Return on Capital of a Regulated Electricity Network

NERA
ECONOMIC CONSULTING

Return on Capital of a Regulated Electricity Network

A report for Ashurst

May 2014

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Tel: 61 2 8864 6500 Fax: 61 2 8864 6549
www.nera.com

Contents

Executive Summary

We have prepared this report at the request of Ashurst on behalf of TransGrid, an electricity transmission network service provider (TNSP) in New South Wales. The context of our report is the regulatory proposal to be submitted to the Australian Energy Regulator (AER) by TransGrid on 31 May 2014. TransGrid's regulatory proposal is the first significant step in the AER's revenue determination process for TransGrid's next regulatory control period, 1 July 2014 to 30 June 2019 (the next regulatory period).

Ashurst has requested that we develop and implement a recommended approach to determining TransGrid's return on capital in accordance with the National Electricity Rules (the rules). The rules require that the allowed rate of return must be determined such that it contributes to the allowed rate of return objective, ie:

> *'The allowed rate of return objective is that the rate of return for a Transmission Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Transmission Network Service Provider in respect of the provision of prescribed transmission services.*[1]

Setting an allowed rate of return that achieves the allowed rate of return objective is of considerable importance, since it will directly affect the extent to which the National Electricity Objective (NEO) is achieved. In essence, the NEO provides that the overarching objective of the National Electricity Law is to promote efficient investment, operation and of use of electricity services for the long term interest of consumers of electricity.

Setting a rate of return that is commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk will, in turn:

- promote efficient investment in the electricity transmission services;
- maintain output and service levels; and
- promote the long-term interest of consumers of electricity.

Conversely, a rate of return that is not commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk will fall short of achieving any of the above conditions, with long lasting detrimental effects on the welfare of consumers.

In our opinion, a nominal post-tax 'Vanilla' WACC of 8.83 per cent represents the best estimate of the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to TransGrid for 2014/15. Table 1, sets out the constituent elements of the WACC.

[1] Clause 6A6.2(c) of the rules.

Table 1
Recommended Rate of Return

Parameter	Value
Gearing	0.60
Return on Debt*	7.72%
Return on Equity	10.50%
Nominal Vanilla WACC	**8.83%**

** Indicative rate, based on observations for January to March 2014, to be updated once data for April to June 2014 is published.*

Gearing ratio

We recommend a gearing ratio of 60 per cent debt and 40 per cent equity. This gearing ratio is the benchmark gearing ratio applied to all Australian regulated energy networks. Further, a 60 per cent debt gearing ratio is consistent with the most recent study of the gearing ratio of listed Australian firms with revenues substantially sourced from regulated energy networks.

Return on debt

We recommend an indicative return on debt allowance for 2014/15 of 7.72 per cent. In due course, this allowance should be updated to include estimates of the benchmark return on debt for the remaining months of the 2013/14 financial year.

In our opinion, a benchmark efficient TNSP is a 'pure play, regulated TNSP operating within Australia'. On this basis, a benchmark entity would issue debt with the following characteristics:

- Australian corporate debt;
- benchmark credit rating of BBB+;[2] and
- a term at issuance of 10-years.[3]

For the purpose of estimating the yield on debt, we recommend using a third party data source; in particular, the non-financial corporate bond yields for 10-year BBB rated corporate debt published by the RBA. In this regard, we considered the appropriateness of both Bloomberg and RBA data series and concluded that the non-financial corporate bond yields for 10-year BBB rated corporate debt data series published by the RBA is most appropriate because:

---

[2] For the reasons set out in the AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, pages 152-157 in our opinion a BBB+ credit rating is a the best estimate of the benchmark credit rating.

[3] For the reasons set out in the AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, pages 135-147 in our opinion a term of 10-years is the best estimate of the average term at issuance of debt by regulated Australian energy networks.

- it is the only third party data service provider that currently provides an estimate of the 10-year BBB corporate bond yield;
- it is the only third party data service provider that discloses the methodology used to estimate the corporate bond yield;
- the RBA calculates the Australian dollar equivalent yield on foreign currency denominated bonds issued by Australian corporations and so uses a richer sample set than Bloomberg;[4]
- the RBA series appears to perform better than the Bloomberg Australian dollar FVCs in the period during the global financial crisis (GFC);[5] and
- the RBA is a highly regarded institution capable of providing high quality econometric analysis and, for these reasons, its assurance of the continued publication of the 10-year BBB corporate bond yield is credible.[6]

Consistent with the approach set out in the guidelines, we recommend estimating the return on debt by reference to a 10-year trailing average of benchmark debt yields. In particular, the return on debt allowance should be established by:

- estimating the annual average yield on benchmark debt over each of the preceding 10-years; and
- calculating the arithmetic average of 10 annual observations to determine the return on debt for a given regulatory year.

Further, we recommend that TransGrid update the return on debt allowance annually to maintain a 10-year trailing average.

To this point our approach to estimating the return on debt has been consistent with the approach proposed in the guidelines. Nevertheless, in contrast to the guidelines, we recommend that a transition to a trailing average not be imposed because a benchmark efficient entity would already periodically issue fixed rate corporate debt, ie, it would adopt the trailing average approach.[7] Further, we note that TransGrid already adopts the debt financing practices of a benchmark efficient entity.

Imposing a transition in these circumstances would require all TNSPs to transition to the trailing average approach over a ten year period, regardless of whether their existing debt

---

4 Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

5 See footnote 26, Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

6 We note that, in the past, commercial third party data providers have ceased publishing a 10-year BBB yield, with Bloomberg ending its 10-year BBB FVC in August 2009 and CBASpectrum ending its 10-year BBB+ series in August 2010. See: AER, *Victorian electricity distribution network service providers - Distribution determination 2011–2015: Final Decision*, October 2010, pages 490 and493.

7 We were asked by Ashurst to consider two alternative formulations of a benchmark efficient entity, however, under both of these formulations, a benchmark efficient entity would adopt a debt financing practice that involved the periodic issuance of fixed rate corporate debt, ie, the trailing average approach.

financing practice is already consistent with the trailing average approach. This would delay the alignment of the efficient debt raising practices with the return on debt allowance, which cannot be said to contribute to the achievement of the allowed rate of return objective.

Importantly, imposing the transition mechanism proposed in the guidelines will also, in turn:

- result in a $141 million[8] windfall loss on a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid;
- not provide TransGrid with a reasonable opportunity to recover at least the efficient costs of the operation of a benchmark efficient service provider; and
- be inconsistent with the revenue and pricing principles.

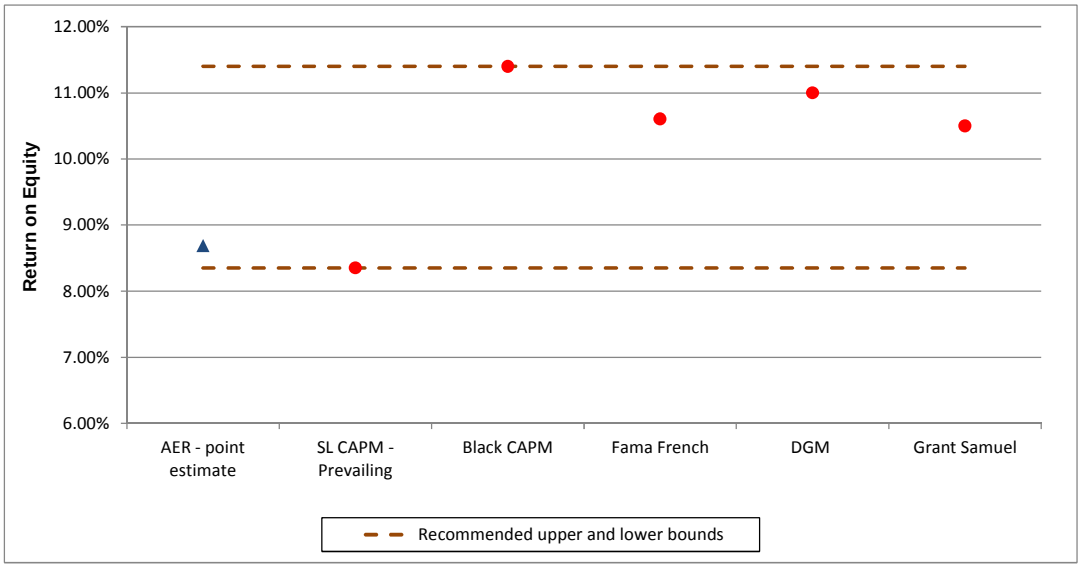
For these reasons we conclude that no transitional mechanism be imposed.

Return on equity

A rate of 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP.

In forming this opinion, we had regard to information provided by a number of forms of relevant information. The indicative range of return on equity estimates for a benchmark efficient TNSP derived using each form of relevant material is illustrated in Figure 1 below.

Figure 1
Estimates of the indicative rate and range of the return on equity



[8] For simplicity, we have assumed TransGrid's RAB to be $6.1 billion in each year – an assumption that is conservative since TransGrid's RAB is likely to appreciate through time.

In our opinion, a rate of 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP on the basis that:

- the range of return on equity estimates for a benchmark efficient TNSP derived using each form of relevant material is from 8.25 per cent to 11.5 per cent, as illustrated in Figure 1 above.[9]
- most estimates fall within the range of between 10.5 per cent and 11.5 per cent, with the only estimate outside this range being that derived by the Sharpe-Lintner CAPM.[10] However, this result is unsurprisingly given there is a substantial body of evidence suggesting that this model will underestimate the return on equity for a benchmark efficient TNSP because it:
  - is a low beta stock and the evidence shows that the empirical form of the Sharpe-Lintner CAPM underestimates the returns on stocks with a beta less than one; and
  - has an economically significant, positive exposure to a value factor, which is not compensated for in the Sharpe-Lintner CAPM;[11]
- a return on equity of 10.5 per cent is equal to the mid-point of the gamma adjusted return on equity range used by an independent capital market expert, Grant Samuel, to value Envestra, a firm recognised by the AER as comparable to a benchmark efficient TNSP. In that context, it represents an unbiased, independent expert estimate of the return on equity that will in turn be relied upon by shareholders to determine whether or not to accept APA Group's proposal to acquire all the issued capital for Envestra.
- the observed risk premium provided to debt investors following the global financial crisis (GFC) increased by over 150 basis points when compared with pre-GFC debt premiums. A return on equity of 10.5 per cent is consistent with a post-GFC increase in the required return for equity investors in a benchmark TNSP that is comparable (in absolute terms) with the increase observed in the debt market since that same event.[12]

In contrast, the rate of return guidelines published by the AER in December 2013 (guidelines) propose using only one financial model – an empirical version of the Sharpe-Lintner CAPM – to establish the range for the expected return on equity. Of some significance, and consistent with a substantial body of empirical research, the guidelines acknowledge that an empirical version of the Sharpe-Lintner CAPM is biased, but:

- do not attempt to quantify the bias inherent in an empirical version of the Sharpe-Lintner CAPM;
- make an arbitrary adjustment to correct for the bias; and

---

9 Noting that return on equity estimates are rounded to the closest 25 basis points.

10 All references to estimates generated by the Sharpe-Lintner CAPM are those derived by an empirical version of the model that uses the market portfolio of stocks as a proxy for the market portfolio of all risky assets.

11 The evidence indicates that an empirical version of the Sharpe-Lintner CAPM will underestimate the return required on a stock with a positive exposure to a value factor.

12 The long-term historical average MRP is 6.5 per cent and so a firm with an equity beta of 0.7 would have an equity premium of 4.55 per cent. This is approximately 180 basis points lower than the equity premium implied by a return on equity of 10.5 per cent.

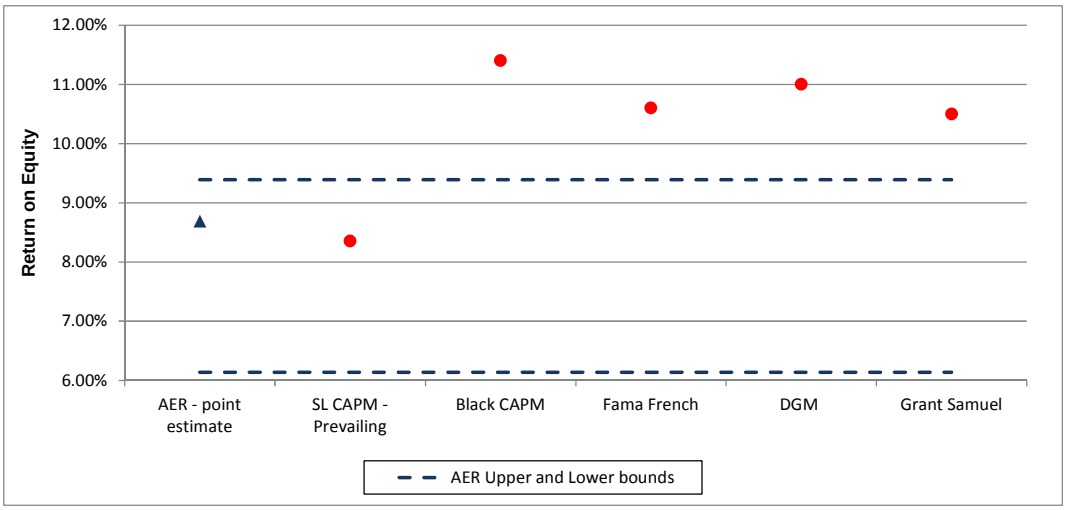
- do not evaluate the extent to which the adjustment made adequately corrects for the bias.

In addition, the approach set out in the guidelines is problematic on account of the fact that:[13]

- it does not assess the relevance of the empirical version of the foundation model proposed to be used to estimate the allowed return on equity;
- there are inadequacies in the assessment criteria that were used to assess sources of relevant material; and

Notwithstanding these methodological problems, the approach set out in the guidelines results in a range that is significantly below estimates derived from other financial models, which do not suffer from the same bias as an empirical version of the Sharpe-Lintner CAPM, as illustrated in Figure 2 below.

Figure 2
Estimates of the indicative return on equity and the AER's range (estimated for the 20 days to 31 March 2014)



Significantly, the insufficiency of the AER's proposed reasonable range for the return on equity can also be demonstrated when it is compared to the premium (over the 10-year CGS yield) provided to BBB corporate debt. We conducted such an analysis and concluded that a significant portion of the reasonable range proposed by the guidelines for the return on equity risk premium falls below the allowed risk premium for BBB corporate debt. It is completely inconsistent with the core principles of financial economics that the premium required by equity investors could fall below that required by debt investors.

Given the methodological problems with the approach proposed in the guidelines and the resulting downwards bias in the estimate of the expected return on equity, we recommend an approach to estimating the expected return on equity that departs from that proposed in the guidelines.

[13] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 30.

1. Introduction

We have prepared this report at the request of Ashurst on behalf of TransGrid. The context of our report is the regulatory proposal to be submitted to the Australian Energy Regulator (AER) by TransGrid on 31 May 2014. TransGrid's regulatory proposal is the first significant step in the AER's revenue determination process for TransGrid's next regulatory control period, 1 July 2014 to 30 June 2019 (the next regulatory period).

Ashurst has requested that we develop and implement a recommended approach to determining TransGrid's return on capital in accordance with the National Electricity Rules (the rules).

The Australian Energy Market Commission (AEMC) amended the rules in 2012, with the most significant changes affecting the way in which the AER determines the allowed rate of return on assets that is in turn used to determine a service provider's total allowed revenue. The stated intention of these amendments was to expand the material considered by the AER.

The amended rules also require the AER to develop and publish a rate of return guideline (the guidelines) that sets out the approach it intends to take to determine the allowed rate of return for electricity and gas service providers.[14] Further, in preparing its TNSP's revenue proposal, TransGrid must document any departures from the methodologies set out in the guidelines and the reasons for that departure.[15]

This report sets out our recommended approach to determining TransGrid's allowed rate of return and describes the reasons for any departure from the approach described in the guidelines.

1.1. Expertise

This report has been prepared by Greg Houston and Brendan Quach with assistance from Dale Yeats and Simon Wheatley.[16]

Over a twenty five-year period, Greg has developed substantial expertise and experience in both the principles of regulatory economics and their application. He has developed this expertise in the course of advising regulators, infrastructure service providers, upstream and downstream users of infrastructure services, as well as governments. Greg's experience encompasses a range of policy, regulatory design and financial economics questions as well as detailed third-party access and price setting matters arising in the electricity, gas, water, wastewater, telecommunications, ports, rail and airport industries.

---

[14] Clause 6A.2.3(a)(1) and (n) of the rules.

AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013.

[15] Clause 6A.1.3(4A) and (4B) of the rules.

[16] Dale Yeats is an Analyst in NERA's Sydney office, while Simon Wheatley is a Special Consultant to NERA based in Melbourne.

Greg has testified on these as well as competition economics matters on numerous occasions before arbitrators, appeal panels, regulators, the Federal Court of Australia, the Australian Competition Tribunal and other judicial or adjudicatory bodies. On proceedings concerning the estimation of the cost of capital, including application of the capital asset pricing model (CAPM), Greg has provided expert reports and associated testimony on six separate occasions.

Greg holds a post-graduate, BSc (Hons) in economics from the University of Canterbury, which he was awarded with first class honours in 1983.

Brendan Quach is a Senior Consultant at the global firm of expert economists, NERA Economic Consulting (NERA).

Brendan Quach has fifteen years of experience as an economist, specialising in regulatory and financial modelling and the cost of capital for network businesses. Brendan has recently advised the Energy Networks Association, Sydney Water, the Queensland Competition Authority, Brisbane Airport, Actew Water and Rio Tinto Coal Australia on a range of cost of capital issues.

Curriculum vitae of both Greg Houston and Brendan Quach are attached to this report at Appendix D.

1.2. Form of the WACC

The rules require the allowed rate of return to be determined such that it achieves the allowed rate of return objective,[17] which is:

> *'The allowed rate of return objective is that the rate of return for a Transmission Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Transmission Network Service Provider in respect of the provision of prescribed transmission services.*[18]

Subject to achieving this objective, the allowed rate of return for a regulatory year must be:[19]

- a weighted average of the return on equity for the regulatory control period in which that regulatory year occurs, and the return on debt for that regulatory year; and
- determined on a nominal vanilla basis that is consistent with the estimate of the value of imputation credits.

Further, the rules require that a post-tax framework is used to determine building block revenue, ie, all tax related matters are excluded from the weighted average cost of capital (WACC) calculation.[20]

---

17 Clause 6A.6.2(b) of the rules.

18 Clause 6A6.2(c) of the rules.

19 Clauses 6.5.2(d), and 6A.6.2(d) of the rules.; Rule 87(4) of the National Gas Rules.

In other words, the rules require TransGrid's WACC to be determined using a combination of the nominal post-tax return on equity and a nominal pre-tax return on debt, whereby the combination of these two parameters is determined by TransGrid's gearing ratio.

It follows that, under this framework, TransGrid's WACC must be calculated as:

$$WACC = (1 - \frac{D}{D+E}) \times R_e + \frac{D}{D+E} \times R_d$$

where:

R_e is the nominal post-tax return on equity;

R_d is the nominal pre-tax return on debt; and

$\frac{D}{D+E}$ is the debt gearing ratio, ie, ratio of the value of debt to the value of debt plus equity.

The above formula illustrates that the determination of TransGrid's allowed rate of return, ie, its WACC, necessitates the estimation of three parameters, ie:

- the gearing ratio;
- the return on debt; and
- the return on equity.

Accordingly, this report sets out our recommended approach to estimating these three parameters, in accordance with the rules.

1.3. Structure of report

The remainder of our report is structured as follows:

- section 2 describes the context for the allowed rate of return objective and its relationship to the achievement of the National Electricity Objective (NEO);
- section 3 highlights the importance of setting the allowed rate of return, as relevant to the achievement of the NEO;
- section 4 sets out our recommended gearing ratio to be used in the WACC calculation;
- section 5 describes our recommended approach to estimating the return on debt and summarises that set out in the guidelines, with particular attention to why a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid would not require the transitional arrangement included in the guidelines;
- section 6 explains our recommended approach to estimating the return on equity, how it differs to the approach in the guidelines, and highlights our concerns with the approach in

[20] Clauses 6.4.2, 6.4.3, 6A.5.3 and 6A.5.4 of the rules; Rule 76, 87A of the National Gas Rules.

the guidelines, namely, the approach to assessing relevant information and to combining relevant material; and

- section 7 sets out our conclusions.

Also attached to this report are a number of appendices. Appendix A discusses the tests that can be used to assess the empirical performance of financial models. Appendix B provides a detailed examination of each of the sources of information relevant to the estimation of the return on equity. Appendix C reproduces our letter of instruction from Ashurst. Appendix D contains the curriculum vitae of Greg Houston and Brendan Quach.

1.4. Declaration

The authors of this report, Mr Houston and Mr Quach, declare that we have both read and understood the Federal Court's Practice Note CM 7, entitled "*Expert Witnesses in Proceedings in the Federal Court of Australia*", and that we have prepared this report in accordance with those guidelines. We confirm that we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld from this report.

2. The national electricity objective

Our recommended approach to determining a rate of return that achieves the allowed rate of return objective has been developed in the context of both the allowed rate of return objective and the wider, NEO, which refers to the promotion of the long-term interests of consumers of electricity. In this section, we discuss the relationship between these objectives.

2.1. Legal framework

The rules state that the allowed rate of return must be determined such that it contributes to the allowed rate of return objective, ie:

> *'The allowed rate of return objective is that the rate of return for a Transmission Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Transmission Network Service Provider in respect of the provision of prescribed transmission services.*[21]

In addition, Section 7 of the National Electricity Law (NEL) sets out the NEO, which is the overarching objective of the NEL. The NEO states that:[22]

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

Further, the rules require the AER to perform its functions in a way that will or is likely to contribute to the achievement of the NEO.[23] Accordingly, the AER has stated that:[24]

> *'This objective [the NEO] is at the heart of all decisions we make when regulating electricity service providers.'*

Importantly, setting the rate of return such that it contributes to the achievement of the rate of return objective, which is the subject of this report, will directly affect the extent to which the NEO is achieved. In other words, setting an incorrect allowed rate of return will be of material detriment to the long run interests of consumers of electricity.

---

21 Clause 6A6.2(c) of the rules.

22 National Electricity Law, section 7.

23 National Electricity Law, section 16(1)(a).

24 AER, *Better Regulation – Rate of Return Guidelines Consultation Paper*, May 2013, page 7.

2.2. Allowed rate of return and its effect on the NEO

It is a well-accepted principle that investment decisions are informed by an assessment of the risk and reward, in what is colloquially known as the risk/reward trade-off.[25]

Therefore, the level of risk expected by an investor in a TNSP will be reflected in the level of return expected on the investment. In other words, for a benchmark TNSP with a given level of risk, the level of investment it attracts will be a product of the expected return associated with investing in the TNSP, ie, the allowed rate of return.

If the allowed rate of return is set such that it is not commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk, the level of investment in transmission services will not be optimal. An allowed rate of return that is set too low will inevitably compromise the ability of a TNSP to attract sufficient capital to undertake the investment necessary to meet its supply obligations, ie, will result in sub-optimal investment in the transmission network. For example, the AER notes that:[26]

> *'If the rate of return is set too low, the network business may not be able to attract sufficient funds to be able to make the required investments in the network and reliability may decline.'*

A sub-optimal level of investment will:

- reduce output and service levels, which will give rise to shortfalls that a consumer would otherwise have been willing to pay for; and
- lead to inefficient input mix decisions that favour operating over capital costs, thereby raising the price of the service above what it would otherwise have been.

To summarise, setting a rate of return that is commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk will, in turn:

- promote efficient investment in the electricity transmission services;
- maintain output and service levels; and
- promote the long-term interest of consumers of electricity.

Conversely, a rate of return that is not commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk will fall short of achieving any of the above conditions, with long lasting detrimental effects on the welfare of consumers. In our opinion, it is therefore important that the correct rate of return is set for the next regulatory period.

---

[25] The trade-off between returns and risk was embodied in the 'expected return – variance rule' used by Markowitz (1952), which is generally accepted as the birth of modern portfolio theory. The 'expected return - variance rule' is that the investor would (or should) want to select a portfolio that gives rise to efficient expected return/variance combinations, ie, those with minimum variance for given expected returns or more and maximum expected returns for given variance or less.

Markowtiz, H., Portfolio Selection, Journal of Finance 7, 1952, pp.77-91.

[26] AER, Better Regulation, Rate of Return Guideline, Factsheet, page 1.

3. Gearing

Gearing is the ratio of the value of a firm's total debt to its total capital, as represented by the value of debt plus equity. In determining the regulated rate of return, gearing is used to weight the proportion of debt and equity finance when formulating the WACC.

In deriving an estimate of the WACC, gearing is also used:

- to adjust the observed equity betas of comparable businesses for the purposes of determining the systematic risk of equity of the benchmark business;[27] and
- as a factor in determining the benchmark credit rating.

Reflecting these multiple roles for an estimate of the applicable gearing in formulating the WACC, the rules require consistency across them.[28]

Analysis undertaken by the AER shows that over the 2002 to 2012 period the average gearing (net debt to market value) of firms with operations in Australia that predominantly involve energy network services was 63.1 per cent.[29] A subset of these firms, which has a longer time series of gearing data, had an average gearing of 59.0 per cent over the 2002 to 2012 period.[30] Based on this analysis, the AER proposes the adoption of a gearing ratio of 60 per cent in the WACC.[31]

A gearing ratio of 60 per cent is also consistent with the gearing assumed in the last three regulatory determinations for TransGrid.[32]

We recommend that TransGrid adopt a gearing ratio of 60 per cent in estimating the WACC to be applied for the 2014/15 to 2018/19 period.

---

[27] Where a comparable firm has a gearing ratio different from the assumed benchmark efficient TNSP, the observed beta of the comparable firm is re-levered to take account of the differences in the gearing ratio. See: AER, *Electricity transmission and distribution network service providers - Review of the weighted average cost of capital (WACC) parameters: Final Decision*, May 2009, pages 265-267.

[28] Clauses 6A.6.2(e)(1) and 6A.6.2 (e)(2) of the rules.

[29] Firms included as comparators include: Alinta; AGL; APA; Group Diversified Utility and Energy Trusts; Envestra Ltd; GasNet; Hasting Diversified Utilities Fund; SP AusNet; and Spark Infrastructure.

See AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 128.

[30] Firms excluded as comparators include: AGL (acquired by Alinta in October 2006); GasNet (acquired by APA in November 2006); and Alinta (sold to various companies in October 2007).

See AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 128.

[31] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 9.

[32] ACCC, *NSW and ACT Transmission Network Revenue Caps 1999/00-2003/04: Final Decision*, 25 January 2000, page 23.

ACCC, *NSW and ACT Transmission Network Revenue Cap TransGrid 2004–05 to 2008–09: Final Decision*, 25 April 2005, page 161.

AER, *Orders varying TransGrid transmission determination 2009–10 to 2013–14*, March 2010, page 1.

4. Return on Debt

The requirements in relation to the return on debt component of the *allowed rate of return* are more complex than those in relation to the return on equity. The rules state that it must:

> "be estimated such that it contributes to the achievement of the *allowed rate of return objective*."[33]

In so doing the return on debt may be estimated using a methodology that:[34]

- results in either the same or different estimates in each regulatory year; and
- adopts a methodology that reflects the return required by debt investors in a benchmark efficient entity that either:
  - raises all its debt at the time of the AER's determination; or
  - raises all its debt over an historical period prior to the AER's determination; or
  - some combination of the two.

In adopting one or other of these approaches, regard must be had to (among other things):

> "the desirability of minimising any difference between the return on debt and the return on debt of a benchmark efficient entity referred to in the *allowed rate of return objective;*"[35]

and

> "any impacts…on a benchmark efficient entity referred to in the *allowed rate of return objective* that could arise as a result of changing the methodology that is used to estimate the return on debt from one *regulatory control period* to the next."[36]

For present purposes, we assume that the above provision applies to the proposed change from the methodology applied in the 2009-2014 regulatory control period to that to be applied in the next regulatory control period, and that it presupposes the continued existence of a benchmark efficient entity across both periods. We infer from this that, for the purposes of TransGrid's next price reset, the benchmark efficient entity for the earlier period was the benchmark efficient entity that was the subject of the AER's 28 April 2009 determination.

4.1. Recommended approach to the return on debt

We recommend an indicative return on debt allowance for 2014/15 of 7.72 per cent. In due course, this allowance should be updated to include estimates of the benchmark return on debt for the remaining months of the 2013/14 financial year.

---

[33] Clauses 6A.6.2(i) and 6A.6.2(j) of the rules.

[34] Clause 6A.6.2(k) of the rules.

[35] Clause 6A.6.2(k)(1) of the rules.

[36] Clause 6A.6.2(k)(4) of the rules.

Table 4.1, sets out the annual estimates of the yield on non-financial corporate bonds with a term of 10 years and a credit rating of BBB, as published by the Reserve Bank of Australia (RBA) over the 10-year historical or trailing period prior to 2014/15.[37]

Table 4.1
RBA Aggregate Measures of Australian Non-Financial Corporate Bonds: (10-year BBB Yields)

Number of observations	Year	Average
12	2005	6.31
12	2006	6.79
12	2007	7.72
12	2008	9.91
12	2009	9.72
12	2010	7.90
12	2011	7.81
12	2012	7.06
12	2013	6.98
3*	2014*	6.98
Average		7.72*

* *Indicative rate, based observations for January to March 2014.*

We recommend using all available data to estimate the historical trailing average cost of debt for a benchmark efficient entity, thereby avoiding the risk that the estimate is affected by selective sampling.

Further, this trailing average should be updated annually:

- to include updated annual observations of the yield on non-financial Australian corporate bonds of a term of 10 years and a credit rating of BBB as reported by the RBA; and
- to remove the oldest annual observation.

4.2. Approach to the return on debt set out in the guidelines

This section sets out our recommended approach to estimating the return on debt and discusses those aspects that differ from that proposed in the guidelines.

[37] RBA, *Statistical Table F3 - Non-financial corporate bond yields*.

In our opinion, a benchmark efficient TNSP is a 'pure play, regulated transmission network service provider (TNSP) operating within Australia'. In other words, such a TNSP is:

- a 'pure play' business, being that which only offers regulated electricity transmission network services;
- a 'regulated TNSP' that is subject to economic regulation under Chapter 6A of the rules;
- 'operating in Australia', so that regard should be had to the conditions of operating a business in Australia, including the regulatory regime, tax laws, industry structure, and broader economic environment.

Notably, there is no publicly listed business in Australia that perfectly matches a benchmark efficient TNSP. The only listed business that owns and operates an electricity transmission network is SP AusNet. However, SP AusNet is not a 'pure play' TNSP since, in addition to owning the Victorian transmission network, it also owns both gas and electricity distribution networks in Victoria.[38]

We therefore recommend that, for the purposes of estimating a rate of return for a benchmark efficient TSNP, consideration should be had to a 'pure play, regulated *energy* network business operating within Australia'. This definition is consistent with the benchmark efficient entity adopted by the AER in the guidelines. [39]

On this basis, a benchmark entity would issue debt with the following characteristics:

- Australian corporate debt;
- benchmark credit rating of BBB+;[40] and
- a term at issuance of 10 years.[41]

Again, this is consistent with the debt benchmark adopted by the AER in the guidelines. [42]

In order to estimate the cost of debt for this benchmark, we recommend that TransGrid use a third-party data service provider as the source for yield information. In our opinion, a third-party data service provider is essential to allow the return on debt to be updated automatically. The use of a third-party data service provider is consistent with the guidelines. We recommend that yield data published by the RBA be used to establish the return on debt allowance for TransGrid. The reasons for using RBA data are discussed in section 4.3.

---

38 SP AusNet, *Statutory Annual Report 2013*, May 2013, page 27

39 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, pages 32-35.

40 For the reasons set out in the AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, pages 152-157 a BBB+ credit rating is in our opinion a the best estimate of the benchmark credit rating.

41 For the reasons set out in the AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, pages 135-147 a term of 10 years is in our opinion the best estimate of the average term at issuance of debt issued by regulated Australian energy networks.

42 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 126.

The new rate of return framework allows the return on debt to reflect a benchmark efficient entity that either:[43]

- raises all its debt at the time of the AER's determination; or
- raises all its debt over an historical period prior to the AER's determination; or
- adopts some combination of the two.

We recommend estimating the return on debt by reference to a 10-year trailing average of benchmark debt yields. In particular, the return on debt allowance should be established by:

- estimating the annual average yield on benchmark debt over each of the preceding 10 years; and
- calculating the arithmetic average of 10 annual observations to determine the return on debt for a given regulatory year.

