk assessment by Frontier Economics does not lead to the conclusion that the business risk of the benchmark firm will be sufficiently low to offset its financial risk. There is a leap of faith involved in drawing such a conclusion. As Frontier Economics clearly states, "it is not feasible to assess whether each business risk assessed one at a time is relevant to the rate of return," a conclusion which the ENA suggests holds is true, regardless of whether the risks are considered "low," "medium" or "high." Therefore there is no way of establishing conceptually which of the low/medium business risks are relevant to the rate of return. It could be that many medium risks are relevant while only a few low risks are relevant. The degree to which systematic business risk is lower than "medium" remains unsubstantiated.[44]

So the first issue of concern is that, on the basis of conceptual analysis, there is no way to determine the magnitude of the systematic component of business risk. According to the Frontier Economics assessment it is somewhere between "low" and "medium." This then leads naturally to an assessment of whether the benchmark firm has sufficient financial leverage to offset its "low" or "medium" financial risk.

There appears to be general agreement between the AER and the ENA that, for a given firm and holding all else equal, higher financial leverage implies higher equity beta. The Issues Paper further explains the mechanism by which leverage increases systematic risk or beta:

> *Financial risk relates to the additional systematic risk exposure that arises from the debt holdings of the firm. The underlying principle is that since payments to debt holders take precedence over payments to equity holders, the systematic risk exposure for equity holders (i.e. the equity beta) increases as more debt is issued. It is generally accepted that the benchmark efficient entity has higher financial risk than the market average firm. The key characteristic causing this higher financial risk is the relatively high financial leverage (gearing) for the benchmark efficient entity (60 per cent) relative to the market average firm (roughly 30–35 per cent).[45]*

The ENA agrees that leverage increases equity beta due to the fact that payments to debt holders take precedence over payments to equity holders. The ENA also agrees with the AER's assessment that the benchmark firm can be considered to have approximately twice the leverage of the average firm. Consequently, there appears to be general agreement that leverage increases beta due to debt having priority over equity and that the benchmark firm has twice the leverage of the average firm.

There also appears to be general agreement that the equity beta has two components: the asset beta (which reflects fundamental business risk) and an adjustment for leverage. The asset beta is an estimate of what the equity beta would be if there was no leverage. It appears to be generally agreed that the standard (or indeed universal) practice is to recognise that, for a given asset beta, higher leverage will result in a higher equity beta.

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[43] AER (2013), *Equity Beta Issues Paper*, p. 16.
[44] The ENA also draws the AER's attention again to the ENA's comments on the business risks facing the network industry, which were provided in response to the draft report of Frontier Economics in July 2013.
[45] AER (2013), *Equity Beta Issues Paper*, p. 16.

A number of approaches for performing this re-levering have been proposed in the literature and the AER has adopted one of them, referring to it as the Brealey-Myers formula.[46] The AER adopted that procedure at the time of its last WACC review process and that same approach is also the basis for all of the beta estimates on which the AER relies in its Issues Paper.[47] Specifically, the AER approach is to specify the relationship between the asset beta (β_a) and the equity beta (β_e) as:

$$\beta_e = \beta_a \left(1 + \frac{Debt}{Equity} \right) = \beta_a \div \frac{Equity}{Value}$$

That is, the effect of leverage is to increase the asset beta, by dividing it by the proportion of equity finance. The AER has expressed a view that this relationship between equity and asset beta is not known with certainty.[48] However the AER has not expressed any preferred view on the relationship between asset beta and equity beta. ENA has not raised this as an issue in the Guideline process, given that it has not anticipated the AER altering its view. So for the purposes of the current analysis this is the relationship relied upon in calculations.

The Issues Paper then refers to the Frontier Economics (2013) report, which discusses the various risks that the benchmark firm may be exposed to. The AER notes that several of these risks are financial in nature: default risk, financial counterparty risk, illiquidity risk, refinancing risk, and interest rate reset risk. In its discussion of these risks, the AER notes that Frontier Economics assesses a number of these risks to be "low" or "medium."[49] The AER also asserts that its new procedure for estimating the allowed return on equity will produce more stable estimates over time, reducing one of the financial risks (the risk that the benchmark firm would default). The AER then concludes that:

> *Taken together, conceptual analysis of the new approach to the determination of the return on capital should reduce the benchmark efficient entity's exposure to financial risk.[50]*

That is, the AER appears to contend that leverage affects equity beta via the financial risks that are set out in the Frontier Economics report. That contention is entirely incorrect and demonstrates a fundamental misunderstanding of beta. Leverage does not have an effect on equity beta via the five risks set out in the Frontier report. Rather, leverage will increase equity beta because it has the effect of making positive returns in up-markets even better and negative returns in down-markets even worse. This is why it is called "leverage."

Leverage has an effect on beta via the re-levering formula set out above, which is independent of each of the five financial risks identified in the Frontier Economics report.[51] This point is demonstrated in detail in Appendix 1.

The ENA submits that it is fundamentally wrong to conceptualise equity beta as a trade-off between business risk (asset beta) and the five types of financial risks set out in the Frontier Economics report. It is correct to say that, if a business is exposed to an economic downturn, cash flows might be too low to repay lenders so there would be a default. It is also correct to say that equity holders

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[46] AER (2013), *Equity Beta Issues Paper*, p. 16.
[47] This relationship was relied upon by the ERA (2013), *Explanatory statement for the draft rate of return guidelines*, August, p. 313, and by SFG (2013), Regression-based estimates of risk parameters for the benchmark firm, June, p. 2, on the basis that it is the same relationship relied upon by the AER.
[48] AER (2013), *Equity Beta Issues Paper*, p. 16.
[49] AER (2013), *Equity Beta Issues Paper*, pp. 16–17.
[50] AER (2013), *Equity Beta Issues Paper*, p. 17.
[51] If the AER no longer considers this equation to be a reasonable approximation of the relationship between asset beta, financial leverage and equity beta, the same conclusions will hold under alternative equations which describe this relationship.

are exposed to refinance risk, counterparty risk, interest rate reset risk and illiquidity risks. But the equity holders are exposed to financial risk from taking on debt even if these risks did not exist at all. The risk to equity holders from taking on leverage is the variation in their returns from being the residual claimant.

When conceptualizing equity beta (to the extent that such a process has any tangible benefit) one must consider the trade-off between the asset beta (or business risk) on the one hand and the amount of leverage on the other. In performing its conceptualisation exercise, the AER is wrong to have considered the trade-off between asset beta and a list of five risks that were classified as financial. This makes the results of the AER's conceptualisation exercise invalid. Moreover, the ENA notes that nowhere in the Frontier Economics report is there a suggestion that the description of "financial risks" could be used in the way the AER has used it.

So with reference to the analysis provided by Frontier Economics, all that can be concluded is that the aggregate business risk of a benchmark energy network is less than the aggregate business risk of the average firm. In the absence of any assessment of the magnitude of these risks, relative to the magnitude of financial risks, the AER's conclusion is unwarranted.

The AER also relies upon advice from McKenzie and Partington (2012)[52] to make an assessment that:

- the business risk component of the systematic risk of the benchmark firm is low;

- the relationship between financial risk and financial leverage is unclear; and, overall:

    Having regard to this conceptual analysis, including the expert opinions from Frontier and McKenzie and Partington, we consider that business risk for the benchmark efficient entity will be very low.[53]

This conclusion is not supported by any quantitative measurement of either business risk or financial risk. The ENA does not disagree that the business risk of an energy network is less than the business risk of an average firm. This is the reason that energy networks are funded with a higher proportion of debt than the average firm. But if there is no measurement of the systematic risk component of business risk, and no conclusion as to how leverage relates to systematic risk, it is simply not possible to reach the conclusion that one component of risk more than offsets the other.

Consider again the leverage equation adopted by the AER in its prior empirical analysis:[54]

$$\beta_e = \beta_a \times \left(1 + \frac{Debt}{Equity}\right)$$

According to the AER's assessment of leverage, there is uncertainty over this relationship. Yet this does not imply that leverage has sufficiently low impact on beta that it offsets below-average business risk. Both the AER and McKenzie and Partington (2012) simply made a judgment that the combined impact of a low asset beta, and high Debt/Equity ratio, result in an equity beta less than

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[52] McKenzie, M., and G. Partington (2012), *Estimation of the equity beta (conceptual and econometric issues) for a gas regulatory process in 2012*, April.
[53] AER (2013), *Equity Beta Issues Paper*, p. 16.
[54] AER (2013), *Equity Beta Issues Paper*, p. 47.

one. The only quantitative assessment of risk in the conceptual analysis is a reference to regression-based estimates of beta. McKenzie and Partington (2012) state:[55]

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

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

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

So there are five utility industries with beta estimates less than one, but with all five utility industries having Debt/Equity ratios which are less than 1.5, which is the AER's assessment of benchmark Debt/Equity.[56] If the regression-based estimates of beta were re-estimated under the assumption that Debt/Equity is 1.5, under the exact same re-levering process the AER adopts in its empirical analysis, the beta estimates would be as follows:

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

Despite these beta estimates being the only quantitative assessment of risks in the conceptual analysis, the AER reaches the conclusion that the beta estimate should be less than 1. In its discussion of the impact of financial leverage the AER states that:

> *We simply do not know enough about the exact nature of the relationship between financial leverage and financial risk.*[57]

This uncertainty about the relationship between financial leverage and financial risk does not support the conclusion that a benchmark firm's beta is influenced more by low business risk than high financial risk. Even if the same data relied upon by the AER is examined, without any view of the exact nature of the relationship between leverage and financial risk, it does not support the AER's conclusion, as shown below.

In the same data relied upon by the AER, there are eight industries with Debt/Value ratios within the range of 50% to 70%, and their beta estimates lie within the range of 0.77 to 1.59.[58] The only thing that can be concluded from this data is that:

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[55] McKenzie, M., and G. Partington (2012), *Estimation of the equity beta (conceptual and econometric issues) for a gas regulatory process in 2012*, April, p. 15.
[56] AER (2013), *Explanatory Statement – Draft Rate of Return Guideline*, p. 180.
[57] AER (2013), *Equity Beta Issues Paper*, p. 16.

1. for a set of utilities with mean Debt/Value of about 40% to 46%, the mean equity beta estimate is about 0.66 to 0.75; and

2. for a set of firms in other industries with Debt/Value ratios of about 50% to 70%, the mean equity beta estimate is about 0.77 to 1.59.

The implication is that *even if* there is uncertainty about the equation via which leverage impacts on equity beta, the data does not support the conclusion that the equity beta estimates of utilities would remain below one if they had gearing of 60% Debt/Value. The ENA therefore considers that the McKenzie and Partington (2012) view is currently unsubstantiated.

> **Key position 3**
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> The ENA considers that no overall conclusion can be drawn from conceptual analysis regarding the systematic risk of the benchmark firm. The conceptual analysis performed by the AER provides no information about the estimate of equity beta. It implies that a benchmark energy network has below-average operating risk and above-average finance risk. But there is no basis from this conceptual analysis to conclude that beta would be less than one, on the basis that low operating risk has more impact than high financial risk.

3.3.2. Empirical evidence

Selecting a range for beta

The empirical analysis referred to by the AER is the regression-based estimates of beta from a small sample of Australian-listed firms. The AER concludes that this primary source of evidence supports a range of 0.4 to 0.7. The ENA does not agree with the use of this range and does not understand what concept the range is intended to capture. This issue is discussed further below. In the current section the issue is on the use of cross-checks to determine whether this range is appropriate, and to select a point from within the range.

The AER relies upon three cross-checks both to support its range of 0.4 to 0.7, and to select a point estimate of 0.7 from within this range. These cross-checks are regression-based estimates of beta for overseas-listed energy networks, regression-based estimates of beta from overseas-listed water networks and predictions of the Black CAPM (namely, that the expected return on stocks with betas less than one will be higher than predicted by the SL CAPM).