Further, we recommend that TransGrid update the return on debt allowance annually to maintain a 10-year trailing average. In our opinion, adopting a trailing average:

- provides a reasonable approximation of the financing practices of a benchmark efficient TNSP that periodically issues long-term debt to minimise the refinancing risk associated with investing in long lived assets;
- provides a benchmark efficient entity with the ability to manage interest rate risk arising from a mismatch between the regulatory return on debt allowance and the return on debt, without exposing the entity to substantial refinancing risk;
- ensures that movements in the market return on debt from year to year are reflected in the return on debt allowance; and
- offers a benchmark TNSP with a staggered debt portfolio a reasonable opportunity to recover at least its efficient debt financing costs.

We note that in the guidelines the AER concludes that:

> *'We consider that holding a portfolio of debt with staggered maturity dates is likely an efficient debt financing practice of the benchmark efficient entity operating under the trailing average portfolio approach.*
>
> *We consider that the regulatory return on debt allowance under the trailing average portfolio approach is, therefore, commensurate with the efficient debt financing costs of the benchmark efficient entity.'*[44]

We concur with the AER's assessment and so, in our opinion, setting the return on debt equal to a trailing average yield of benchmark debt will contribute to the achievement of the *allowed rate of return objective.*

---

[43] Clause 6A.6.2(j) of the rules.

[44] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 102.

However, the guidelines also propose to move regulated energy networks to a trailing average through the adoption of a mechanism that provides for a gradual transition from the current "on the day" to a trailing average return on debt allowance. The transition mechanism adopted by the AER was first proposed by the Queensland Treasury Corporation (QTC). In contrast, we recommend that TransGrid immediately adopt a trailing average portfolio approach to set the return on debt allowance.

In our opinion, the imposition of the transition mechanism on TransGrid is inconsistent with the requirements of the rules, including the Allowed Rate of Return Objective and, therefore the NEO, and the revenue and pricing principles.

In particular, the conclusion that the efficient debt financing practice of a benchmark efficient entity under the current 'on-the-day' approach would be to hold a debt portfolio with staggered maturity dates while using swap transactions to hedge underlying interest rate exposure for the duration of a regulatory control period is inconsistent with:

- past regulatory decisions made by the AER; and
- the risks faced by a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid.

We discuss these issues in greater detail in section 4.4.

4.3. Independent third-party data service

The guidelines propose to use estimates of the benchmark debt yield produced by an independent third-party data service provider.[45] We concur with this approach and recommend that the return on debt be estimated using yields published by the RBA.[46]

There are currently only two possible third-party data service providers of Australian corporate bond yields, ie:

- the non-financial corporate bond yields for 10-year BBB rated corporate debt published by the RBA; and
- the Bloomberg Valuation (BVAL)[47] curve for 7-year BBB rate corporate debt, which must then be extrapolated to a 10-year yield.[48]

There are a number of compelling reasons to use the RBA as the third-party data service provider for Australian corporate bond yields. First, the RBA is the only data service provider to publish an estimate of the 10-year BBB yield. The reason that the RBA is able to publish a

---

45 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 126.

46 RBA, *Statistical Table F3 - Non-financial corporate bond yields*.

47 We note that the BVAL curve was first published in November 2013, this replaces the legacy Bloomberg Fair Value (BFV) bond pricing service that is to be discontinued.

48 We note that in the AER's most recent decisions the extrapolation of the 7-year yield to a 10-year yield has been achieved through an analysis of 'paired bond' analysis. See AER, *Access arrangement final decision: APA GasNet Australia (Operations) Pty Ltd 2013-17*, March 2013, page 24.

10-year yield is that it accesses a richer sample of comparable bonds than Bloomberg, which only samples Australian dollar denominated debt. [49]

Further, the BVAL 7-year BBB curve must be extrapolated to a 10-year yield. In recent decisions the AER has adopted a range of methods for undertaking this extrapolation, including:

- the use of 'paired bonds' to estimate the debt risk premium increment per annum by reference to pairs of bonds issued by the same corporation with terms close to 7 and 10 years;[50] or
- the use of the last historical spread between the Bloomberg 7 and 10-year AAA rated fair value curves (FVCs), to extrapolate the 7-year debt risk premium estimate to 10 years.[51]

A requirement to extrapolate the 7-year BVAL diminishes a number of the stated advantages of using a third-party data service provider because the extrapolation:

- is not undertaken by the third-party data provider and is instead produced by either the AER or the regulated entity;
- has the potential to introduce considerable scope for debate, since the choice of extrapolation methodology is contentious;[52] and
- cannot be automatically updated and so must be assessed each time the return on debt is estimated.

We also note that the AER has in the past been highly critical of the Bloomberg estimates:

> *'There is evidence to suggest that the behaviour of the Bloomberg fair value estimates since the onset of the GFC is somewhat counterintuitive… [Bloomberg data] implies that prevailing conditions in debt markets are more risky now than during the GFC. This is counterintuitive, as substantial evidence indicates that debt market conditions have improved significantly.'*[53]
>
> *'…without an in depth understanding of Bloomberg's methodology, analysis can only be based on conjecture about how its fair value estimates are derived. Given the*

---

[49] Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

[50] AER, *SP AusNet Transmission determination 2014-15 to 2016-17: Final decision*, January 2014, page 23.

[51] AER, *APT Petroleum Pipeline Pty Ltd Access Arrangement Final Decision Roma to Brisbane Pipeline 2012–13 to 2016–17*, Final Decision, August 2012, page 62.

[52] The possibility for debate was recognised by the AER when it first accepted the 'paired bond' approach and stated that:

The AER considers that all three of the extrapolation approaches have shortcomings, and all three rely on contentious assumptions.

See, AER, *Powerlink Transmission determination 2012–13 to 2016–17: Final decision*, April 2012, pages 184-185.

[53] AER, *APT Allgas Access Arrangement proposal for the QLD gas network 1 July 2011 to 30 June 2016*, Final Decision, June 2011, page 37.

> *limited ability to assess Bloomberg's fair value methodology, coupled with the contrary behaviour of Bloomberg's BBB rated fair value estimates (in comparison to independent market commentary), the AER maintains its position that it should remain cautious of relying solely on Bloomberg's fair value estimates to establish the benchmark DRP.'*[54]

Further, the RBA is a highly regarded institution that is capable of providing high quality econometric data including reliable estimates of the yield on BBB 10-year debt. There is no reason to expect that the RBA would derive estimates of corporate bond yields that are subject to bias.[55]

The guidelines identify a number of advantages of using a third-party data service provider, ie:[56]

- the data are provided for use by market practitioners and developed independently from regulatory processes;
- such providers employ a comprehensive financial database constructed by finance experts that necessarily require the exercise of judgement in terms of data selection and adjustments to yields; and
- such providers reduce the scope for debate on debt yields and can be used to update the return on debt automatically.

In our opinion, the estimates of the non-financial Australian corporate bond yields published by the RBA contain these meritorious characteristics. An article published by the RBA at the commencement of this series concludes that:

> *'The estimation method is simple, transparent and robust in small samples. The bank will commence publishing monthly credit spreads from December 2013. The newly constructed credit spread measures will provide richer information than is currently available publicly, allowing the public – researchers, investors, regulators and others – to examine developments in the Australian credit market in more detail.'*[57]

---

[54] AER, *APT Allgas Access Arrangement proposal for the QLD gas network 1 July 2011 to 30 June 2016*, Final Decision, June 2011, page 144.

[55] The RBA *Code of Conduct* articulates core values including:

- **Promotion of the Public Interest** - We serve the public interest. We ensure that our efforts are directed to this objective, and not to serving our own interests or the interests of any other person or group.
- **Integrity** - We are honest in our dealings with others within and outside the Bank. We are open and clear in our dealings with our colleagues. We take appropriate action if we are aware of others who are not acting properly.
- **Excellence** - We strive for technical and professional excellence.
- **Intelligent inquiry** - We think carefully about the work we do and how we undertake it. We encourage debate, ask questions and speak up when we have concerns.

[56] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 127.

[57] Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December, pages 24-25.

The guidelines also identify a number of potential shortcomings associated with using a third-party dataset, including that:[58]

- the third-party data service provider may stop publishing data;
- the third-party data service provider may stop publishing data at maturities and/or credit ratings that are consistent with the definition of the benchmark efficient TNSP;
- the methodology of the third-party data service provider may not be shared publicly; and
- the lack of transparency around the methodology may also reduce confidence in the consistency of estimates over time and between different points of the curve.

Having regard to these concerns we note that:

- the RBA has indicated that it will continue to publish estimates of the non-financial corporate bond yields monthly from December 2013, including the yields for 10-year BBB securities;[59] and
- the RBA has been completely transparent and published its methodology for estimating the credit yields.[60]

In contrast, the methodology used to estimate the BVAL is proprietary and so is not transparent. Of some significance, we note that the Independent Pricing and Regulatory Tribunal (IPART) also emphasised the importance of a transparent methodology when it proposed to start using the RBA data to estimate the debt margin for reviews starting from 1 July 2014.[61] In explaining its decision, IPART noted that:

> *'… using the RBA's series would further increase transparency of our WACC determination process as data we use to calculate debt margins will be readily available through the RBA's website.'*[62]

However the AER has indicated a concern that the RBA only publishes an end-of-month estimate, ie:

> *'The RBA currently publishes estimates of credit spreads for only the last day of a given month. Dependent on the length of the proposed averaging period, therefore,*

---

58 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 128.

59 Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December, page 1.

60 See Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

61 IPART, *New Approach to Determining the Cost of Debt: Use of the RBA's Corporate Credit Spread*, February 2014, page 5.

62 IPART, *New Approach to Determining the Cost of Debt: Use of the RBA's Corporate Credit Spread*, February 2014, page 3.

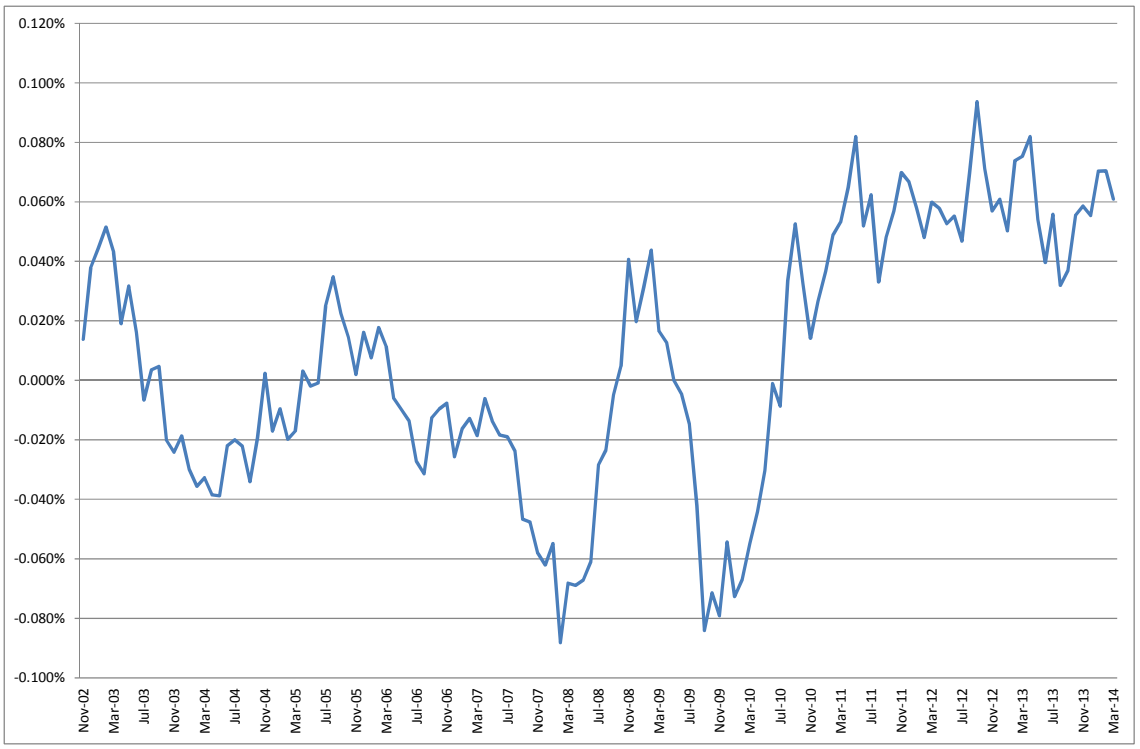
> *this may lead to an estimate of the return on debt that reflects short term market fluctuations.'*[63]

Although this may be an issue when the annual return on debt yield is sampled over short periods, it is inconsequential if the annual yield is estimated over the full year. Using data from Bloomberg (which publishes daily data), the difference between annual yields using end-of-month as compared with daily data for the Bloomberg FVC for BBB 7-year debt shows that, over the period December 2001 to March 2014:

- the average difference is 0.7 basis points; and
- the maximum difference is 9.4 basis points.

Figure 4.1 illustrates the difference between using end-of-month or daily observation to measure an average annual yield.

Figure 4.1
Difference between end-of-month and daily estimates of the annual yield (Bloomberg FVC 7-year BBB)



This difference is further diminished when a 10-year trailing average is adopted. Again, using Bloomberg data (ie, FVC for 7-year BBB corporate debt) the difference between the 10-year

[63] AER, *Return on debt: Choice of third party data service provider: Issues Paper*, April 2014, second paragraph section 4.4.6.

trailing average using end-of-month as compared with daily data over the period November 2001 to March 2014, shows that:

- the average difference is 0.4 basis points; and
- the maximum difference is 1.4 basis points.

In our opinion, a maximum difference of 1.4 basis points between the 10-year trailing average using daily and end-of-month data is immaterial.[64]

Table 4.2 sets out again the historical yields on Australian corporate debt of a 10-year maturity and a BBB credit rating.

Table 4.2
RBA Aggregate Measures of Australian Non-Financial Corporate Bonds: (10-year BBB Yields)

Number of observations	Year	Average
12	2005	6.31
12	2006	6.79
12	2007	7.72
12	2008	9.91
12	2009	9.72
12	2010	7.90
12	2011	7.81
12	2012	7.06
12	2013	6.98
3*	2014*	6.98
Average		7.72*

* *Indicative rate, based on observations for January 2014 to March 2014.*

In our opinion, the RBA data for non-financial corporate bond yields represents the best source of information on the yields for benchmark debt, because:

[64] We note that the AER has stated its intention to round the return on equity estimate to the closest 25 basis points and states that this is immaterial. On this basis a 1.4 basis point difference in the return on debt, which translates into less than 1 basis point difference in the overall WACC, would also be immaterial. See AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 65.

- the RBA is the only third-party data service provider that currently provides an estimate of the 10-year BBB corporate bond yield whereas, in contrast, Bloomberg only produces an estimate of the 7-year BBB corporate bond yield;
- the RBA is the only third-party data service provider that discloses the methodology used to estimate the corporate bond yield whereas, in contrast, Bloomberg's methodology is proprietary;
- the RBA calculates the Australian dollar equivalent yield on foreign currency denominated bonds issued by Australian corporations and so uses a richer sample set than Bloomberg, which only samples Australian dollar denominated debt;[65]
- the RBA series appears to perform better than the Bloomberg Australian dollar FVCs in the period during the global financial crisis (GFC);[66] and
- the RBA is a highly regarded institution capable of providing high quality econometric analysis and, for these reasons, its assurance of the continued publication of the 10-year BBB corporate bond yield is credible.[67]

4.4. The adoption of a trailing average

The guidelines propose that the return on debt allowance will be established on the basis that all businesses are to transition to a trailing average return on debt.[68] The proposed transition mechanism is set out in the Appendices to the guidelines as:[69]

- in year 1 – the entire return on debt allowance would be set at the prevailing rate, averaged over the agreed averaging period;
- in year 2 – the return on debt allowance would be a weighted sum of the prevailing rates in the first and second years (with weights of 0.9 and 0.1, respectively);
- in year 3 – the return on debt allowance would be a weighted sum of the prevailing rates in the first, second and third years (with weights of 0.8, 0.1 and 0.1, respectively);
- etc; and
- in year 10 – the return on debt allowance would be an equally weighted sum of the prevailing rates in the preceding 10 years.

---

65 Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

66 See footnote 26, Arsov I, M Brooks and M Kosev (2013), 'New Measures of Australian Corporate Credit Spreads', RBA Bulletin, December.

67 We note that, in the past, commercial third-party data providers have ceased publishing a 10-year BBB yield, with Bloomberg ending its 10-year BBB FVC in August 2009 and CBASpectrum ending its 10-year BBB+ series in August 2010. See: AER, *Victorian electricity distribution network service providers - Distribution determination 2011–2015: Final Decision*, October 2010, pages 490 and493.

68 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 120.

69 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, pages 131-135.

In assessing the application of the transition mechanisms for the return on debt, we have been asked by Ashurst to consider two alternative formulations of the "benchmark efficient entity" that establishes the reference point for the allowed rate of return. Those two formulations are that:

- the benchmark efficient entity is to mimic the efficient financing practices that would be expected in an effectively competitive market; or, alternatively
- that the benchmark efficient entity is to mimic the efficient financing practices of an entity subject to a previous regulatory regime.

We find that under both formulations of the "benchmark efficient entity" a transition mechanism is unnecessary and inconsistent with the allowed rate of return objective.

Under the first formulation, the benchmark efficient entity is conditioned by the outcomes of a competitive market. We discuss in section 4.4.1 that a benchmark efficient entity that provides services by means of long lived fixed assets would adopt a debt financing practice that involved the periodic issuance of fixed rate corporate debt. In consequence, at any point in time the average yield on the debt portfolio that a benchmark efficient entity has outstanding would be a historical trailing average of benchmark debt yields. It follows that no transitional mechanism is required when introducing a regulatory methodology that reflects a trailing average return on debt allowance.

Further, we note that TransGrid already adopts the debt financing practices of a benchmark efficient entity. In particular, at any point in time the average yield on TransGrid's debt portfolio is close to a historical trailing average of benchmark debt yields. This reinforces our conclusions that no transitional mechanism is necessary, since to do so would cause TransGrid to incur (or receive) a windfall loss (gain), simply though the use of a transition mechanism when no transition is necessary.

Under the second formulation, the benchmark efficient entity is conditioned by the existence of a previous regulatory regime. In particular, the debt raising practices of the benchmark efficient entity are conditioned by the regulatory regime applying hitherto, which adopts an 'on-the-day' approach to the determination of the return on debt allowance.

However, the AER's conclusion as to the way in which the efficient debt financing practice of a benchmark efficient entity would be conditioned by the current 'on-the-day' approach is inconsistent with:

- all past regulatory decisions that the AER itself has made; and
- the conduct of a benchmark efficient entity with a similar risk profile to TransGrid.

In our opinion, there is no unique approach to debt financing that can properly be characterised as being that of an efficient benchmark entity operating under an 'on-the-day' regulatory approach to determining the return on debt. This conclusion is consistent with that drawn by the AEMC when it stated in the rule change determination that:

> *'the rule requires the regulator to have regard to the characteristics of a benchmark service provider and how this influences assumptions about its efficient debt management strategy. As highlighted by SFG in its report, debt management*

practices tend to differ according to the size of the business, the asset base of the business, and the ownership structure of the business.'[70]

An efficient benchmark entity with a similar risk profile to TransGrid would not economically be able to hedge the risk associated with the underlying risk-free rate element of the 'on–the-day' approach. Rather, it would periodically issue fixed rate debt. Under this debt management practice, the benchmark efficient entity would accept the additional risk that its actual debt costs will diverge from the return on debt allowance, but would also avoid the additional costs of hedging that risk. In consequence, the benchmark efficient entity would be subject to a greater degree of interest rate risk, but also would achieve a higher long run average return on assets. We discuss this point in greater detail in section 4.4.2.

4.4.1. A benchmark efficient entity conditioned by a competitive market

Ashurst has asked us to consider the debt management practices of a benchmark efficient entity that is conditioned by operating in an effectively competitive market. This formulation of the benchmark efficient entity is consistent with the statements made by the AEMC when developing the new WACC framework, ie:

'In its draft rule determination, the Commission considered that the long-term interests of consumers would be best served by ensuring that the methodology used to estimate the return on debt reflects, to the extent possible, the efficient financing and risk management practices that might be expected in the absence of regulation.'[71]

In assessing the debt management practices of a benchmark efficient entity, we first observe that assets in which a regulated energy network service provider must invest are predominately long lived. By way of example, we have previously calculated the forecast average standard life of assets in the current regulatory period to be, for:[72]

- *NSW DNSPs, 42 years;*
- *Vic DNSPs, 43 years;*
- *Qld DNSPs, 45 years;*
- *ETSA Utilities (SA), 45 years;*
- *ActewAGL (ACT), 44 years; and*
- *for transmission network service providers (TNSPs), 39 years.*

To finance these capital investments a mixture of debt and equity is used by the entity. Debt finance is almost always provided for specified terms, in sharp contrast to equity finance,

---

[70] AEMC 2012, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper, 29 November 2012, Sydney, pages 84-85.

[71] AEMC 2012, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper, 29 November 2012, Sydney, page 76.

[72] NERA and PwC, *Trailing Average Approaches to the Cost of Debt Allowance: A joint report for the Energy Networks Association*, 16 April 2012, page 3.

which is generally provided for an unspecified term. However, with average asset lives of close to 40 years it is neither possible nor economic for TNSPs to raise debt for such terms. As a result, TNSPs must periodically refinance their debt. This in turn gives rise to refinancing risk such that the borrower cannot repay its debt obligations when they fall due,.

A benchmark efficient entity operating in an effectively competitive market can be expected to minimise its exposure to refinancing risk, even though such risk can never be completely eliminated. An entity can minimise refinancing risk by:

- issuing longer term debt, thereby limiting the number of occasions that debt must be rolled over; and/or
- staggering its debt maturity dates over time, thereby minimising the amount of debt that must be refinanced in any given time period.

Counterbalancing the desire for longer term debt and evenly spaced debt issues is that:

- borrowers generally must pay relatively higher yields for longer term debt, since investors in long dated debt forgo the potential to seek higher returns for an extended period; and
- the pattern of borrowing will be affected by fluctuations in the market cost of debt.

In other words, in the absence of any regulatory distortions a benchmark efficient entity would finance its long lived assets with a portfolio of long term debt with staggered maturity dates, thereby optimising the trade-off between refinancing risk and the overall cost of debt.

We also note that a benchmark efficient entity operating in a competitive market would have no reason to accept the additional expense of entering into 'pay fixed – receive floating' swap contracts to hedge interest exposure for a fixed five-year duration.

In consequence, a benchmark efficient entity's average cost of debt at any point in time will be a historical trailing average of fixed rate debt yields. It follows that, under this formulation of the benchmark efficient entity, no transitional mechanism would be required to facilitate the introduction of a trailing average return on debt allowance.

Further, we note that TransGrid's actual debt management practices already mimic those of a benchmark efficient entity conditioned by operating in a competitive market. In particular, TransGrid currently holds a portfolio of fixed rate debt, reflecting that different tranches of debt have periodically been issued in the past. Again it follows that the adoption of a return on debt allowance that reflects the practice that TransGrid already adopts means that no transitional mechanism is necessary.

4.4.2. Benchmark efficient entity conditioned by a regulatory regime

The AER's decision to impose a transition mechanism for all entities is predicated on the conclusion that, under the current 'on-the-day' approach, a benchmark efficient entity would:[73]

- periodically issue floating rate corporate debt, prior to the regulatory determination; and
- at the time that the risk-free rate was set for the next regulatory control period, enter into 'pay fixed – receive floating' swap contracts to hedge interest exposure for the duration of a regulatory period.

This conclusion is principally based on the stated debt management approach adopted by a number of small to medium sized regulated business. The particular network service providers (NSPs) that have indicated that they manage their debt portfolio through staggered debt issuances and then enter swap agreements to fix the underlying risk-free rate in line with the regulatory period are:[74]

- SA Power Networks;[75]
- Powercor;
- SP AusNet;
- CitiPower; and
- Jemena.

On the basis of this information, the AER concludes that its proposed transition mechanism is appropriate because:[76]

- the benchmark efficient firm will require transitional arrangements to move from its hypothetical debt financing practices under the current 'on–the-day' approach to those that it is assumed to adopt under the new trailing average approach;
- it is likely to contribute to the achievement of the allowed rate of return objective and other requirements of the rules;
- it provides a gradual transition to the trailing average approach, given a possible change in prior expectations regarding the regulatory framework by stakeholders;
- of practical considerations regarding use of historical information (and possible disagreement) to calculate the return on debt; and

---

[73] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 106.

[74] CitiPower, Powercor Australia and SA Power Networks, Response to the AER's Draft Rate of Return Guideline, 11 October 2013, page 7.

SP AusNet, Rate of Return Guideline Consultation Paper, 21 June 2013, page 1.

Jemena, Submission on the Rate of Return Guidelines – AER Issues Paper, 15 February 2013, page 15.

[75] SA Power Networks was formerly known as ETSA Utilities.

[76] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 120.

- it minimises incentives for potential strategic behaviour of service providers.

In our opinion, the imposition of the proposed transition mechanism for TransGrid does not contribute to the achievement of the *Allowed Rate of Return Objective* and, accordingly, does not contribute to the National Electricity Objective.

In particular, the AER's conclusion in relation to the efficient debt financing practice of a benchmark efficient entity under the current 'on-the-day' approach is inconsistent with:

- the AER's past regulatory decisions; and
- the conduct of a benchmark efficient entity with a similar risk profile to TransGrid.

In its reasoning, the AER also places weight on the observation that both government and small to medium sized NSPs seek to minimise the difference between their debt costs and the debt allowance benchmark.[77] However, while it is uncontroversial that businesses seek to minimise risk, they do not pursue this objective at any cost. In this section we discuss the trade-off between the amount of risk that can be avoided and the cost of retiring this risk. Further, we highlight that the trade-off is different for a business with a similar degree of risk as that which applies to TransGrid compared to that of a small to medium sized regulated energy networks.

4.4.2.1. Past AER decisions on the debt benchmark

The AER's conclusion in the guidelines is that a benchmark efficient entity confronted with an 'on-the-day' approach to estimating the return on debt would hold a floating rate debt portfolio with staggered maturity dates and use swap transactions to hedge interest rate risk exposure for the duration of a regulatory control period. However, this conclusion in relation to the debt management practices of a benchmark efficient entity is inconsistent with the AER's own decisions in the period from 2004 to 2014, during which it set return on debt allowances using an 'on–the-day' approach.[78]

In 2004 the AER accepted the advice of the Allen Consulting Group (ACG) on the appropriate approach to determining the level of compensation for debt transaction costs that should be included in the maximum annual revenue of a regulated energy network, ie:

---

[77] The AER cites the conclusions and statements of SFG and NSW TCorp that NSP seeks to minimise the difference between debt costs and the debt allowance. See AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, pages 106-107.

[78] For example:

- ACCC, *NSW and ACT Transmission Network Revenue Cap TransGrid 2004–05 to 2008–09: Final Decision*, 25 April 2005;
- AER, *TransGrid Transmission Determination 2009–10 to 2013–14*, 27 April 2009;
- AER, *ElectraNet Transmission determination 2013-14 to 2017-18: Draft decision*, November 2012; and
- AER, *SP AusNet Transmission determination 2014–15 to 2016–17: Final decision*, January 2014.

> *'In the benchmark approach for financing arrangements employed by regulators in Australia, the benchmark debt margin and benchmark transaction return on raising debt are as follows:*
>
> - ***Benchmark debt margin** — the debt margin for fixed rate bonds for the appropriate notional credit rating (for the notional gearing measured against the Regulated Asset Value (RAV)) and tenor, as estimated by a credible, independent source (such as the CBASpectrum service).*
> - ***Benchmark debt raising cost** — the transaction return on re–financing fixed rate bonds to the value of the notional gearing component of the utility measured against the RAV assuming a consistent notional credit rating.'*[79] [emphasis added]

In other words, ACG identified the benchmark debt that a regulated energy network is assumed to issue as being *fixed rate debt.* As a result, the allowance for benchmark debt raising costs includes:[80]

- gross underwriting fees;
- legal and roadshow costs;
- company credit rating;
- issue credit rating
- registry fees; and
- paying fees.

Importantly, this approach rejects the proposition that a regulated energy network should be compensated for the costs of entering into swap contracts, ie:

> *Two other potential components of the fees paid for issuing debt that we consider should be excluded from the derivation of the allowance for the transaction return on debt are the dealer swap margin and credit wrapping fees.*
>
> …
>
> *Turning first to the dealer swap margin, the margin reflects the return on converting floating rate debt into fixed rate debt*[81]

ACG did not include any allowance for the cost of entering into 'pay fixed – receive floating' swap contracts necessary to hedge the underlying risk-free rate of floating rate debt at the start of the regulatory control period.

---

[79] ACG, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004, page 5.

[80] ACG, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004, page xviii.

[81] ACG, *Debt and Equity Raising Transaction Costs: Final Report*, December 2004, pages xix-xx.

The ACG approach to compensating the cost of raising benchmark debt has been consistently applied by the AER in all subsequent energy determinations.[82] In one of its most recent decisions, the AER states:

> *'To decide on the total benchmark debt raising cost allowance, we rely on a method that the Allen Consulting Group (ACG) developed:*[83]
>
> - *First, a benchmark unit rate for debt raising costs is calculated. This unit rate, expressed in basis points per year, is determined based on estimates of:*
> - *the transaction costs that a prudent service provider, acting efficiently, would incur in raising debt*
> - *the expected timing and frequency of these transaction costs*
> - *the number of 'standard' bond issuances required over the regulatory control period to finance the benchmark portion of the TNSP's RAB.*
> - *Second, the debt raising cost allowance is determined in the post-tax revenue model as the product of the benchmark unit rate and the debt portion of the TNSP's RAB.'*[84]

A similar approach was adopted in the AER's 28 April 2009 final determination for TransGrid. The AER calculated the debt risk premium by reference to FVCs and noted that 'fair yields represent estimates for fixed interest bonds, rather than variable bonds'.[85] In addressing benchmark debt raising costs, the AER noted that the benchmark firm was a 'pure play regulated electricity network operating in Australia without parent ownership'.[86] The AER stated that 'the benchmark firm was assumed to issue public debt in the Australian market'.[87] The AER adopted the ACG methodology and made allowance for distinct categories of debt-raising costs.[88] No separate allowance was made for hedging costs or swap fees.

---

[82] For example:

- AER, *SP AusNet Transmission determination 2014–15 to 2016–17: Final decision*, January 2014, pages 38-39.
- AER, *ElectraNet Transmission determination 2013-14 to 2017-18: Draft decision*, November 2012, page 162;
- AER, *TransGrid Transmission Determination 2009–10 to 2013–14*, 27 April 2009, pages 85-86; and
- ACCC, *NSW and ACT Transmission Network Revenue Cap TransGrid 2004–05 to 2008–09: Final Decision*, 25 April 2005, pages 143-145.

[83] ACG, *Debt and equity raising transaction costs—Final report*, December 2004.

[84] AER, *SP AusNet Transmission determination 2014–15 to 2016–17: Draft decision*, August 2014, page116.

Note that this draft decision was accepted in the AER's final decision, see AER, *SP AusNet Transmission determination 2014–15 to 2016–17: Final decision*, January 2014, pages 38-39.

[85] AER, *TransGrid transmission determination 2009–10 to 2013–14: Final decision*, 28 April 2009, page 60.

[86] AER, *TransGrid transmission determination 2009–10 to 2013–14: Final decision*, 28 April 2009, page 201

[87] AER, *TransGrid transmission determination 2009–10 to 2013–14: Final decision*, 28 April 2009, page 202.

[88] AER, *TransGrid transmission determination 2009–10 to 2013–14: Final decision*, 28 April 2009, page 209.

In other words, in all its regulatory decisions since receiving the ACG report in December 2004, the AER has determined that a benchmark efficient entity would issue fixed rate debt and that only these costs will be included in the revenue allowances of regulated energy networks. In no decision has the AER provided for a business to recover the costs of entering into the 'pay fixed – receive floating' swap contracts necessary to hedge the underlying risk-free rate of floating rate debt at the start of the regulatory control period.

4.4.2.2. Too large to hedge floating rate debt

The explanatory statement for the guidelines divides the risks to which service providers are exposed in delivering regulated services into business and financial risks.[89] One practical question that arises is whether the risk, and in particular the financing risk, faced by large service providers (ie, those with relatively large amounts of debt) is similar to the risk faced by smaller entities (with smaller amounts of debt). Unless the risks are similar, it would be a mistake to adopt a single benchmark efficient entity to cover all service providers.

In its report for the AEMC, SFG Consulting (SFG) reviewed and analysed the debt management practices used by regulated energy networks and noted that they tend to differ according to:

a) *'The size of the business: small to medium sized businesses can make use of interest rate swap contracts, whereas the swap market may not have sufficient depth to accommodate the requirements of very large businesses;*[90]

It was recognised by SFG that some businesses are likely to be 'too large to lock in interest rates using swap contracts'. SFG observed that:

> *'A number of submissions have indicated that some businesses are simply too large to lock in interest rates using swap contracts – the swaps market does not have sufficient depth to accommodate the volume that would be required by businesses with large amounts of debt funding. Moreover, since each determination generally applies to a number of businesses, having multiple businesses seeking to access the swap market over the same (or very similar) short period acts to exacerbate the potential inadequacy of the swap market.'*[91]

Table 4.3 below illustrates the amount of debt that a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid would need to hedge compared to the risks that apply to small and medium sized regulated energy networks that issue floating rate debt at the time of their last regulatory determination.

---

89 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 33.

90 SFG Consulting, *Rule change proposals relating to the debt component of the regulated rate of return - Report for AEMC*, 21 August 2012, page 21.

91 SFG Consulting, *Rule change proposals relating to the debt component of the regulated rate of return - Report for AEMC*, 21 August 2012, page 25.

Table 4.3
Debt Portfolios for TransGrid and NSPs that enter the swap market[92]

	RAB value ($m)	Debt Component ($m)
TransGrid[93]	6,104	3,662
SA Power*	2,772	1,663
Powercor*	2,213	1,328
SP AusNet (Transmission)*	2,191	1,315
SP AusNet (Distribution)*	2,075	1,245
CitiPower*	1,387	832
Jemena (Vic electricity networks)*	757	454

* *Opening RAB value at the start of the last regulatory determination and the assumed level of debt financing.*

Table 4.3 shows that TransGrid's debt portfolio is between 2 and 8 times greater than that of the small to medium sized regulated energy networks that enter swap agreements. It follows that TransGrid would be required to enter swap agreements in relation to a materially larger amount of debt.

Further, in order to adopt the approach cited by the AER, TransGrid would have to access the swap market at substantially the same time as:

- Ausgrid (Distribution), with an estimated RAB at 1 July 2014 of $12,536 million;[94]
- Ausgrid (transmission), with an estimated RAB at 1 July 2014 of $2,109million;[95]
- Endeavour Energy, with an estimated RAB at 1 July 2014 of $7,067 million;[96]
- Essential Energy, with an estimated RAB at 1 July 2014 of $6,888 million;[97]
- Transend, with an estimated RAB at 1 July 2014 of $1,417 million;[98] and

---

92 AER, AER, *TransGrid Transend: Transitional transmission decision 2014-15*, March 2014, page 53.

AER, South Australia distribution determination 2010–11 to 2014–15, Final Decision, May 2010,page 38.

AER, SP AusNet transmission determination 2008-09 to 2013-14, Final Decision, January 2008, page 43.

AER, Victorian electricity distribution network service providers Distribution determination 2011–2015, October 2010, page 464.

93 AER, *TransGrid Transend: Transitional transmission decision 2014-15*, March 2014, page 53.

94 AER, *Ausgrid Endeavour Energy Essential Energy ActewAGL: Transitional distribution decision 2014-15*, March 2014, page 65.

95 AER, *Ausgrid Endeavour Energy Essential Energy ActewAGL: Transitional distribution decision 2014-15*, March 2014, page 65.

96 AER, *Ausgrid Endeavour Energy Essential Energy ActewAGL: Transitional distribution decision 2014-15*, March 2014, page 77.

97 AER, *Ausgrid Endeavour Energy Essential Energy ActewAGL: Transitional distribution decision 2014-15*, March 2014, page 71.

- ActewAGL (Distribution), with an estimated RAB at 1 July 2014 of $855 million;[99]

In other words, at essentially the same time that TransGrid needs to enter into 'pay fixed – receive floating' swap contracts, if all relevant entities were adopting the approach determined by the AER, the demand for swaps would be approximately $22 billion. This amount is substantially greater than that which would need to be transacted by the Victorian electricity distribution network service providers at the time of their last determination, or the amount in demand when SA Power Networks last sought swap contracts.

Table 4.4 shows that, at the time TransGrid would need to enter into the swap market, regulated businesses would be seeking to hedge approximately $22 billion of debt. In contrast, the swap requirements of the Victorian electricity distribution network service providers at their last determination was $4.7 billion, which is approximately 20 per cent of the amount demanded by regulated businesses when TransGrid would need to enter the market to engage in swap transactions in the manner hypothesised by the AER.

Table 4.4
Total debt portfolios of NSPs that would be required to access the market simultaneously

State	Total RAB of NSPs ($m)	Debt Component ($m)	Percentage of NSW etc.
New South Wales networks, Transend and ActewAGL	36,976	22,186	100.0%
Victoria DNSPs	7,812	4,687	21.1%
SA Power Networks	2,772	1,663	7.5%

By way of explanation, Table 4.4 also shows that the total swap transactions required when SA Power Networks would have last hedged is just 7.5 per cent of the amount that would be demanded by all regulated businesses were TransGrid to engage in the swap transactions hypothesised by the AER.

Table 4.3 and Table 4.4 demonstrate that the quantum of hedging that the small to medium sized regulated energy networks had to raise was a modest fraction of the amount that would need to be raised (in the manner hypothesised by the AER) by TransGrid and others at the time of their determination. In our opinion, it is extremely unlikely that the Australian swap market would be able to accommodate transactions of this total volume, either at all, or without substantial adverse price effects. This conclusion is consistent with that noted in the AEMC's final decision paper, where it reiterated the conclusion drawn by SFG, ie:[100]

---

98 AER, *TransGrid Transend: Transitional transmission decision 2014-15*, March 2014, page 58.

99 AER, *Ausgrid Endeavour Energy Essential Energy ActewAGL: Transitional distribution decision 2014-15*, March 2014, page 83.

100 AEMC 2012, Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services, Final Position Paper, 15 November 2012, Sydney, page 56.

> *'… larger state-owned service providers such as those in NSW and Queensland appear unable to enter into these hedges because the relevant financial markets are not sufficiently deep to meet their requirements.'*

It follows that a benchmark efficient NSP with a similar degree of risk as that which applies to TransGrid would:

- need to use a longer period to hedge its debt, diminishing the benefits of hedging; or
- enter into swap contracts at significantly higher costs than small and medium sized regulated energy networks.

We note that Westpac, one of the largest inter-bank market participants, has provided TransGrid with a professional opinion of the liquidity of the Australian dollar interest swap rate (IRS) market. In their opinion:

> *'… in order not to distort the market and impact pricing, the maximum notional amount of 5yr IRS, is $300m per day.'*[101]

Consequently, for a benchmark efficient entity to hedge $3.6 billion in debt, their transactions would represent over 60 per cent of the maximum notional amount of 5 year IRS for 20 consecutive day period. It is unlikely that this activity would pass without notice in the banking sector. In contrast, a requirement to hedge SA Power's debt over 20 consecutive days would represent just 27.7 per cent of the maximum notional amount of 5 year IRS and for CitiPower it would be just 13.9 per cent.

More importantly, the benchmark efficient entity would also be placing their swaps at the same time that NSW Networks, Transend, and ActewAGL Distribution. With a maximum daily liquidity of $300 million per day the 5 year IRS market would clearly not be able to place $22 billion in swaps within a 20 day window. The quantum of swaps required by these regulated business represents 30 per cent of the maximum *annual* notional amount of 5 year IRS.[102]

In our opinion, it is therefore unsafe to presume that the preferred approach to debt risk management of a number of small to medium sized regulated energy networks represents efficient conduct for a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid. Rather, a more reasonable approach would be to give weight to the actual debt management practices of TransGrid and other NSW regulated energy networks. This would lead to the conclusion that, for large regulated energy networks, the benefits from entering into such swap contracts are likely to be outweighed by the costs.

The size of the debt that would need to be hedged and the demand for hedging at the time of regulatory determination mean that a benchmark efficient TNSP with a similar degree of risk

---

[101] Westpac, Letter to Tony Meehan entitled *Liquidity of the interest rate swap market*, dated 26 May 2014.

[102] There are approximately 250 business days in any given year. If on each business day $300 million in 5 year IRS is placed then the notional maximum annual amount of the 5 year IRS market is $75 billion. As a result, the volume of swaps demanded by regulated business that have regulatory decisions at the same time as TransGrid would represents 30 per cent (ie, 30% = $22.186 billion divided by $75 billion) of the notional maximum annual 5 year IRS market.

as that which applies to TransGrid would, rather, minimise its refinancing risks by periodically issuing fixed rate debt, and accept the additional risk of a divergence between debt costs and the debt allowances. Such an approach would:

- be consistent with the debt benchmark previously adopted by the AER; and
- involve the implicit assessment that unrecoverable costs of entering into the swap transactions would outweigh the possible benefits from hedging against movements in the risk-free rate element of the cost of debt.

4.4.2.3. Imposing a transition is inconsistent with the revenue and pricing principles

Mandating the proposed transition mechanism for a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid that, hitherto, has periodically issued fixed rate debt, would impose a substantial windfall loss on the entity.

The reason that a return on debt allowance adopting the proposed transition mechanism would impose a windfall loss on a benchmark efficient TNSP is that its historical average cost of debt (ie, that imposed by adopting a 10-year trailing average) would be 7.72 per cent. However, the proposed transition mechanism would have the effect of locking in the prevailing debt yield of 6.98 per cent, ie, the average of the yields from January to March 2014. In subsequent years, less weight would be placed on this prevailing yield with progressively greater weight being placed on new observations of the benchmark debt yield.

Under both the proposed transition mechanism and the alternative, immediate adoption of an historical average, new observations of the benchmark debt yield are the same. It follows that it is possible to measure precisely the extent of the windfall loss implied by adoption of the proposed transition mechanism. Table 4.5 sets out the weights that are placed on each new observation of the benchmark debt yield (common in both scenarios) and the yields implied by the proposed transition mechanism as well as the immediate adoption of an historical average.

Table 4.5
Yield difference between the Proposed Transition Mechanism and Adopting Historical Average

Year	Proposed transition mechanism yield	Historical average yield	Proportion of new yields	Difference in the return on debt
2014/15	6.98%	7.72%	0%	-0.74%
2015/16	6.98%	7.88%	10%	-0.89%
2016/17	6.98%	8.01%	20%	-1.03%
2017/18	6.98%	8.05%	30%	-1.07%
2018/19	6.98%	7.74%	40%	-0.76%
2019/20	6.98%	7.35%	50%	-0.37%
2020/21	6.98%	7.21%	60%	-0.23%
2021/22	6.98%	7.01%	70%	-0.03%
2022/23	6.98%	6.98%	80%	0.00%
2023/24	6.98%	6.98%	90%	0.00%

Source: NERA

Table 4.5 shows the effect of adopting the proposed transition mechanism as compared with the immediate adoption of a historical trailing average return on debt allowance. In 2014/15 the historical average would result in a return on debt allowance of 7.72 per cent as compared with 6.98 per cent under the proposed transition mechanism. This results in a difference in the return on debt allowance of 74 basis points.

In 2015/16 both the historical average and the proposed transition mechanism would be updated for the observation of benchmark debt in 2014/15, which in both cases would have a weight of 10 per cent. Further, the historical average would drop the 2005 observation of 6.31 per cent, so that the historical average yield for 2006 to 2014 would be 7.88 per cent. In contrast, under the proposed transition mechanism, 90 per cent of the 2014/15 return on debt allowance would be estimated on the basis of the 2014 observation of benchmark debt, ie, 6.98 per cent for the January to March 2014. As a result, the difference between adopting the proposed transition mechanism as compared with the immediate adoption of a historical trailing average return on debt allowance in 2015/16 would be 89 basis points, ie, $0.89\% = (7.88\% - 6.98\%) \times 90\%$.

By 2018/19, the effect would be that:

- under the proposed transition mechanism, the prevailing rate of 6.98 per cent would have a weight of 60 per cent in the return on debt allowance (with the remaining 40 per cent coming from observations from 2014/15 to 2017/18, that are common to both the transition mechanism and the historical trailing average); and
- under an immediate adoption of a historical average yield scenario, the average of yield observations from 2009 to 2014 would also have a weight of 60 per cent and an average yield of 7.74 per cent.

As a result, the return on debt allowance in 2018/19 will be 76 basis points lower under the proposed transition mechanism, as compared with immediate adoption of an average historical yield.

On this basis, Table 4.6 sets out the approximate loss caused by the adoption of the proposed transition mechanism on a benchmark efficient TNSP with a similar degree of risk as that which applies to TransGrid in each year. In total the windfall loss is estimated to be $141 million.[103]

Table 4.6
Loss from the Proposed Transition Mechanism
($million)

	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24
Windfall gain/loss	-27.0	-29.5	-30.1	-27.4	-16.7	-6.7	-3.3	-0.3	-0.0	-0.0

Source: NERA

It follows that, imposing a windfall loss on TransGrid through the adoption of the proposed transition mechanism is likely to be inconsistent with the revenue and pricing principles,[104] because it does not provide TransGrid with a reasonable opportunity to recover at least the efficient costs of the operation of a benchmark efficient service provider.

4.4.3. The proposed transition mechanism is inconsistent with its objective

The rules require that the return on debt should contribute to the achievement of the *allowed rate of return objective*, ie, it must achieve a rate of return commensurate with the efficient financing costs of a benchmark efficient entity.

Notably, the AER's ultimate conclusion is that estimating the return on debt by reference to a trailing average approach will promote the achievement of the allowed rate of return objective. We agree with this conclusion.

However, in proposing the transition mechanism, the AER adopted a different test, ie, it assessed the efficient financing practices of an entity operating under either:

- a trailing average approach to setting the return on debt; or
- an "on–the-day" approach to setting the return on debt.

---

[103] For simplicity, we have assumed TransGrid's RAB to be $6.1 billion in each year – an assumption that is conservative since TransGrid's RAB is likely to grow through time.

[104] We note that the previous 'on-the-day' approach to setting the return on debt did not impose a windfall loss when the prevailing debt yield was less than a benchmark efficient TNSP historical trailing average debt costs. This is because, although historical debt costs can diverge from the return on debt allowance at the time of a decision, over the long-term periods of over recovery should be balanced by periods of the under recovery. In other words, in some decisions the return on debt allowance will be above the benchmark efficient TNSP's debt costs while, in others, it will be below. In contrast, the proposed transition mechanism 'locks-in' the loss over the transitional period and so that there is no opportunity for the return on debt allowance to be set higher than the trailing average in the period beyond.

In other words, the AER has effectively added an additional criterion, being that the benchmark efficient business is regulated in a particular manner. The implication of imposing this additional criterion is that the AER concludes that an entity operating under an "on-the-day" approach to setting the return on debt would adopt the small to medium sized NSPs' approach to raising debt.[105] As a consequence, the AER's proposed approach requires all entities to 'transition' to the efficient financing costs of a benchmark efficient entity over a 10-year period (ie, a trailing average approach), regardless of whether they already raise debt in a manner that is consistent with that hypothesised benchmark efficient entity.

To the extent that imposing the proposed transition mechanism delays the alignment of the efficient debt raising practices with the return on debt allowance, cannot be said to contribute to the achievement of the allowed rate of return objective. The one reason for delaying this alignment is to allow entities to unwind their current financial arrangements without undue penalty or reward. This point is discussed in greater detail in the following section.

4.4.4. Transition unnecessary in the circumstances of TransGrid

The evident intention of the AEMC when making the current rule was that, when the methodology for setting the return on debt allowance changes from one period to the next, transitional arrangements would be provided to ensure the change did not impose significant costs on service providers and could be sensibly implemented.[106]

For example, the AEMC noted that SFG concluded that:[107]

> *Service providers are likely to have entered into financial arrangements to mitigate their risk given the current approach to estimating the return on debt. Therefore, any change in approach could lead to some service providers gaining extra revenue or losing revenue as a result of unwinding those financial arrangements. Gains or losses of revenue of this type from changes in regulatory arrangements could be perceived by investors as increasing regulatory risk, and thereby lead investors to seek a higher rate of return. SFG therefore recommend that consideration be given to transitional arrangements when changing the approach to estimating the return on debt.*

Furthermore, the AEMC's stated intention was that transitional arrangements were:[108]

> *… intended to promote consideration of concerns raised by service providers with regard to transitions from one methodology to another. Its purpose is to allow*

---

[105] We explained in section 4.4.2.2 that we do not agree with the AER's conclusion that all regulated energy networks would adopt the debt management practices of the small to medium sized regulated energy networks.

[106] It is unclear to us whether the rule is intended to apply so as to refer to a change in the future from a past methodology, or is only intended to apply to changes from one methodology applied in the future, to another methodology applied in the future. However, for the purposes of this report we assume it can apply in both situations.

[107] AEMC 2012, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, Final Position Paper, 15 November 2012, Sydney, page 57.

[108] AEMC 2012, *Economic Regulation of Network Service Providers, and Price and Revenue Regulation of Gas Services*, Final Position Paper, 15 November 2012, Sydney, page 65.

> *consideration of transitional strategies so that any significant costs and practical difficulties in moving from one approach to another is taken into account.*

In other words, the transitional arrangements were intended to ensure that businesses were not unreasonably penalised when the approach to determining the return on debt allowance changes. Notwithstanding this intent, the effect of the proposed transition mechanism is to impose a significant windfall loses on TransGrid and to delay unnecessarily the alignment of the return on debt allowance from the efficient financing costs of a benchmark efficient entity.

The preferable approach would be to adopt different benchmark efficient entities for large NSPs such as TransGrid and small NSPs, such as the service providers operating in Victoria and South Australia. This would recognise the reality that large and small providers face different financing risks. It would also give effect to the language of the rules and the intent of the AEMC. It would appear to make little difference whether the adoption of different benchmark efficient entities should be applied across the board, or only for the purpose of the transitional arrangements for the return on debt. The distinction appears only to have practical content in the latter context.

5. The Return on Equity Methodology

5.1. Recommendation

Our analysis shows that 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP.

The range of evidence that we have taken into account in drawing our conclusion in relation to the return on equity is consistent with the objective and relevant considerations set out in the rate of return framework applying to TNSPs. The relevant rule states that:

> *'The allowed rate of return objective is that the rate of return for a Transmission Network Service Provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the Transmission Network Service Provider in respect of the provision of prescribed transmission services.*[109]
>
> *'In determining the allowed rate of return, regard must be had to… relevant estimation methods, financial models, market data and other evidence.'*[110]
>
> *'The return on equity for a regulatory control period must be estimated such that it contributes to the achievement of the allowed rate of return objective.'*[111]
>
> *'In estimating the return on equity under paragraph (f), regard must be had to the prevailing conditions in the market for equity funds.'*[112]

In other words, the task is to estimate the rate of return that equity providers require to invest in a benchmark efficient TNSP.[113] Throughout the remainder of this report, we refer to relevant estimation methods, financial models, market data and other evidence as 'relevant material'.

We have taken 'relevant material' to be any information that is capable of being used to improve the estimate of the return on equity for a benchmark efficient TNSP. Consistent with this, we recognise that the evaluation and incorporation of any particular item of information in the estimation process may involve a combination of both qualitative and quantitative analysis.

---

[109] Clause 6A6.2(c) of the rules.

[110] Clause 6A.6.2(e)(1) of the rules.

[111] Clause 6A.6.2(f) of the rules.

[112] Clause 6A.6.2(g) of the rules.

[113] We note the return on equity must also be estimated:

- on a nominal post-tax basis (clauses 6A.6.2(d)(2) of the rules);
- having had regard to the desirability of using an approach that leads to the consistent application of any estimates common to the return on equity and debt (clauses 6A.6.2(e)(2) of the rules); and
- being consistent with the other financial parameters used to calculate the WACC, such as, the assumed gearing assumption and the assumed value of imputation credits (clauses 6A.6.2(e)(3) of the rules)

It follows that the return on equity estimate will be improved by having regard to all relevant material and so, conversely, no relevant material should be disregarded. It is self-evident that an improved estimate of the return on equity for a benchmark efficient TNSP will contribute to the achievement of the rate of return objective.

This approach is consistent with the reasoning that underpinned the 2012 amendments to the rate of return framework set out in the rules, one purpose of which was to expand the material able to be considered by the AER. In the course of developing the revised rule, the AEMC's expert advisor stated that:[114]

> *'If the goal is to produce the highest-quality estimate of the required return on equity – the value that most closely corresponds with what equity investors would actually require from an investment in the benchmark firm – the question is whether restricting the estimation approach to the CAPM only is more likely to produce the highest-quality estimate. In our view it is difficult to make the case that allowing the regulator to consider more information about the required return on equity would systematically result in lower-quality estimates.'*

Our approach to estimating the return on equity for a benchmark efficient TNSP departs from the method proposed in the guidelines.[115] Significantly, we do not adopt a 'foundation' model approach, which can only be appropriate in circumstances where one financial model can be shown to be demonstrably superior to all other relevant material. Instead, we explain in section 5.3 that no estimation model is demonstrably better at estimating the return on equity for a benchmark efficient TNSP than all other relevant material.

On this basis, we conclude that the results derived from more than one financial model, together with other relevant material, should be used to determine the reasonable range of estimates for the expected return on equity. This range of estimates, together with a systematic assessment of the strengths and weaknesses of each element within it, can be used to derive a superior estimate for the return on equity.

In our opinion a rate of 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP. We reach this conclusion on the basis that:

1. the estimates of the return on equity for a benchmark efficient TNSP derived using each form of relevant material range from 8.25 per cent to 11.5 per cent (see Figure 5.1 below);[116]

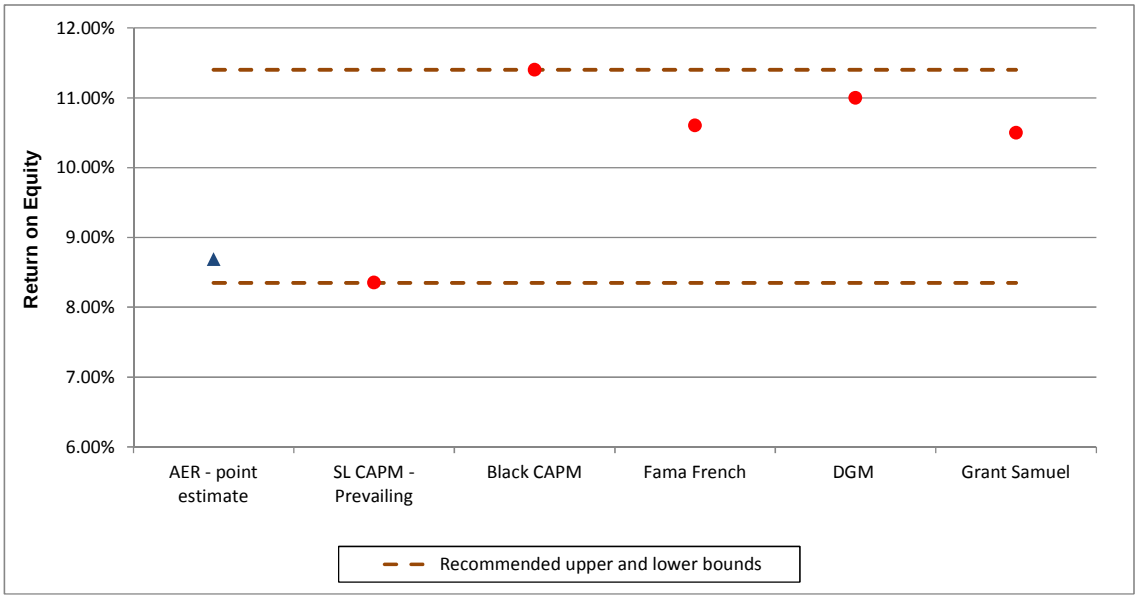
---

[114] SFG Consulting, *Preliminary analysis of rule change proposals: Report for AEMC*, 27 February 2012, paragraph 109.

[115] We note that that the guidelines refer to a benchmark efficient entity since they apply to both electricity distribution and transmission network service provides as well as regulated gas pipelines. However, clause 6A.6.2(c) only refers to a TNSP and the provision of regulated transmission services.

[116] Noting that return on equity estimates are rounded to the closest 25 basis points.

Figure 5.1
Estimates of the indicative rate and range of the return on equity



2. most estimates fall within the range of between 10.5 per cent and 11.5 per cent, with the only estimate outside this range being derived by the Sharpe-Lintner CAPM;[117]
3. however, estimates derived by the Sharpe-Lintner CAPM should be expected to be at the lower end of any range, since there is a substantial body of evidence suggesting that this model will underestimate the return on equity for a benchmark efficient TNSP. This is because the benchmark efficient TNSP:
   - is a low beta stock and the evidence shows that empirically the Sharpe-Lintner CAPM underestimates the returns on stocks with a beta less than one; and
   - has an economically significant, positive exposure to the value factor, which is not compensated for in the Sharpe-Lintner CAPM;
4. empirically there is little relation across stocks between estimates of beta and subsequent returns – this result suggests that in determining the return on equity for a benchmark efficient TNSP regard should be had to an estimate of the required return on the market;
5. a return on equity of 10.5 per cent is equal to the mid-point of the gamma adjusted return on equity range used by Grant Samuel to value Envestra, a firm recognised by the AER as comparable to a benchmark efficient TNSP.[118] In that context, it represents an unbiased, independent expert estimate of the return on equity that will in turn be relied upon by

---

[117] All references to estimates generated by the Sharpe-Lintner CAPM are to estimates generated by an empirical version of the model that uses the market portfolio of stocks as a proxy for the market portfolio of all risky assets. We will often, for emphasis, make explicit reference to the fact that an empirical version of the model rather than the model itself is being used to generate estimates of the return required on equity.

[118] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 47; and AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 143.

shareholders to determine whether or not to accept APA Group's proposal to acquire all the issued capital for Envestra; and

6. a return on equity of 10.5 per cent is consistent with estimates derived from the Fama-French three-factor model and the dividend growth model.

Finally, we note that the observed risk premium provided to debt investors following the GFC has increased by over 150 basis points, as compared with pre-GFC debt premiums. A return on equity of 10.5 per cent is consistent with a post-GFC increase in the required return for equity investors in a benchmark TNSP that is comparable with the increase observed in the debt market since that same event.[119]

In the remainder of this section we:

- set out our approach to assessing and combining material that is relevant to the estimation of the return on equity for a benchmark efficient TNSP;
- summarise the relevance of material that we have considered in our assessment of the prevailing return on equity for a benchmark efficient TNSP;
- provide our recommended range and point estimate of the prevailing return on equity for a benchmark efficient TNSP; and
- outline our concerns with the AER's proposed approach in the guidelines to estimating the return on equity for a benchmark efficient TNSP.

5.2. Assessing and combining relevant material

5.2.1. Approach to assessing relevance

Determining the return on equity is not a straightforward process.[120] This is principally because the variable cannot be directly observed on either an *ex ante* or *ex post* basis. Instead it must be inferred from financial estimation methods, financial models, market data and other evidence, ie, relevant material.

Despite the volume of research conducted in this area by both academics and market practitioners, there is no single approach that is able to estimate the expected return on equity without error.

A common method for drawing inferences as to the expected return on equity is through the estimation of theoretical financial models, such as the CAPM – of Sharpe (1964) and Lintner (1965).[121]

---

[119] The long-term historical average *MRP* is 6.5 per cent and so a firm with an equity beta of 0.7 would have an equity premium of 4.55 per cent and, when added to a risk-free rate of 4.14 per cent, a return on equity of 8.69 per cent. This is approximately 180 basis points lower than the equity premium implied by a return on equity of 10.5 per cent.

[120] This is a point was also made by the Assistant Governor of the Reserve Bank of Australia, Guy Debelle in his letter to the ACCC entitled *The Commonwealth Government Security Market* dated 16 July 2012.

[121] Sharpe, William F., Capital asset prices: A theory of market equilibrium under conditions of risk, Journal of Finance 19, 1964, pp.425-442.

Financial models are simplified mathematical statements of the implications of *hypothesised* investor behaviour. However, the practical application of such models often involves deviating from their theoretical underpinnings, eg:

- financial models are almost always concerned with expected returns, whereas it is only possible to observe actual returns; and
- some parameters within financial models are difficult to measure, eg, the use of the Sharpe-Lintner CAPM requires a series of returns to the market portfolio of all risky assets that should include equities, property, debt and human capital but timely data is not available on these asset classes and so a series of returns to a portfolio of stocks is typically used as a substitute.

In practice, estimates of the required return on equity are often generated by empirical versions of financial models rather than the model themselves. One consequence of this necessity is that the assessment of the relevance of any model must be directed to the performance of its empirical (rather than theoretical) version, before then being used to draw inferences as to the required return on equity of a benchmark efficient TNSP.

Given the relationship between the underlying theory and empirical evidence, it is imperative that any assessment of the relevance of a financial model be undertaken after it has been specified, ie, adjusted or adapted as necessary for its application. In our opinion, the relevance of any empirically applied financial model will depend on its ability to meet three criteria, ie:

- the extent to which it fits the facts, ie, the degree to which the applied financial model explains mean returns across equities and so forms a reasonable basis for investors to infer the allowed return on equity;
- the theoretical integrity underpinning the model once specified, which is relevant only to the extent that this may affect confidence that a model, once applied, will deliver a reliable estimate of the required return on equity; and
- evidence that the approach is used by financial practitioners.

We have applied these criteria in evaluating the relevance of all available material. We discuss each of these criteria in turn below.

5.2.1.1. Assessing empirical support for a financial model

A financial model that is incapable of explaining the past behaviour of equity returns is unlikely to provide compelling insights into the future requirements of equity investors. Empirical tests of financial models therefore focus on the 'end results' of using them to estimate the required return on equity, rather than on any theoretical deficiencies the models may exhibit.

Lintner, John, The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics 47, 1965, pp.13-37.

In particular, empirical testing allows one to assess the extent to which a model:

- makes predictions that are consistent with the data, as distinct from predictions that are at odds with the data; and so
- will deliver unbiased, as distinct from biased, estimates of the required return on equity.[122].

Importantly, such assessments cannot be made purely through introspection.

Besides knowing whether an empirical version of a financial model will deliver unbiased estimates of the return required on equity, it is also important to know whether the estimates produced are likely to be precise. The precision of a random variable is the reciprocal of its variance.[123]

By way of example, as a relatively simple model, the Sharpe-Lintner CAPM generates estimates that are comparatively precise. Notwithstanding the precision of the estimates it generates, the Sharpe-Lintner CAPM produces estimates that can be biased, in that the required return on equity for low beta stocks is systematically underestimated, while the required return on equity for high beta stocks is systematically overestimated. In addition, the Sharpe-Lintner CAPM underestimates value stocks.

The two most common ways of testing pricing models are through the use of time series tests, like those introduced by Gibbons (1981), and cross-sectional tests, like those that Fama and MacBeth (1973) introduce.[124] We discuss these testing procedures in greater detail in Appendix A.

---

[122] An estimator of a parameter is said to be unbiased if the expected value of the estimator matches the parameter and is said to be biased if the expected value differs from the parameter. See, for example:

Hamilton, J.D., *Time series analysis*, Princeton University Press, Princeton, NJ, 1994, page 741.

[123] This definition, standard in the statistics literature, differs from the Oxford Dictionary definition of precision which is:

> 'accuracy or exactness.'

In statistics a precise estimator can be exact but inaccurate. As Davidson and MacKinnon note, however,

> 'it is sometimes more intuitive to think in terms of precision than in terms of variance.'

We agree and so use the terms precise and precision to render our discussion easier to follow.

Davidson, R. and J. G. MacKinnon, *Estimation and inference in econometrics*, Oxford University Press, Oxford, 1993, page 144.

Fowler, F.G. and H.W. Fowler, *Pocket Oxford Dictionary*, Oxford University Press, Oxford, 1966, page 623.

[124] See, for example:

- Cochrane, J., *Asset pricing*, Princeton University Press, 2001.
- Fama, E. F. and J. D. Macbeth, *Risk, return and equilibrium: Empirical tests*, Journal of Political Economy, 1973, pages 607-636.
- Gibbons, Michael R., *Multivariate tests of financial models: A new approach*, Journal of Financial Economics, 1982, pages 3–27.

5.2.1.2. Theoretical support

Theoretical financial models cannot themselves be used to produce estimates of the required return on equity. Rather, the financial models applied by practitioners require the use of estimates of or proxies for parameters contained in the financial models.

It follows that the theoretical integrity of the financial models used to infer the required return on equity is relevant only to the extent that it provides additional confidence that empirical versions of the models will deliver a reliable estimate of the return. The fact that a financial model has a strong theoretical underpinning may provide some confidence that empirical results observed in one period or in relation to a particular market portfolio will extend to other time periods or markets.

Notwithstanding the apparent merits of 'theoretical integrity', the same confidence may alternatively be obtained through empirical performance, such as where the results have been observed across different markets and observed consistently over a number of time periods.