The first issue to consider is the range. The range is not altered on the basis of any cross-checks, which are considered in turn:

- **Listed energy networks.** The AER's consideration of beta estimates from overseas-listed energy networks is that "the majority of recent updates include point estimates between 0.5 and 0.9 (although some estimate exceed 1.0).[59] The ENA does not agree with this assessment of the magnitude of overseas-listed beta estimates and addresses this issue in

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[58] The eight industries are Maritime (Debt/Equity = 1.7038, beta = 1.40), Bank (Debt/Equity = 1.5611, beta = 0.77), Utility (foreign) (Debt/Equity = 1.5503, beta = 0.96), Power (Debt/Equity = 1.4882, beta = 1.35), Property management (Debt/Equity = 1.4063, beta = 1.13), Automotive (Debt/Equity = 1.3457, beta = 1.59), Diversified companies (Debt/Equity = 1.0224, beta = 1.14) and Homebuilding (Debt/Equity = 1.0028, beta = 1.45).
[59] AER (2013), *Equity Beta Issues Paper*, pp. 7, 32, 42.

Section 5 and an expert report from Competition Economists Group (Attachment A).[60] But even if the ENA did agree with this assessment of the evidence, this evidence does not support the conclusion that the beta estimate should be bounded at 0.7.

The AER has not provided any reasoning for which studies of international-listed firms are most relevant or reliable, or which information would lead to an alteration of the range. This means that it is unlikely that any consideration of international evidence would lead to the range being altered. As a specific example, the ENA submitted beta estimates for 56 U.S.-listed firms, provided a comprehensive explanation of the sample selection criteria, the beta estimates for each individual firm, and reported beta estimates of 0.88 for individual firms and 0.91 for an index. These estimates are based entirely on regressions of stock returns on market returns, yet the AER determined that the upper bound of the beta estimate cannot exceed 0.7.

The basis for not adjusting the range on the basis of estimates from international-listed firms is that firms listed overseas integrate generation and retail activities and operate in markets with different economic and market conditions.[61] With respect to the specific analysis presented by the ENA, the AER states that there was not "satisfactory evidence that the suggested sample of US businesses represent close comparators to the benchmark entity."[62] The AER also considers the US to be only one country from which to draw international evidence, stating that "we consider it desirable to examine evidence on all available international comparators, rather than only those based in the US."[63]

The ENA disagrees with the extent to which the AER's concerns over firm selection are likely to influence the beta estimate. But setting this disagreement aside, even with the AER's considerations in mind, the implication of the international evidence is not that the beta estimate should be capped at 0.7. The implication of the international evidence is that beta of a benchmark energy network could well exceed 0.7.

In summary, even on the AER's own assessment of the international evidence (beta estimates from 0.5 to 0.9, with some estimates above 1) the implication is that, all else being equal, the range from the Australian-listed firms should increase. Yet faced with contrary evidence there is no adjustment because the AER considers the evidence is not sufficiently persuasive to change its range or to select a point estimate from outside it.

The most important implication of the AER's assessment is that the regression-based estimates from international firms will have no bearing on the AER's estimated range, regardless of the magnitude of beta estimates or the rigor of the analysis undertaken. Provided that one set of firms over one time period implied a beta estimate below 0.7, the logical extension of the AER's rationale is that the range will be determined entirely on the basis of the AER's assessment of Australian-listed firms.

Further evidence consistent with the conclusion that the overseas evidence is irrelevant to determining the range for beta, is the fact that the empirical beta estimation update work that the AER has commissioned excludes the analysis of firms listed overseas. Having cast doubt on the relevance of the sample of firms relied upon by the ENA, the AER has elected not to conduct any of its own assessment of international-listed firms. This is consistent with the conclusion that, in reality, the AER has determined that it considers the international evidence to be irrelevant and that it need not have regard to it.

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[60] CEG (2013), *AER equity beta issues paper: international comparators*, October.
[61] AER (2013), *Equity Beta Issues Paper*, p. 32.
[62] AER (2013), *Equity Beta Issues Paper*, p. 33.
[63] AER (2013), *Equity Beta Issues Paper*, p. 34.

- **Listed water networks.** The AER's consideration of water utilities is based upon regression-based estimates from international-listed firms, and determinations by Australian regulators (for which the only empirical estimates available are regression-based estimates of beta from international-listed firms). The AER refers to an estimate of 0.55, within a 90% confidence interval of 0.40 to 0.70,[64] compiled by SFG Consulting who also compiled the beta estimates submitted by the ENA.[65] The AER states that these regression-based estimates of beta for international water utilities are consistent with the AER's range of 0.4 to 0.7.[66]

  The ENA does not disagree that the average regression-based estimates of beta for international-listed water utilities are close to the average regression-based estimates of beta for Australian-listed energy networks. The means and standard errors in samples of Australian-listed energy networks and international-listed water utilities are close.

  However, the AER has applied an inconsistent assessment of the relevance of international-listed water utilities and international-listed energy utilities. On the one hand, the AER was presented with a beta estimate of 0.89 for a large sample of U.S.-listed energy networks, but this was not sufficient for the range to incorporate an estimate greater than 0.7 because the firms selected were not sufficiently comparable to Australian-listed energy networks. Yet the AER states that a mean estimate of 0.55 (with about the same standard error as the energy firm sample) from international-listed water utilities, which surely are *less* comparable than energy utilities, is also consistent with its range of 0.4 to 0.7.

  So after consideration of international-listed water utilities and international-listed energy utilities, there appears to be three conclusions reached by the AER: (1) regression-based estimates of beta for Australian-listed energy networks are about 0.4 to 0.7; (2) regression-based estimates of beta for international-listed energy networks are about 0.5 to 0.9; and (3) regression-based estimates of beta for international-listed water networks are about 0.4 to 0.7 (based upon the 90% confidence interval reported by SFG). The logical implication of these conclusions is that the upper bound of the AER's range should exceed 0.7. Regardless of what the AER's concept of the range is, the ENA does not see how these conclusions are consistent with there being no change to the AER's range.

- **Black CAPM.** The AER's consideration of the Black CAPM is that it predicts that a firm with a beta estimate below one is has an expected return higher than predicted by the SL CAPM.[67] The ENA has presented evidence to the AER that there is no discernible relationship between regression-based estimates of beta and average stock returns.[68] The implication of this analysis is that there is a very real possibility that regression-based estimates of beta have no relevance for the cost of equity, which would imply that they cannot be used to adopt a cost of equity different from the market return. In short, that evidence is consistent with consideration being given to a beta estimate of 1.

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[64] AER (2013), *Equity Beta Issues Paper*, p. 44.
[65] SFG Consulting (2011), *Cost of capital parameters for Sydney Desalination Plant*, August. The conclusion to the SFG analysis was that, for the Sydney Desalination Plant, an equity beta estimate of 0.80 was appropriate, in combination with gearing of 70%. If 60% gearing was adopted, the conclusion was that a beta estimate of 0.70 would be appropriate. These beta estimates for the Sydney Desalination Plant were lower than would have been adopted for a water network of average risk, because of specific contractual provisions in the Sydney Desalination Plant which reduced risk. These conclusions were based on a measurement of asymmetric exposure to market conditions, consideration of internal consistency, and the limited reliability that can be placed on regression-based estimates of beta.
[66] AER (2013), *Equity Beta Issues Paper*, p. 44.
[67] AER (2013), *Equity Beta Issues Paper*, p. 42.
[68] NERA Economic Consulting (2013), *Review of cost of equity models*, June, Figure 6 and Figure 7, pp. 6-7; NERA Economic Consulting (2013), *Estimates of the zero beta premium*, June, Table 5.1 and Figure 15, pp.14–15.

The AER's assessment of the Black CAPM has not been used to make adjustment to the range for beta determined from the AER's primary evidence. The AER's assessment of the Black CAPM is, in part, used to justify the selection of a point estimate above the mid-point of the range, as discussed below.

It does not make logical sense for the AER to adopt the same range of 0.4 to 0.7, both with and without consideration of the Black CAPM. As discussed in Section 6 the AER's range is determined with reference to a set of mean beta estimates from different sets of analysis. So it represents a set of previous estimates of the historical relationship between stock returns and market returns. The implication of the evidence in support of the Black CAPM is that, if these regression-based beta estimates were used in the SL CAPM, the expected return would be understated. So, all else being equal, and taking the AER's range derived exclusively from regression-based estimates of risk, the appropriate range would be higher than 0.4 to 0.7.

The AER's position is that it does not have a reliable mechanism to determine what the range should be in this circumstance, so it is more appropriate to select a point estimate from above the mid-point of the range. The limitation of this approach is that the upper bound represents a cap on the impact that the evidence in support of the Black CAPM can have. There is no reason that the AER's consideration of the evidence in favour of the Black CAPM should be associated with a cap on the beta estimate of 0.7, or any other value below one.

In summary, at its last WACC review process, the AER concluded that the appropriate range for beta was 0.4 to 0.7 and it selected a point estimate of 0.8 based on considerations not including the Black CAPM. In the Issues Paper, the AER again concludes that the appropriate range is 0.4 to 0.7, but adopts a point estimate of only 0.7 *including* consideration of the Black CAPM. ENA submits it is not clear whether the AER has had regard to the Black CAPM, or if so, how that regard has been given material practical effect.

Key position 4

The implication of all the AER's cross-checks is that the equity beta range should be higher than its initial range of 0.4 to 0.7. As discussed in Section 6 the ENA is unclear what the range is intended to represent, and so has not presented an alternative range for the AER. If the AER were to explain the concept that the range is intended to capture, the ENA would be in a position to evaluate the evidence to arrive at a range consistent with this concept. The ENA submits that the convoluted application of a primary set of evidence, and a set of secondary evidence, leads to a higher potential for error to arise. In particular, it potentially leads to higher weight being placed on evidence that supports the initial range, than evidence that contradicts the initial range.

Selecting a point estimate with a range

Having selected a range for beta of 0.4 to 0.7, the AER determined that a point estimate of 0.7 was appropriate, in part because of consideration of evidence from international-listed energy firms and the evidence in support of the Black CAPM. The AER has not stated what its beta estimate would be in the absence of these two considerations. But these are the only two considerations that have led to the selection of a point estimate at the upper end of the range. As discussed in Sub-section 3.1.2 there is a suite of evidence that has been submitted by ENA or that is otherwise available to the AER that the AER has yet to consider, each element of which would imply an increase in the beta estimate from that implied by regressions of stock returns on market returns for Australian-listed

firms. This evidence can effectively carry no weight, because the AER has already reached a beta estimate at the top of the range.

Furthermore, AER's aggregate consideration of relevance provides no guidance to participants about how the estimation of parameters can be improved. All participants know is that the beta estimate is bounded at 0.4 and 0.7 on the basis of the AER's foundation implementation of the CAPM, and that selecting the upper boundary is considered to be sufficient to account for all other relevant evidence. For all other relevant evidence, of which the ENA has provided detailed theoretical and empirical analysis, the final estimate will be the same whether or not this evidence is considered.

Relegating this evidence to a secondary cross-check has the same effect as eliminating it from consideration. Whereas that approach may have been acceptable under the Tribunal's interpretation of the old Rules, the new Rules are materially different. An acceptable approach under the new Rules would be to set out all evidence that is relevant to beta and to assign weight (or importance) to each piece of evidence based on its relevance and reliability. By contrast, the AER's *implementation* of the foundation model, like the foundation model approach itself, is another two stage approach which leads to non-transparent outcomes and inconsistent weights. Specifically, the outcomes are non-transparent because it is unclear just what consideration was given to any piece of evidence; and the weights are inconsistent because, once a boundary of the range is met, the more evidence to suggest that boundary is inappropriate, the more weight is placed on the previously-considered evidence.

Key position 5

The AER submits that the Final Guideline should transparently explain the effect, if any, that the cross-checks have had on its beta estimate. Further, the AER submits that the Final Guideline should account for all relevant evidence. This means that if the AER continues with its foundation model approach (using the SL CAPM), the AER submits that all relevant evidence relating to the risk of equity in the benchmark firm (relative to the market) must be incorporated into the beta estimate. Under the foundation model approach, this appears to be the only manner in which relevant evidence relating to the risk of the benchmark firm can be incorporated.

3.3.3.   Implications of proposed beta

It is worth considering the implications of the AER's proposed beta range, and point estimate, in the context of the AER's preferred re-levering formula. The AER notes that an average firm has leverage of 30% to 35% and that the benchmark firm has leverage of 60%. If the average firm has leverage of 30% to 35% the implied asset beta is 0.65 to 0.70, computed as:

$$\beta_a = 1.00 \left(\frac{Equity}{Value} \right) = 1.00 \times 0.7 = 0.70; \, or \, \beta_a = 1.00 \times (0.65) = 0.65.$$

According to the AER's beta range, the asset beta for the benchmark efficient entity is between 0.16 and 0.28, computed as:

$$\beta_a = 0.7 \times \left(\frac{Equity}{Value} \right) = 0.70 \times 0.4 = 0.28; \, or \, \beta_a = 0.40 \times 0.4 = 0.16.$$

The asset beta range for the benchmark firm (0.16 to 0.28) implies that the benchmark firm has an asset beta that is just 23% to 43% of the asset beta for the average firm. At the upper bound of the

beta range (0.70), the asset beta of 0.28 is 40% to 43% of the asset beta for the average firm of 0.65 to 0.70. At the lower bound of the beta range (0.40), the asset beta of 0.16 is 23% to 25% of the asset beta for the average firm.

The question then is whether it would be a reasonable conclusion to draw from the AER's analysis that the benchmark firm has only 23% to 43% of the business risk of the average firm. The ENA submits that there is no basis for such a conclusion. All of the conceptual evidence considered by the AER is qualitative in nature and, at most, suggests that the business risk of the benchmark firm is somewhat lower than for the average firm, and all of the ENA's submissions are consistent with that conclusion. However, there is no basis whatsoever for concluding that "somewhat lower" can properly be interpreted as "23% to 43%."

The ENA submits that, at most, the AER's conceptual analysis could lead to the conclusion that the benchmark firm has lower business risk (asset beta) than the average firm. There is no conceptual basis for concluding that the benchmark firm has only 23% to 43% of the business risk of the average firm. Consequently, there is no conceptual basis for concluding that the equity beta for the benchmark firm is below one.

Key position 6

If the AER maintains its view that a conceptual analysis supports an equity beta less than one, the Final Guideline should clearly set out the quantitative basis for the conclusion that the benchmark firm has only 23-43% of the business risk of the average firm. If there is no conceptual basis for concluding that the benchmark firm has only 23-43% of the business risk of the average firm, the conceptual analysis does nothing to corroborate the reasonableness of the AER's proposed range of 0.16 to 0.28 for asset beta, corresponding to 0.4 to 0.7 for equity beta. In this case, the conceptual analysis would appear to be irrelevant to the AER's task of estimating beta for the benchmark firm.

3.4.   Use of information from other models

As set out above, the ENA submits that the regulatory task, in relation to beta estimation, has changed under the new Rules and that it is no longer appropriate for the AER to persist with its previous approach. Rather, the AER should select a value of beta that, when inserted into its foundation model, produces an allowed return on equity that is most consistent with the allowed rate of return objective. In performing this task, the AER should have regard to all relevant estimation methods, financial models, market data and other evidence and to the prevailing conditions in the market for equity funds. The previous section explains how the advancement of one subset of evidence to "primary determinant" status and the relegation of other evidence to "cross-check" status is inconsistent with the regulatory task under the new Rules. The new Rules require that proper regard must be given to all relevant market data. This section discusses how proper regard can be given to all relevant financial models – under the new Rules and within the context of the AER's foundation model approach.[69]

In its response to the draft guideline the ENA reiterated that the best and most transparent way to reach a final estimate of the cost of equity is to apply weights to estimates compiled from different models, data and estimation techniques according to the reliability of the various pieces of evidence.

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[69] The remainder of this section is based on Section 3.8 of ENA (2013), *Response to the draft rate of return guideline of the Australian Energy Regulator*, October.

If, however, the AER determines that all evidence must be filtered through the SL CAPM, the ENA proposes that this should be done in a simpler and more transparent manner. In particular, the ENA submits that all of the relevant evidence should first be set out. Then all of the evidence that is relevant to beta should be used to produce an estimate of beta, and all of the evidence that is relevant to MRP should be used to produce an estimate of MRP. In both cases, different pieces of evidence can receive different weights depending on the reliability and precision of the evidence, or whatever other criteria the AER determines to be relevant. The result is a single value for the allowed return on equity.

In this section, the ENA demonstrates how this approach could be implemented in relation to the beta parameter. That is, the goal of this section is to illustrate how all of the relevant evidence that has been submitted so far could be used to inform the estimate of beta that is most likely to lead to an allowed return on equity that meets the allowed rate of return objective. This is to be compared with the AER's proposed approach in which a subset of the evidence will be used to determine a range for beta and the remainder of the evidence will either be rejected (to the extent that it suggests an estimate outside that range) or used to select a final allowed return on equity point estimate.

In particular, if all evidence is to be filtered through the lens of the SL CAPM (which the ENA has already noted is an approach that is at high risk of falling into error), the relevant task is to determine the estimate of beta that, when inserted into the SL CAPM, is most likely to produce an estimate of the required return on equity that is consistent with the allowed rate or return objective. With this framework and objective in mind, four approaches for determining appropriate beta estimates are set out below.

First, the ENA has previously shown that regression analysis of stock returns on market returns for comparable listed firms in Australia and the United States supports a point estimate of 0.82.[70] A reasonable range around this point estimate would be quite wide because the standard error of the regression estimate is relatively high and the ENA has also submitted evidence of the instability of beta estimates across time, across firms within the sample, and even across which days of the month are used to compute the return series (see Attachment A).

Second, the AER has acknowledged that there are concerns with the application of the SL CAPM on the basis of its empirical performance and has concluded that:

> *Theoretical and empirical evidence, however, supports using the Black CAPM, to some extent, in the process for estimating the return on equity. As such, we propose to use the Black CAPM to inform the selection of the equity beta.[71]*

The AER's concern over the empirical performance of the CAPM, populated with regression-based estimates of beta, was borne out by evidence presented by the ENA that there was no relationship between regression-based beta estimates and average stock returns.[72] So there is the very real possibility that beta estimates from regressions of stock returns on market returns convey no information at all which allows us to distinguish the cost of equity for the benchmark from the cost of equity for the market. In other words a beta estimate of one is likely to produce an estimate of the required return on equity at least as reliable as that produced by a regression-based estimate of beta.

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[70] SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, June, p. 16.
[71] AER (2013), *Explanatory statement – Draft rate of return guideline*, August, p. 62.
[72] NERA Economic Consulting (2013), *Estimates of the zero-beta premium*, June, Table 5.1 and Figure 5.1, p. 15.

Third, the ENA put forward an estimate from dividend discount model analysis, formed on the basis that listed energy networks had 96% of the risk premium of the market.[73] The dividend discount model analysis does not make any assumptions about exactly which risks are priced and how they are priced by the market and is therefore less restrictive than other models. However, if all evidence is to be filtered through the lens of the SL CAPM, the implication from the dividend discount model analysis is that a beta estimate of 0.96 should be used.

Fourth, the ENA compiled cost of equity estimates under the Fama-French Model. These estimates showed that the risk premium for the benchmark firm was 91% of that for the average firm (with a market beta of 1 and other factor sensitivities of 0). Again, if all evidence is to be filtered through the lens of the SL CAPM, this implies that an equity beta of 0.91 is likely to produce a reasonable estimate of the required return on equity. This estimate of beta reflects the evidence that the SL CAPM, with simple regression-based estimates of beta, tends to under-estimate the returns required on stocks with low beta estimates, high book-to-market ratio and small market capitalisation.[74] Computing the beta estimate on the basis of total risk premium is simply correcting for mis-measurement in the beta estimate from regression analysis.

This leaves us with four point estimates for equity beta:

1. 0.82 from regression analysis of stock returns on market returns;

2. 1.00 from analysis which suggests that regression-based estimates of beta could well provide no relevant information at all about systematic risk;

3. 0.96 from dividend discount model analysis; and

4. 0.91 from measurement of equity beta which accounts for exposure to the Fama-French factors.[75]

The ENA does not propose to enter into a debate at this stage about the precise weightings to be applied to estimates of beta from different data and estimation techniques and has consistently stated that weights can be altered over time according to new information about relevance and reliability of different data and estimation techniques. In its initial submission, the ENA proposed weights of 1/6 for the SL CAPM, 1/6 for the Fama-French Model, 1/3 for the dividend discount model analysis and 1/3 for the market return. These weights would imply a beta estimate of 0.94. While there may be debate about appropriate weights to apply to beta estimates from different sources, the important point is that evidence is assessed in a transparent manner, and without constraints being placed on evidence according to a first-tier/second-tier classification of evidence. In the absence of specifying weights and reason for those weights, the ENA does not see how a conclusion can be reached in a transparent manner.

> **Key position 7**
>
> The ENA submits that, if the AER continues with the foundation model approach (with the SL CAPM), that relevant cost of equity estimates from other models be incorporated into the beta estimate for the SL CAPM. The ENA further submits that the most transparent manner in which this can be achieved is to apply weights to the implied beta estimates from those alternative models.

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[73] SFG Consulting (2013), *Dividend discount model estimates of the cost of equity*, June, pp. 27–28.

[75] 0.91 is the estimate under prevailing market conditions and 0.95 is the estimate under long-term average market conditions.

4. Reliability of Australian regression estimates

4.1.   Summary of the ENA's previous submissions

In its recent Issues Paper, the AER states that:

> *ENA submitted three SFG reports that discuss the LAD regression technique, the Vasicek adjustment and the reliability of regression-based estimates of risk. We have only been able to give limited regard to these consultant reports because they were submitted late and because of the complexity of those reports. We do not discuss these issues in this paper, however, we will consider them in more detail in the future.*[76]

The ENA submitted these reports on 28 June 2013. This means the AER has had around three and a half months to consider the findings of the reports. Stakeholders were given two weeks to respond to the Issues Paper and will be given no opportunity at all to respond to the empirical work that the AER has commissioned in relation to this important parameter.

The reports in question make three important points about the reliability of regression-based estimates of beta in small samples that have not yet been considered by the AER. If any of this evidence was considered it would lead to a material change in the AER's beta range as the evidence is inconsistent with an upper bound of 0.7.[77]

- The least absolute deviation (LAD) regression technique generates beta estimates with a material downward bias. This evidence has not been considered by the AER in setting its beta range. The AER treats OLS estimates on an equal basis with LAD estimates (and other techniques that adjust weights on observations according to whether they might be considered outliers). So not only has the AER failed to consider the direct evidence of a downward bias, the AER has not considered whether other estimation techniques which account for outliers could also lead to biased outcomes in the context of regression-based estimates of beta.[78]

- The use of Vasicek-adjusted beta estimates, as opposed to unadjusted OLS beta estimates, leads to expected returns which have a higher association with realised returns. The AER has consistently ruled out the use of any approach that adjusts a regression-based estimate of beta towards one, either by applying a fixed weight (Blume adjustment) or a weight that depends upon the standard error of the beta estimate (Vasicek adjustment). Yet the AER has not given consideration to the empirical evidence that this adjustment leads to more reliable beta estimates, and which will also lead to beta estimates that are more stable across firms and over time.

- Samples of just nine listed firms result in mean beta estimates that are highly unstable over time, holding constant the sample of firms, and highly variable across samples of firms in the same industry. Incorporating larger samples leads to a material improvement in stability of

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[76] AER (2013), *Equity Beta Issues Paper*, p. 47.
[77] The ENA reiterates that a fundamental flaw in the AER's process is that the range itself does not appear to have been derived through a transparent and logical process.
[78] As mentioned previously the AER's role is not to evaluate only the submissions put forward by participants in the regulatory process but to evaluate relevant evidence. It could well be the case that other regression techniques, which are also designed to mitigate the influence of outliers, lead to downward-biased estimates of beta.

beta estimates across samples. In its discussion of the dividend discount model, the AER has acknowledged that a small sample of nine listed firms could lead to inference problems because of sampling error. Yet in its analysis of beta the AER's conclusions suggest a high degree of confidence in a sample size of this magnitude. Further, the AER considers sample size to be a minor issue compared to the impacts of location and vertical integration, by giving little regard to the beta estimates for U.S.-listed energy networks.