5.2.1.3. Use by financial practitioners

In our opinion, a reasonable criterion for assessing the relevance of financial models is the extent to which investors themselves use various models to form *their* expectations of the return on equity. Evidence that an approach informs the expectations of investors may be inferred from acceptance among:

- academics;
- market practitioners; and
- regulators.

5.2.2. Approach to combining relevant material

In our opinion, when determining how best to have regard to relevant material, the fundamental consideration to be addressed is the way in which relevant material can be used or combined, such that it contributes to an improved estimate of the expected return on equity for a benchmark efficient TNSP. The process of combining relevant material must also allow greater regard to be had to material with greater relevance.

Given our assessment that no single form of relevant material is demonstrably superior to all others, constructing a range of return on equity estimates using results derived from a single source would inevitably:

- disregard important insights as to the return on equity for a benchmark TNSP; and
- result in arbitrarily disproportionate regard being given to the results derived from one particular form of relevant material.

This would neither give effect to an improved estimate of the expected return on equity nor contribute to the achievement of the rate of return objective. These considerations also highlight the importance of determining how best to have regard to relevant material *after* assessing both whether and the degree to which the material is relevant.

There is no widely accepted procedure that can be usefully applied so as to combine systematically different return on equity estimates derived from multiple sources of relevant material. Therefore, it is not possible to construct a range by ascribing fixed weights to the results derived from multiple sources of relevant material that would be widely accepted.

Instead, in our opinion, the point estimate of the return on equity should be established from the range of estimates produced using a qualitative analysis of:

- the way in which estimates are distributed within the range;
- the respective strengths and weaknesses of the relevant material used to construct the estimates that form the range; and
- prevailing market conditions that, at any particular time, may make a particular source of relevant material more or less relevant.

Regardless of whether or not one source of relevant material is demonstrably superior to the others, in our opinion the final estimate of the return on equity should be determined as a multiple of 25 basis points. This recognises the inherent imprecision of return on equity estimates, and is consistent with the approach proposed in the guidelines.[125]

If an assessment of relevance indicates that no single form of relevant material is demonstrably superior to all other forms, in our opinion the results derived from more than one form of relevant material should be used to determine the reasonable range of estimates for the expected return on equity.

In the event that an assessment of relevance indicates that one source of relevant material is demonstrably superior to all others, in our opinion the expected return on equity range should be constructed from estimates derived from that single source.

To the extent that the remaining forms of relevant material are also capable of improving the estimate of the expected return on equity, regard should be had to the estimates derived from those models when determining the point estimate.

This approach has some similarity to the approach proposed in the guidelines, which uses a 'foundation model' to determine a range, but which recognises that other relevant material may result in a point estimate outside this range. However, there is a further difference, beyond the absence of a foundational model.[126] In contrast to the AER's approach, in our opinion the analysis should not be restricted so that the insight that comes from any particular estimation methodology is applied only once. If relevant material has the potential to deliver insights in relation to the benchmark return on equity in a number of ways, then restricting its use cannot be said to further the rate of return objective.

In contrast, the guidelines state that an approach will be used only once to avoid the potential for 'double counting'.[127] The consequence of this conclusion is that neither an empirical

[125] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 62.

[126] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, pages 56 to 58.

[127] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 57.

version of the Black CAPM nor the dividend growth model (DGM) are used to estimate directly the return on equity for a benchmark efficient entity because, instead:

- the theory of the Black CAPM is used to guide the AER's judgment on the point estimate of the equity beta that it chooses; and
- the DGM estimates of the return on the market are used as one of the sources of information in determining a value for the market risk premium (*MRP*).

In our opinion, the AER's concerns for the potential for double counting are without foundation, because it does not propose to combine information in a prescriptive manner, eg, through the use of fixed weights. The decision maker has the capacity to balance any legitimate concerns of 'double counting' against the probative value of incorporating relevant information through the use of a technique more than once.

The approach proposed in the guidelines also involves using models and information other than for the purpose for which they were developed. The Black CAPM, for example, was not prepared for the purpose of determining inputs into the Sharpe-Lintner CAPM model. The use of models and information for this purpose does not meet the second of the criteria in section 2 of the guidelines, being that 'estimation methods, financial models, market data and other evidence should be consistent with the original purpose for which it was compiled'.

5.3. Assessment of relevant material

We have assessed a range of material for relevance using the criteria we identified in section 5.2.1. In particular, we have assessed four estimation models for relevance, ie:

- an empirical version of the Sharpe-Lintner CAPM;
- an empirical version of the Black CAPM;
- the Fama-French three-factor model; and
- the DGM.

In addition to these financial models, we have also considered other financial information derived from recent independent expert valuation reports and the debt markets.

We summarise below our assessment of the relevance of each.

Sharpe-Lintner CAPM

We have assessed the relevance of four specifications of the Sharpe-Lintner CAPM that we have labelled:

- the 'AER specification';
- the 'prevailing specification';
- the 'long-term average specification'; and
- the 'Wright specification'.

The Sharpe-Lintner CAPM relates the required return on equity to equity's beta computed relative to *the market portfolio of all risky assets*. Whereas, in contrast, an empirical version of the Sharpe-Lintner CAPM tries to relate the required return on equity to that equity's beta computed relative to *the market portfolio of stocks*.

It follows that, even if the theoretical Sharpe-Lintner CAPM were true, as a theoretical proposition, there is no reason to presume that the model that is actually used in practice would generate estimates of the return required on equity with desirable properties. The relevance of the return on equity estimates generated using an empirical version of the model will depend on whether an empirical version of the model is consistent with the data.

Against this measure, it has been observed in both Australia and the United States that an empirical version of the Sharpe-Lintner CAPM:

- has little explanatory power, in that beta is a poor predictor of stock returns; and so
- underestimates (overestimates) the return required on low-beta (high-beta) stocks

In addition, it has been observed in both Australia and the United States that an empirical version of the Sharpe-Lintner CAPM underestimates (overestimates) the returns required on value (growth) and small-cap (large-cap) stocks.[128]

These observations have particular importance to the estimation of the return on equity for a benchmark efficient TNSP because:

- the equity of a benchmark TNSP has a low beta and, in consequence, an empirical version of the Sharpe-Lintner CAPM is likely to underestimate the required return on the equity; and
- the equity of a benchmark TNSP has a statistically significant exposure to the value factor and so an empirical version of the Sharpe-Lintner CAPM is also likely to underestimate the required return on the equity for this reason.

Notably, the AER accepts that an empirical version of the Sharpe-Lintner CAPM is likely to underestimate the return on equity because a benchmark efficient TNSP has a low beta. The AER recognises this bias and so uses the '*theory of the Black CAPM*' to set the equity beta at the top of its reasonable range.[129] However, there is no evidence that an adjustment that the AER makes is sufficient to negate the bias associated with an estimate of the return on equity for a benchmark efficient TNSP. Rather, there is compelling evidence that the adjustment is insufficient.[130]

The Sharpe-Lintner CAPM also attributes no role to measures of risk other than an asset's market beta. It follows that an undue focus on the Sharpe-Lintner CAPM is unlikely to

---

[128] A value stock is one with a high book value of equity to market value of equity ratio (ie, the book-to-market ratio) while a growth stock is one with a low book-to-market ratio. A small-cap firm is one with a relatively low market capitalisation while a large company has a relatively large market capitalisation.

[129] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (*Appendices), December 2013, pages 71-73.

[130] See section B.2.2.2 of this report.

encapsulate the possible range of the return on equity for a benchmark efficient TSNP, given that the past performance of this model suggests a downward bias in the range.

We have examined four specifications of an empirical version of the Sharpe-Lintner CAPM, ie:

- the specification preferred by the AER, which combines estimates of the prevailing risk-free rate and equity beta together with an *MRP* that is predominately set by reference to the long-term average of market excess returns;[131]
- the use of prevailing parameter estimates of the *MRP* and risk-free rate;
- the use of long-term averages of the *MRP* and risk-free rate; and
- the Wright specification, which assumes that the mean real return on the market portfolio is constant through time and uses a prevailing risk-free rate.

The return on equity for a benchmark efficient TNSP estimated using each of these specifications is set out below in Table 5.1.

Table 5.1
Sharpe-Linter CAPM Estimates

CAPM specification	Return on equity
AER specification	8.69%
Prevailing specification	**8.4%**
Long-term average specification	8.9%
Wright specification	8.5%

In our opinion, the specification of an empirical version of the Sharpe-Lintner CAPM that best reflects the prevailing conditions in the market for equity funds is one that populates the model with forward looking estimates of the *MRP* and risk-free rate, ie, the 'prevailing' specification identified above.

Separately, we have taken account of the likelihood that an empirical version of the Sharpe-Lintner CAPM provides a biased estimate of the benchmark efficient TNSP in the context of the weight that should be placed on this financial model. In other words, we have not adjusted the Sharpe-Lintner CAPM parameters in an attempt to overcome deficiencies in the model.

We provide a more detailed analysis of the Sharpe-Lintner CAPM in Appendix B.1.

[131] Note that the AER's specification includes an equity beta of 0.7, which is at the top of its reasonable range for the equity beta. In contrast all other specifications on the Sharpe-Lintner CAPM uses the best estimate of the equity beta, ie, 0.58.

The Black CAPM

The Black CAPM and Sharpe-Lintner CAPM share similar theoretical foundations. The Black CAPM, though, is a more general model because it does not restrict the return required on a zero-beta portfolio to be the risk-free rate. This characteristic of the Black CAPM allows the slope of the security market line (that relates mean return to beta) to be flatter.

The AER states that:[132]

> *'The empirical support for the Black CAPM, however, is inconclusive. There is evidence both for and against the empirical outperformance of the model over the Sharpe–Lintner CAPM. Further, there is also evidence that indicates both models are relatively poor predictors of returns.'*

We agree that there may be circumstances where an empirical version of the Black CAPM provides a better estimate of the return on equity than an empirical version of the Sharpe-Lintner model. Similarly, there may be circumstances where an empirical version of the Sharpe-Lintner model provides a better estimate of the return on equity than an empirical version of the Black CAPM.

We also agree that there is evidence that empirical versions of both models tend to underestimate the returns to value stocks.

The empirical evidence suggests that an estimate of the equity beta of a firm is not useful for determining the required return on the firm's equity. In other words, beta estimates provide no information about whether the required return on equity for a particular firm is above or below that of the average firm. Thus, estimates of the return required on low-beta equities that use an empirical version of the Black CAPM are likely to have more attractive characteristics than estimates that use an empirical version of the Sharpe-Lintner CAPM.

We estimate that the prevailing return on equity for a benchmark efficient TNSP using the Black CAPM is 11.40 per cent.

We provide a more detailed analysis of the Black CAPM in Appendix B.2.

The Fama-French three-factor model

The Fama-French three-factor model (FFM) was developed in response to the Sharpe-Lintner CAPM's inability to explain returns to small and value stocks, and uses factors other than beta to explain expected returns to equity.[133]

---

[132] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (*Appendices), December 2013, page 17.

[133] Banz, R., *The relationship between return and market value of common stocks*, Journal of Financial Economics 9, 1981, pages 3-18.

Rosenberg, B., K.Reid and R. Lanstein, *Persuasive evidence of market inefficiency*, Journal of Portfolio Management 11, 1985, pages 9-17.

Fama and French (1992) found that size and book-to-market are better predictors of return than beta, contrary to the predictions of both the Sharpe-Lintner CAPM and Black CAPM.[134] This led Fama and French to theorise that size and book-to-market were proxies for an exposure to additional sources of risk and to develop their three-factor model accordingly.[135] In effect, the FFM was developed to explain investor behaviour that Fama and French knew the Sharpe-Lintner CAPM could *not* explain.

A common criticism of the FFM is that while Sharpe-Lintner CAPM has a strong theoretical basis, the FFM has none. If there are factors besides the return to the market portfolio of stocks that are pervasive, then the Arbitrage Pricing Theory (APT) of Ross (1976) predicts that the additional risks associated with the factors should be priced.[136] The intuition behind the APT is that investors will be rewarded for risks that are pervasive and so cannot be diversified away, but will not be rewarded for risks that are idiosyncratic and can be diversified away. If investors were not rewarded for bearing pervasive risks, arbitrage opportunities would arise.

Fama and French (1993) therefore argue that:

> *'…if assets are priced rationally, variables that are related to average returns, such as size and book-to-market equity, must proxy for sensitivity to common (shared and thus undiversifiable) risk factors in returns.'*
>
> *'Suppose the explanatory returns have minimal variance due to firm specific factors, so they are good mimicking returns for the underlying state variables or common risk factors of concern to investors. Then the multifactor asset-pricing models of Merton (1973) and Ross (1976) imply a simple test of whether the premiums associated with any set of explanatory returns suffice to describe the cross-section of average returns: the intercepts in the time-series regressions of excess returns on the mimicking portfolio returns should be indistinguishable from zero.'*[137]

Merton was awarded the 1997 Nobel Prize in Economics in part for developing the inter-temporal pricing model to which Fama and French refer.[138] In his model, investors care about whether assets are likely to pay off unexpectedly well or badly when future investment opportunities are unexpectedly good.[139]

Irrespective of its theoretical underpinning, more importantly, there is strong empirical evidence supporting the presence of the FFM risk premiums, including in Australia. The size

---

134 Fama, Eugene and Kenneth French, *The cross-section of expected returns*, Journal of Finance 47, 1992, pages 427-465.

135 Fama, Eugene and Kenneth French, *Common risk factors in the returns to stocks and bonds*, Journal of Financial Economics 33, 1993, pages 3-56.

136 Ross, Stephen, *The arbitrage theory of capital asset pricing*, Journal of Economic Theory 13, 1976, pages 341-360.

137 Fama, Eugene and Kenneth French, *Common risk factors in the returns to stocks and bonds*, Journal of Financial Economics 33, 1993, pages 4-5 and pages 31-35.

138 See http://nobelprize.org/nobel_prizes/economics/laureates/1997/press.html

139 Merton, Robert C., *An intertemporal capital asset pricing model*, *Econometrica* 41, 1973, pages 867-887.

risk premium may be referred to as the small minus big (*SMB*) premium. The value risk premium may be referred to as the high minus low (*HML*) premium.

In Australia there is strong empirical evidence in support for the existence a value risk premium.[140] SFG has constructed the Fama French factor premiums (*HML* and *SMB*) according to the process adopted by Brailsford, Gaunt and O'Brien (2012a).[141] SFG finds that the mean value for *HML* is 9.97%, which is statistically significantly different from zero, ie, one can reject the hypothesis that the *HML* is zero with 95 per cent confidence.[142] A finding of a statistically significant positive *HML* was also found by both:

- Brailsford, Gaunt and O'Brien (2012a);[143] and
- NERA (2013).[144]

In contrast, the Australian *SMB* factor premium is not found to be statistically significantly different from zero, ie, one cannot reject the hypothesis that the *SMB* is zero with a 95 per cent confidence. SFG estimated that the mean value for *SMB* is −0.43%.[145] A finding of a *SMB* that is not statistically significant from zero was also found by both:

- Brailsford, Gaunt and O'Brien (2012a);[146] and
- NERA (2013).[147]

Further, in the US, where value and size risk premiums can be computed over substantially longer periods (ie, from 1926), both premiums are found to be both economically and statistically significantly different from zero.[148]

Another observation of particular importance to the estimation of the return on equity for a benchmark efficient TNSP is the evidence that, for the regulated energy utility sector in the US over a 30-year period (1980 to 2009), the FFM provides a better estimate of the return on equity than does the Sharpe-Lintner CAPM.[149] Over this period, the FFM model errors are

---

140 The Australian HML risk premium is found to be statistically significant, ie, it is found to differ from zero at the 5 per cent confidence level. See SFG, *The Fama-French model*, 13 May 2014, page 37.

141 Brailsford, T., C. Gaunt and M. O'Brien, *Size and book-to-market factors in Australia*, Australian Journal of Management, 2012, pages 261-281.

142 SFG, *The Fama-French model*, 13 May 2014, page 37.

143 Brailsford, T., C. Gaunt and M. O'Brien, *Size and book-to-market factors in Australia*, Australian Journal of Management, 2012, pages 261-281, page 272.

144 NERA, *The Market, Size and Value Premiums*, June 2013, page 91.

145 SFG, *The Fama-French model*, 13 May 2014, page 37.

146 Brailsford, T., C. Gaunt and M. O'Brien, *Size and book-to-market factors in Australia*, Australian Journal of Management, 2012, pages 261-281, page 272.

147 NERA, *The Market, Size and Value Premiums*, June 2013, page 91.

148 NERA, *Cost Of Equity - Fama-French Three-Factor Model*, August 2009, page 40.

SFG, *The Fama-French model*, 13 May 2014, page 37.

149 See:

- NERA, *Cost Of Equity - Fama-French Three-Factor Model*, August 2009, pages 22-26; and

only about half the size of their CAPM counterparts, and so are not statistically significant at conventional (5 per cent) levels.

In other words, the FFM provides a better explanation for observed returns on US energy utilities because, like their Australian counterparts, the equities of regulated US energy businesses appear to have a positive exposure to the *HML* factor.[150] Since the FFM rewards an exposure to the *HML* factor, the FFM provides a better fit to the data.

We note that this finding is consistent with those made by Chrétien and Coggins who conclude that:

> *'… the Fama-French model and the Adjusted CAPM are both able to provide costs of equity that are not significantly different from the historical ones.*
>
> …
>
> *The Fama-French model and the Adjusted CAPM are well specified for this purpose as they reduce considerably the estimation errors. These models could thus be considered as alternatives to the CAPM in the Equity Risk Premium method employed by regulatory bodies to obtain the risk-return relationship for the fairness to investors' criterion.'*[151]

In our opinion, the FFM provides a less biased estimate of the return on equity than an empirical version of the Sharpe-Lintner CAPM, although there is evidence suggesting that, like an empirical version of the Sharpe-Lintner CAPM, the FFM underestimates the returns to low-beta companies.[152] However, one consequence of the FFM being a model that contains more parameters is that estimates it uses are less precise.

We estimate that the prevailing return on equity for a benchmark efficient TNSP using the Fama French three-factor model is 10.60 per cent.

We present a more detailed analysis of the FFM in Appendix B.3.

The dividend growth model

The DGM is based on the no-arbitrage condition that an asset's current price, ie, a stock's share price, must match the present value of future cash flows derived from ownership of that

---

- NERA, *Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision*, 19 March 2010, pages 33-34.

150 Although there is insufficient financial data to undertake a similar analysis of regulated Australian utilities, US data provide a strong foundation from which to conclude that the Fama-French three-factor model provides a better estimate of the return on equity for a regulated energy business.

151 Chrétien, Stéphane and Coggins, Franks (2011), "Cost of equity for Energy Utilities: Beyond the CAPM," Energy Studies Review: Vol. 18: Iss. 2, Article 2, page 20.

152 Lewellen, J., S. Nagel and J. Shanken, *A skeptical appraisal of asset pricing tests*, Journal of Financial Economics, forthcoming.

asset, ie, dividends. In contrast to the Sharpe-Lintner CAPM and Black CAPM, the DGM does not therefore make an assumption about investor behaviour.

The use of the DGM is likely to improve estimates of the return on equity for a benchmark efficient TSNP because it:

- is widely adopted by regulators in North America to estimate the return on equity for regulated utilities;
- is not dependent upon assumptions of investor behaviour;
- offers an estimate that uses prevailing stock prices and prevailing forecasts of dividend growth rates and so may better reflect prevailing conditions in the market; and
- provides an independent check on the estimates generated by the other three models.

Like the Sharpe-Lintner CAPM and the Black CAPM, the DGM requires data that are difficult to find. The Sharpe-Lintner CAPM and Black CAPM require one to find a series of returns to the market portfolio of all risky assets, which, again, may include real estate and human capital. The DGM requires forecasts of long-term dividend growth.

SFG have developed a version of the DGM that implements a process whereby growth reverts to a sustainable level over time, and that lets the data determine the sustainable growth rate. In other words, the SFG technique jointly estimates the growth rates and the return on equity.

SFG uses this technique first to estimate the expected return on the market portfolio and the market risk premium. In order to estimate the prevailing return on equity for the listed Australian energy network businesses SFG uses the following process:

- estimate the **risk premium** for each of the 99 half year observations pertaining to the Australian energy network businesses;
- calculate the **risk premium ratio** for Australian energy network businesses to the market risk premium; and
- apply the **risk premium ratio** to the prevailing market risk premium to derive the risk premium for the Australian energy network businesses.

The advantages of the SFG DGM are:

> *First, our analysis does not require us to exercise judgement about what are reasonable long-term growth assumptions or returns on investment, which has been a feature of past submissions and advice in relation to dividend growth models. We allow the data to determine long-term growth rates and return on investment.*[153]

Furthermore, the SFG DGM produces estimates of the return on equity that are more stable over time than a technique that assumes constant growth. This stability over time is

[153] SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, page 3.

considered by the AER to be a worthwhile attribute of the cost of equity for setting the regulated return.[154]

In our opinion, the best estimate of the prevailing return on equity for a benchmark efficient TNSP using the DGMs is provided by SFG and is 11.0 per cent with a gamma value of 0.25.

We provide a more detailed analysis of the DGM model in Appendix B.4.

Other information

Our estimate of the return on equity for a benchmark efficient TNSP has regard to two additional sources of relevant information, ie:

- independent expert valuation reports; and
- the observed required returns on benchmark debt.

We provide a more detailed analysis of the DGM model in Appendix B.5

Independent expert valuation reports

Takeover and valuation reports are prepared by independent experts in relation to proposed corporate transactions and are subject to requirements under the Corporations Act (2001), ASX listing rules and the Australian Securities and Investment Commission (ASIC) regulatory guidelines.

The reports provide an independent capital market expert's opinion on whether a proposed capital transaction involving a listed entity is "fair and reasonable" and/or "in the best interests of" affected shareholders. One of the valuation tools applied in some expert reports is an assessment of the value of the business by reference to a discounted cash flow (DCF) analysis. A DCF analysis discounts the expected future cash flows to determine the current value of the business.

A critical input to the DCF is the discount rate. Independent experts generally estimate the discount rate by reference to a WACC. In other words, some independent valuation experts separately estimate:

- the prevailing return on debt;
- the opportunity cost of equity; and
- the optimal proportion of debt and equity finance.

It follows that the independent expert valuation reports prepared in the context of and for the purpose of guiding investors in significant capital market transactions may provide relevant information of the return on equity for a benchmark efficient TNSP. This conclusion is consistent with that of the AER, which states that takeover and valuation reports are credible,

[154] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 48.

verifiable and clearly sourced and so may be sufficiently relevant as to warrant their use as a cross-check to the return on equity estimate.[155]

Grant Samuel & Associates Pty Limited (Grant Samuel) recently published an independent expert report to Envestra's Independent Board Sub-committee in relation to an acquisition proposal by APA Group.[156] Envestra is the owner of the largest portfolio of gas distribution networks in Australia and is one of the comparable businesses that the AER uses to estimate both the return on debt and the return on equity for a benchmark efficient energy network.[157]

The Grant Samuel report employs DCF analysis to determine a fair value for Envestra. It therefore represents a timely, independent estimate of the return on equity for an Australian regulated energy network. In our opinion, this independent expert valuation report provides highly relevant information of the prevailing conditions in the market for equity funds.

In estimating the discount rate, Grant Samuel found that:[158]

- the prevailing return on debt was 7.0 per cent, which it used in both the high and low WACC scenarios; and
- the appropriate debt/equity ratio was 35-45% equity and 55-65% debt;

Further, Grant Samuel set out in some detail its approach to estimating the prevailing return on equity, including that:

- the CAPM results in estimates of between 7.8 per cent and 8.4 per cent;
- a DGM analysis (using a simple Gordon growth model) and comparable businesses suggest estimates of between 9.0 and 11.3 per cent;[159]
- anecdotal information suggests that equity investors have repriced risk since the global financial crisis, on which basis it was considered appropriate to increase the *MRP* by 1 per cent to 7.0 per cent, the effect of which is to increase the return on equity estimate to between 8.4 and 9.1 per cent;[160]
- global interest rates are depressed, reflecting the very substantial amounts of liquidity being pumped into many advanced economies, a phenomenon that is unsustainable, one consequence of which being that some academics/valuation practitioners consider a

---

155 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (*Appendix), December 2013, page 28.

156 Grant Samuel & Associates Pty Ltd, Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group, 3 March 2014.

157 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 47; and AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 143.

158 Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3. Note that Grant Samuel calculates a traditional post tax WACC (not a nominal vanilla post tax WACC), ie:

$$WACC = R_e \times \left(1 - \frac{D}{D+E}\right) + (1-t) \times \frac{D}{D+E} \times R_d$$

159 Comparable businesses used by Grant Samuel included: DUET Group; SP AusNet; APA and Spark Infrastructure.

160 NERA has calculated this range by substituting the historical MRP of 6.0 per cent with the higher MRP of 7.0 per cent.

"normalised" risk-free rate of 5 per cent should be used, which results in an estimate of between 8.6 and 9.0 per cent;[161] and

- analysis of recent research reports on Australian entities involved in the energy infrastructure sector (ie, APA Group, Envestra, DUET Group, Spark and SP AusNet) indicates that brokers are currently adopting costs of equity capital in the range 8.5-11.2%, with a median of 9.6%.

On the basis of this information, Grant Samuel states that:[162]

> *Having regard to these matters and the calculations set out above, Grant Samuel's judgement is reasonable discount rates to apply to discounted cash flow analysis for regulated energy assets in current market conditions would be anywhere in the range 6.5-8.0%.*

A WACC range of 6.5-8.0 per cent corresponds to an implied return on equity range of between 9.5 per cent and 11.8 per cent.[163] Notwithstanding Grant Samuel's opinion that current market conditions suggest a WACC range of 6.5-8.0 per cent, for the purpose of valuing Envestra, Grant Samuel adopts a discount rate of between 6.5-7.0 per cent. This implies a return on equity range of between 9.5 per cent and 9.6 per cent.[164]

Importantly, Grant Samuel's estimates of the return on equity do not include any adjustment for the effect of dividend imputation.[165] In consequence, assigning a value of gamma of 0.25 would raise Grant Samuel's return on equity estimate for the purposes of valuing Envestra to between 10.5 per cent and 10.6 per cent.[166]

---

[161] NERA has calculated this range by substituting the prevailing risk-free rate of 4.2 per cent with the "normalised" rate of 5.0 per cent.

[162] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, page 9.

[163] NERA has calculated the implied return on equity on the basis of the return on debt 7.0 per cent, with:

- the lower bound return on equity estimate corresponding to the lower WACC estimate of 6.5% and a gearing of 35% equity; and
- the upper bound return on equity estimate corresponding range to the upper WACC estimate of 8.0% and a gearing of 45% equity.

[164] NERA has calculated the implied return on equity on the basis of the return on debt 7.0 per cent, with:

- the lower bound return on equity estimate corresponding to the lower WACC estimate of 6.5% and a gearing of 35% equity; and
- the upper bound return on equity estimate corresponding range to the upper WACC estimate of 7.0% and a gearing of 45% equity.

[165] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, pages 9-10.

[166] That is, $10.5\% = \frac{9.5\%}{0.9032}$ while $10.6\% = \frac{9.6\%}{0.9032}$. We have been instructed to adopt a gamma value of 0.25 and to make an adjustment to the pre-imputation credit estimates of the return on equity consistent with those made by SFG. See SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, page 37.

We also note the recent report by Incenta that updates a number of previous studies on the relevance of independent expert reports to the return on equity in terms of both estimation methods and outcomes, as adopted by independent experts.[167]

Incenta notes that the two previous studies that have analysed the evidence of independent expert reports both concluded that:

> *'independent experts are not constrained by the Sharpe-Lintner CAPM, but rather begin with this model and make adjustments that are informed by alternative market-based information sources, additional analysis and professional judgement.'*

Further, both previous studies found that the final return on equity adopted by independent experts differed from the results of a 'mechanistic' application of the CAPM, with:[168]

- Ernst & Young (November 2012) concluding that in expert reports undertaken in the first six months of 2012, 'the difference in the prevailing market cost of equity implied by independent experts and the AER's implied market cost of equity is therefore 2.2 percentage points'; and
- SFG (June 2013) concluding that in the period from 11 October 2012 to 26 April 2013, independent experts applied an average uplift of 3.3 per cent over the return on equity implied by a mechanistic application of the Sharpe-Lintner CAPM.

Incenta examines all 185 independent expert reports released during the period 27 April 2013 to 20 April 2014. Incenta finds that 19 independent expert reports undertake an assessment of the cost of equity, which included 20 individual cost of equity estimates. Analysis of these reports shows that:[169] [170]

- in the application of the Sharpe-Lintner CAPM, the return on the market is on average 0.2 per cent higher than a mechanistic application of the model, ignoring any additional uplift for 'alpha';[171]
- that the required return on equity is 1.9 per cent higher than a mechanistic application of the Sharpe-Lintner CAPM;
- that the five lowest beta firms/projects, which had an average beta of 0.77, had an average uplift in the cost of equity of 2.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM; and

---

167 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014.

168 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, pages 2-3.

169 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 4.

170 We have been instructed to adopt a gamma value of 0.25 and to make an adjustment to the pre-imputation credit estimates of the return on equity consistent with those made by SFG. See:

SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, page 37.

171 Incenta define a mechanistic application of the Sharpe-Lintner CAPM as one that uses the prevailing risk free rate and a MRP of 6 per cent.

- that the independent expert applied a cost of equity of 9.5 per cent for Envestra (2014), which was an uplift of 0.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM.

Further, Incenta noted that independent expert reports universally ignore any impact of imputation credits on valuation, and so in effect apply a gamma of zero.[172] Ascribing any positive value to gamma would require a further uplift to the cost of equity estimates.

We note that the adjustments made by Grant Samuel in its report on Envestra are consistent with industry norms reported by Incenta. In particular, when deriving an appropriate discount rate for valuation purposes, independent expert valuation generally apply an uplift to the cost of equity estimates derived from a mechanistic adjustment of the Sharpe-Lintner CAPM. Further, on average these adjustments are larger for low beta stocks/projects.

Comparison to returns on debt

Information on the prevailing conditions for the market for equity funds can also be inferred from observed bond yields. It is generally accepted that returns on equity should be higher than returns on debt, because equity holders bear significantly more risk, ie, the financial claims of equity holders rank behind that of debt holders.

Similarly, the AER's rate of return guidelines propose to use the spread between debt and equity returns as a relative indicator and note that:[173]

> *'… if the return on equity does not exceed the return on debt, we may consider the foundation model input parameter estimates. In these circumstances, we may also reconsider the foundation model itself.'*

The use of observed bond yields to check the reasonableness of return on equity estimates is consistent with the practice by the Federal Energy Regulatory Commission (FERC) of the United States. FERC uses the average yield on public utility bonds over a six month period to ensure that any return on equity estimate is reasonable. Any return on equity estimate that is within 100 basis points of the bond yield is excluded from the Commission's analysis of the return on equity.[174]

Figure 5.2 plots the yields on 10-year BBB rated corporate bonds reported by the RBA.

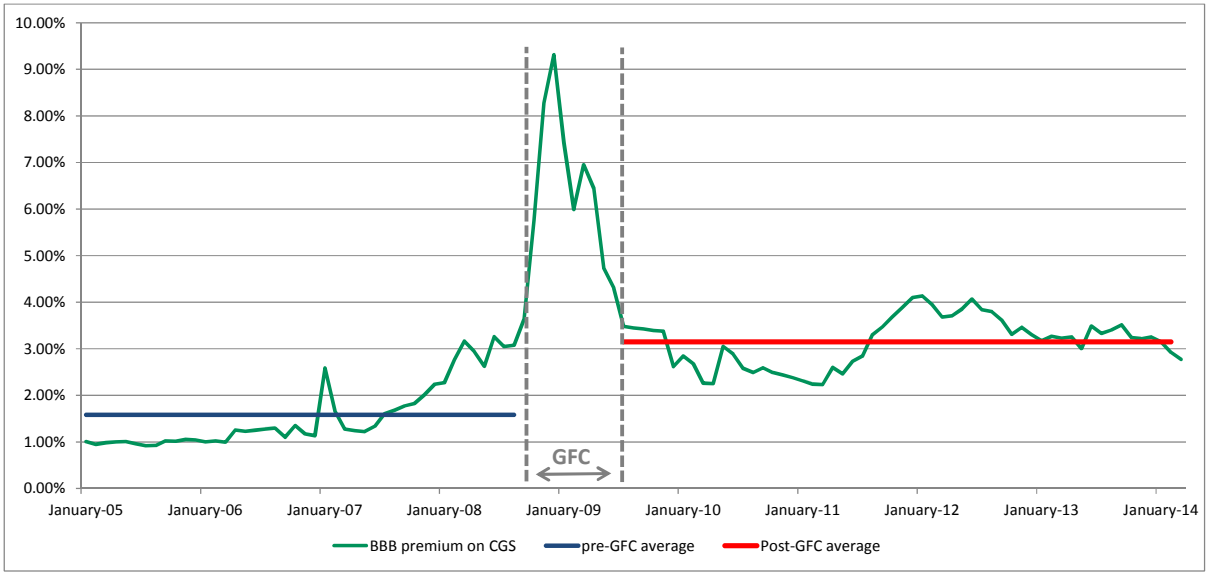
---

[172] Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 7.