The AER's reliance on just nine firms, of which just five remain listed, leads to a series of questions. If the AER believes that a sample of nine firms is too small to draw inferences from the dividend discount model, on what basis is this same sample size sufficiently large to draw inferences from regression-based estimates of beta? Given that just five firms remain listed, will this be a sufficiently large sample to rely upon in the future? Does the AER have any view on the sampling evidence submitted by the ENA that the sample means of beta estimates from nine firms are highly imprecise? Given that the AER places limited reliance on U.S.-listed firms because of location and vertical integration, and the extensive analysis undertaken by the ENA to both identify comparable firms and describe those firms, does the AER intend to conduct any of its own analysis to identify a set of more relevant firms listed overseas?

The ENA is of the view that the sample of domestic comparables is so small as to be incapable of producing estimates of beta that are sufficiently reliable to be used as the primary determinant of beta for the benchmark efficient entity. The AER proposes to exclusively use a small handful of domestic firms to determine the range for beta. All other evidence can, at most, have an effect only on the point estimate selected from within that range – apparently, even if that other evidence supports an estimate outside of the range. The ENA is of the view that it is inappropriate to use the domestic evidence in this way due to the concerns about its reliability set out in this section.

At present, there are five listed firms in the AER's set of domestic comparables. The Issues Paper indicates that the AER considers this to be a sufficient number of firms to be the "primary determinant" of beta.

Key position 8

The AER submits that it would be valuable guidance for stakeholders if the Final Guideline set out the minimum number of currently listed firms that the AER considers would provide estimates of sufficient reliability to be used as the primary determinant of beta (presumably this would be a number between 2 and 5), and the reasons and evidence supporting that conclusion.

4.2. Further evidence on the reliability of domestic beta estimates

4.2.1. Variation in estimates across firms

The Issues Paper states the AER's intention to use regression analysis of its set of domestic comparables as its primary determinant of beta, concluding that this data supports a range of 0.4 to 0.7. In this regard, the Issues Paper refers to estimates from studies performed by the ERA in 2011 and 2013 and the results presented in SFG Consulting (2013), a report attached to the ENA's June submission to the AER.

The SFG study reports the results of OLS regression analysis of nine Australian firms (five of which remain listed today). Three of the beta estimates fall within the 0.4 to 0.7 range, three fall slightly below it and three fall various distances above it.

The ERA studies use a range of methods to perform the statistical regression analysis, and consequently report more individual point estimates. Their results are consistent with those of SFG in that some estimates fall within the 0.4 to 0.7 range, some fall above it and some fall below it. A summary of these results is set out in the figure below.

Figure 1. Regression-based estimates of Australian-listed energy networks
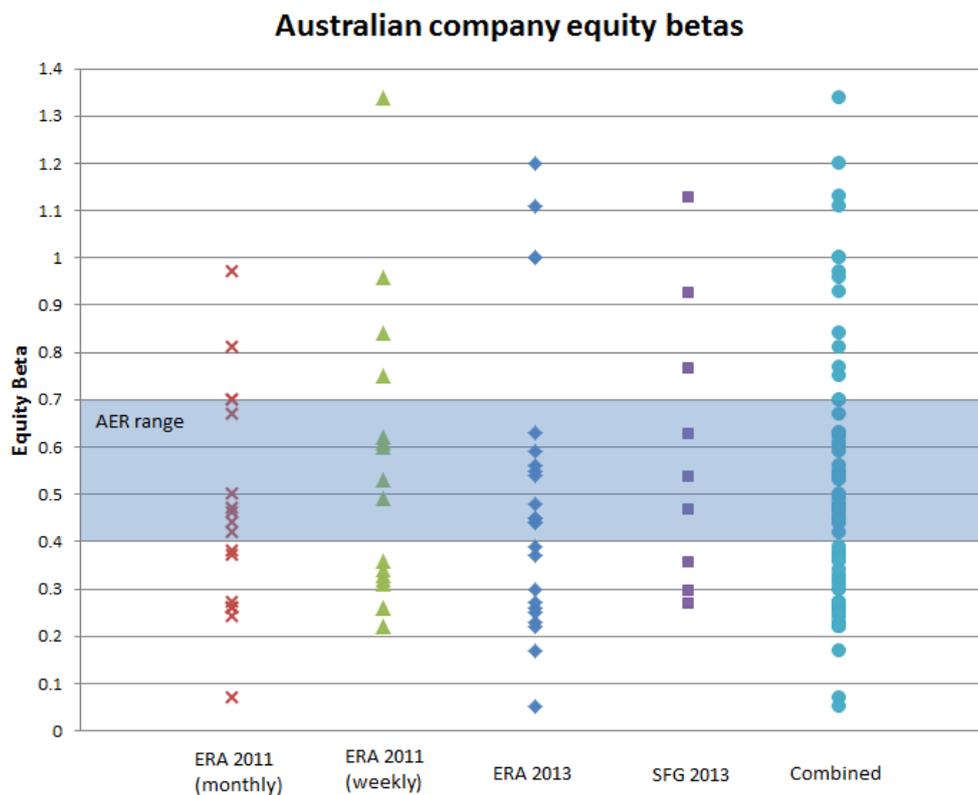
Source: ERA (2011), ERA (2013), SFG (2013).

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

4.2.2. Variation in estimates across methodological choices

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

Table 1. Regression-based beta estimates for HDF from ERA (2011) reported by the AER

		Regression Method	
		OLS	LAD
Sampling	Monthly	0.07	0.47
period	Weekly	1.34	0.84

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

4.2.3. Variation in estimates across time

According to the figures set out in the Issues Paper Tables 4.4 to 4.6, the average estimate of beta for Envestra increased by 20% between 2011 and 2013. There are two potential explanations for this:

1. the true systematic risk of Envestra did actually increase by 20% over a two-year period; or

2. the beta *estimates* are unreliable.

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

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

2. the beta *estimates* are unreliable.

4.2.4.   Variation in estimates across sampling days

The report by SFG Consulting (2013) attached to the ENA's June submission highlighted to the AER the fact that beta estimates can vary materially depending on which day of the month is used as the reference point when determining returns. In particular, SFG Consulting (2013) informed the AER that:

> *The beta estimates for each firm can vary markedly, depending upon the start point during the month that returns are calculated. In other words, the beta estimate for a given firm will be quite different depending upon whether the returns are estimated from the first Monday of the month or the third Wednesday of the month.[79]*

As there is no reason why "first Monday" returns would produce more reliable estimates than "third Wednesday" returns, SFG proposed to perform the analysis for every possible sampling period and to present the average:

> *We compute total returns over a four-weekly period for each stock, but repeat our analysis 20 times using different start points within this four-weekly period. [80]*

In its Issues Paper, the AER indicates that it has had regard to beta estimates based on monthly and weekly returns. In a recent submission to the ERA, CEG (2013a) has documented a similar pattern in weekly data. The relevant figure from that report is reproduced below. This figure shows the mean (re-geared to 60%) equity beta estimate for the ERA's sample of six domestic comparables (the five that remain listed plus HDF) according to the way returns are measured. The mean estimate of beta can change by a factor of three simply by measuring returns from the sixth day of each month rather than from the 17th.

Key position 10

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

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[79] SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, p. 5.
[80] SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, p. 5.

Figure 2. Australian OLS beta estimates associated with different sampling intervals

Figure 3: Australian OLS beta estimates associated with different sampling intervals
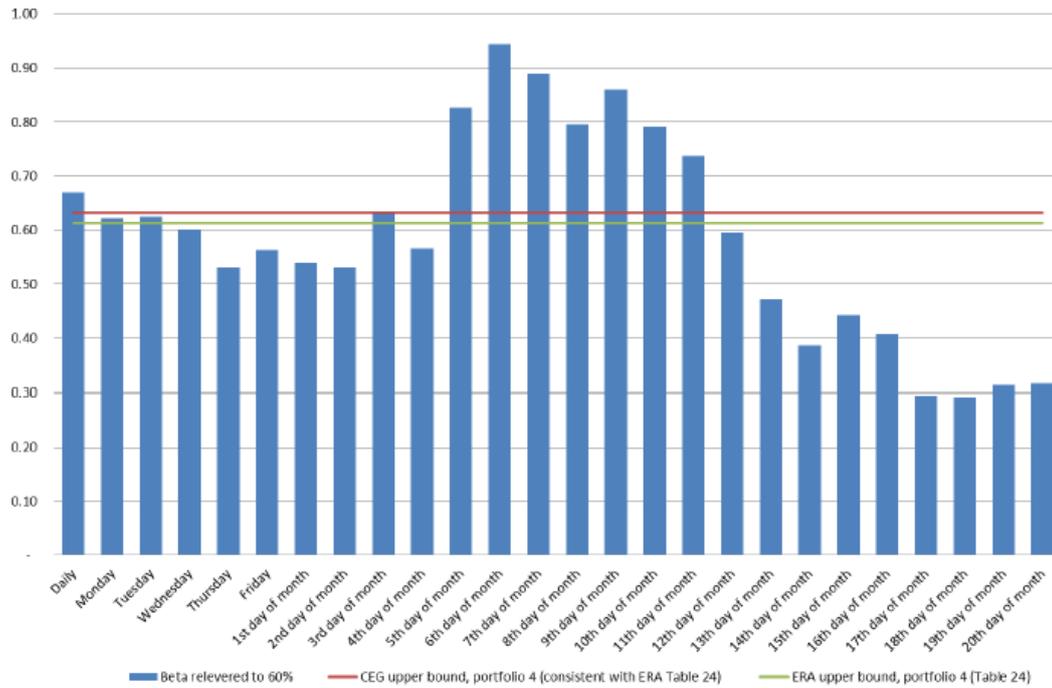
Source: Bloomberg, CEG analysis

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

In the report attached to this submission, CEG (2013 – <u>Attachment A</u>) show that there is variation in the mean beta of the sample of ten US firms that the AER instructed its consultant to examine in Henry (2008) and Henry (2009). The CEG report demonstrates that the results in Henry (2008) appear to be based on Friday-to-Friday returns and that the results of Henry (2009) appear to be based on Monday-to-Monday returns.[81]

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

> *involves a move from the second lowest to the lowest beta. Had Henry moved from Friday to Wednesday rather than Monday the estimated beta would have been 0.21 higher.[82]*

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[81] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 127.
[82] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 129.
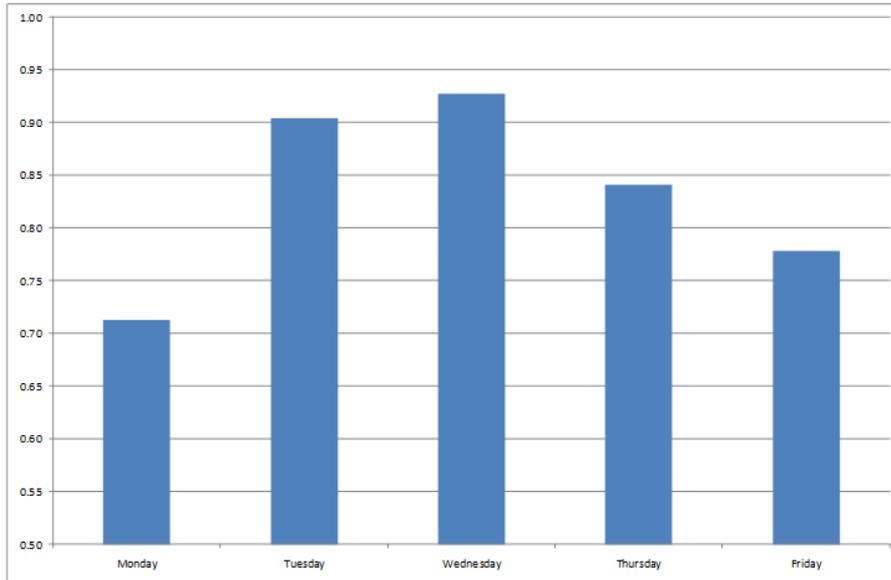
Source: CEG (2013), Figure 13, p. 44.

4.2.5.   Comparison of Australian and US beta estimates

The SFG Consulting (2013) report attached to the ENA's June submission presented equity beta estimates for nine domestic firms and 56 US firms. As noted above, the estimates for the Australian firms are disbursed over a very wide range. By contrast, the distribution of beta estimates from the much larger sample of US firms is uni-modal and approximately symmetric with a large majority of estimates within a narrow range. The distributions of the two sets of beta estimates are set out in the figure below.

The Issues Paper concludes that the Australian data supports a range of 0.4 to 0.7 (no more, no less) with such a high degree of reliability that the US data is effectively irrelevant.

By contrast, the ENA submits that the Australian distribution looks like the distribution of a tiny sample of random numbers whereas the US distribution looks like the standard probability distribution of a statistically valid sample of estimates.
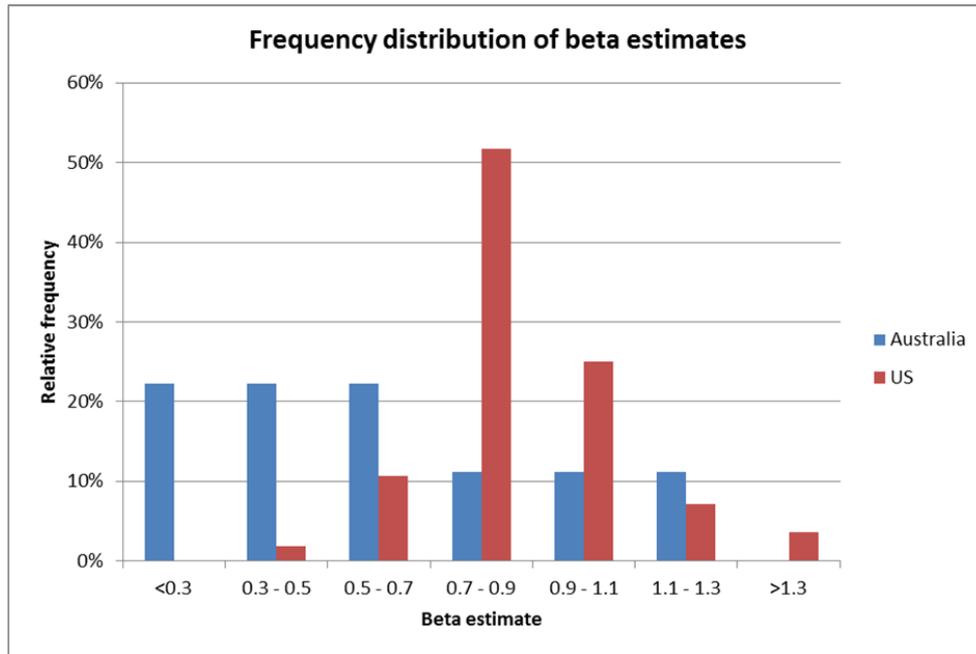
Source: Re-levered equity beta estimates from SFG (2013).

4.3.   The potential impact of business-specific events

In its Issues Paper, the AER notes that:

> In the 2009 WACC review we distinguished between two types of events that may create outlier observations and, thus, potentially lead to bias in the equity beta estimates: business-specific events (such as merger announcements) and events that may be 'unrepresentative' of the market (such as the 'technology bubble' or the global financial crisis, GFC).[83]

The impact of business-specific events can be reduced by selecting a larger sample. Since business-specific events relate, by definition, specific businesses they will not have a systematic effect over a large sample. That is, random business specific events will tend to cancel each other out over a large sample. However, in a small sample, business-specific events can have a material impact on beta estimates. For example, if in a tiny sample of six firms, two firms announce a merger, a material fraction of the sample has been affected.

To determine the extent to which the AER's preferred domestic sample might have been affected by business specific events, Table 2 below sets out list of illustrative merger announcements consistent with the example provided in the Issues Paper. This table shows that the AER's preferred sample of domestic firms has been the subject of numerous merger announcements over the relevant sample period. Numerous merger announcements have been made across the entire sample. Moreover, since the sample is so small, and since all firms have been affected, there is no opportunity for the averaging out or cancellation that could occur in a larger sample.

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[83] AER (2013), *Equity Beta Issues Paper*, p. 22.

Table 2 – Examples of merger announcements

AGL

Nov-04	Sold its New Zealand operations following significant losses
Oct-05	Announces acquisition of Southern Hydro
Oct-05	Announces demerger of infrastructure and retail operations
Apr-06	AGL and Alinta announced an agreement to merge and restructure

Envestra

Oct-10	Envestra acquires Country Energy gas networks business
Jul-13	APA proposes a merger with Envestra

APA Group

Dec-06	Completes the GasNet acquisition
Jul-07	Acquires the Origin Energy Networks assets
Dec-11	Launches off-market takeover bid for Hastings Diversified Utilities Fund
Nov-12	Acquires Hastings Diversified Utilities Fund
Jul-13	Proposes a merger with Envestra

Hastings Diversified Utilities Fund

Mar-05	Acquired 50% of Mid Kent Water
Oct-06	Acquired 50% of South East Water
Dec-10	Divests UK water business
Dec-11	APA announces takeover bid for HDF

GasNet

Jun-06	Babcock announces takeover offer

Aug-06	APA announces takeover offer

Alinta

Jul-03	Acquires part of United Energy, MultiNet Gas and Uecomm
Jul-03	Sold 26% interest in AlintaGas Networks to DUET
Apr-04	Acquired gas infrastructure and power generation assets from Duke Energy
Feb-06	Acquired a 19.9% interest in AGL
Feb-Apr 2006	AGL/Alina merger speculation
Apr-06	AGL and Alinta announced an agreement to merge and restructure
Oct-06	Merged with AGL
Feb-07	Completed a takeover of AIH, thereby re-acquiring the Duke Energy assets

DUET

Oct-04	Announcement of purchase of DUET consortium purchase of DBP
May-07	Acquires 29% interest in Duquesne Light
Jul-11	Acquired 20% of DBP and Multinet and sold interest in WA Gas Networks
Sep-11	Sale of its stake in Duquesne Light

The ENA does not suggest that, in relation to the merger announcements set out above, data points should be adjusted (because there is no reliable basis for making an adjustment) or eliminated (because there are so few data points already, and because it is not clear how many, or which, data points would be removed around each announcement). Rather, the ENA notes that:

1. the AER has recognized that business specific announcements "potentially lead to bias in the equity beta estimates" and has provided the example of merger announcements;

2. the AER's preferred domestic sample has been the subject of numerous merger announcements as the industry has gone through a rationalization process over the AER's sample period; and

3. the AER's domestic sample is very small, so that the benefit of large sample diversification of business specific announcements is unavailable.

Key position 11

The ENA submits that the preponderance of merger announcements pertaining to the AER's preferred sample is an important consideration when determining the reliability of estimates from that sample. This is a further reason to give material weight to the (much larger) sample of US firms.

5. Proper analysis of overseas evidence

5.1.   AER test for use of overseas evidence

In its Issues Paper, the AER indicates that it has applied what may be termed a 'binary' test when considering whether to have regard to foreign data:

> *The use of a foreign proxy is a suboptimal outcome that can only be justified where there is evidence that this will produce more reliable estimates of the domestic equity beta than the Australian estimates.*[84]

The ENA submits that a binary selection approach, whereby 100% weight is applied to the single piece of evidence that is deemed to be "best," is inconsistent with the new Rules. Rather, the regulator should consider all relevant evidence and weight each piece appropriately. This is quite apart from the fact that the foreign data *does* produce a more reliable estimate, as set out below.

Moreover, it is not clear that the AER has even sought to apply its own test. It would seem that the test of whether overseas evidence would produce estimates that are "more reliable" than the domestic estimates would require an analysis of the reliability of the domestic estimates. However, the AER has performed no such analysis of reliability.

Rather, the Issues Paper simply assumes that the domestic Australian source of evidence the trumps every other consideration. In this regard, the CEG (2013 – <u>Attachment A</u>) observes that:

> *The AER rejects the use of foreign comparables to inform the reasonable range for the beta of an Australian regulated utility. The basis for this position is an assertion that beta risk for a US regulated energy utility is likely to be different to Australian regulated energy utility. However, the AER provides no conceptual mechanism by which any specific difference can be expected to affect beta risk for a regulated energy utility. Without any conceptual basis for its claim it is not reasonable for the AER to conclude that these differences are likely to give rise to different beta risk. The only claim that is open to the AER based on the analysis it has presented is that these differences might give rise to different beta risk.*[85]

The Issues Paper proposes that the systematic risk of US firms might differ from that of Australian firms due to factors such as weather, geography and business cycles. Of course, the climate varies materially *within* Australia. If these are factors that materially affect beta, the AER should set out a schedule of beta estimates in its Guideline – according to the systematic risk of the benchmark firm in each region.

As another example, the Issues Paper suggests that US comparables may have different systematic risk to the extent that they tend to be more vertically integrated. The Issues Paper asserts that:

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[84] AER (2013), *Equity Beta Issues Paper*, p. 33.
[85] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 5.

This could result in different beta estimates for those types of businesses.[86]

However, the question (and the task of the regulator) is to determine whether or not it *does*. It is inappropriate and wrong for the AER to effectively dismiss the entire body of US evidence on the basis that vertical integration "could" have an effect on beta estimates. Proper regulatory practice would have involved:

1. **An assessment of whether or not vertical integration actually *does* have an effect on beta estimates** - In its Issues Paper, the AER identifies certain companies that it considers to be vertically integrated.[87] The SFG (2013) report attached to the ENA's June submission sets out equity beta estimates for every firm in the sample. It would have been a simple exercise for the AER to test whether the firms that are the source of concern have materially different equity beta estimates, but the AER has performed no analysis at all. CEG (2013 - Attachment A) do perform such an analysis and conclude that there is no difference.[88]

2. **A consideration of the likely directional effect, if any, of vertical integration** - For example, CEG (2013 - Attachment A) conclude that there is no conceptual reason why vertical integration would result in materially different equity beta estimates. Frontier Economics (2010) concluded that vertical integration would have the effect of *lowering* equity betas[89] – in which case the US beta estimates might be used as a lower bound. The AER has done no more than suggest that vertical integration "could" have "an effect" on equity beta.

CEG (2013 - Attachment A) also note that:

The AER provides no logical basis for assuming that an Australian business with a smaller proportion of regulated activities is a better proxy for the benchmark than US companies with a larger proportion of regulated activities. The AER's approach amounts to assuming that any Australian proxy is better than any US proxy no matter how they perform on other criteria. In my view, this is not a reasonable approach.[90]

Key position 12

The ENA submits that the Issues Paper does not properly justify the effective rejection of all data other than the tiny sample of domestic firms.

5.2.   Relevant Tribunal decisions

The question of whether WACC parameter estimates should be based on very small samples of data that are selected to be closely comparable was addressed by the Tribunal in the *ActewAGL* matter.[91] In that case, the AER argued that it should assess the relative reliability of the CBA

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[86] AER (2013), *Equity Beta Issues Paper*, p. 34.
[87] AER (2013), *Equity Beta Issues Paper*, p. 34.
[88] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 5.
[89] Frontier Economics (2010), *The cross sectoral application of equity betas: energy to water*, Report for the ACCC, pp. 22-23.
[90] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 12.
[91] Australian Competition Tribunal [2011] ACompT 4.