[173] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (*Appendix), December 2013, page 33.

[174] *Order on Transmission Rate Incentives and Formula Rate Proposal*, 126 FERC ¶ 61,281 (27 March 2009), paragraph 84.

Figure 5.2
The premium on the nominal yield of 10-year BBB rated debt securities over the nominal yield of 10-year Commonwealth Government Securities from January 2005 to March 2014



Source: Reserve Bank of Australia

Figure 5.2 illustrates the stark peak in debt premiums from late 2008 to mid-2009 and the marked increase in the pricing of risk in the period following the global financial crisis (GFC).[175] In the pre-GFC period the premium of BBB corporate bond yields over the yield for Commonwealth government securities (CGS) averaged 158 basis points. In contrast, in the post-GFC period the premium of BBB corporate bonds yields over the CGS yield has averaged 315 basis points. In other words, debt market evidence shows that, in the post-GFC period, debt investors require an additional debt risk premium of over 150 basis points relative to pre-GFC debt premiums.

Given the rise in the pricing of risk in the debt markets following the GFC, it would be expected that a similar, if not larger, increase in the premium would be required by equity investors.[176] However, Figure 5.3 shows that the return on the market portfolio implied from AER decisions for gas pipelines, electricity distributors and transmission service providers has increased only marginally in the post-GFC period, compared with the pre-GFC period.

---

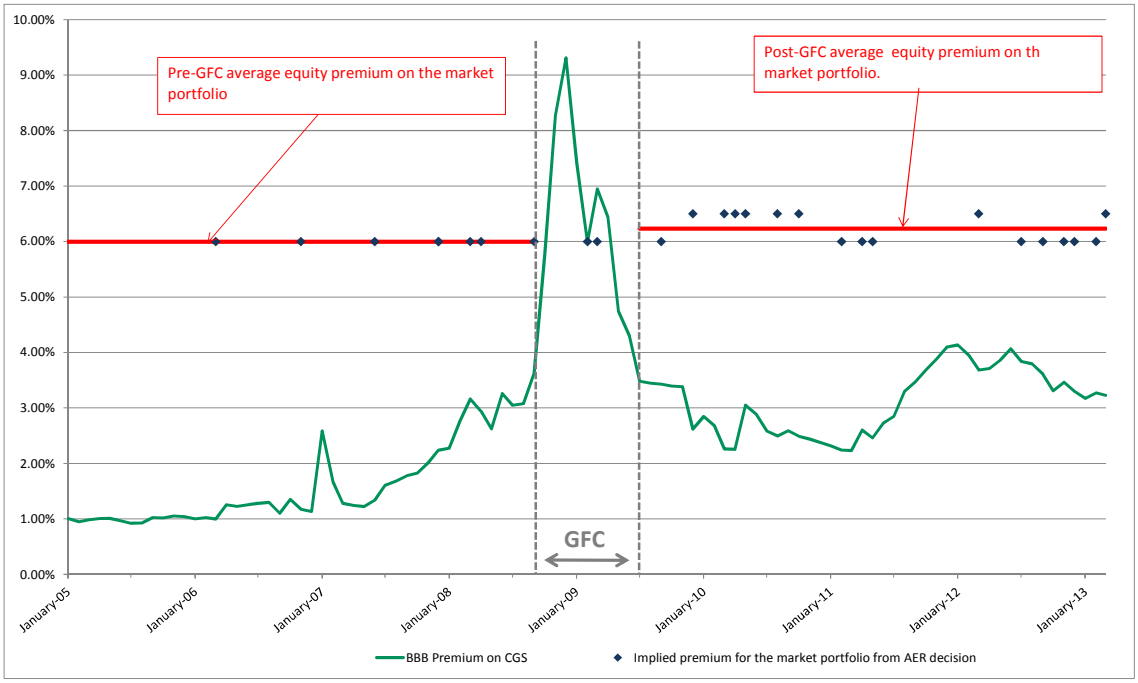
[175] The GFC is generally acknowledged as beginning in September 2008 following:

- Lehman Brothers filing for bankruptcy;
- two United States Government-sponsored enterprises that guaranteed mortgage pools placed in conservatorship;
- the sale of Merrill Lynch to Bank of America; and
- the US government taking over 80 per cent of the equity in AIG.

[176] In any firm, equity will be more risky than debt since debt obligations must be paid in full before equity investors receive any payment. It follows that if the price of risk has increased then it is reasonable to expect that the return on equity would rise by at least, if not greater than, the amount for the return on debt given that equity is more risky.

Further, the guidelines propose a *MRP* of just 6.5 per cent, which is an increase of just 50 basis points over that allowed in the pre-GFC period. This increase in the equity premium is less than a third of the observed increase in the debt premium.

Figure 5.3
The premium on the nominal yield on 10-year BBB-rated debt securities and the return the market portfolio estimated in AER decisions from January 2005 to March 2014.



Source: Reserve Bank of Australia and NERA analysis.

In our opinion, the observed debt yields suggest that risk has been significantly repriced in the period following the GFC. It is reasonable to conclude that this repricing of risk extends to equity investors, and that required returns on equity (relative to risk-free assets) have similarly been repriced in the post-GFC period.

We provide a more detailed assessment of other relevant information in Appendix B.5.

Summary

Our assessment of relevance indicates that, of the four financial models that we have considered, no one is demonstrably superior to all others, ie, each of the financial models has distinct strengths and weaknesses. Further, in our opinion the respective merits and shortcomings of all four estimation models are sufficiently understood that each can be used to provide insights as to the return on equity.

Important insights into the return on equity for a benchmark efficient TNSP can also be inferred from independent expert valuation reports and observed debt yields.

It follows that each model is capable of providing its own particular insights as to the expected return on equity that is commensurate with the efficient financing costs of a

benchmark efficient TNSP with a similar degree of risk. In addition, the estimates of the return on equity can be cross-checked against information that can be gained from independent expert valuation reports and observed debt yields.

5.4. Results of our analysis

We illustrate in Figure 5.4 below the range of estimates that we have derived for the expected return on equity. These same estimates are presented in numeric form in Table 5.2 below.

Figure 5.4
Indicative range of the return on equity estimates

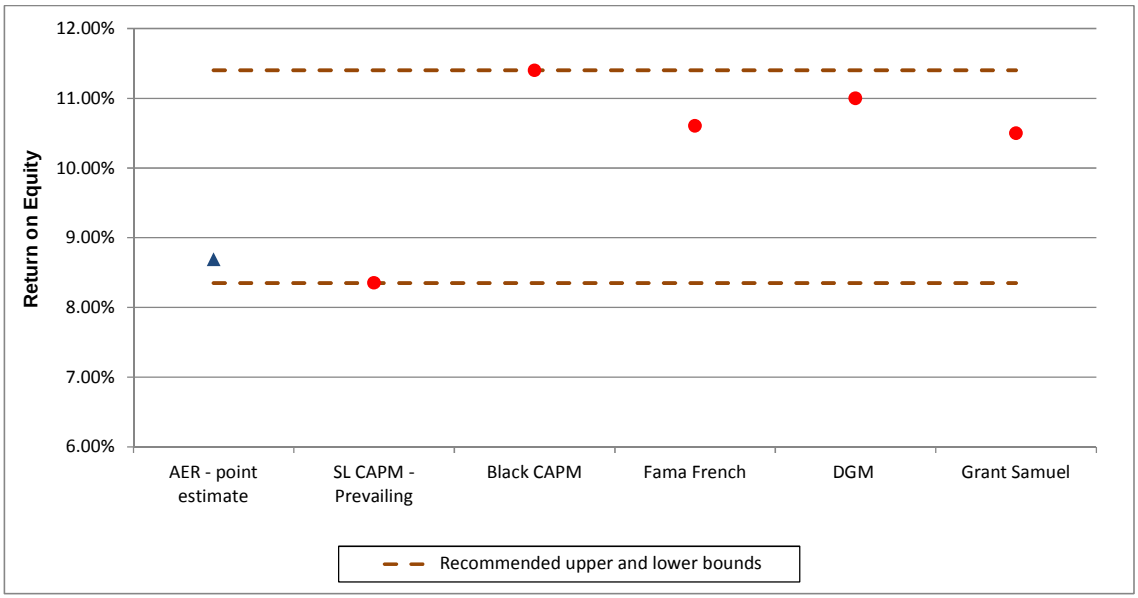


Table 5.2
Financial model estimates of the indicative expected return on equity

Estimation model	Estimate
Sharpe-Lintner CAPM - Prevailing	8.4%
SFG FFM	10.6%
SFG DGM	10.9%
Black CAPM	11.4%
Grant Samuel Envestra	10.5%

Source: NERA analysis.

We set out in section 5.2 that, in determining the point estimate of the expected return on equity, regard should be had to:

- the spread of estimates derived using a range of financial models;
- the financial models' strengths and weaknesses; and
- prevailing market conditions that may make particular models more or less relevant.

We noted in section 5.2.2 that there is no widely accepted method that can be applied systematically to combine the results derived from multiple sources of relevant material.

The relevant material suggests an indicative return on equity range of between 8.25 per cent and 11.5 per cent.[177] Further, we observe that most estimates fall within the range of between 10.5 per cent and 11.5 per cent, with the only estimate outside this range being derived using the Sharpe-Lintner CAPM.

However, this result is consistent with the evidence that an empirical version of this model is likely to result in downwardly biased estimates of the return on equity because the benchmark efficient TNSP:

- has a beta estimate of less than one; and
- has an economically and statistically significant exposure to a value factor, which the Sharpe-Lintner CAPM is incapable of assessing.

It follows that estimates of the return on equity of a benchmark efficient TNSP derived from an empirical version of the Sharpe-Lintner CAPM should be regarded as a lower bound. In our opinion, this conclusion is strengthened by the substantially higher estimates of the return on equity produced by the DGM. Further, we note that, in its valuation of Envestra, Grant Samuel implicitly adopts a return on equity substantially higher than that produced by an empirical version of the Sharpe-Lintner CAPM.

On the basis of the relevant material presented in 5.3 we assess the indicative return on equity as being 10.5 per cent.[178] In our opinion, a return on equity of 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP, for the reasons we elaborate below.

First and foremost, this estimate is consistent with the gamma adjusted return on equity used by Grant Samuel to determine the value of Envestra, in the context of a capital markets transaction under which investors were both committing and withdrawing significant capital from a business that is highly comparable to that of a benchmark efficient TNSP. In our opinion, a return on equity estimate upon which informed investors have made substantial decisions deserves significant weight.

Second, a return on equity of at least 10.5 per cent is consistent with the estimates of the required return on equity for a benchmark efficient TNSP produced by FFM and the DGM.

Finally, we note that the observed risk premium provided to debt investors following the GFC has increased by over 150 basis points compared to the pre-GFC debt premiums. A return on equity of 10.5 per cent provides equity investors in a benchmark TNSP with a comparable increase in return as that observed in the debt market.

---

[177] Noting that return on equity estimates are rounded to the closest 25 basis points.

[178] Note that this rate is indicative since is based on market conditions in March 2014, and will be updated for market conditions close to TransGrid's final decision in early 2015.

5.5. Differences from the approach set out in the guidelines

In this section we summarise why we believe our recommended approach to estimating the expected return on equity involves a systematic application of reasoning to give effect to the requirements in the rules. In contrast, we describe what we consider to be a number of methodological errors in the approach set out in the guidelines, the effect of which is that the guidelines:

- do not meet the requirements of the rules; and
- result in a substantial downward bias in the estimate of the expected return on equity.

Finally we describe our broad concerns with the approach proposed in its guidelines, namely:

- the treatment of relevant material; and
- the use of a 'foundation model'.

5.5.1. Our recommended approach

The rules provide that:

> *'In determining the allowed rate of return, regard must be had to… relevant estimation methods, financial models, market data and other evidence.'*[179]

We defined 'relevant material' as that which is capable of being used to improve the estimate of the expected return on equity for a benchmark TNSP and, in so doing, contribute to the achievement of the rate of return objective. In our opinion, it should be uncontroversial that this definition will give effect to the best estimate of the expected return on equity that, in accordance with the rate of return objective, is:

> *'… commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the [service provider] in respect of the provision of [regulated services]'.*[180]

Further, we developed two intuitive principles to guide our approach to assessing relevant material and combining relevant material, ie:

- the return on equity estimate will be improved by having regard to all relevant information and so, conversely, no relevant information should be disregarded; and
- the extent to which relevant material is used to inform the estimate of the return on equity should be commensurate with the degree to which that material is relevant.

Taking these principles in combination with a systematic application of reason, our approach indicates that none of the financial models assessed was demonstrably superior - as a result,

---

[179] Clause 6A.6.2(e)(1) of the rules.

[180] Clauses 6.5.2(c) and 6A6.2(c) of the rules.

all were capable of improving the estimate of the expected return on equity. In our opinion it follows that the allowed rate of return objective will be best achieved by adopting a multi-model approach that has regard to estimates derived from four financial models.

5.5.2. The approach set out in the guidelines

The guidelines contemplate that the point estimate will fall within the range set by the foundation model but acknowledge that it will not necessarily do so.

It is unclear to us whether the guidelines contemplate that:

- the range set by the foundation model will be presumed to be correct, so that some level of persuasion will be required to displace this assumption - we refer to this as the *narrow approach*; or
- whether it is proposed to adopt a completely open-minded approach as to whether the point estimate will fall within the range.

Our concerns with the guidelines are more significant to the extent that the narrow approach is intended.

The guidelines propose using only one financial model – an empirical version of the Sharpe-Lintner CAPM – to establish the range for the expected return on equity. Further, and consistent with a substantial body of empirical research, the guidelines acknowledge that an empirical version of the Sharpe-Lintner CAPM is biased. However, the guidelines:

- do not attempt to quantify the bias inherent in an empirical version of the Sharpe-Lintner CAPM;
- make an arbitrary adjustment to correct for the bias; and
- do not evaluate the extent to which the adjustment made adequately corrects for bias.

5.5.3. Comparison between outcome of the guidelines and of other models

The approach set out in the guidelines implicitly assumes that the bias associated with estimates generated by an empirical version of the Sharpe-Lintner CAPM, can be eliminated by choosing an estimate that sits close to the top of the AER's range.

However, Figure 5.5 below illustrates that the approach in the guidelines results in a range that is significantly below estimates derived from other financial models, which do not suffer from the same bias as an empirical version of the Sharpe-Lintner CAPM.

Figure 5.5
Expected Return on Equity Estimates

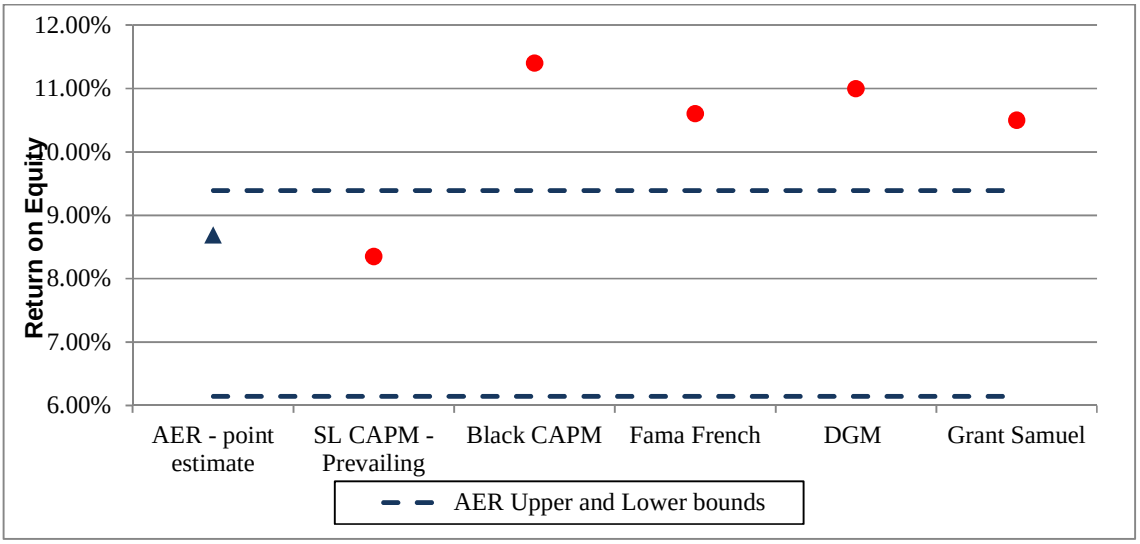
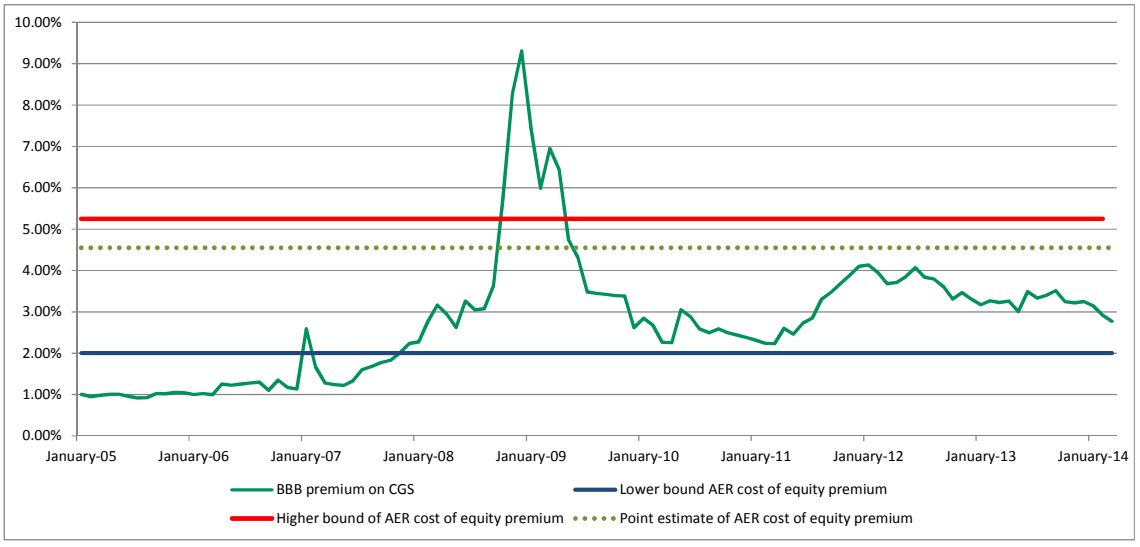


Figure 5.5 illustrates that, when regard is had to estimates derived from other financial models, it is apparent that there is a significant downward bias in the range and point estimate proposed in the guidelines.

5.5.4. Comparison between return on equity and return on debt outcomes

The insufficiency of the AER's proposed reasonable range for the return on equity (estimated for the 20 days to 31 March 2014) can also be demonstrated when it is compared to the premium (over the 10-year CGS yield) provided to BBB corporate debt.

Figure 5.6
AER reasonable range and point estimate of the return on equity premium and the debt risk premium on BBB bonds



Source: RBA and NERA analysis.

Figure 5.6, illustrates that the AER's reasonable range for the return on equity premium is bounded by:

- a lower threshold of 200 basis points over the 10-year CGS yield;[181] and
- an upper threshold of 525 basis points over the 10-year CGS yield.[182]

As a result, a significant portion of the reasonable range proposed by the guidelines for the return on equity risk premium falls below the allowed risk premium for BBB corporate debt. It is completely inconsistent with the core principles of financial economics that the premium required by equity investors could fall below that required by debt investors. In our opinion, the magnitude of the observed debt risk premium demonstrates that the AER's assessment of the return on equity in the guidelines is flawed.

We note that the FERC removes low end return on equity estimates that are within 100 basis points of the average yield on public utility bonds over a six month period.[183] The average yield on BBB corporate bonds reported by the RBA over the last 6 months is 7.17 per cent,[184] while the reasonable range adopted in the guidelines results in a range from 6.14 per cent to 9.39 per cent and a point estimate of 8.69 per cent for the 20 days ending 31 March 2014. As a result, if the FERC were to have regard to prevailing debt yields, it would reject any estimate of the return on equity that is below 8.17 per cent. In other words, over 60 per cent of the AER's reasonable range would be rejected by the FERC as unreasonably low.

5.5.5. Comparison between return on equity and that used by Grant Samuel to value Envestra

Finally, we note that, when valuing Envestra in March 2014, Grant Samuel implicitly adopts a return on equity of 10.5 per cent, which is substantially higher than that provided by the guidelines.

5.5.6. Concerns with the AER's approach to relevance

In our opinion, the approach proposed in the AER guidelines is problematic on account of the fact that:[185]

- it does not assess the relevance of the applied foundation model;

---

[181] 200 basis points being the lower bound MRP estimate of 5.0 per cent in combination with the lower bound equity beta of 0.4.

[182] 525 basis points being the upper bound MRP estimate of 7.5 per cent in combination with the upper bound equity beta of 0.7.

[183] *Order on Transmission Rate Incentives and Formula Rate Proposal*, 126 FERC ¶ 61,281 (27 March 2009), paragraph 84.

[184] This average has been calculated over the six months from November 2013 to March 2014, using 10-year BBB non-financial corporate bond yields, as reported by the RBA in statistical Table F3.

[185] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 30.

- there are inadequacies in the assessment criteria; and
- it does not adequately adjust for the recognised bias in the Sharpe-Lintner CAPM.

The end result of these methodological deficiencies is that the AER's approach in the guidelines (or at least the narrow approach) involves no material change in the approach to estimating the return on equity, even though the stated intention of the 2012 change to the rules in relation to the allowed rate of return was to expand the material considered by the AER.[186] We expand on these points below.

5.5.6.1. AER does not assess the relevance of the applied foundation model

The guidelines propose to select and apply the foundation model using a process that broadly comprises three steps, ie:

1. identify financial estimation models;
2. assess how they will inform the estimate of the return on equity;
3. specify the estimation model selected as the foundation model.

One consequence of this process is that the estimation model used to inform the estimate of the return on equity is specified only after the various models have being assessed for relevance. It follows that the model actually used to estimate the return on equity is not assessed for its relevance.

The practical effect is that the guidelines do not assess whether relevant information on the prevailing return on equity for a benchmark efficient entity is provided by an empirical version of the Sharpe-Lintner CAPM of a form specified with:

- a prevailing risk-free rate using the 10-year CGS yields;
- a *MRP* range, with a lower bound of 5.0 per cent[187] and an upper bound of 7.5 per cent;[188] and a point estimate of 6.5 per cent; and

---

[186] By way of an example, the approach proposed by the AER under the new rules and the AER's 2013 decision for a Victorian gas transmission network service provider both:

- used only the Sharpe-Lintner CAPM ;
- estimate a MRP that primarily has regard to observed historical excess return as well as DGM estimates of the prevailing excess returns; and
- determines an equity beta by reference to a group of Australian comparable entities but selects a point estimate after having regard to US equity beta estimates and to negate any possible bias from using a low beta.

See:

- AER, *Access Arrangement Final Decision APA GasNet Australia (Operations) Pty Ltd 2013-17, Final Decision Part 1*, March 2013, pages 28-30.
- AER, *Electricity Transmission and Distribution Network Service Providers Review of the Weighted Average Cost of Capital (WACC) Parameters, Final Decision*, May 2009, page 343.

[187] According to the excess returns on a diversified portfolio of Australian equities over the Australian 10-years CGS yield.

[188] According to estimates derived from DGMs.

- an equity beta range of between 0.4 to 0.7, according to an empirical analysis of a set of Australian energy utility firms, and a point estimate of 0.7 with reference to the Black CAPM.

In our opinion, an analysis to determine the relevance of the AER's specification of an empirical version of the Sharpe-Lintner CAPM may well reach a materially different conclusion from that contained in the guidelines. We have already commented upon the absence of empirical support for the Sharpe-Lintner CAPM and the divergence between the theoretical model and that actually applied. We set out below a number of further observations in relation to the AER's specification of an empirical version of the Sharpe-Lintner CAPM below.

Empirical support

Empirical analysis of the model strongly suggests that there is little or no relationship across stocks between beta estimates and subsequent returns; in other words, an empirical version of the Sharpe-Lintner CAPM does not fit the data.

Further, empirical analysis illustrates that an empirical version of the Sharpe-Lintner CAPM provides downwardly biased estimates of the required return on equity for a benchmark TNSP, ie, a low beta stock, that has a statistically significant and positive exposure to the Fama-French value factor.

Theoretical support

The theoretical Sharpe-Lintner CAPM reflects sound economic and financial principles. However, an empirical version of the Sharpe-Lintner CAPM does not, because while the theoretical Sharpe-Lintner CAPM relates the return on equity to the equity's beta relative to the market portfolio of all risky assets, an empirical version of the model tries to relate the return on equity to the equity's beta relative to the market portfolio of stocks alone.

Use by practitioners

The Sharpe-Lintner CAPM applied by the AER is not widely applied by market practitioners. Rather, there is evidence from independent valuation reports that, while market practitioners may use or commence their analysis by reference to the Sharpe-Lintner CAPM, they commonly apply adjustments not suggested by the theory behind the model to reach a reasonable return on equity. For example, market practitioners have been observed:

- adjusting the market risk premium;
- adjusting the risk-free rate, or adopting long-term risk-free rates; and
- applying an uplift to either their estimated return on equity or WACC.

Incenta notes that in two previous studies that have analysed the evidence of independent expert reports both concluded that:

> *'independent experts are not constrained by the Sharpe-Lintner CAPM, but rather begin with this model and make adjustments that are informed by alternative market-based information sources, additional analysis and professional judgement.'* [189]

Incenta examines all 185 independent expert reports released during the period 27 April 2013 to 20 April 2014. Incenta finds that 19 independent expert reports undertake an assessment of the cost of equity, which included 20 individual cost of equity estimates. Analysis of these reports shows that:[190]

- in the application of the Sharpe-Lintner CAPM, the return on the market is on average 0.2 per cent higher than a mechanistic application of the model, ignoring any additional uplift for 'alpha';[191]
- that the required return on equity is 1.9 per cent higher than a mechanistic application of the Sharpe-Lintner CAPM;
- that the five lowest beta firms/projects, which had an average beta of 0.77, had an average uplift in the cost of equity of 2.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM; and
- that the independent expert applied a cost of equity of 9.5 per cent for Envestra (2014), which was an uplift of 0.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM.

Furthermore, Incenta noted that independent expert reports universally ignore any impact of imputation credits on valuation and so, in effect, apply a gamma of zero.[192] Ascribing any positive value to gamma would require a further uplift to the cost of equity estimates.

Evidence that market practitioners make adjustments to the parameters included in their financial models demonstrates that such models are not slavishly applied. This highlights that regard must be had to all relevant information and that all financial models have acknowledged strengths and weaknesses.

Conclusion

Although an empirical version of the Sharpe-Lintner CAPM does not satisfy most of the AER's own assessment criteria (including a finding of bias), it has been chosen as the foundation model. In contrast, other models that potentially provide significant insight into the benchmark return on equity are given no direct weight, under the approach proposed in the guidelines.

In our view, this is inconsistent with the aim of furthering the achievement of the allowed rate of return objective.

---

189 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 2.

190 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 4.

191 Incenta define a mechanistic application of the Sharpe-Lintner CAPM as one that uses the prevailing risk free rate and a MRP of 6 per cent.

192 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 7.

5.5.6.2. AER assessment criteria

Whether or not information improves the estimate of the return on equity of a benchmark entity should be the fundamental/primary consideration when determining what information contributes to the achievement of the allowed rate of return objective.

However, the AER's criteria for assessing information does not consider whether the use of an estimation method, financial model, market data or other evidence would result in a more accurate estimate of the return on equity of a benchmark entity. Rather, the AER's criteria assert a number of objectives that are secondary to the above principle, eg:

- the desirability of an approach that produces certainty and predictability;
- the desirability of a sound and well-accepted theoretical foundation for a regulatory approach;[193]
- whether material enhances the credibility and acceptability of a decision[194]
- the use of information should be consistent with its original purpose;[195] and
- simpler and less complex approaches should be preferred because they: [196]
  - are more likely to be understandable;
  - are less prone to data mining;
  - are less prone to inappropriate correlation within the model; and
  - may have fewer data requirements.

Further, a number of these principles are inconsistent with the fundamental/primary consideration, eg, a preference for:

- simple over complex approaches; and
- the use of information being consistent with its original purpose.

Although there are clearly advantages to less complex approaches, they are only achieved through simplifying assumptions. For example, the Sharpe-Lintner CAPM assumes that:

- equity investors are only concerned with the expected covariance of a stock to the market portfolio;
- equity investors can borrow and lend at the risk-free rate; and
- equity investors have only a single investment period.

---

193 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 28.

194 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 28.

195 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 28.

196 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, pages 28-29.

These are clearly significant simplifying assumptions and investors' behaviour is more complex. More complex approaches are capable of testing whether these simplifying assumptions are reasonable. As a result, disregarding complex approaches simply because of their complexity is counter to the fundamental objective of estimating the return on equity of a benchmark entity.

Further, disregarding information simply because it was not originally designed to estimate the return on equity for benchmark efficient entity is, in our opinion, also inconsistent with the fundamental objective. We also note that this is a separable issue from whether the approach inconsistently uses a common parameter.[197] If there are concerns that a particular approach inconsistently uses a common parameter, then the AER can take guidance from clause 6A.6.2(e)(2) of the rules, ie:

> *the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt;*

On this basis, it might be said that the AER has not properly discharged the task assigned to it under the rules.

5.5.6.3. Adjustment for bias in the foundation model

The guidelines explicitly acknowledge that adopting an empirical version of the Sharpe-Lintner CAPM produces a biased estimate of the expected return on equity.[198] However, the AER's guidelines make no reference to any quantification of the extent of the bias associated with the model.

Instead, the guidelines propose an arbitrary adjustment to the point estimate of the equity beta, ie, an equity beta of 0.7 is selected from a range of between 0.4 and 0.7. There are a number of reasons why this approach to accounting for bias may not deliver outcomes that are consistent with the rate of return objective.

First, it is impossible to tell whether any adjustment is sufficient to compensate for bias without conducting some empirical analysis. An indication as to whether the adjustment is sufficient to remove the bias associated with the model can be attained from the AER's use of the Black CAPM theory. As explained in Appendix B.2, the AER's arbitrary adjustment to beta can be rejected as insufficient to deal with the low-beta bias associated with an empirical version of the Sharpe-Lintner CAPM. In other words, an analysis of historical Australian financial data rejects at the 5 per cent significance level, that the implied adjustment to the equity beta was sufficient.

---

[197] The AER notes that models that are not originally designed to provide an absolute return on equity could potentially be less sensitive to common parameters. See *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, pages 28-29.

[198] Reference to the theory of the Black CAPM in setting the equity beta implicitly accepts that the Sharpe-Lintner CAPM will downwardly bias estimates of low beta stocks/projects. See *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 88.

Second, an empirical version of the Sharpe-Lintner CAPM underestimates the returns to value stocks, and the equity of a regulated utility behaves like a value stock, ie, it has a positive and significant exposure to a value factor.

Third, the bias associated with an empirical version of the Sharpe-Lintner CAPM will affect both point and range estimates of the model. In other words, while the AER adjusts its point estimate to the top of its reasonable range in recognition of bias, there is no corresponding adjustment to its reasonable range.

Further, by applying an arbitrary adjustment to the empirical version of the Sharpe-Lintner CAPM, the AER is not actually using any financial model to set the return on equity for a benchmark TNSP. In our opinion, if the guidelines had considered whether its proposed approach provides an unbiased estimate of the return on equity for benchmark efficient TNSP, then:

- an empirical version of the Sharpe-Lintner CAPM would not be chosen as the foundation model; and
- regard would be had to a wider set of estimates from relevant estimation methods, financial models, and market data on the return on equity.

In our opinion, adopting a model that produces biased estimates as the foundation model without assessing the quantum of the bias means that the resulting estimates of the return on equity cannot be said to contribute to the achievement of the *allowed rate of return objective*.

5.5.7. Errors in the AER's approach to combining relevant material

We discussed above that, of the four financial models assessed, none is demonstrably superior to the others. All of the financial models are capable of improving the estimate of the expected return on equity, ie, are relevant. By contrast, the foundation model approach disregards relevant information (or affords it secondary significance) by having regard to the results derived from only one financial model and, indeed, a financial model that has an inherent bias.