Spectrum and Bloomberg fair value curves on the basis of five BBB+ bonds that it had selected. The Tribunal held that it was unreasonable to base any conclusion on the analysis of five data points:

> *In the Tribunal's view, it is not reasonable to decide which of three non-linear*
> *curves best fits a set of data that consists of only five points.[92]*

The Tribunal went on to consider whether the sample should be expanded to include floating rate bonds even though they were not as directly comparable to the fixed rate benchmark. On this issue, the Tribunal concluded that it was:

> *unreasonable for the AER not to include floating rate bonds in its population.[93]*

The Tribunal also considered whether the sample should be expanded to include BBB and A- bonds, even though they were not as directly comparable to the fixed rate BBB+ benchmark. On this point, the Tribunal concluded that:

> *The AER rejected this proposal on the basis that it would potentially give equal*
> *weight to bonds with higher and lower credit ratings than the benchmark of BBB+.*
> *We think this is too cursory a rejection of the relevance of differently rated bonds.*
> *It is one thing to hold that a differently rated bond should not be given equal*
> *weight. It is quite another to refuse to take it into account in any way.[94]*

In particular, the yields from A- bonds exceeded the CBA Spectrum BBB+ fair value curve. The AER dismissed that evidence on the basis that those observed yields "do not reflect reasonable expectations." The Tribunal held that the AER was wrong to simply dismiss any evidence that was inconsistent with its preferred estimate. Rather, the inconsistent evidence "should have sent alarm signals calling for further analysis":

> *The Tribunal considers the AER's analysis to be too superficial. In fact, the longer*
> *term A- bond yields were above the CBASpectrum curve, contrary to what would*
> *usually be expected. We also consider that the AER was wrong to conclude as it*
> *did (at 56) that "[g]iven that the observed yields do not reflect reasonable*
> *expectations it is difficult to compare the selected fair value curve to the observed*
> *yields." The very fact that observed higher rated (A-) bond yields were higher than*
> *the CBASpectrum curve for lower rated (BBB+) bonds should have sent alarm*
> *signals calling for further analysis.[95]*

In the *Jemena* case, the Tribunal again held that WACC parameters should not be based on very small samples selected to be as comparable with the benchmark as possible:

> *Given the paucity of relevant BBB+ bonds, it is appropriate to have regard to*
> *bonds (fixed and floating) with other credit ratings. There is the issue of what*
> *weight should be given to those bonds. We do not agree that greater weight*
> *should be given to the BBB+ bonds merely because they match the task of*

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[92] Australian Competition Tribunal [2011] ACompT 4, Paragraphs 38-39.
[93] Australian Competition Tribunal [2011] ACompT 4, Paragraph 55.
[94] Australian Competition Tribunal [2011] ACompT 4, Paragraph 61.
[95] Australian Competition Tribunal [2011] ACompT 4, Paragraph 62.

*estimating the cost of 10 year BBB+ debt. That would defeat the purpose of
including bonds with other credit ratings in the sample.*[96]

and:

*We do not agree with Professor Handley's preferred approach to exclude non-
standard bonds. Faced with a limited number of relevant bonds, it is appropriate
to include bonds with nonstandard features.*[97]

Key position 13

The ENA submits that there are strong similarities between the current AER beta estimate and
the Tribunal cases set out above. The AER currently has available to it five data points from the
five currently listed Australian companies. The ENA submits that "only five data points"
represents a "paucity" of data by any reasonable interpretation. The fact that the overseas
companies may be not be quite as comparable to the benchmark firm must be weighed against
the paucity of the domestic data – in the same way that BBB and A- bonds should be included
due to the paucity of BBB+ bonds.

The AER's range of 0.4 to 0.7 is based on the results of Henry (2009), the ERA (2011, 2013) and
SFG Consulting (2013). Henry (2009) reports beta estimates for the small number of firms
examined that range between 0.15 and 1.26. ERA (2013) reports domestic beta estimates
between 0.04 and 1.20. SFG Consulting report beta estimates that range from 0.27 to 1.13. In
the *Jemena* case, the small number of BBB+ bond yields were much more consistent with each
other. Consequently, there would seem to be even more reason to consider an expanded data
set when estimating beta than when estimating DRP.

The question of whether the small domestic data set is sufficient for the purposes of beta
estimation depends on the reliability of the estimates that are produced. Section 4 above
demonstrates that the paucity of domestic data produces estimates that are highly unreliable.

5.3.   Proper interpretation of overseas evidence

5.3.1.   Basis for AER conclusion

In its Issues Paper, the AER considers that foreign beta estimates support a range of 0.5 to 0.9:

*The majority of recent updates include point estimates between 0.5 and 0.9
(although, some estimates exceed 1.0).*[98]

This conclusion appears to be based entirely on the dated work of Henry (2009). Henry (2008,
2009) provides beta estimates for one UK firm and ten US firms – a list that was supplied to him
by the AER. Under the terms of reference from the AER, Henry provided no opinion about
whether this subset of firms was appropriate in size or composition. Henry (2009) concludes, in
relation to the small subset of firms the AER instructed him to examine:

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[96] Australian Competition Tribunal [2011] ACompT 10, Paragraph 55.
[97] Australian Competition Tribunal [2011] ACompT 10, Paragraph 57.
[98] AER (2013), *Equity Beta Issues Paper*, pp. 7, 32, 42.

The majority of the estimates are clustered in the 0.5 to 0.9 range, although several estimates exceed 1.[99]

Thus, it seems that the AER's interpretation of the evidence from international-listed firms is based entirely on a set of stale estimates (that are now more than five years out of date) for a small sample of firms selected by the AER.

Moreover, the CEG report that is attached to this submission identifies a number of concerns with the Henry (2009) report and the AER's interpretation of it:

1. the Issues Paper makes a number of errors in referencing the the results of Henry (2009), including in reporting averages of 'lower bound' beta estimates;[100]

2. Henry (2009) reports results for several different time periods, whereas the Issues Paper summarises only those results from the single time period that (ex post) produced the lowest beta estimates. Specifically, the Issues Paper does not report results for the period that it elsewhere considers to produce its "core" estimates. The estimates from the core period are higher than those reported in the Issues Paper;[101] [102]

3. the AER specified the sample that Henry must use. This sample produces lower beta estimates than would be obtained from the samples used by other regulators and it includes firms that are vertically integrated, even though the AER now uses vertical integration as a reason for attributing less weight to the international evidence;[103] and

4. the Henry (2008) study appears to be based on Friday-to-Friday returns and the Henry (2009) study appears to be based on Monday-to-Monday returns. In both cases, the selected day produces the lowest equity beta of all five possible choices. No reason was provided for this change.[104]

Key position 14

The ENA submits that dated overseas evidence should not be preferred to more recent overseas evidence.

This is particularly the case given the AER's statement in relation to domestic evidence that:

Four years on, we now have more studies, spanning a longer time period and a diversity of market conditions.[105]

5.3.2. Other overseas evidence cited in the Issues Paper

The Issues Paper also sets out the range of other overseas evidence that it considers to be relevant to the estimation of equity beta. The AER concludes that this body of evidence does not

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[99] Henry, O.T., (2009), *Estimating β*, April, p. 47.
[100] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 89.
[101] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 89.
[102] AER (2013), *Equity Beta Issues Paper*, p. 34.
[103] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 89.
[104] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 89.
[105] AER (2013), *Equity Beta Issues Paper*, p. 7.

lead it to alter its conclusion from the last WACC review – a range of 0.5 to 0.9 (with some estimates above 1), based on Henry (2009). The Issues Paper discusses a number of studies and concludes that none would lead it to alter its previously determined range of 0.5 to 0.9.

The CEG (2013 - Attachment A) report reviews this evidence in detail and notes that much of it has been incorrectly interpreted by the AER. CEG conclude that "there are a number of errors, omissions and inconsistencies in the AER's representations of these studies."[106] CEG further demonstrate that:

a. each of these errors, omissions and inconsistencies has the effect of supporting the previously determined range of 0.5 to 0.9; and

b. in every case the correction of the errors, omissions and inconsistencies produces higher beta estimates.

The errors, omissions and inconsistencies identified by CEG include:

a. when interpreting the Damodaran estimates, the AER has performed the re-levering procedure using the debt-to-equity ratio instead of the debt-to-value ratio. Correcting this error materially increases the beta estimates;

b. when interpreting the NERA report for the QCA, the AER cites only a sub-set of the results that use a re-levering approach that differs materially from the AER's approach and which the authors of the report recommended against. The NERA report recommends the beta estimates that are based on the AER's re-levering approach, but those estimates are not mentioned in the AER's Issues Paper. The beta estimates that are recommended by the authors of the report are materially higher than the subset of estimates cited in the Issues Paper;

c. the AER's Issues Paper cites only a subset of the results from the ACG report in a way that is inconsistent with the reporting of the results of the NERA report:

    i.   in the NERA report, the results from the most recent sub-period supported a lower beta and were reported in the Issues Paper;

    ii. in the ACG report, the results from the most recent sub-period supported a higher beta and were omitted from the Issues Paper;

d. the figures ascribed to the PwC study by the Issues Paper do not appear in the PwC report. CEG explain that the AER had made a number of downward adjustments to the PwC figures and ascribed the adjusted results to the PwC report in a way that is "unorthodox."[107] The AER adjusted figures are below the bottom end of the range actually recommended by PwC;

e. the Issues Paper cites some dated results from a study by the ESCV. The proper interpretation of those results, which is not set out in the Issues Paper, is that:

    i.   after considering the overseas evidence, the ESCV was led to increase the top end of its range for beta; and
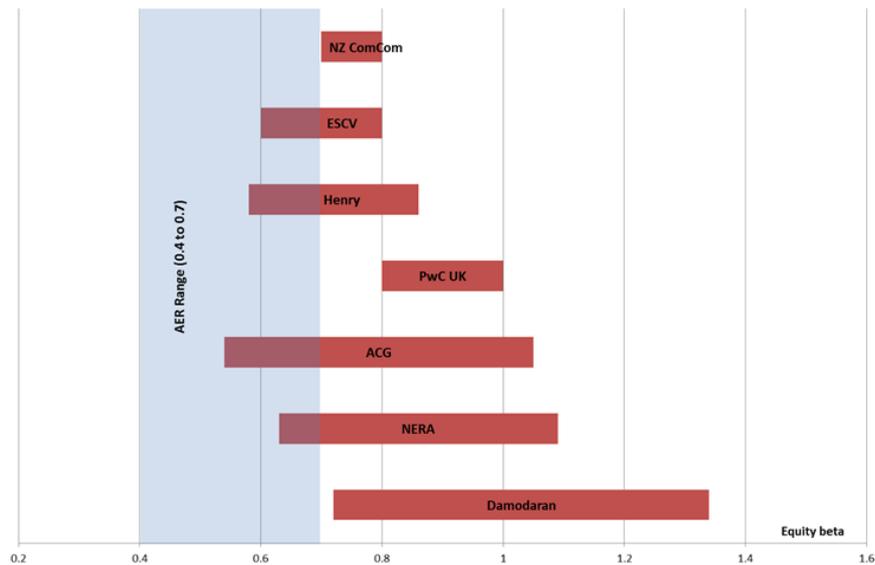
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[106] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 56.
[107] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 83.

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ii.   since the ESCV study, overseas beta estimates have risen, which would be consistent with an even greater increase to the top end of the range for beta.

f.   the CEG report notes that the NZCC estimates are universally at or above the top end of the AER's range for beta. CEG also point out a number of methodological issues in relation to the NZCC study.

The CEG report summarises the beta estimates from the international studies, corrected for errors, omissions and inconsistencies in a figure that is reproduced below.

Figure 1: AER range versus corrected ranges for international studies

Source: CEG (2013 - Attachment A), Figure 1, p. 5.

In relation to the international evidence, CEG conclude that:

> *The AER's conclusion that the studies provide support for its estimate of an equity beta range for the benchmark efficient entity of 0.4 to 0.7 is, at best, tenuous even based on the uncorrected range[108]*

and

> *The tenuous nature of the AER's conclusion based on the uncorrected range becomes untenable based on the corrected range.[109]*

The ENA endorses those conclusions in relation to the international evidence.

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[108] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 15.
[109] CEG (2013), *AER equity beta issues paper: international comparators*, Paragraph 15.

Key position 15

The ENA submits that the AER is wrong to continue to rely on the results of Henry (2008, 2009) when more comprehensive and more recent estimates are available. Indeed, but for the limited and dated evidence of Henry (2009), there is no basis for the notion that the overseas data supports a beta range of 0.5 to 0.9. The ENA submits that more comprehensive and more recent estimates set out above support a range of 0.7 to 1.0, with a point estimate of 0.9 based on the most recent, detailed, and transparent analysis of CEG/SFG (2013).

6. Arbitrariness of range

The AER approach to the estimation of beta, in combination with its foundation model approach, has a substantial impact on the regulated rate of return. Under the foundation model approach, it is the AER's expectation that the cost of equity will lie within a range formed with respect to its implementation of the SL CAPM. This expectation, in turn, is based upon a view that the uncertainty inherent in estimating input parameters is likely to result in ranges that are not overly narrow.[110] The range will be determined by a point estimate of the risk-free rate, and upper and lower bounds for the estimates of beta and the market risk premium.[111]

The AER has determined that an appropriate range for the estimate of beta is 0.4 to 0.7.[112] This range has been formed by only considering a sub-set of the evidence available to the AER. Specifically, the evidence used to compile this range is regression analysis of stock returns on market returns for a small sample of Australian-listed firms. There are nine firms in the sample, of which just five remain listed at present. So the AER has considered one estimation technique (regression analysis), one dataset (stock returns and market returns) and one small sample (Australian-listed firms). It is the AER's intention that all other relevant evidence can only be used to arrive at a value from within this range.

This means that the AER has not merely introduced a foundation model into the cost of capital estimation process. The AER has introduced a foundation implementation for determining a *parameter input* into that model, constraining the estimation technique, dataset and sample to exactly the same approach that it applied under the old Rules.

The implication of the AER approach is that the range effectively limits the relevance that other information can have in the estimation process – the narrower the range, the less consideration that can, in effect, be given to other evidence. Specifically, the further a beta estimate implied from other evidence is from 0.7, the less weight is effectively given to that estimate, because by construction the beta estimate cannot move above this upper bound.

Given the importance assigned to the beta estimation range, it is important to understand just what the range represents. At present, the AER has disclosed beta estimates from different sets of analysis that roughly correspond to figures of 0.4 and 0.7 (the full suite of ranges and point estimates referred to by the AER spans 0.43 to 0.78 as listed in Table 3). But there is no conceptual statement as to just what the range represents. This conceptual understanding is crucial because it necessarily implies what sort of evidence is appropriate for quantifying the range.

For instance, the range is not meant to represent the minimum and maximum of observed regression-based estimates of beta. The AER states that the range "does not represent the total range of individual equity beta estimates."[113]

Neither does the range appear to span beta estimates that are plausible. If this was the case the range would encompass a value of at least one. The ENA submitted beta estimates for nine Australian-listed firms and 56 U.S.-listed firms.[114] One of the Australian-listed firms had a beta estimate of 1.13 and 13 of the U.S.-listed firms had beta estimates within the range of 1.00 to 1.51. So 11% of Australian-listed firms, and 23% of U.S.-listed firms, had beta estimates which exceeded

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[110] AER (2013) *Explanatory statement to the draft guideline*, p. 65.
[111] AER (2013) *Explanatory statement to the draft guideline*, pp. 63–64.
[112] AER (2013), *Equity Beta Issues Paper*, pp. 6, 7, 9, 24 and 38.
[113] AER (2013), *Equity Beta Issues Paper*, p. 39.
[114] SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, pp. 18–19.

one. Three Australian-listed firms (33%) and 49 U.S.-listed firms (88%) had beta estimates which exceeded the upper bound of 0.70.

The AER referred to samples of U.S.-listed firms which, given corrections to the AER's re-levering adjustments, have mean estimates of more than one.[115] In addition, in the most recent beta estimates received by the AER from its own expert, the AER is informed that "the majority of the estimates are clustered in the 0.5 to 0.9 range, although several estimates exceed 1."[116] The AER decided that the evidence from firms listed overseas would only be used to select a point estimate from within the range.[117] The ENA fundamentally disagrees with this second-stage consideration of evidence. However, setting this disagreement aside, the ENA considers that a beta estimate of one for Australian-listed firms must be plausible, given the international evidence referred to by the AER.

The notion that a beta estimate of one is plausible is also supported by the evidence submitted by the ENA on the unreliability of regression-based estimates of beta and their lack of association with stock returns.[118] This evidence suggests that the use of regressions of stock returns on market returns to measure beta is questionable. The implication is that it is difficult to establish, using regression analysis, whether or not a stock or portfolio bears more or less systematic risk than the market.

To demonstrate just how variable beta estimates are, especially in small samples, consider the following two results. First, depending upon the start day for returns computations within a month or a week, there is considerable variation in beta estimates. This means that, even though the sample of firms, time period and share prices in the data remain constant, the random selection of a start day within a week or a month will lead to considerable variation in the estimates. As a specific example, CEG (2013) reports that the average beta estimates for the Australian-listed firms can vary from below 0.3 to above 0.9 contingent upon whether returns are computed on the 18th day of the month or the 6th day of the month.[119]

Second, the standard error of mean beta estimates across small samples of nine firms in the same industry has been estimated within the range of 0.15 to 0.22 across different industries.[120] So the range relied upon by the AER is less than one standard error either side of the mid-point. The implication is that it is quite plausible that another small sample of firms would have a mean beta estimate outside this range.

In part, the AER has acknowledged that there is a risk that regression-based estimates of beta will lead to a cost of equity estimate that is too low, by placing some reliance on the Black CAPM. But the AER will only use the concept of the Black CAPM to select a point estimate from within the range.[121]

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[115] The AER refers to industry beta estimates compiled by Professor Damodaran from New York University. The AER reports six industry average re-levered beta estimates compiled in January of 2007 to 2008, and 2010 to 2013. The AER has incorrectly computed the leverage adjustment for these beta estimates. With the correct leverage adjustment, the re-levered equity beta estimates in these years are, respectively, 1.33, 1.32, 0.99, 1.01, 1.01 and 0.72.

[116] Henry, O.T (2009), *Estimating β*, April, p. 41.

[117] AER (2013), *Equity Beta Issues Paper*, p. 40.

[118] Gray, Hall, Diamond and Brooks (2013), *Assessing the reliability of regression-based estimates of risk*, June; Gray, Hall, Diamond and Brooks (2013), *The Vasicek adjustment to beta estimates in the Capital Asset Pricing Model*, June; NERA Economic Consulting (2013), *The Fama-French Three Factor Model*, October; NERA Economic Consulting (2013), *Estimates of the zero-beta premium*, June.

[119] CEG (2013), *Regression estimates of equity beta*, September, Figure 3, p. 26.

[120] Gray, Hall, Diamond and Brooks (2013), *Assessing the reliability of regression-based estimates of risk*, June.

[121] AER (2013), *Equity Beta Issues Paper*, p. 40.

The range also does not represent a beta estimate that corresponds to a statistical probability. The AER states that the range "does not represent the confidence interval around the beta estimate."[122]

The AER states that, with reference to the same range of 0.4 to 0.7 arrived at in its 2009 WACC Review:[123]

> [t]his equity beta range of 0.4 to 0.7 was informed by the average of individual equity beta point estimates for the comparable Australian-listed firms and various portfolios estimates based on these Australian-listed firms.

According to this statement, the range represents average outcomes from different sub-samples of Australian-listed firms analysed over different time periods. The table below presents a summary of the specific empirical evidence the AER refers to in determining that a range of 0.4 to 0.7 is appropriate. There are eight specific ranges or point estimates referred to by the AER in selecting a range. Considering the lower and upped bounds from each of these ranges or point estimates, the total range of average outcomes relied upon by the AER is 0.43 to 0.78.

The eight ranges and point estimates relied upon by the AER have a relatively narrow dispersion. The reason for this narrow dispersion is that the beta estimates are all estimates of the historical relationship between stock and market returns for the same sample of firms from January 2002 onwards. The narrowest range of data used is from January 2003 to September 2008 and the widest range of data used is from January 2002 to April 2013. **So the range of 0.43 to 0.78 represents estimates of what the linear relationship between stock returns and market returns was, during a period of between six and 11 years, for a sample of six to nine Australian-listed firms.**

As mentioned above, the AER has stated that the range is not meant to represent the upper and lower bound of individual firm beta estimates and is not meant to represent a statistical confidence interval. It also appears that the range is meant to represent something much narrower than a range that is considered plausible. What the range, in fact, represents, is simply a set of diverse outcomes from applying different weights to individual returns to the same sample of firms over the same time period of 11 years. This is quite different to the statement of the AER that "there is a consistent and robust pattern … to the use of different econometric techniques, different comparator sets and different time periods."[124] There is *one* sample of nine firms, *one* time period of 11 years and variations on how the line of best fit is drawn through a plot of stock returns on market returns.

Having formed a range in this manner, the AER plans to account for all other evidence only to select a point estimate from within the range. This means that the beta estimate is constrained to the range of mean outcomes estimates for this small sample of firms over 11 years. (The term *mean outcome* also refers to the best fit for a portfolio). This, in effect, means that all other evidence considered by the AER carries very little weight in reaching its final cost of equity estimate, as discussed below.

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[122] AER (2013), *Equity Beta Issues Paper*, p. 39.
[123] AER (2013), *Equity Beta Issues Paper*, p. 39
[124] AER (2013), *Equity Beta Issues Paper*, p. 38.

Table 3. Empirical evidence referred to by the AER in support of the equity beta range

Source and technique	Basis	Range
Henry (2009)	Averages for individual firms	0.45 to 0.71[125]
OLS and LAD	Constant-weighted portfolios	0.49 to 0.66[126]
	Time-varying portfolios	0.43 to 0.78[127]
ERA (2011) – OLS and LAD	Averages for individual firms	0.44 to 0.60[128]
ERA (2013)	Averages for individual firms	0.49 to 0.52[129]
OLS, LAD, Robust MM, Theil-Sen	Portfolios	0.47 to 0.53[130]
SFG (2013)	Averages for individual firms	0.60[131]
OLS	Portfolios	0.55[132]
Range from all mean estimates		0.43 to 0.78
Range adopted by the AER		0.40 to 0.70

There is also an extensive list of evidence that the AER has not yet considered in arriving at its beta estimate from within a range, but which also is unable to carry any material weight, because the maximum beta estimate has already been reached. This includes the evidence that:

- beta estimates from regression analysis are highly unreliable, especially in small samples, because of the high variability across samples and over time;[133]

- beta estimates from LAD regression have a material downward bias;[134]

- beta estimates from regression analysis have little or no association with realised stock returns;[135]

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[125] AER (2013), *Equity Beta Issues Paper*, Table 4.1, p. 25, p. 24 and p. 39. The lower bound of 0.45 is the average LAD estimate based upon both weekly and monthly returns using data from 2002 to 2008. The upper bound of 0.71 is the average OLS estimate based upon weekly data from 2003 to 2008.

[126] AER (2013), *Equity Beta Issues Paper*, Table 4.2 and Table 4.3, pp. 26–27, p. 24 and p. 39. The lower bound of 0.49 is the average LAD estimate of P1' and P2 to P5 based upon weekly returns using data from 2002 to 2008. The upper bound of 0.66 is the average LAD estimate of P1 to P5 based upon monthly returns using data from 2003 to 2008.

[127] AER (2013), *Equity Beta Issues Paper*, pp. 25 – 26. The lower bound of 0.43 is the LAD estimate using the median return in a portfolio based upon weekly returns using data from 2002 to 2008. The upper bound of 0.78 is the LAD estimate using the average return in a portfolio based upon monthly returns from 2003 to 2008.

[128] AER (2013), *Equity Beta Issues Paper*, Table 4.4 and Table 4.5, pp. 27 – 28, p. 24 and p. 39. The lower bound of 0.44 is the average LAD estimate based upon weekly returns from 2002 to 2011. The upper bound of 60 is the average OLS estimate based upon weekly returns from 2002 to 2011.