The guidelines develop and apply a foundation model approach to combining relevant material that, by definition, only allows the results derived from a single financial model to be used to construct the expected return on equity range.

Further, the AER imposed an unnecessary restriction on the use of relevant information in that a financial model can only be used once. As a result, since the DGM is used to provide an estimate of the forward looking *MRP*, this technique is not used to directly estimate the return on equity for a benchmark efficient electricity or gas network. The reason for this restriction is to avoid the potential for 'double counting'.[199] However, it is not clear how using a technique twice with very different sets of inputs could constitute 'double

[199] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 57.

counting'.[200] Furthermore, the effect of any potential 'double counting' can be minimised through the exercise of regulatory judgement.

As a result, the approach to combining relevant material is unnecessarily restrictive. The consequences of adopting this restrictive use of information are that the approach:

- is unable to assess whether the adjustment made to an empirical version of the Sharpe-Lintner CAPM is sufficient to remove the acknowledged bias for low-beta stocks; and
- unnecessarily disregards information that can improve the estimate of the return on equity of a benchmark efficient TNSP.

The construction of the foundation model approach does not allow relevant material to be used more than once in estimating the expected return on equity. Although it is prudent to avoid double-counting, this 'blanket approach' to disallowing the use of relevant material more than once is unnecessarily restrictive. As a matter of principle, using relevant material more than once can improve the estimate of the expected return on equity and does not necessarily result in double counting. For example, the DGM can be applied in two different ways to estimate the *MRP* and the expected return on equity without double counting occurring.

[200] A direct estimate of the return on equity for a stock involves specific estimates of that stock's dividend yield, and expected growth in those dividends. In contrast, the DGM estimate of the return on the market (and listed regulated electricity and gas stocks represent a very small faction of total market) involves estimating the dividend yield of the market and the general growth in dividends for the market as a whole.

6. Conclusion and Recommendation

In our opinion, a nominal post-tax 'Vanilla' WACC of 8.83 per cent represents the best estimate of the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the TNSP for 2014/15. Table 6.1, sets out the constituent elements of the WACC.

Table 6.1
Recommended Rate of Return

Parameter	Value
Gearing	0.60
Return on Debt	7.72%
Return on Equity	10.50%
Nominal Vanilla WACC	**8.83%**

Gearing

A gearing ratio of 60 per cent debt and 40 per cent equity is the benchmark gearing ratio applied to all Australian regulated energy networks. Further, a 60 per cent debt gearing ratio is consistent with the most recent study of the gearing ratio of listed Australian firms with revenues substantially sourced from regulated energy networks.

Return on debt

We recommend an indicative return on debt allowance for 2014/15 of 7.72 per cent. In due course, this allowance should be updated to include estimates of the benchmark return on debt for the remaining months of the 2013/14 financial year.

The indicative return on debt allowance for a benchmark efficient TNSP has been estimated using :

- bonds issued by Australian corporations;
- yields measured in Australian dollar terms;
- with a BBB+ credit rating; and
- of a term of 10-years to maturity.

In particular, the indicative return has been estimated using:

- the non-financial corporate bond yields with a term of 10-years and a credit rating of BBB as published by the RBA; and
- a 10-year historical or trailing period prior to 2014/15 using all available RBA data.

We recommend that this trailing average be updated annually:

- to include updated annual observations of the yield on non-financial Australian corporate bonds of a term of 10-years and a credit rating of BBB as reported by the RBA; and
- to remove the oldest annual observation.

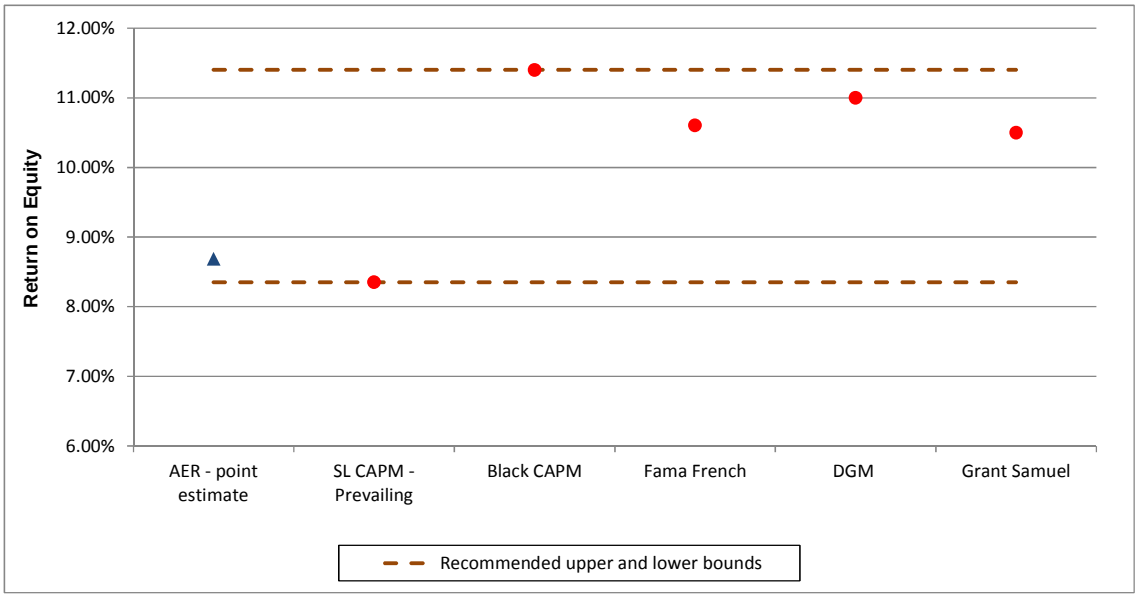
Return on equity

In our opinion a rate of 10.5 per cent represents the best estimate of the prevailing return on equity for a benchmark efficient TNSP.

We reach this conclusion on the basis that:

1. the range of return on equity estimates for a benchmark efficient TNSP derived using each form of relevant material range from 8.25 per cent to 11.5 per cent (see Figure 6.1, below);[201]

Figure 6.1
Estimates of the indicative rate and range of the return on equity



2. most estimates fall within the range of between 10.5 per cent and 11.5 per cent, with the only estimate outside this range being derived by the Sharpe-Lintner CAPM;
3. however, estimates derived by the Sharpe-Lintner CAPM should be expected to be at the lower end of any range, since there is a substantial body of evidence suggesting that this model will underestimate the return on equity for a benchmark efficient TNSP. This is because the benchmark efficient TNSP:
   - is a low beta stock and the evidence shows that the empirical form of the Sharpe-Lintner CAPM underestimates the returns on stocks with a beta less than one; and

[201] Noting that return on equity estimates are rounded to the closest 25 basis points.

- has an economically significant, positive exposure to the value risk premium, which is not compensated for in the Sharpe-Lintner CAPM;

4. empirically there is little relation across stocks between estimates of betas and subsequent returns – this result suggests that in determining the return on equity for a benchmark efficient TNSP regard should be had to the required return on the market;
5. a return on equity of 10.5 per cent is equal to the mid-point of the gamma adjusted return on equity range used by Grant Samuel to value Envestra, a firm recognised by the AER as comparable to a benchmark efficient TNSP. In that context, it represents an unbiased, independent expert estimate of the return on equity that will in turn be relied upon by shareholders to determine whether or not to accept APA Group's proposal to acquire all the issued capital for Envestra; and
6. a return on equity of 10.5 per cent is consistent with estimates derived using the FFM and the DGM.

Finally, we note that the observed risk premium provided to debt investors following the GFC has increased by over 150 basis points, as compared with pre-GFC debt premiums. A return on equity of 10.5 per cent is consistent with a post-GFC increase in the required return for equity investors in a benchmark TNSP that is comparable (in absolute terms) with the increase observed in the debt market since that same event.[202]

[202] The long-term historical average MRP is 6.5 per cent and so a firm with an equity beta of 0.7 would have an equity premium of 4.55 per cent. This is approximately 180 basis points lower than the equity premium implied by a return on equity of 10.5 per cent.

Appendix A. Empirical Tests of Financial Models

Empirical tests of pricing models focus on the properties of the 'end results' of using financial models to estimate the return on equity rather than on any theoretical deficiencies the models may exhibit. This 'end result' doctrine was developed in US case law in the *Hope* case[203] and has long since been embraced by US regulators. This doctrine is expressed:[204]

> *'It is the result reached and the impact of the rate order rather than the method or theory employed that is controlling. Potential infirmities inherent in the methods used are of secondary importance, according to this doctrine. This is a reassuring assertion, given the stringency and surrealism of the assumptions that frequently characterize the financial models and theories employed in the determination of a fair return.'*

Empirical tests generally take the form of time series tests or cross sectional tests, which we describe in turn below.

A.1. Time series tests

Pricing models typically place restrictions on time series regressions of the returns, or excess returns, to assets on one or more factors and then examine these restrictions.

For example, consider a regression of the return to an asset in excess of the risk-free rate on the excess return to the market portfolio. The Sharpe-Lintner CAPM imposes a restriction on the intercept of this time series regression. This intercept is known as the asset's alpha, and the Sharpe-Lintner CAPM predicts that the alpha of every asset should be zero.

By way of a second example, the Black CAPM involves the same regression but imposes a different restriction. The zero-beta premium is defined as the difference between the expected return to a portfolio that has a beta of zero and the risk-free rate. The Black CAPM then restricts the asset's alpha to be the product of:

- the zero-beta premium; and
- the difference between one and the asset's beta.

The zero-beta premium is unknown but can be estimated by using the restrictions that the Black CAPM imposes.[205]

There are a variety of different methods for estimating these time series regressions and testing the restrictions that the pricing models impose. However, these different methods typically generate similar results.

---

[203] Federal Power Commission v Hope Natural Gas Company, 320 U.S. 391 (1944).

[204] Morin, R., *New Regulatory Finance*, Public Utilities Reports, Inc., Vienna, Virginia, 2006, p.14.

[205] As well as excess-return regressions like those we describe above for a cross-section of assets.

A finite-sample test of whether the alphas of a set of assets are simultaneously zero can be constructed using the method of Gibbons, Ross and Shanken (1989).[206] However, this test requires certain characteristics in the regression's variance. An alternative is to test the same proposition, ie, that the alphas of a set of assets are simultaneously zero, using the Generalised Method of Moments (GMM) of Hansen (1982).[207] Lars Hansen was awarded a Nobel Prize in Economics in 2013 in part for developing these tests. [208]

A.2. Cross-sectional tests

Cross-sectional tests like those that Fama and MacBeth (1973) designed involve two steps, or passes. [209] To understand how these tests work, we will focus on tests of empirical versions of the CAPM.

In the first pass, for each asset and month, least-squares estimates are computed of the asset's betas using data over the previous five years. In the second pass, for each month a regression is run of the excess return to each asset on the most recent estimate of its beta computed using past data. The intercept in the regression provides an estimate of the zero-beta premium while, if the Sharpe-Lintner CAPM is true, the slope coefficient provides an estimate of the *MRP*.

An empirical version of the Sharpe-Lintner CAPM presumes that the zero-beta premium is zero. This presumption can be tested by conducting cross-sectional regressions of excess returns on estimates of beta and testing whether the average of the time series of intercept estimates produced is zero.

Litzenberger and Ramaswamy (1979) modify the two-pass methodology of Fama and MacBeth (1973) to explicitly take into account the fact that the second pass regressions use estimates of betas and not the parameters themselves. [210]

---

[206] Gibbons, M., S.A. Ross and J. Shanken, *A test of the efficiency of a given portfolio*, Econometrica, 1989, pages 1121-1152.

This test requires that the data are homoskedastic

[207] Hansen, L.P., *Large sample properties of Generalized Method of Moments estimators*, Econometrica, 1982, pages 1029-1054.

GMM tests do not require the data be homoskedastic but are large-sample tests.

[208] http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2013/advanced-economicsciences2013.pdf

[209] See, for example, Cochrane (2001).

Cochrane, J., *Asset pricing*, Princeton University Press, 2001.

Fama, E. F. and J. D. Macbeth, *Risk, return and equilibrium: Empirical tests*, Journal of Political Economy, 1973, pages 607-636.

Gibbons, Michael R., *Multivariate tests of financial models: A new approach*, Journal of Financial Economics, 1982, pages 3–27.

[210] Fama, Eugene F. and James D. Macbeth, *Risk, return and equilibrium: Empirical tests*, Journal of Political Economy, 1973, pages 607-636.

The two-pass methodology provides some important advantages over the time series methodology.

- First, the tests allow one to examine the important question of whether estimates of measures of risk are useful for predicting returns. For example, the AER uses estimates of betas to pin down a cost for equity. If these estimates are useful in tracking variation in the return on equity across firms, then this should be revealed in the data and there should be a positive relation on average between the excess returns to assets and estimates of their betas computed using past data.
- Second, the two-pass methodology allows one to examine whether there is significant variation over time in parameters like the zero-beta premium.
- Third, the modifications that Litzenberger and Ramaswamy (1979) introduce allow one to use large numbers of securities without the necessity of allocating the securities to portfolios. [211]

Litzenberger, Robert H. and Krishna Ramaswamy, *The effect of personal taxes and dividends on capital asset prices: Theory and empirical evidence*, Journal of Financial Economics, 1979, pages 163-195.

[211] Litzenberger, Robert H. and Krishna Ramaswamy, *The effect of personal taxes and dividends on capital asset prices: Theory and empirical evidence*, Journal of Financial Economics, 1979, pages 163-195.

Appendix B. Assessment of Relevant material

This appendix contains our assessment of the relevance of:

- the Sharpe-Lintner CAPM;
- the Black CAPM;
- the Fama-French three-factor model; and
- the DGM; and
- 'other material'.

B.1. Sharpe-Lintner CAPM

The capital asset pricing model of Sharpe and Lintner is commonly regarded as the first asset pricing theory.

Sharpe (1964) and Lintner (1965) examine the asset prices that would result if all investors chose portfolios that were mean-variance efficient,[212] ie, portfolios with the highest mean return for a given level of risk, measured by variance of return. The resulting model, which is known as the Sharpe-Lintner CAPM, provides insights into how risk might be measured and how mean return and risk might be related and is an attractively simple model.[213]

Sharpe and Lintner's insight is that the return that an investor will require on an individual asset will be determined not by how risky that asset would be if held alone, but by how the asset contributes to the risk of the portfolio that the investor holds. Because of the strong assumptions that Sharpe and Lintner make, all investors in their model hold a share of the market portfolio of risky assets.

The Sharpe-Lintner CAPM is expressed as the following equation:

$$\mathrm{E}(R_j) = R_f + \beta_j[\mathrm{E}(R_m) - R_f]$$

where

$E(R_j)$ = is the expected return on asset j;

R_f = is the risk-free rate;

---

[212] Sharpe, William F., *Capital asset prices: A theory of market equilibrium under conditions of risk*, Journal of Finance 19, 1964, pages.425-442.

Lintner, John, The *valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets*, Review of Economics and Statistics 47, 1965, pages13-37.

[213] Sharpe, William F., *Capital asset prices: A theory of market equilibrium under conditions of risk*, Journal of Finance 19, 1964, pages 425-442.

Lintner, John, *The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets*, Review of Economics and Statistics 47, 1965, pages 13-37.

β_j = asset *j*'s equity beta, which measures the contribution of the asset to the risk, measured by standard deviation of return, of the market portfolio; and

R_m = the expected return to the market portfolio of risky assets.

B.1.1. Specifications of the Sharpe-Lintner CAPM

Application of the Sharpe-Lintner CAPM requires values for three parameters:

- the risk-free rate (R_f),
- the equity beta (β); and
- the market risk premium ($[E(R_m) - R_f]$).

There is some debate about whether to use a prevailing value for the risk-free rate or a long-term average and, similarly, there is some debate over whether to use an estimate of the *MRP* prevailing in the market or an estimate of the *MRP* that is the average of a long time series. So, we consider four alternate specifications of the Sharpe-Lintner CAPM:

- the AER specification;
- a prevailing specification;
- a long-term average specification; and
- the Wright specification.

We provide a brief description of each of these specifications below.

B.1.1.1. The AER specification

The AER specification refers to the specification of the Sharpe-Lintner CAPM that was applied by the AER previously.[214] The AER specification uses:

- a prevailing value for the risk-free rate; and
- an estimate of the *MRP* that is predominately determined by reference to an historical average.

The prevailing risk-free rate for the 20 business days to 31 March 2014 is 4.14 per cent.[215] The guidelines conclude that the empirical evidence for Australian electricity and gas

[214] AER, *TransGrid Transmission Determination 2009-10 to 2013-14: Final Decision*, 28 April 2009.

[215] The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds TB133 (21 April 2023) and TB137 (21 April 2024).

networks supports an equity beta of between 0.4 and 0.7 with a point estimate of 0.7.[216] The reasons for selecting a point estimate at the top of the range were:

- the theoretical underpinnings of the Black CAPM suggest that the Sharpe-Lintner CAPM may underestimate the return on equity for firms with equity betas of less than 1.0; and
- consideration of the betas of overseas energy networks.

The guidelines also adopt a *MRP* range of between 5.0 per cent and 7.5 per cent with a point estimate of 6.5 per cent.[217] This range reflects:

- a lower bound derived from observations of the historical excess returns; and
- an upper bound calculated using the DGM.

B.1.1.2. The prevailing specification

A prevailing specification of the Sharpe-Lintner CAPM uses:

- a prevailing value for the risk-free rate; and
- an estimate of the *MRP* that is determined by reference forward looking estimates of the required return on the market portfolio.

The prevailing risk-free rate for the 20 business days to 31 March 2014 is 4.14 per cent.[218] In our opinion the best estimate of the forward looking return on the market is 10.3 per cent as reported by SFG.[219] Adjusting the expected return on the market for imputation credits results in the "with imputation credit return" of 11.4% (ie, 11.4% = 10.3%/0.9032). This results in a prevailing *MRP* of 7.26 per cent (ie, 7.26% = 11.4% - 4.14%). We have adopted an equity beta of 0.58 as estimated by SFG for the group of 9 comparable Australian firms.[220]

B.1.1.3. The long-term average specification

The long-term average specification of the Sharpe-Lintner CAPM uses estimates of both the risk-free rate and the *MRP* that are averages of long time series. The equity beta estimate is

---

[216] AER, *Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Final Decision*, May 2009, page 86.

[217] AER, *Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Final Decision*, May 2009, page 93.

[218] The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds TB133 (21 April 2023) and TB137 (21 April 2024).

[219] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 64.

[220] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June 2013, page 16.

that provided by the AER in its 2009 review of the WACC parameters for electricity transmission and distribution network service providers.[221]

This specification is similar to the approach proposed by IPART[222] as well as that used by Ofwat and Ofgem in the United Kingdom (UK).[223]

The long-term risk-free rate calculated over the last 10-years to 31 March 2014 is 5.11 per cent.[224] We have adopted a long-term average excess return on the market portfolio of 6.5 per cent based on the analysis provided by NERA for the period 1883 to 2012.[225] We note that NERA found that the data set used by the AER to calculated historical returns contained a downward bias.

We have also adopted an equity beta of 0.58 as estimated by SFG for the group of 9 comparable Australian firms.[226]

B.1.1.4. The Wright specification

The Wright specification uses an estimate of the prevailing risk-free rate and the equity beta, however, the Wright specification assumes that the return on the market is relatively constant through time and so estimates of the expected return on equity for a benchmark efficient entity will only move marginally with variations in the risk-free rate. That is, the Wright specification of the Sharpe-Lintner CAPM uses:

- a prevailing value for the risk-free rate; and
- the long-term real return on the market portfolio and a prevailing estimate of inflation.

The prevailing risk-free rate for the 20 business days to 31 March 2014 is 4.14 per cent.[227] In Our opinion the best estimate of the real return on the market is 8.87 per cent as reported by NERA.[228] Together with an inflation expectation of 2.5 per cent results in a nominal return on

---

221 AER, *Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Final Decision,* May 2009, pages 239–344.

222 IPART, *Review of WACC Methodology: Research — Final Report*, December 2013, page 9.

223 Ofwat, *Future water and sewerage charges 2010-15: Final determinations*, 2009, page 128-129.

Ofgem, *RIIO-GD1: Initial Proposals Supporting Document – Finance and uncertainty*, 2012, page 21.

224 The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds maturing immediately prior to and after the ten year term.

225 NERA, *The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines*, October 2013, page iii.

226 SFG, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June 2013, page 16.

227 The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds TB133 (21 April 2023) and TB137 (21 April 2024).

228 NERA, *The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines*, October 2013, page 28.

the market of 11.6 per cent. This results in a *MRP* of 7.46 per cent (ie, 7.46% = 11.6% - 4.14%). We have also adopted an equity beta of 0.58 as estimated by SFG for the group of 9 comparable Australian firms.[229]

B.1.2. Assessment of the Sharpe-Lintner CAPM

This section assesses an empirical version of the Sharpe-Lintner CAPM as a tool to estimate the return on equity against the assessment criteria set out in section 5.3.

First, we set out our assessment of an empirical version of the Sharpe-Lintner CAPM with reference to considerations that apply to all three of the specifications described above. Second, we discuss considerations that are peculiar to each specification.

B.1.2.1. Theoretical Support

The development of the Sharpe-Lintner CAPM in the early 1960's represented a significant advance in our understanding of how assets might be priced. The model is intuitive and simple and so it is not surprising that the Sharpe-Lintner CAPM is generally the first, and sometimes the only, financial model taught in Master of Business Administration finance courses.

Theoretically, the Sharpe-Lintner CAPM predicts that the market portfolio of all risky assets must be mean-variance efficient.[230] If the market portfolio of all risky assets is mean-variance efficient, then the mean return to an asset will be a positive linear function of the asset's beta computed relative to the market portfolio of all risky assets and the mean return to a zero-beta asset will equal the risk-free rate.

This simple relation between mean return and beta provides market participants and regulators with what, in principle, should be a simple way of estimating a firm's return on equity. In practice, however, applying this theoretical model is more complicated.

Applying this financial model is more complicated because, in practice, one cannot observe the return to the market portfolio of all risky assets. The market portfolio of all risky assets includes not only stocks, for which returns are readily available, but also corporate bonds, real estate and human capital, for which returns are not readily available.

Because of these difficulties, an empirical version of the Sharpe-Lintner CAPM typically uses a portfolio of stocks as a proxy for the market portfolio of all risky assets. As Ibbotson, Siegel and Love (1985) point out, though, stocks make up only a relatively small fraction of total wealth and so the return to a portfolio of stocks need not be a good proxy for the return to the market portfolio of all risky assets.[231] Real estate, for example, makes up a substantial

---

[229] SFG, *Regression-based estimates of risk parameters for the benchmark firm*, 24 June 2013, page 16.

[230] Again, a portfolio is mean-variance efficient if it has the highest mean return for given variance of return.

[231] Ibbotson, Roger G., Laurence Siegel and Kathryn S. Love, *World Wealth: U.S. and Foreign Market Values and Returns*, Journal of Portfolio Management, Fall, 1985.

portion of total wealth and the returns to real estate and stocks do not appear to track each other closely.

While the Sharpe-Lintner CAPM predicts that the market portfolio of all risky assets must be mean-variance efficient the model makes no prediction about whether the market portfolio of stocks alone should be efficient. It follows that, even were the Sharpe-Lintner CAPM to be true, the relation between the mean return to an asset and the asset's beta computed relative to the market portfolio of stocks alone need be neither linear nor positive. Further, the Sharpe-Lintner CAPM does not imply that the mean return to an asset that has a zero beta relative to the market portfolio of stocks must equal the risk-free rate.

To summarise, while there is strong theoretical support for the Sharpe-Lintner CAPM, the model applied to estimate the cost of equity materially departs from the theoretical version of the Sharpe-Lintner CAPM. As a result, even if the model is correct and investors are only concerned with the covariance of a stock to an efficient portfolio containing all risky assets, there is no reason to believe that investors will be concerned with the covariance of a stock to a portfolio of Australian publically listed stocks.

B.1.2.2. Empirical Support

Empirical versions of the Sharpe-Lintner CAPM are widely acknowledged as having poor empirical records. Evidence from Australia and the US indicates that the relation between the mean return to an asset and the asset's beta computed relative to the market portfolio of stocks is not linear. Moreover, evidence from Australia and the US indicates that the mean return to an asset that has a zero beta relative to the market portfolio of stocks lies above the risk-free rate.

Using Australian data from 1974 to 2007, CEG (2008) reject the hypothesis that the mean return to an asset that has a zero beta relative to the market portfolio of stocks matches the risk-free rate. [232] CEG cannot, on the other hand, reject the hypothesis that this zero-beta return matches the mean return to the market portfolio of stocks. In other words, CEG find no evidence of a relation between an asset's beta computed relative to the market portfolio of stocks and the asset's mean return. NERA (2013) finds similar results using Australian data from 1974 to 2012. [233]

Brailsford, Gaunt and O'Brien (2012) find, using Australian data from 1982 to 2006 and a portfolio of stocks as a proxy for the market portfolio of all risky assets, that an empirical version of the Sharpe-Lintner CAPM underestimates the returns required on value stocks and overestimates the returns to growth stocks.[234] Thus they find evidence against the joint hypothesis that the relation between an asset's mean return and the asset's beta computed

---

[232] CEG, *Estimation of, and correction for, biases inherent in the Sharpe CAPM formula*, September 2008.

[233] NERA, *Estimates of the zero-beta premium: A report for the Energy Networks Association*, June 2013.

[234] Brailsford, T., C. Gaunt and M. O'Brien, *Size and book-to-market factors in Australia*, Australian Journal of Management, 2012, pages 261-281.

relative to the market portfolio of stocks is linear and the mean return to an asset with a zero beta relative to the portfolio matches the risk-free rate.

Using US data from before the model was developed, ie, 1964, Fama and MacBeth (1973) test and reject an empirical version of the Sharpe-Lintner CAPM.[235] Similarly, Campbell and Vuolteenaho (2004) and Lewellen, Nagel and Shanken (2008) test an empirical version of the model using US data from predominantly after 1964 and are also able to reject it.[236] All three sets of authors find that the mean return to an asset that has a zero beta relative to the market portfolio of stocks exceeds the risk-free rate. Campbell and Vuolteenaho and Lewellen, Nagel and Shanken find that in the more recent data the difference between the mean return to an asset that has a zero beta relative to the market portfolio of stocks and the risk-free rate is substantial.

Consistent with the evidence of Campbell and Vuolteenaho (2004) and Lewellen, Nagel and Shanken (2008), Fama and French (1992) find, in US data from 1963 to 1990, no significant relation between the mean return to an asset and an estimate of the asset's beta computed relative to the market portfolio of stocks.[237] Moreover, Fama and French find that size and book-to-market are better predictors of the return to a stock than an estimate of the stock's beta computed relative to the market portfolio of stocks. Thus they find evidence against the hypothesis that the relation between the mean return to an asset and the asset's beta computed relative to the market portfolio of stocks is linear.

We also note a study published in 2011 by Chrétien and Coggins concludes that:

> *'Our empirical results can be summarized as follows. First, the CAPM significantly underestimates the risk premiums of energy utilities compared to their historical values. The underestimations are economically important, with annualized averages of respectively 4.5% and 6.2% for the Canadian and American gas utilities we consider, and are consistent with the finance literature on the mispricing of low beta, value-oriented stocks. Second, the Fama-French model and the Adjusted CAPM[238] are both able to provide costs of equity that are not significantly different from the historical ones.*
>
> …

---

[235] Fama and MacBeth (1973) use data from 1935 to 1968 to test the Sharpe-Lintner CAPM. Their table 3, though, provides sufficient information for one to construct a test of the SL CAPM using data only from before 1964. Excluding data from 1964 through 1968 does not alter their conclusion that the zero-beta rate exceeds on average the risk-free rate.

[236] Campbell, J. and T. Vuolteenaho, *Bad beta, good beta*, American Economic Review 2004, pp. 1249-1275.

Lewellen, J., S. Nagel and J. Shanken, *A skeptical appraisal of asset pricing tests*, Journal of Financial Economics 96, 2008, pages 175- 194.

[237] Fama, F. and French, K., *The cross-section of expected returns*, Journal of Finance 47, 1992, pages 427-465.

[238] We note that the Adjusted CAPM makes the following two adjustments to the Sharpe-Lintner CAPM:

- the use of Blume adjusted betas, (ie, $\beta^{Adj} = 0.333 + 0.667 \times \beta^{his}$); and
- a bias correction premium, that has regard to the historical risk premium error and the firm's beta.

> *Overall, we conclude that the CAPM is problematic in estimating econometrically the cost of equity of energy utilities. The Fama-French model and the Adjusted CAPM are well specified for this purpose as they reduce considerably the estimation errors. These models could thus be considered as alternatives to the CAPM in the Equity Risk Premium method employed by regulatory bodies to obtain the risk-return relationship for the fairness to investors' criterion.'* [239]

To summarise, there is a large body of work from reputable sources in both Australia and the US that indicates that in data drawn from the last 50 years or so there is little in the way of a relation between the return to a stock, or a portfolio of stocks, and an estimate of its beta computed relative to a portfolio of stocks. In other words, in data drawn from the last 50 years or so there is little empirical support for an empirical version of the Sharpe-Lintner CAPM. This evidence does not indicate that the Sharpe-Lintner CAPM itself is incorrect but it does cast considerable doubt on the usefulness of an empirical version of the model.

B.1.2.3. Use by practitioners

The poor empirical performance of an empirical version of the Sharpe-Lintner CAPM is well known by market practitioners. As a result an empirical version of the Sharpe-Lintner CAPM is rarely used and relied upon by market practitioners without significant adjustments being made to the inputs that the model requires.

We note Grant Samuel in its evaluation of the discount rate used to estimate the value of Envestra states that:

> *'Many businesses and investors use relatively arbitrary "hurdle rates" which do not vary significantly from investment to investment or change significantly over time despite interest rate movements. Valuation is an estimate of what real world buyers and sellers of assets would pay and must therefore reflect criteria that will be applied in practice even if they are not theoretically correct. Grant Samuel considers the rates adopted to be reasonable discount rates that acquirers would use irrespective of the outcome of any particular theoretical model.'* [240]

While Grant Samuel utilised the CAPM as a starting point of their analysis of the return on equity it cautioned against strictly regarding the rates calculated using the CAPM as inviolate. Grant Samuel highlighted that:

> *'… while the theory underlying the CAPM is rigorous the practical application is subject to shortcomings and limitations and the results of applying the CAPM model should only be regarded as providing a general guide.'* [241]

---

[239] Chrétien, Stéphane and Coggins, Franks (2011), "Cost of equity for Energy Utilities: Beyond the CAPM," Energy Studies Review: Vol. 18: Iss. 2, Article 2, page 20.

[240] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, page 1.

[241] Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, page 1.

Incenta in its examination of independent expert reports did not mechanistically apply the Sharpe-Lintner CAPM and the following adjustments were made to the model:[242]

- adjustments to the risk-free rate, when the prevailing rate was substantially different from the long-term average;
- adjustments to the market risk premium; and
- the inclusion of additional risk factors.

B.1.2.4. Assessment of the alternate specifications

AER specification

The AER's specification of the Sharpe-Lintner CAPM combines a current risk-free rate with an estimate of the *MRP* that is predominately determined by reference to historical data. While the current risk-free rate will reflect prevailing market conditions, as required by the rules,[243] an historical estimate of the *MRP* will not in general be an unbiased estimator of the currently prevailing *MRP*. Thus, as the expert reports of Professors Gregory and Wright note, a combination of a prevailing risk-free rate with an historical estimate of the *MRP* can – regardless of whether an empirical version of the Sharpe-Lintner CAPM is true – result in a downwardly biased estimator for the return on equity.[244]

Prevailing specification

In estimating the return on equity, the rules require the estimate to have regard to the prevailing conditions in the market for equity funds.[245]

The prevailing specification of the Sharpe-Lintner CAPM that uses a best estimate of both the risk-free rate and the *MRP* and, as a result, has significant regard to prevailing conditions in the market.

Long-term average specification

In estimating the return on equity, the rules require the estimate to have regard to the prevailing conditions in the market for equity funds.[246]

The long-term average specification of the Sharpe-Lintner CAPM uses historical estimates of both the risk-free rate and the *MRP* and, as a result, has limited regard to prevailing

---

[242] Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, pages 12-22.

[243] Clause 6A.6.2(g) of the rules.

[244] Gregory A., *The AER approach to establishing the cost of equity – Analysis of the method used to establish the risk free rate and the market risk premium*, October 2012.

Wright, S., *Review of the risk free rate and cost of equity estimates: A comparison of UK approaches and the AER*, October 2012.

[245] Clause 6A.6.2(g) of the rules.

[246] Clause 6A.6.2(g) of the rules.

conditions in the market. In other words, under a long-term average specification of the Sharpe-Lintner CAPM the expected return on equity for a benchmark efficient TNSP does not react to changes prevailing market conditions, instead the expected return on equity changes gradually with changes in the long-term average risk-free rate.

Wright specification

The principle feature of the Wright specification of the Sharpe-Lintner CAPM is that the return on the market portfolio is independently estimated from observed historical data. Implicit in this specification is that the return on the market portfolio is invariant to changes in market conditions. As a consequence the expected return on equity for a benchmark efficient TNSP will only move marginally with variations in the prevailing risk-free rate.

B.1.3. Summary

In estimating the return on equity, the rules requires the estimate to have regard to the prevailing conditions in the market for equity funds.[247] Given this requirement we observe that estimates of the return on equity for a benchmark efficient TNSP:

- generated by the Wright or the long-term average specifications of the Sharpe-Lintner CAPM are capable of reacting to changes prevailing market conditions; and
- AER's specification of the Sharpe-Lintner CAPM that relies on an estimate of the *MRP* that is predominately determined by reference to historical data will not, in general, be an unbiased estimator of the currently prevailing *MRP*.

As a consequence we recommend that the Shape-Lintner CAPM be estimated using prevailing estimates of the risk-free rate and *MRP*.

B.1.4. Estimates

An empirical version of the Sharpe-Lintner CAPM and the three specifications set out in section B.1.1 generate the three estimates of the return on equity shown in Table B.1 below.

[247] Clause 6A.6.2(g) of the rules.

Table B.1
Return on equity estimates using different specifications of the Sharpe-Lintner CAPM

Specification	Risk-free rate	Beta	MRP	Return on equity
AER	4.14%	0.70	6.50%	8.69%
Prevailing	**4.14%**	**0.58**	**7.26%**	**8.4%**
Long-term	5.11%	0.58	6.50%	8.9%
Wright	4.14%	0.58	7.46%*	8.5%

B.2. Black CAPM

While the theoretical version of the Sharpe-Lintner CAPM is an intuitive and attractively simple theory, it is widely acknowledged that there is little empirical support for an empirical version of the model. In particular, the evidence indicates that an empirical version of the Sharpe-Lintner CAPM underestimates the mean returns of low-beta assets and over-estimates the mean returns of high-beta assets.[248]

The poor performance of an empirical version of the Sharpe-Lintner CAPM prompted Black (1972) and Brennan (1971) to examine whether the model would better fit the data if the assumption that investors can borrow and lend freely at a single rate were relaxed.[249]

Brennan (1971) shows that if the assumption that investors can borrow and lend freely at a single rate is replaced by the assumption that investors can borrow at one risk-free rate and lend at another lower risk-free rate then the market portfolio of all risky assets must be mean-variance efficient. [250] If, with these assumptions about an investor's borrowing and lending opportunities, the market portfolio of all risky assets is mean-variance efficient, then the mean return to an asset will be a positive linear function of the asset's beta computed relative to the market portfolio of all risky assets and the mean return to a zero-beta asset will lie between the borrowing and lending rates.

Although three authors contributed to the development of the model, the model is generally known as the 'Black' CAPM. The Sharpe-Lintner CAPM is a special case of the Black CAPM in which the zero-beta rate matches a single risk-free rate. Put another way, the Black CAPM is a more general model than the Sharpe-Lintner CAPM.

---

[248] Black, F., Jensen, M., Scholes, M, *The capital asset pricing model: Some empirical tests*, in Jensen, Michael, (ed.), Studies in the Theory of Capital Markets, 1972, Praeger, New York.

[249] Black, Fischer, *Capital market equilibrium with restricted borrowing*, Journal of Business 45, 1972, pages 444-454.

Brennan, Michael, *Capital market equilibrium with divergent borrowing and lending rates*, Journal of Financial and Quantitative Analysis 6, 1971, pages 1197-1205.

[250] Brennan, Michael, *Capital market equilibrium with divergent borrowing and lending rates*, Journal of Financial and Quantitative Analysis 6, 1971, pages 1197-1205.

B.2.1. Specifications of the Black CAPM

The sole difference between the Black CAPM and the Sharpe-Lintner CAPM is the inclusion of an additional parameter, the zero-beta premium. The zero-beta premium is the difference between the mean return of a zero-beta portfolio and the risk-free rate. The Black CAPM collapses to the Sharpe-Lintner CAPM when the zero beta premium has a value of zero.

Australian estimates of the zero-beta premium have been found to be not significantly different from the *MRP*.[251] So our specification of the Black CAPM incorporates the assumption that the zero-beta premium is equal to the *MRP*.

Further, we use with the Black CAPM:

- a prevailing risk-free rate; and
- an historical estimate of the *MRP*.

The prevailing risk-free rate for the 20 business days to 31 March 2014 is 4.14 per cent.[252] In our opinion the best estimate of the forward looking return on the market is 10.3 per cent as reported by SFG before consideration of imputation credits.[253] Adjusting the expected return on the market for imputation credits results in the "with imputation credit return" of 11.4% (ie, 11.4% = 10.3%/0.9032). This results in a prevailing *MRP* of 7.26 per cent (ie, 7.26% = 11.4% - 4.14%).

B.2.2. Assessment of the Black CAPM

In this section we assess our specification of the empirical Black CAPM against our assessment criteria.

B.2.2.1. Theoretical support

Theoretically, the Black CAPM predicts that the market portfolio of all risky assets must be mean-variance efficient. If the market portfolio of all risky assets is mean-variance efficient, then the mean return to an asset will be a positive linear function of the asset's beta computed relative to the market portfolio of all risky assets. In addition, with the assumptions that the Black CAPM makes about an investor's borrowing and lending opportunities, the mean return to a zero-beta asset will lie between the borrowing and lending rates.

---

[251] See:

- CEG, *Estimation of, and correction for, biases inherent in the Sharpe CAPM formula*, September 2008; and
- Lajbcygier, P. and S. M. Wheatley, *An evaluation of some alternative models for pricing Australian stocks*, Monash University, March 2012.

[252] The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds TB133 (21 April 2023) and TB137 (21 April 2024).

[253] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 64.

An empirical version of the Black CAPM typically uses a portfolio of stocks as a proxy for the market portfolio of all risky assets. While the Black CAPM predicts that the market portfolio of all risky assets must be mean-variance efficient, however, the model makes no prediction about whether the market portfolio of stocks alone should be efficient. It follows that, even were the Black CAPM to be true, the relation between the mean return to an asset and the asset's beta computed relative to the market portfolio of stocks alone need be neither linear nor positive. Further, the Black CAPM does not imply that the mean return to an asset that has a zero beta relative to the market portfolio of stocks must lie between the borrowing and lending rates.

To summarise, like the Sharpe-Lintner CAPM there is strong theoretical support for the Black CAPM, however, the applied Black CAPM materially departs from the theoretical version of the model. Specifically, in that the market portfolio is estimated by reference to listed Australian stocks rather than all risky assets.

B.2.2.2. Empirical support

The guidelines involve: [254]

> '*using the Black CAPM theory to inform our equity beta estimate may mitigate possible low beta bias.'*

The Black CAPM predicts that the mean return to an asset that has a zero beta computed relative to the market portfolio of all risky assets will lie between the borrowing and lending rates. As we have emphasised, the Black CAPM does not imply that the mean return to an asset that has a zero beta relative to the market portfolio of stocks alone must lie between the borrowing and lending rates. Thus how far the mean return to an asset that has a zero beta relative to the market portfolio of stocks sits from the borrowing rate must be an empirical, rather than a theoretical matter.

The AER, nevertheless, examines the impact that a number of assumptions about the mean return to an asset that has a zero beta relative to the market portfolio of stocks would have on the cost of equity for a regulated firm. [255] In particular, the AER asks what upward adjustment to the firm's equity beta one would need to make for an empirical version of the Sharpe-Lintner CAPM to deliver the same cost of equity.

An empirical version of the Black CAPM states that:

$$\mathrm{E}(z_j) = \gamma_0 + \beta_j[\mathrm{E}(z_m) - \gamma_0], \quad (1)$$

where:

z_j = the return to asset j in excess of the risk-free rate;

[254] AER, *Better regulation - Explanatory statement: Rate of return guideline (Appendices) December* 2013, page 12.

[255] AER, *Better regulation - Explanatory statement: Rate of return guideline (Appendices) December* 2013, page 71.

z_m = the return to the market portfolio of stocks in excess of the risk-free rate;

β_j = the beta of asset *j* relative to the market portfolio of stocks; and

γ_0 = the return to a portfolio that has a zero beta relative to the market portfolio of stocks in excess of the risk-free rate, that is, the zero-beta premium.

An empirical version of the Sharpe-Lintner CAPM, on the other hand, states that:

$$\mathrm{E}(z_j) = \beta_j \mathrm{E}(z_m) \tag{2}$$

Let $\beta_{j,adj}$ be the upwardly adjusted equity beta that will ensure that an empirical version of the Sharpe-Lintner CAPM will deliver the same cost of equity as an empirical version of the Black CAPM. Then from (1) and (2)

$$\beta_{j,adj} = \beta_j + (1-\beta_j)\frac{\gamma_0}{\mathrm{E}(r_m)} \tag{3}$$

The equity beta of a firm whose true equity beta lies below one must be adjusted upwards if the zero-beta premium exceeds zero.

The AER concludes that a range for the equity beta of a regulated utility lies between 0.4 and 0.7 and states that: [256]

> *'adopting a point estimate around the mid-point would be more reasonable if our intention was to base the allowed return on equity on the Sharpe–Lintner CAPM and empirical estimates alone'*
>
> *'we propose to select a point estimate at the higher end of the range considering the theoretical predictions of the Black CAPM.'*

Equation (3) can be used to ascertain what value for the zero-beta premium will deliver an adjusted value for the equity beta at the higher end of the AER's range of 0.7. Rearranging (3) yields:

$$\gamma_0 = \left(\frac{\beta_{j,adj} - \beta_j}{1-\beta_j}\right)\mathrm{E}(r_m) \tag{4}$$

Using (4), the fact that the midpoint of the range of from 0.4 to 0.7 is 0.55 and an *MRP* of 6.5 per cent per annum, it is evident that a value for the zero-beta premium in per cent per annum of

---

[256] AER, *Better regulation - Equity beta issues paper*, October 2013, page 53.

AER, *Better regulation - Explanatory statement: Rate of return guideline (Appendices)*, December 2013, page 76.

$$\gamma_0 = \left(\frac{0.70 - 0.55}{1 - 0.55} \right) \times 6.5 = 2.17 \quad (5)$$

is required to generate an adjusted equity beta of 0.70.

Having established what value for the zero-beta premium the AER appears to employ, we now examine whether the empirical evidence supports its choice.

Estimates of the zero-beta premium produced by studies that use long time series of Australian data are generally larger than the estimates of the *MRP* that the AER has in the past used.

- CEG (2008) uses Australian data from 1974 to 2007 and reports estimates of the zero-beta premium that range between 7.21 per cent per annum and 10.31 per cent per annum using various cross-sections of stocks traded on the ASX data formed into 10 portfolios on the basis of past estimates of beta;[257] and
- NERA (2013) uses Australian data from 1974 to 2012 and reports estimates of the zero-beta premium that range between 8.74 per cent per annum and 13.95 per cent per annum using both individual stocks and stocks formed into portfolios on the basis of past estimates of beta. [258]

The standard errors attached to the CEG and NERA estimates are generally low enough that one can reject the hypothesis that the zero-beta premium is zero. The standard errors that are attached to the NERA estimates computed over its entire sample that runs from 1974 to 2012 are low enough that one can reject the hypothesis that the zero-beta premium lies below 3 per cent per annum.

Estimates of the zero-beta premium computed from US data drawn from a similar period, that is, the last 50 years or so, are of a similar magnitude. For example:

- Lewellen, Nagel Shanken (2010) compute estimates of the zero-beta premium of 8.12 and 11.60 per cent using data from 1963 to 2004;[259] and
- Campbell and Vuolteenaho (2004) compute an estimate of the zero-beta premium of 8.28 per cent using data from 1963 to 2001.[260]

---

257 CEG, *Estimation of, and correction for, biases inherent in the Sharpe CAPM formula*, September 2008.

258 Estimates that NERA produce using subsets of the data are, as one would expect, typically less precise and so there is more variation across the estimates. Estimates that NERA produce using data from 1974 to 1993 and from 1994 to 2012 range from 9.00 to 17.68 per cent per annum.

NERA, *Estimates of the zero-beta premium: A report for the Energy Networks Association*, June 2013.

259 Lewellen, J., S. Nagel and J. Shanken, *A skeptical appraisal of asset pricing tests*, Journal of Financial Economics, 2008, pages 175-194.

260 Campbell, J. and T. Vuolteenaho, *Bad beta, good beta*, American Economic Review, 2004, pages 1249-1275.

Estimates of the zero-beta premium computed from US data drawn from earlier in the 20th century, on the other hand, tend to be somewhat lower. For example:

- Fama and Macbeth (1973) compute an estimate of the zero-beta premium of 5.76 per cent using data from 1935 to 1968;[261] and
- Campbell and Vuolteenaho (2004) compute an estimate of the zero-beta premium of 2.76 per cent using data from 1929 to 1963;[262]

Australian and US data drawn from the last 50 years or so indicate that estimates of the zero-beta premium do not differ significantly from estimates of the *MRP*. In other words, Australian and US data drawn from the last 50 years or so indicate that estimates of beta computed relative to the market portfolio of stocks have not been useful for tracking variation in returns across stocks.

So our specification of the Black CAPM assumes that the zero-beta premium is equal to the *MRP*. In other words, our specification of the Black CAPM will result in the same mean return for all stocks. This result may appear implausible, but it merely reflects the inability of estimates of beta computed relative to the market portfolio of stocks to track variation in returns across stocks.

Our specification of the Black CAPM combines long-term estimates of the *MRP* and zero-beta premium with a prevailing risk-free rate, which may result in significant variation in cost of equity estimates over time.

As we have already noted, Brailsford, Gaunt and O'Brien (2012) find, using Australian data from 1982 to 2006 and a portfolio of stocks as a proxy for the market portfolio of all risky assets, that an empirical version of the Sharpe-Lintner CAPM underestimates the returns required on value stocks and overestimates the returns to growth stocks.[263] Thus they find evidence against the hypothesis that the relation between an asset's mean return and the asset's beta computed relative to the market portfolio of stocks is linear.

Similarly, Fama and French (1992) find, in US data from 1963 to 1990, that size and book-to-market are better predictors of the return to a stock than an estimate of the stock's beta computed relative to the market portfolio of stocks. Thus they also find evidence against the hypothesis that the relation between the mean return to an asset and the asset's beta computed relative to the market portfolio of stocks is linear.

So evidence from Australian and US data indicates that there are sources of risk that neither the Sharpe-Lintner nor the Black CAPM capture.

---

[261] Fama, E and J. MacBeth, *Risk, return, and equilibrium: Empirical tests*, Journal of Political Economy, 1973, pages 607-636.

[262] Campbell, J. and T. Vuolteenaho, Bad beta, good beta, American Economic Review 94, pages 1249-1275.

[263] Brailsford, T., C. Gaunt and M. O'Brien, *Size and book-to-market factors in Australia*, Australian Journal of Management, 2012, pages 261-281.

B.2.2.3. Use by practitioners

As discussed, evidence of high/low beta bias has been published by a number of authors in highly respected financial and economic journals and has been identified in a number of markets, including the US and Australian markets.

Despite correcting for the high/low beta bias present in the Sharpe-Lintner CAPM, the Black CAPM is not a well-accepted financial model that is formally adopted by market practitioners.

Furthermore, Incenta examined the five lowest beta firms/projects from its sample of 20 that used a 10-year risk-free rate time horizon, which had an average equity beta of 0.77. Incenta found:

> *'For this low beta group during the 27 April 2013 to 20 April 2014 period the average cost of equity estimated by independent experts was 11.9 per cent compared with 9.1 per cent estimated by a mechanistic approach (median values 12.2 per cent and 8.8 per cent respectively)'* [264]

This finding suggests that market practitioners are concerned with the results of Sharpe-Lintner CAPM for low beta firms/projects.

B.2.3. Summary

The greatest strength of the Black CAPM is its central message tenet that the Sharpe-Lintner CAPM systemically underestimates the returns on low beta stocks and overstates the returns on high beta stocks. This finding has been published by a number of authors in highly respected financial and economic journals. Furthermore, this bias has been found in multiple markets including the US and Australia.

Importantly, the finding of bias is consistent with the previous studies by CEG and NERA where the standard errors attached to the zero beta estimates are low enough that one can reject the hypothesis that the zero-beta premium is zero. In addition, the standard errors that are attached to the NERA estimates computed over its entire sample that runs from 1974 to 2012 are low enough that one can reject the hypothesis that the zero-beta premium lies below 3 per cent per annum. In other words, the NERA study demonstrates that the implied adjustment to the point estimate of the equity beta, made by the AER in the guidelines, is also insufficient to remove the bias.

Empirical estimates of the Black CAPM suggest that the equity beta of a firm is not useful for determining the required return on the firm's equity. In other words, the empirical studies into the Black CAPM demonstrates that one cannot use an estimate of the equity beta of a particular firm to provide a better estimate of the required return on the firm's equity than that derived, simply, from an estimate of the required return on the market.

---

[264] Incenta, *Update of evidence on the return on equity from independent expert reports*, May 2014, page 21.

B.2.4. Black CAPM estimate

We applied the Black CAPM and estimated the mean return on equity to be 11.4 per cent for the period ending 30 March 2014. This has been calculated using:

- a prevailing risk-free rate for the 20 business days to 31 March 2014 is 4.14 per cent;[265]
- an expected return on the market (adjusted for a gamma value of 0.25) of 11.4%;[266] and
- a zero beta value equal to the *MRP*.

B.3. Fama-French three-factor model

The Fama-French three-factor model (FFM) was developed in response to the Sharpe-Lintner CAPM's inability to explain the returns earned by small and value stocks.

Contrary to the predictions of the Sharpe-Lintner CAPM and the Black CAPM, Fama and French (1992) show that the market value of a firm's equity and the ratio of the book value of the equity to its market value are better predictors of the equity's return than a stock's equity beta.[267,268]

Further, Fama and French (1993) show that mean equity returns can be largely explained by the extent to which equities are exposed to three factors:[269]

- the excess return to the market portfolio;

---

[265] The risk free rate has been calculated using the *Indicative mid rates of selected Commonwealth government securities* (CGS) (table F16) as reported on the RBA website. An annualised 10-year CGS yield is calculated by interpolating bonds TB133 (21 April 2023) and TB137 (21 April 2024).

[266] This is based on our opinion that the best estimate of the forward looking return on the market is 10.3 per cent as reported by SFG before consideration of imputation credits.[266] Adjusting the expected return on the market for imputation credits results in the "with imputation credit return" of 11.4% (ie, 11.4% = 10.3%/0.9032). See:

SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 64.

[267] Fama, E., French, K., *The cross-section of expected returns*, Journal of Finance 47, 1992, pages 427-465.

[268] Kothari, Shanken, and Sloan (1995) suggest that the evidence that Fama and French provide may reflect survivorship bias. In particular, they suggest that selective backfilling by Compustat may provide the appearance of a stronger value effect than actually exists. Chan, Jegadeesh and Lakonishok (1995), however, show that selection bias contributes negligibly to the value effect in Compustat data and Davis (1994) shows that a value effect exists in pre-Compustat data that are free from any survivorship bias.

Chan, L. K. C., Jegadeesh, N., and Lakonishok, J., *Evaluating the performance of value versus glamour stocks: The impact of selection bias*, Journal of Financial Economics, 1995, pages 269–296.

Davis, James L., *The cross-section of realized stock returns: The pre-Compustat evidence*, Journal of Finance, 1994, pages 1579-1593.

Kothari, S.P., Jay Shanken, and Richard G. Sloan, *Another look at the cross-section of expected stock returns*, Journal of Finance, 1995, pages 185-224.

[269] Fama, E., French, K., *Common risk factors in the returns to stocks and bonds*, Journal of Financial Economics 33, 1993, pages 3-56.

- the difference between the return to a portfolio of high book-to-market stocks, ie, value stocks, and the return to a portfolio of low book-to-market stocks, ie, growth stocks, described as 'high minus low' or HML; and
- the difference between the return to a portfolio of small capitalisation stocks and the return to a portfolio of large capitalisation stocks, described as 'small minus big' or SMB.

The resulting model is known as the FFM, is:

$$\mathrm{E}(R_j) = R_f + b_j[\mathrm{E}(R_m) - R_f] + h_j HML + s_j SMB$$

where

b_j, h_j and s_j are the slope coefficients from a multivariate regression of R_j on R_m, *HML* and *SMB.*

We note that the AER states that there is no unique specification for the FFM.[270] This is incorrect, and that while there are many multivariate models which utilise additional risk factors to the Sharpe-Lintner CAPM there is only one FFM.

It is helpful to note that mean returns in the FFM do not depend on a firm's actual size and book-to-market ratio. Rather, mean returns depend on a stock's exposure to the three factors set out above. For example, a company that has a high book-to-market ratio will not necessarily earn higher returns on average because it is a value stock – it will only earn higher returns on average if it has high exposures to the three Fama-French factors.[271]

B.3.1. Specification of the FFM

Application of the FFM requires the specification of seven parameters:

- the risk-free rate;
- three betas – a market beta, an HML beta and an SMB beta; and
- three risk premiums – the *MRP*, an HML premium and an SMB premium.

We rely on the recent report by SFG who have constructed the Fama French factor premiums (*SMB* and *HML*) according to the process adopted by Brailsford, Gaunt and O'Brien (2012a). That is:

- large stocks are those that in aggregate, comprise 90 per cent of the market capitalisation;
- small stocks are all listed stocks not defined as large;
- value stocks are defined as stocks in the top 30th percentile of the book-to-market value; and

---

[270] AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 19.

[271] Koller, Tim, Marc Goedhart and David Wessels, *Valuation: Measuring and managing the value of companies*, 2005, McKinsey.

- growth stocks are defined as stocks in the bottom 70th percentile of the book-to-market value.

The Australian SMB and HML factor premiums are estimated from monthly data from January 1985 to February 2014.[272] SFG find that the mean value for *SMB* is −0.43% and the mean value for *HML* is 9.97%.[273] Furthermore, consistent with our estimates for the Sharpe-Lintner CAPM and Black CAPM in our opinion the best estimate of the forward looking *MRP* (with imputation credits) is 7.26%.[274]

These findings are consistent with those previously reported by NERA; namely, that empirical evidence supports the proposition that:[275]

- there is a persistent and statistically significant value risk premium in Australia; and
- there may be size premium in Australia.

Furthermore, SFG estimate the Fama-French three-factor betas for benchmark efficient TNSP using the nine Australian comparable firms is:[276]

- b_j 0.48;
- s_j 0.03; and
- h_j 0.30.

The resulting estimate of the return on equity for a benchmark efficient TNSP using the FFM is 10.6 per cent, ie:

$$\mathrm{E}(R_j) = R_f + b_j[\mathrm{E}(R_m) - R_f] + h_j HML + s_j SMB$$

$$10.6\% = 4.14\% + 0.48 \times [11.4\% - 4.14\%] + 0.03 \times [-0.43\%] + 0.30 \times [9.97\%]$$

B.3.2. Assessment of the FFM

B.3.2.1. Theoretical Support

A stock's price will depend on the cash flows that the stock is expected to provide and on the rate at which the market will discount the cash flows. So the cross-section of stock prices should contain useful information about the cross-section of mean returns to stocks. A stock whose price is low is, all else constant, a stock whose mean return is likely to be high. A stock whose price is high is, all else constant, a stock whose mean return is likely to be low.

---

272 SFG, *The Fama-French model*, 13 May 2014, page 37.

273 SFG, *The Fama-French model*, 13 May 2014, page 37.

274 See section B.2.1 of this report.

275 NERA, *The Market, Size and Value Premiums*, June 2013.

276 SFG, *The Fama-French model*, 13 May 2014, Table 3: Panel C, page 39.

A stock's price, however, will also depend on factors like the number of shares of the stock that are outstanding. A stock's price, for example, will fall by approximately one half when a two-for-one stock split is executed. For this reason, financial ratios in which price sits either in the denominator or numerator are more likely to track variation across stocks in mean returns than are prices that have not been scaled in some way.

Ball (1978) emphasises that financial ratios may provide information about the cross-section of mean returns to stocks not provided by estimates of beta.[277] Similarly, Berk (1995) emphasises that the market value of a firm's equity may provide information about the cross-section of returns to stocks not provided by estimates of beta.[278] Fama and French (1992) show that the market value of a firm's equity and the ratio of the book value of the equity to its market value do not just provide information about the equity's return not provided by an estimate of the equity's beta, but they provide information whereas the estimate does not.[279]

If there are factors besides the return to the market portfolio of stocks that are pervasive, then the Arbitrage Pricing Theory (APT) of Ross (1976) predicts that the additional risks associated with the factors should be priced.[280] The intuition behind the APT is that investors will be rewarded for risks that are pervasive and they cannot diversify away but will not be rewarded for risks that are idiosyncratic and that they can diversify away. If investors were not rewarded for bearing pervasive risks, arbitrage opportunities would arise.

Fama and French (1993) argue, therefore, that:

> *'… if assets are priced rationally, variables that are related to average returns, such as size and book to market equity, must proxy for sensitivity to common (shared and thus undiversifieable) risk factors in returns.'*[281]

The mean excess returns to the 25 portfolios, that Fama and French form on the basis of size and book-to-market, range from 4.7 per cent per annum to 12.6 per cent per annum while estimates of their Sharpe-Lintner betas range from 0.8 to 1.4. So the evidence that Fama and French provide indicates that an empirical version of the SL CAPM cannot describe the data that they assemble. Instead, as Cochrane (2001) points out, the evidence that Fama and French provide indicates that, to rule out near-arbitrage opportunities, their three-factor model *must* be approximately true. Cochrane states that:

> *'extremely high Sharpe ratios for the residuals would have to be invoked for the [Fama-French] model not to fit well. Equivalently, given the average returns and the failure of the CAPM to explain those returns, there would be near-arbitrage*

---

277 Ball, R., *Anomalies in relationships between securities' yields and yield surrogates*, Journal of Financial Economics, 1978, pages 103-126.

278 Berk, J., *A critique of size-related anomalies*, Review of Financial Studies, 1995, pages 275-286.

279 Fama, Eugene and Kenneth French, *The cross-section of expected returns*, Journal of Finance 47, 1992, pages 427-465.

280 Ross, Stephen, *The arbitrage theory of capital asset pricing*, Journal of Economic Theory 13, 1976, pages 341-360.

281 Fama, Eugene and Kenneth French, *Common risk factors in the returns to stocks and bonds*, Journal of Financial Economics 33, 1993, pages 3-56.

opportunities if value and small stocks did not move together in the way described by the Fama-French model.' [282, 283]

The Sharpe ratio is the ratio of the return to a portfolio that one can expect to receive relative to the return that one would receive were one to bear no risk to the risk, measured by standard deviation of return, which one must bear in holding the portfolio.

To summarise, we consider that the FFM has a reasonable theoretical underpinning that is comparable to those of empirical versions of the Sharpe-Lintner CAPM and Black CAPM.

B.3.2.2. Empirical Support

The empirical evidence provides more support for the FFM than for an empirical version of the Sharpe-Lintner CAPM.

- The FFM does a better job of explaining the sample mean returns from 1982 to 2006 to 25 Australian portfolios formed on the basis of size and book-to-market value than does an empirical version of the Sharpe-Lintner CAPM.[284]
- The Fama-French model does a better job of explaining the sample mean returns from 1963 to 1990 to 25 US portfolios formed on the basis of size and book-to-market value than does an empirical version of the Sharpe-Lintner CAPM.[285]

However, there is also some empirical evidence against the FFM. Lajbcygier and Wheatley (2009) and Lewellen, Nagel and Shanken (2010) provide evidence using Australian and US data, respectively, that the FFM will tend to underestimate (overestimate) the return required on a low-market-beta (high-market-beta) stock.[286]

Another important observation of particular importance to the estimation of the return on equity for a benchmark efficient TNSP is the evidence that, for the regulated energy utility sector in the US over a 30-year period (1980 to 2009), the FFM provides a better estimate of

---

[282] The emphasis is Cochrane's.

Cochrane, John H., *Asset pricing*, Princeton University Press, 2001, page 442.

[283] Of course, for an investor to be able to take full advantage of an arbitrage opportunity requires the investor face no short sale constraints. Whereas the Black CAPM, however, requires *all* investors face no short-sale constraints, for there to be no arbitrage opportunities it is only necessary that *some* investors face no short-sale constraints. Thus the assumptions necessary for there to be no arbitrage opportunities are less restrictive than the assumptions necessary for the Black CAPM to hold.

[284] Brailsford, T. C, Gaunt and M. O'Brian, *Size and book-to market factors in Australia*, Australian Journal of Management, 2012, pages 261-281.

[285] Fama, Eugene and Kenneth French, *Common risk factors in the returns to stocks and bonds*, Journal of Financial Economics 33, 1993, pages3-56.

[286] Lajbcygier and Wheatley, *An evaluation of some alternative models for pricing Australian stocks*, Monash University, 2009.

Lewwellen, J., Nagel, S., and Shanken, J., *A Skeptcial appraisal of asset pricing tests*, Journal of Financial Economics, 2010, pages 175-194.

the return on equity than does the Sharpe-Lintner CAPM.[287] Over this period the FFM errors are only about half the size of their CAPM counterparts, and so are not statistically significant at conventional (5 per cent) levels.

In other words, the FFM provides a better explanation for observed returns on US energy utilities because, like their Australian counterparts, the equities of regulated US energy businesses appear to have a positive exposure to the *HML* factor.[288] Since the FFM rewards an exposure to the *HML* factor, the FFM provides a better fit to the data.

We note that this finding is consistent with those made by Chrétien and Coggins who conclude that:

> *'… the Fama-French model and the Adjusted CAPM are both able to provide costs of equity that are not significantly different from the historical ones.*
>
> …
>
> *The Fama-French model and the Adjusted CAPM are well specified for this purpose as they reduce considerably the estimation errors. These models could thus be considered as alternatives to the CAPM in the Equity Risk Premium method employed by regulatory bodies to obtain the risk-return relationship for the fairness to investors' criterion.'* [289]

Fama and French (1996) show that their three-factor model is unable to explain the continuation of returns that Jegadeesh and Titman (1993) document. [290] As Fama and French (2004) later point out, however, since momentum is short-lived, this deficiency of the model is largely irrelevant when it comes to estimating the cost of equity. [291]

While an empirical version of the Sharpe-Lintner CAPM uses three parameter estimates, the FFM uses seven parameter estimates. As a result, estimates of the cost of equity that use the Fama-French model are likely to be less precise than estimates that use an empirical version

---

[287] See:

- NERA, *Cost Of Equity - Fama-French Three-Factor Model,* August 2009, pages 22-26; and
- NERA, *Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision*, 19 March 2010, pages 33-34.

[288] While there is insufficient financial data to undertake a similar analysis of regulated Australian utilities, US data provide a strong foundation from which to conclude that the Fama-French three-factor model provides a better estimate of the return on equity for a regulated energy business.

[289] Chrétien, Stéphane and Coggins, Franks (2011), "Cost of equity for Energy Utilities: Beyond the CAPM," Energy Studies Review: Vol. 18: Iss. 2, Article 2, page 20.

[290] Fama, Eugene and Kenneth French, *Multifactor explanations of asset pricing anomalies*, Journal of Finance, 1996, pages 55-84.

Jegadeesh, N. and S. Titman, *Returns to buying winners and selling losers: Implications for stock market efficiency*, Journal of Finance, 1993, pages 65-91.