[129] AER (2013), *Equity Beta Issues Paper*, Table 4.6, p. 28, p. 24 and p. 39. The lower bound of 0.49 is the average LAD estimate based upon weekly returns from 2002 to 2013. The upper bound of 0.52 is the average Robust MM estimate based upon weekly returns from 2002 to 2013. Note that both SFG Consulting (2013), *Beta estimation: Considerations for the Economic Regulation Authority*, September; and CEG (2013), *Regression estimates of equity beta*, September, were unable to replicate the beta estimate for SP Ausnet in the ERA (2013) analysis.

[130] AER (2013), *Equity Beta Issues Paper*, Table 4.7, p. 29, p. 24 and p. 39. The lower bound of 0.47 is the average Theil-Sen estimate for equal-weighted portfolios based upon weekly returns from 2002 to 2013. The upper bound of 0.53 is the average LAD estimate for equal-weighted portfolios based upon weekly returns from 2002 to 2013.

[131] AER (2013), *Equity Beta Issues Paper*, p. 24 and p. 39; SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, Table 2, p. 13.

[132] AER (2013), *Equity Beta Issues Paper*, p. 24 and p. 39; SFG Consulting (2013), *Regression-based estimates of risk parameters for the benchmark firm*, Table 3, p. 15.

[133] Gray, Hall, Diamond and Brooks (2013), *Assessing the reliability of regression-based estimates of risk*, June.

[134] Gray, Hall, Diamond and Brooks (2013), *Comparison of OLS and LAD regression techniques for estimating beta*, June.

- dividend discount model estimates of the cost of equity suggest that the same sample of Australian-listed firms relied upon by the AER have implied beta estimates of 0.96;[136]

- independent experts use an uplift factor to increase required returns on equity (outside any SL CAPM estimate);[137] and

- stocks with a high proportion of book value to market value have, over time and across markets, persistently earned above-average returns, which implies a cost of capital for the sample of Australian-listed firms which is above the SL CAPM estimate.[138]

The key point is that the equity beta range relied upon by the AER is narrow, and constructed with reference to a small sub-set of the evidence before it. This means that all of the remaining evidence before the AER can only carry relatively little weight in decision-making, because the beta estimate is constrained to the top of the AER's range.

At the core of this issue is that the range compiled by the AER has not been framed with a conceptual basis of what the AER is trying to measure. It is not a set of all possible beta estimates, it is not a set of plausible beta estimates, nor is it or a range of outcomes likely to be observed with a given probability. On this basis the ENA has the following recommendations for the AER.

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[135] Gray, Hall, Diamond and Brooks (2013), *The Vasicek adjustment to beta estimates in the Capital Asset Pricing Model*, June; NERA Economic Consulting (2013), *Estimates of the zero-beta premium*, June.

[136] SFG Consulting (2013), *Dividend discount model estimates of the cost of equity*, June; SFG Consulting (2013), *Reconciliation of dividend discount model estimates with those compiled by the AER*, October. While the AER has stated that it does not intend to use individual firm dividend discount model analysis in estimating the cost of equity, this conclusion was based on its own dividend discount model analysis and not the more detailed dividend discount model analysis conducted by SFG Consulting.

[137] SFG Consulting (2013), *Evidence on the required return on equity from independent expert reports*, June.

[138] NERA Economic Consulting (2013), *The Fama-French Three Factor Model*, October. NERA Economic Consulting (2013), *Review of cost of equity models*, June. While the AER has stated that it will not use the Fama-French Model in estimating that cost of equity it has provided no statement on its view as to why high book-to-market ratios have historically earn relatively high returns and why this empirical regularity should not be accounted for in estimating the cost of equity.

Key position 16

As a first principle, there is no need for the AER to select a range for equity beta according to one sub-set of evidence, and then to shift within this range on the basis of all other evidence. This process is likely to lead to non-transparent outcomes (it is impossible to know how much consideration was given to different sources of evidence) and places increased weight on the initial range the more evidence suggests that this range is inappropriate.

As a second principle, if the AER continues to select a range for equity beta as a first step, it is important to describe the conceptual basis of the range. At present, the upper and lower bounds of the range have no real conceptual basis and are determined by a set of regression lines constructed from a small sample of just six to nine firms. If the AER described the basis for the range, participants can assess whether the evidence is consistent with this construct.

As a third principle, if the AER continues to select a range for equity beta as a first step, the range should be informed with respect to *all* the available evidence. At present the AER performs an assessment of whether evidence is consistent, or not consistent with the initial range. This two-stage consideration means that the AER imposes a hurdle for whether evidence is either used to adjust the range, or not, rather than give varying consideration to all available evidence according to its relevance and reliability.

Appendix 1: The effect of leverage

The reason that leverage increases the systematic risk of equity, by definition, is that it increases the variability of the returns to shareholders. To see this via a simple illustration, consider an unlevered firm that currently has assets valued at $100. Over the next year there is an 80% chance of a market expansion and a 20% chance of a contraction. In the event of an expansion the value of the assets will increase to $120 and in the event of a contraction the value of the assets will fall to $80. In this case, the expected return for the firm is:

$$r_e = 0.8 \times 20\% + 0.2 \times (-20\%) = 12\%$$

as set out in the figure below.

Also suppose that the market return is 20% in the expansion state and -20% in the contraction state. In this case the beta of this unlevered firm is 1.0. In particular:[139]

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.0544}{0.0544} = 1.$$
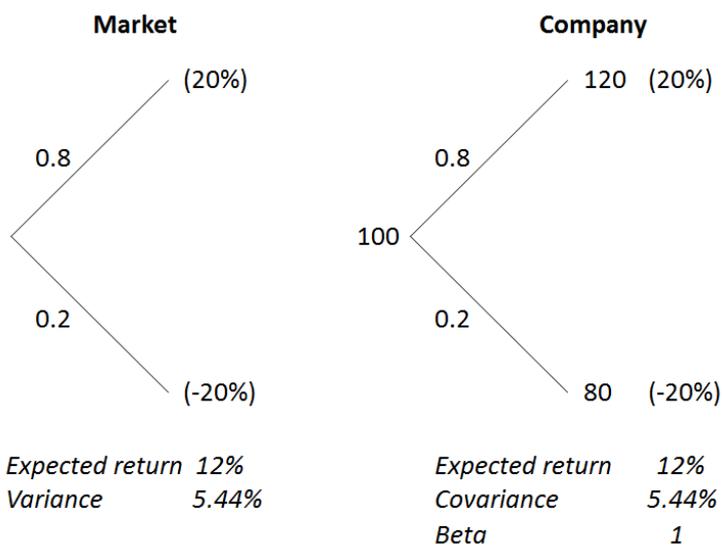
Now suppose the same firm is financed with $70 equity and $30 debt, on which the interest rate is 10% p.a. At the end of the period, the firm must repay its debt plus interest, a total of $33. The residual is then available to the shareholders as set out in the figure below.

In this case, the return on equity in the up-market is better than before and the return on equity in the down-market is worse than before. Again, this is why it is called "leverage." In this case, the

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[139] $\text{var}(r_m) = 0.5(0.20 - 0.12)^2 + 0.5(-0.20 - 0.12)^2 = 5.44\%$ and
$\text{cov}(r_e, r_m) = 0.5(0.20 - 0.12)(0.20 - 0.12) + 0.5(-0.20 - 0.12)(-0.20 - 0.12) = 5.44\%$.
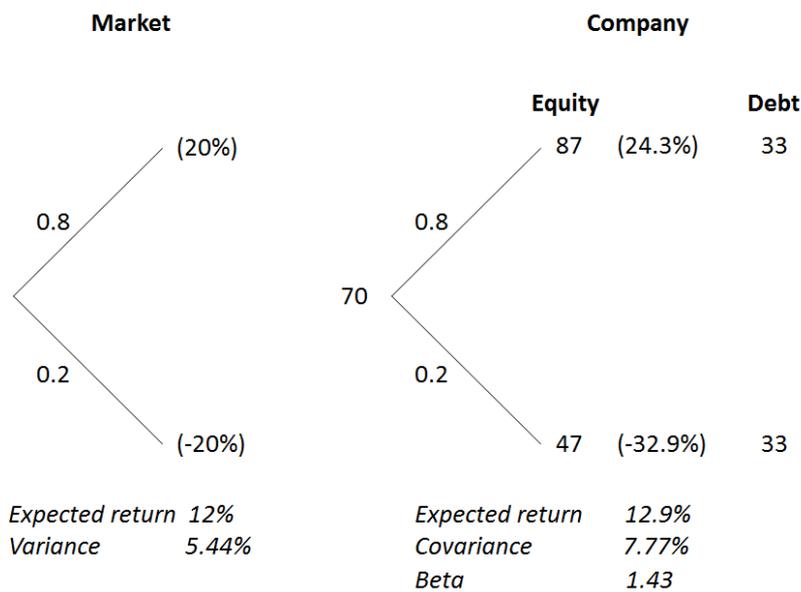
leverage has no effect on the fundamental business risk of the firm (the asset beta), but it does increase the systematic risk of equity (the equity beta). In particular, the equity beta increases to:

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.0777}{0.0544} = 1.43$$

and the expected return on equity rises, commensurate with the increase in the equity beta:

$$r_e = 0.8 \times 24.3\% + 0.2 \times (-39.9\%) = 12.9\% .$$

These effects are all set out in the figure below.

	Market			Company		
				Equity		**Debt**
	(20%)			87	(24.3%)	33
0.8			0.8			
	70					
0.2			0.2			
	(-20%)			47	(-32.9%)	33

Market			Company	
Expected return	*12%*		*Expected return*	*12.9%*
Variance	*5.44%*		*Covariance*	*7.77%*
			Beta	*1.43*

Note that the relationship between the (levered) equity beta and the (unlevered) asset beta is described perfectly by the re-levering equation that the AER has adopted. The asset beta is known to be 1 from the analysis of the unlevered firm above. With 30% leverage, the levered equity beta is 1.43. In this case:

$$\beta_a = \beta_e \frac{E}{V}$$
$$1 = 1.43 \times 0.7.$$

Also note that in this case there is no default risk (even in the down-market the firm is able to service its debt), there is no counterparty risk, there is no illiquidity risk, there is no refinancing risk and there is no reset risk. That is, even if the five financial risks in the Frontier report are eliminated entirely, leverage still has an important effect on the equity beta – an effect that is captured by the AER's re-levering formula. The five financial risks are *not* the means by which leverage has an effect on equity beta. Leverage has an effect on equity beta by widening the range of possible returns, as captured by the AER's re-levering formula. The actual leverage effect is entirely independent of the five types of risk discussed in the Frontier report – indeed, the same leverage effect exists even if all five risks are eliminated entirely.

Now suppose the firm's leverage is doubled to 60%. At the end of the period, the firm must repay its debt plus interest, a total of $66. The residual is then available to the shareholders as set out in the figure below.

In this case, the return on equity in the up-market is even better than before (+35%) and the return on equity in the down-market is even worse than before (-65%). Again leverage has no effect on the fundamental business risk of the firm (the asset beta), but it does increase the systematic risk of equity (the equity beta). In particular, the equity beta increases to:

$$\beta_e = \frac{\text{cov}(r_e, r_m)}{\text{var}(r_m)} = \frac{0.136}{0.0544} = 2.5.$$

and the expected return on equity rises, commensurate with the increase in the equity beta:

$$r_e = 0.8 \times 35\% + 0.2 \times (-65\%) = 15\% .$$

Market **Company**

		Equity		**Debt**
	(20%)	54	(35%)	66
0.8		0.8		
40				
0.2		0.2		
	(-20%)	14	(-65%)	66

Expected return 12%   *Expected return   15%*
Variance   5.44%   *Covariance   13.6%*
                             Beta   2.5

Again, the relationship between the (levered) equity beta and the same (unlevered) asset beta is described perfectly by the re-levering equation that the AER has adopted:

$$\beta_a = \beta_e \frac{E}{V}$$
$$1 = 2.5 \times 0.4.$$