[291] Fama, E. and K. French, *The Capital Asset Pricing Model: Theory and evidence*, Journal of Economic Perspectives, 2004, pages 25-46.

of the Sharpe-Lintner CAPM.[292] Estimates that use an empirical version of the Sharpe-Lintner CAPM, on the other hand, are more likely to be biased. NERA (2013) shows that the costs of using an empirical version of the Sharpe-Lintner CAPM are likely to outweigh the benefits of using an empirical version of the Sharpe-Lintner CAPM for stocks that have a positive exposure to the HML factor – as is the case for regulated energy utilities. [293]

B.3.2.3. Use by market practitioners

We note that SFG provides a thorough summary of the use of the FFM.[294] SFG highlight that the FFM was one of the main reasons for Professor Fama being awarded the 2013 Nobel Prize in Economics.[295] The Economic Sciences Prize Committee (the Committee) cites the FFM in its background paper explaining the basis for the award noting that:

> *'…the classical Capital Asset Pricing Model (CAPM) – for which the 1990 prize was given to William Sharpe – for a long time provided a basic framework. It asserts that assets that correlate more strongly with the market as a whole carry more risk and thus require a higher return in compensation. In a large number of studies, researchers have attempted to test this proposition. Here, Fama provided seminal methodological insights and carried out a number of tests. It has been found that an extended model with three factors – adding a stock's market value and its ratio of book value to market value – greatly improves the explanatory power relative to the single-factor CAPM model.'*[296]

In respect of the contribution of the FFM to market practice and investment analysis the Committee note:

> *…following the work of Fama and French, it has become standard to evaluate performance relative to "size" and "value" benchmarks, rather than simply controlling for overall market returns.*[297]

---

[292] The precision of a random variable is the reciprocal of its variance. This definition, standard in the statistics literature, differs from the Oxford Dictionary definition of precision which is:

'accuracy or exactness.'

In statistics a precise estimator can be exact but inaccurate.

Davidson, R. and J. G. MacKinnon, *Estimation and inference in econometrics*, Oxford University Press, Oxford, 1993, page 144.

Fowler, F.G. and H.W. Fowler, *Pocket Oxford Dictionary*, Oxford University Press, Oxford, 1966, page 623.

[293] NERA, The Fama-French three-factor model: A report for the Energy Networks Association, October 2013.

[294] SFG, *The Fama-French model*, 13 May 2014, pages 17-22.

[295] Formally, the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.

[296] Economic Sciences Prize Committee, 2013, Understanding Asset Prices, page 3.

[297] Economic Sciences Prize Committee, 2013, Understanding Asset Prices, page 44.

Further, the Committee notes that that the FFM is used commonly by professional investors in guiding portfolio decisions and evaluating investment performance, as well as by academics.

In their overall conclusion on the contribution of Fama's work to the area of asset pricing the Committee note:

> *We now know that asset prices are very hard to predict over short time horizons, but that they follow movements over longer horizons that, on average, can be forecasted. We also know more about the determinants of the cross-section of returns on different assets. New factors – in particular the book-to-market value and the price-earnings ratio – have been demonstrated to add significantly to the prior understanding of returns based on the standard CAPM.*[298]

SFG also note that Fama-French three factor model is also an accepted tool in practice. SFG highlight evidence of the study of the FFM - including rationale, development and implementation in practice – a mandatory part of the Chartered Financial Analyst (CFA) certification in both Australia and the US.

Finally, SFG highlight that the Fama-French three factor model has also been used in US courts to estimate the cost of equity. In 2003, the model was used to estimate the cost of equity for a bank. In adopting the model the judge commented that:

> *The advantage of using that formula is that it attempts to better account for certain factors that explain equity return than does the original CAPM. These factors include the relationship of market returns to underlying book value, which is a proxy that, among other things, helps capture the risk associated with possible insolvency and other problems in highly leveraged firms. Although the Fama-French three factor CAPM is not wholly accepted, neither is the original CAPM itself. By better factoring in the real risks of leverage, the Fama-French model captures useful data that contributes to a more reliable and real-world cost of capital.*[299]

B.3.3. Summary

In Australia there is strong empirical evidence in support for the existence of the value risk premium. A finding of a statistically significant value risk premium has been found in numerous recent studies including by:

- SFG in its report entitled *The Fama-French model*, dated 13 May 2014;
- NERA in its report entitled *The Market, Size and Value Premiums*, dated June 2013; and
- Brailsford, Gaunt and O'Brien in its article published in the Australian Hournal of Management (August 2012) entitled *Size and book-to-market factors in Australia*.

---

[298] Economic Sciences Prize Committee, 2013, Understanding Asset Prices, page 46.

[299] Union Illinois v. Union Financial Group, 847 A.2d 340 (Del. Ch. 2004), cited by SFG at:

SFG, *The Fama-French model*, 13 May 2014, page 22.

Each of these studies finds a risk factor that should not exist if the Sharpe-Lintner CAPM were true. The implication of finding a statistically significant value risk premium is that the Sharpe-Lintner CAPM will underestimate the required return for firms/projects that have a positive exposure to this risk factor.

The two studies that explicitly examine the exposure of an Australian regulated energy network to the Fama-French risk factors both find evidence that suggest a benchmark efficient TNSP has an economically significant positive exposure to the value risk factor. As a result, the FFM is likely to better explains the expected equity returns of a benchmark efficient TNSP than the Sharpe-Lintner CAPM.

Furthermore, FFM better explains the returns from the regulated energy utility sector in the US over a 30-year period (1980 to 2009) than does the Sharpe-Lintner CAPM.[300] Over this period, the FFM model errors are only about half the size of their CAPM counterparts, and so are not statistically significant at conventional (5 per cent) levels.

In other words, the FFM provides a better explanation for observed returns on US energy utilities because, like their Australian counterparts, the equities of regulated US energy businesses appear to have a positive exposure to the value risk factor.[301]

This finding is also consistent with those made by Chrétien and Coggins who conclude that:

> *'… the Fama-French model and the Adjusted CAPM are both able to provide costs of equity that are not significantly different from the historical ones.*
>
> …
>
> *The Fama-French model and the Adjusted CAPM are well specified for this purpose as they reduce considerably the estimation errors. These models could thus be considered as alternatives to the CAPM in the Equity Risk Premium method employed by regulatory bodies to obtain the risk-return relationship for the fairness to investors' criterion.'*[302]

In our opinion, the FFM provides a less biased estimate of the return on equity as compared with the Sharpe-Lintner CAPM, although there is evidence suggesting that, like the Sharpe-

---

[300] See:

- NERA, *Cost Of Equity - Fama-French Three-Factor Model,* August 2009, pages 22-26; and
- NERA, *Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision*, 19 March 2010, pages 33-34.

[301] While there is insufficient financial data to undertake a similar analysis of regulated Australian utilities, US data provide a strong foundation from which to conclude that the Fama-French three-factor model provides a better estimate of the return on equity for a regulated energy business.

[302] Chrétien, Stéphane and Coggins, Franks (2011), "Cost of equity for Energy Utilities: Beyond the CAPM," Energy Studies Review: Vol. 18: Iss. 2, Article 2, page 20.

Lintner CAPM, the FFM underestimate the returns to low-beta companies.[303] However, one consequence of the FFM being a more complex model is that more parameters must be estimated and so its estimates are less precise.

B.3.4. Fama-French three-factor estimate

In section B.3.1 we specified the Fama French three-factor model for a benchmark efficient TNSP which resulted in a return on equity of 10.6 per cent.

B.4. Dividend growth model

The DGM is not strictly a financial model, but rather a mathematical procedure that equates an assets current price with the present value of future cash flows derived from the ownership of that asset. In the context of stocks, the DGM equates a stock's price with the present value of its future dividends.

The DGM provides a direct estimate of the forward looking mean return while, in contrast, the Sharpe-Lintner CAPM, the Black CAPM and the Fama French three-factor model provide indirect estimates of the forward looking required return.

B.4.1. Specification of the DGM

The DGM is based on the idea that the price of a stock or a portfolio must equal the present value of the expected stream of dividends it will pay in the future. As Easton, Taylor, Shroff and Sougiannis (2002) and Berk and deMarzo (2007) point out, the DGM is thus based on the principle that there should be no arbitrage opportunities in an efficient capital market. [304]

SFG have developed a version of the DGM that implements a process whereby growth reverts to a sustainable level over time, and has the data determining the sustainable growth rate. In other words, the SFG technique jointly estimates the growth rates and the return on equity.

SFG use this technique to first estimate the expected return on the market portfolio and the market risk premium. In order to estimate the prevailing return on equity for the listed Australian energy network businesses SFG use the following process:

- esstimate the **risk premium** for each of the 99 half year observations pertaining to the Australian energy network businesses;

---

[303] Lewellen, J., S. Nagel and J. Shanken, *A skeptical appraisal of asset pricing tests*, Journal of Financial Economics, October 2008.

[304] Berk, J. and P. deMarzo, Corporate finance, Pearson Addison-Wesley, 2007, pages 246-256.

Easton, P., G. Taylor, P. Shroff and T. Sougiannis, *Using forecasts of earnings to simultaneously estimate growth and the rate of return on equity investment*, Journal of Accounting Research 40, 2002, page 660.

See also:

Rubinstein, M., *The valuation of uncertain income streams and the pricing of options*. Bell Journal of Economics, 1976, pages 407-25.

- calculate the **risk premium ratio** for Australian energy network businesses to the market risk premium; and
- apply the **risk premium ratio** to the prevailing market risk premium to derive the risk premium for the Australian energy network businesses.

SFG finds that the average risk premium ratio is 0.94.[305] Furthermore, SFG calculates that (before imputation credit) return on the market is 10.3 per cent.[306] Together with our prevailing risk-free rate of 4.14 per cent, the resulting (before imputation credit) market risk premium is 6.16 per cent. As a result, the estimated equity premium for a benchmark efficient TNSP is 5.79 per cent above the prevailing risk-free rate of 4.14 per cent. This leads to an estimate (before imputation credit) return on equity for a benchmark efficient TNSP of 9.93 per cent. With a gamma value of 0.25 this results in a return on equity for a benchmark efficient TNSP of 11.4 per cent.

B.4.2. Assessment of the DGM

There are a number of different specifications of the DGM ranging from the simple and constrained to the more complex and less restrictive. We examine two specifications. We examine:

- the model that SFG employ which imposes relatively few restrictions; and
- the simpler but more restrictive model that IPART employs.

B.4.2.1. Theoretical Support

The DGM is based on the principle that there should be no arbitrage opportunities in an efficient capital market and so, unlike the Sharpe-Lintner CAPM and Black CAPM, the model does not require that one make assumptions about investor behaviour. Also, unlike the Sharpe-Lintner CAPM and Black CAPM, the DGM does not require that one make an assumption about the extent to which capital markets are integrated internationally. These characteristics of the DGM make it an attractive model with which to estimate the cost of equity.

The DGM, on the other hand, produces a single estimate of the cost of equity that is a complicated average of the costs of equity over the next year and over all future years. As a result, estimates generated by the DGM can underestimate or overestimate the cost of equity prevailing in any one year – although the estimates should on average over time be unbiased.[307]

---

[305] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 64.

[306] SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 64.

[307] Lally, M., *The dividend growth model*, Victoria University of Wellington, 4 March 2013.

B.4.2.2. Empirical Support

The DGM, like the Sharpe-Lintner CAPM and Black CAPM, requires one use data for which good proxies are difficult to find. Practical application of the Sharpe-Lintner CAPM and the Black CAPM requires one collect a series of returns to the market portfolio of all risky assets but these data do not exist. The DGM requires forecasts of long-term dividend growth and long-term analyst forecasts are difficult to find – although estimates of what the market believes long-term growth to be can be backed out of market prices.

A one-stage DGM assumes that dividends will grow indefinitely at a constant rate. A two-stage DGM assumes that dividends will grow for a number of years at rates forecast by analysts and then, immediately thereafter, grow indefinitely at a constant rate. A three-stage DGM assumes that dividends will grow for a number of years at rates forecast by analysts, slowly revert over some period to a long-term rate of growth and then, from that point onwards, grow at the long-term rate.

Each of these versions of the DGM requires a long-term rate of growth for dividends. One approach to finding a long-term growth is to use the historical time series of real dividend growth, or perhaps, in addition, real gross domestic product growth, together with forecasts of inflation, to construct a forecast of long-term growth for dividends. A second approach, pioneered by Easton, Taylor, Shroff and Sougiannis (2002) and extended by Fitzgerald, Gray, Hall and Jeyaraj (2013), is to use market prices to construct an estimate of long-term growth.[308]

The first method suffers from the problem of participants in the regulatory process facing incentives to manipulate estimates of long-term growth. There is uncertainty about what constitutes a reasonable value for long-term real dividend growth. While this uncertainty may not pose a significant problem for an investor who wishes to use the DGM for his or her own purposes, it may pose a problem for the regulatory process. A participant that seeks to produce an estimate of the cost of equity that is high may find a relatively high estimate of long-term growth attractive because a high estimate will generate a correspondingly high estimate of the cost of equity. Similarly, an institution that seeks an estimate of the cost of equity that is low may find a relatively low estimate of long-term growth attractive because a low estimate will generate a correspondingly low estimate of the cost of equity.

The second method of estimating long-term growth is attractive because long-term growth is estimated from currently available market data and, because the process of extracting estimates from market data is largely mechanical, an ability to manipulate estimates of long-term growth is largely eliminated. Some market participants, of course, must use information not solely extracted from market prices to forecast long-term growth – otherwise the information would never find its way into market prices. Participants to the regulatory process, however, need not do so.

---

[308] Easton, P., G. Taylor, P. Shroff and T. Sougiannis, *Using forecasts of earnings to simultaneously estimate growth and the rate of return on equity investment*, Journal of Accounting Research 40, 2002, pages 657-676.

Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

At the aggregate level, Campbell and Thompson (2008) find evidence from US data that simple valuation models can provide better out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate than an estimate of the return based on the sample mean of a series of historical excess returns. [309] The evidence that Campbell and Thompson (2008) provide is particularly important as Welch and Goyal (2008) argue that providing out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate that can outperform an estimate of the return based on the sample mean of a series of historical excess returns is difficult. [310]

An alternative to the single-stage valuation models that Campbell and Thompson (2008) use is a model in which short-term forecasts of real dividend growth are combined with a long-term assumption about real dividend growth and an assumption about the time that it takes for the short-term to evolve into the long-term. [311] Li, Ng and Swaminathan (2013) examine whether a multi-stage model can forecast the excess return to the market portfolio and find evidence that is statistically significant that it can at horizons of up to four years. [312]

B.4.2.3. Use by market practitioners

Discounted cash flow analyses are used universally to price debt assets and are widely applied by market practitioners. We also note that the DGM plays a central role in the financial analysis and regulation of US utilities.[313]

B.4.3. Summary

The DGM is based on the principle that there should be no arbitrage opportunities in an efficient capital market and so, unlike the Sharpe-Lintner CAPM and Black CAPM, the

---

309 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

310 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

311 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

312 Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

313 For example, FERC, the New York Public Services Commission, the California Public Utilities Commission, the Florida Public Service Commission and the Texas Public Utility Commission use DGMs to determine the return on equity. See:

- FERC Order 420, 1985, Federal Register Vol. 50 No. 103;
- FERC, *Composition of Proxy Groups for Determining Gas and Oil Pipeline Return on Equity - Policy Statement*, 17 April 2008.
- Regulatory Research Associates, New York Rate Case, Final Report, February 10, 2011;
- California Public Utilities Commission, Interim Opinion on Rates of Return on Equity for Test Year 2003, D0211027; and
- Regulatory Research Associates, Florida Rate Case, Final Report, April 13, 2012.

model does not require that one make assumptions about investor behaviour. Also, unlike the Sharpe-Lintner CAPM and Black CAPM, the DGM does not require that one make an assumption about the extent to which capital markets are integrated internationally. These characteristics of the DGM make it an attractive model with which to estimate the cost of equity.

The use of the DGM is likely to improve estimates of the return on equity for a benchmark efficient TSNP because the DGM:

- is widely adopted by regulators in North America to estimate the return on equity for regulated utilities;
- is a model that does not make assumptions about investor behaviour;
- offers an estimate of the cost of equity that reflects prevailing market conditions because it relies on prevailing stock prices and forecast dividend growth rates; and
- provides an independent check on estimates produced by the other three models.

The primary drawback of using the DGM is that estimates derived from it are dependent on an estimate of the long-term growth rate of dividends.

SFG uses a version of the DGM in which growth reverts to a sustainable level over time and lets the data determine the sustainable growth rate. In other words, SFG jointly estimates the growth rate and the return on equity.

The advantages of the SFG DGM are:

> *First, our analysis does not require us to exercise judgement about what are reasonable long-term growth assumptions or returns on investment, which has been a feature of past submissions and advice in relation to dividend growth models. We allow the data to determine long-term growth rates and return on investment.*[314]

Furthermore, the SFG DGM produces estimates of the return on equity that are more stable over time than a technique that assumes constant growth. This stability over time is considered by the AER to be a worthwhile attribute of the cost of equity for setting the regulated return.[315]

B.4.4. DGM estimate

In our opinion, the best estimate of the prevailing return on equity for a benchmark efficient TNSP using the dividend growth models is provided by SFG and is 11.0 per cent with a gamma value of 0.25.[316]

---

314 SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, page 3.

315 SFG, *Alternative versions of the dividend discount model and the implied cost of equity*, 15 May 2014, page 48.

316 We have been instructed to adopt a gamma value of 0.25 and to make an adjustment to the pre-imputation credit estimates of the return on equity consistent with those made by SFG. See:

B.5. Assessment of other information

Our estimate of the return on equity for a benchmark efficient TNSP has regard to two additional sources of relevant information, ie:

- independent expert valuation reports; and
- the observed required returns on benchmark debt.

B.5.1. Takeover and valuation reports

Independent expert reports are undertaken by experienced corporate advisors and valuers to provide an unbiased opinion on the merits of a proposed market transaction such as an acquisition or merger.

They are prepared by accredited independent experts, working within an explicit regime of regulation, comprising both formal statutory rules and less formal guidelines, which require that the experts be accountable for the results of their work. Experts preparing independent expert reports which express an opinion as required by the Corporations Act or ASX Listing Rules should be experts in their field. Section 9 of the Corporations Act defines an expert as:

> *'a person whose profession or reputation gives authority to a statement made by him or her.'*[317]

ASIC requires that experts who prepare independent expert reports:

a. cannot be associated with certain parties who have interests in the transaction for which the independent expert report is prepared;

b. must disclose certain relevant interests and relationships when preparing reports required by the Corporations Act; and

c. must hold an Australian financial services licence which imposes obligations to manage potential conflicts of interest.

In paragraph 111.128 of Regulatory Guide 111 ASIC advises that it will consider regulatory action if it considers there are material issues about the adequacy and completeness of an independent expert's analysis, or if it has concerns about the expert's independence. Regulatory action may include revocation or suspension of the independent expert's licence.[318]

When providing an opinion on the valuation of the asset or shares, an independent expert will normally:

SFG, *Dividend discount model estimates of the cost of equity*, 19 June 2013, page 37.

317 Section 9, *Corporations Act 2001*.

318 ASIC Regulatory Guide 111: Content of expert reports, March 2011, paragraph 111.128.

- apply a capitalisation multiple to a current or prospective earnings or cash flow value; or
- undertake a discounted cash flow (DCF) valuation.

Those independent expert reports that undertake a DCF valuation can provide useful insights for an assessment of the return on equity for a regulated business. This is because DCF valuations require the independent expert to form a view of the appropriate discount rate for the businesses. A discount rate is normally estimated using a WACC which blends estimates of the cost of equity and cost of debt.

Incenta Economic Consulting ('Incenta') lists the following characteristics of independent expert reports that suggest that they can provide useful insights for an assessment of the return on equity for a regulated business:[319]

- ***Potential for bias is low*** *– Independent expert reports are produced for a purpose that is unrelated to regulation (and where the experts have little interests in the regulated utilities), and there is a regulatory regime applying to the production of such reports and potential liability to the expert for negligent advice. We consider that these features indicate that independent expert reports are unlikely to be systematically biased in any direction.*
- ***Robust and transparent methodology*** *– Independent expert reports often underpin large transactions, typically include a significant section (or appendix) on the methodology that has been applied, and are fully transparent in revealing all the evidence relied upon and assumptions made.*
- ***Reasonable degree of consensus –*** *Whilst the question of how closely clustered are the opinions of independent expert reports is an empirical question, we note (and this is discussed further below), that there is, for example, evidence of a significant degree of commonality in the response of independent experts to the historically low Government bond yields in recent years.*
- ***Relevance to regulated businesses*** *– While there has been a recent independent expert report relating to Envestra, which provides direct evidence on the cost of equity, there are sufficient independent expert reports to permit trends in the cost of equity over time to be gauged, which is useful for making inferences as to how the market average cost of equity (i.e., the required return on the market) has changed, including how costs of equity have changed in recent times with changes to the risk free rate of return.*

In the following sections we outline a number of insights of the return on equity for a regulated business that come from:

---

[319] Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, pages 1-2.

- the report by Grant Samuel in March 2014 on the proposal by APA Group to purchase Envestra; and
- the survey of independent expert reports by Incenta.

B.5.1.1. Grant Samuel independent valuation of Envestra (2014)

Grant Samuel & Associates Pty Limited (Grant Samuel) has recently published an independent expert report to Envestra's Independent Board Sub-committee in relation to the Proposal by APA Group.[320] Envestra is the owner of the largest portfolio of gas distribution networks in Australia and is one of the comparable businesses that the AER has used to estimate both cost of debt and equity for a benchmark efficient energy network.[321]

The Grant Samuel report employs DCF analysis to determine a fair value for Envestra. As a result, this report provides a timely independent estimate of the cost of equity for an Australian regulated energy network. In our opinion, this independent expert valuation report provides highly relevant information of the prevailing conditions in the market for equity funds.

In estimating the discount rate Grant Samuel found that:[322]

- the prevailing cost of debt was 7.0 per cent, used in both the high and low WACC scenarios; and
- a debt/equity ratio of 35-45% equity and 55-65% debt was appropriate;

Grant Samuel utilised the CAPM as the starting point in its analysis to determine the return on equity, but noted that:

> *'The reality is that any cost of capital estimate or model output should be treated as a broad guide rather than an absolute truth. The cost of capital is fundamentally a matter of judgement, not merely a calculation. In this context, regard was also had to other methods such as the implied cost of equity based on the Gordon Growth Model (or perpetuity formula), market evidence that suggests that equity investors have substantially repriced risk since the global financial crisis and the fact that interest rates are at low levels by comparison with historical norms.'*

Consistent with our assessment of the Sharpe-Lintner CAPM in appendix B.1.1, Grant Samuel noted that:

---

320 Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014.

321 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, page 47; and AER, *Better Regulation – Explanatory Statement Rate of Return Guideline*, December 2013, page 143.

322 Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3.

'… while the theory underlying the CAPM is rigorous the practical application is subject to shortcomings and limitations and the results of applying the CAPM model should only be regarded as providing a general guide.'

Further, Grant Samuel had regard to the approach proposed in the guidelines but described it as giving:

'… a misleading impression of the precision about what is, in reality, a relatively crude tool of unproven accuracy [The Sharpe-Lintner CAPM] that gives, at best, a broad approximation of the cost of capital.'

With these considerations in mind, Grant Samuel had regard to the following information on the prevailing return on equity:

- the CAPM results in estimates of between 7.8 per cent and 8.4 per cent;
- DGM estimates (using a simple Gordon growth model) of comparable businesses[323] suggest estimates of between 9.0 and 11.3 per cent;
- anecdotal information suggests that equity investors have repriced risk since the global financial crisis and using a 1 per cent increase in the *MRP* to 7.0 per cent, which increases the cost of equity estimate to between 8.4 and 9.1 per cent;[324]
- that global interest rates are depressed reflecting the very substantial amounts of liquidity being pumped into many advanced economies which is unsustainable and that some academics/valuation practitioners consider a "normalised" risk-free rate of 5 per cent should be used, which results in an estimate of between 8.6 and 9.0 per cent;[325] and
- analysis of recent research reports on Australian entities involved in the energy infrastructure sector (i.e. APA Group, Envestra, DUET Group, Spark and SP AusNet) indicates that brokers are currently adopting costs of equity capital in the range 8.5-11.2%, with a median of 9.6%.

On the basis of this information, Grant Samuel states that:

'Having regard to these matters and the calculations set out above, Grant Samuel's judgement is reasonable discount rates to apply to discounted cash flow analysis for regulated energy assets in current market conditions would be anywhere in the range 6.5-8.0%.' [326]

---

323 Comparable businesses used by Grant Samuel included: DUET Group; SP AusNet; APA and Spark Infrastructure.

324 NERA has calculated this range by substituting the historical MRP of 6.0 per cent with the higher MRP of 7.0 per cent.

325 NERA has calculated this range by substituting the prevailing risk free rate of 4.2 per cent with the "normalised" rate of 5.0 per cent.

326 Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, page 9.

A WACC range of 6.5-8.0 per cent corresponds to an implied cost of equity range of between 9.5 per cent and 11.8 per cent.[327] Notwithstanding the opinion that current market conditions suggest a WACC range of 6.5-8.0 per cent, for the purpose of valuing Envestra, Grant Samuel adopt a discount rate of between 6.5-7.0 per cent. This implies a cost of equity range of between 9.5 per cent and 9.6 per cent.[328]

Grant Samuel's estimates of the return on equity do not include any adjustment for dividend imputations.[329] As a consequence, assigning a value of gamma of 0.25 results in a cost of equity estimate used by Grant Samuel to value Envestra of between 10.5 per cent and 10.6 per cent.[330]

To summarise, an investment decision has been made according to a gamma-adjusted return on equity of 10.5 per cent to 10.6 per cent. This is consistent with the return on equity estimated under our recommended approach, 10.5 per cent.

B.5.1.2. Incenta survey of independent expert reports

Incenta has been engaged by TransGrid to update previous studies on the usefulness of independent expert reports to the issue of the return on equity on the estimation methods and outcomes used by independent experts.[331]

Incenta notes that the two previous studies that have analysed the evidence of independent expert reports both concluded that:

> *'independent experts are not constrained by the Sharpe-Lintner CAPM, but rather begin with this model and make adjustments that are informed by alternative market-based information sources, additional analysis and professional judgement.'*

Further, both previous studies found that the final return on equity adopted by independent experts differed from results from a 'mechanistic' application of the CAPM with the:[332]

---

327 NERA has calculated the implied cost of equity on the basis of the cost of debt 7.0 per cent, with:

- the lower bound cost of equity estimate corresponding to the lower WACC estimate of 6.5% and a gearing of 35% equity; and
- the upper bound cost of equity estimate corresponding range to the upper WACC estimate of 8.0% and a gearing of 45% equity.

328 NERA has calculated the implied cost of equity on the basis of the cost of debt 7.0 per cent, with:

- the lower bound cost of equity estimate corresponding to the lower WACC estimate of 6.5% and a gearing of 35% equity; and
- the upper bound cost of equity estimate corresponding range to the upper WACC estimate of 7.0% and a gearing of 45% equity.

329 Grant Samuel & Associates Pty Ltd, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group*, 3 March 2014, Appendix 3, pages 9-10.

330 That is, $10.5\% = \frac{9.5\%}{0.9032}$ while $10.6\% = \frac{9.6\%}{0.9032}$.

331 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014.

- Ernst & Young (November 2012) concluded that in expert reports undertaken in the first six months of 2012 'the difference in the prevailing market cost of equity implied by independent experts and the AER's implied market cost of equity is therefore 2.2 percentage points'; and
- SFG (June 2013) concluding that in in the period from 11 October 2012 to 26 April 2013 that independent experts applied an average uplift of 3.3 per cent over the return on equity implied by a mechanistic application of the Sharpe-Lintner CAPM.

Incenta in updating these studies observed a number of examples where independent experts expressed reservations about the mechanistic applications of the Sharpe-Lintner CAPM. Grant Samuel in its independent expert report on Australian Infrastructure Fund stated: [333]

> *'Valuation is an estimate of what real world buyers and sellers of assets would pay and must therefore reflect criteria that will be applied in practice even if they are not theoretically correct. Grant Samuel considers the rates adopted to be reasonable discount rates that acquirers use irrespective of the outcome of any particular theoretical model…*
>
> *In selecting the discount rate range, we utilised the capital asset pricing model ('CAPM'), as the starting point in our analysis to determine a cost of equity. However, it is easy to credit the output of models with a precision it does not warrant. The reality is that any cost of capital estimate or model output should be treated as a broad guide rather than as an absolute truth. The cost of capital is fundamentally a matter of judgement, not merely of calculation. In this context, regard was also had to other methods such as the implied cost of equity based on the Gordon Growth Model (or perpetuity formula), market evidence that suggests that equity investors have substantially repriced risk since the global financial crisis and the fact that interest rates are at low levels in comparison with historical norms.'*

Incenta examine all 185 independent expert reports released during the period 27 April 2013 to 20 April 2014. Incenta examines all 185 independent expert reports released during the period 27 April 2013 to 20 April 2014. Incenta finds that 19 independent expert reports undertake an assessment of the cost of equity, which included 20 individual cost of equity estimates. Analysis of these reports shows that:[334]

- in the application of the Sharpe-Lintner CAPM, the return on the market is on average 0.2 per cent higher than a mechanistic application of the model, ignoring any additional uplift for 'alpha';[335]

---

[332] Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, pages 2.

[333] Grant Samuel (7 December, 2012), *Independent Expert Report on Australian Infrastructure Fund*, Appendix 1, p.1 cited by Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page, 13.

[334] Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 4.

[335] Incenta define a mechanistic application of the Sharpe-Lintner CAPM as one that uses the prevailing risk free rate and a MRP of 6 per cent.

- that the required return on equity is 1.9 per cent higher than a mechanistic application of the Sharpe-Lintner CAPM;
- that the five lowest beta firms/projects, which had an average beta of 0.77, had an average uplift in the cost of equity of 2.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM; and
- that the independent expert applied a cost of equity of 9.5 per cent for Envestra (2014), which was an uplift of 0.8 per cent compared to a mechanistic application of the Sharpe-Lintner CAPM.

Further, Incenta noted that independent expert reports universally ignore any impact of imputation credits on valuation, and so in effect apply a gamma of zero.[336] Ascribing any positive value to gamma would require a further uplift to the cost of equity estimates.

B.5.2. Comparison to Return on Debt

The AER's rate of return guidelines propose to use the spread between debt and equity returns as a relative indicator and note that:[337]

> *'… if the return on equity does not exceed the return on debt, we may consider the foundation model input parameter estimates. In these circumstances, we may also reconsider the foundation model itself.'*

In our opinion, information on the prevailing conditions for the market for equity funds can also be inferred from observed bond yields. It is generally accepted that returns on equity should be higher than returns on debt, because equity holders bear significantly more risk, ie, the financial claims of equity holders rank behind that of debt holders.

In other words, the return required by equity investors must be greater than the return required by debt holders. We note that previously the AER has indicated that comparisons between the relative cost of debt and equity should be considered with caution to take account of:[338]

- promised versus expected returns; and
- pre–tax versus post–tax returns.

For the following reasons the concerns raised by the AER have no foundation and comparisons between the relative cost of debt and equity provide highly pertinent information on the required return on equity for a benchmark efficient TNSP.

Firstly, while the AER is correct in stating that the reported debt yield is a promised yield rather than an expected yield, the regulated return on equity allowance is also a promised

---

336 Incenta, *Update of evidence on the required return on equity from independent expert reports*, May 2014, page 7.

337 AER, *Better Regulation – Explanatory Statement Rate of Return Guideline (*Appendix), December 2013, page 33.

338 AER, *Access arrangement final decision Envestra Ltd 2013-17, Part3: Appendices*, March 2013, page 66.

yield. This is, because the WACC is a promised, not an expected, rate of return. To the extent that there is a risk that regulated firm will default on its debt obligations neither the debt nor equity investors will receive the allowed return on debt and equity allowances. In other words, the expected return that equity and debt investors will be less than the WACC due to the risk of default.

Furthermore, we note the return on debt is calculated by reference to a defined credit rating, ie, a Standard & Poor's credit rating of BBB+. This credit rating standard grades the risk of default by the firm/bond issue. Consequently, the increase in the observed yield can be attributed to debt investors requiring greater compensation for risk rather than an increase in the risk of default (which would trigger a downgrading in the credit rating).

Secondly, the issue of measuring debt on a pre–tax basis and equity on a post–tax basis is unnecessarily distracting. This is because the analysis is not from the business' perspective but from the perspective of the providers of debt and equity finance. That is, the analysis below measures the relative return required by debt and equity holders.

Following the sub-prime mortgage crisis that began in mid-June 2007, a number of banks realised losses and write downs as asset prices weakened.[339] The resulting funding problems raised concerns about the risk of bank failure and, on 15 September 2008, the investment bank Lehman Brothers filed for bankruptcy. Further, in September 2008, two United States Government-sponsored enterprises that guaranteed mortgage pools were placed in conservatorship, Merrill Lynch was sold to Bank of America and the US government took over 80 per cent of the equity in AIG.[340]

These events led to a global loss of confidence and a marked increase in the pricing of risk. For example, a recent report by Grant Samuel stated that:[341]

> *'…the market upheaval since 2007 has seen a repricing of risk by investors…'*

Figure B.1 below illustrates the stark peak in debt premiums from late 2008 to mid- 2009 and the increase in the pricing of risk in the post-GFC period.

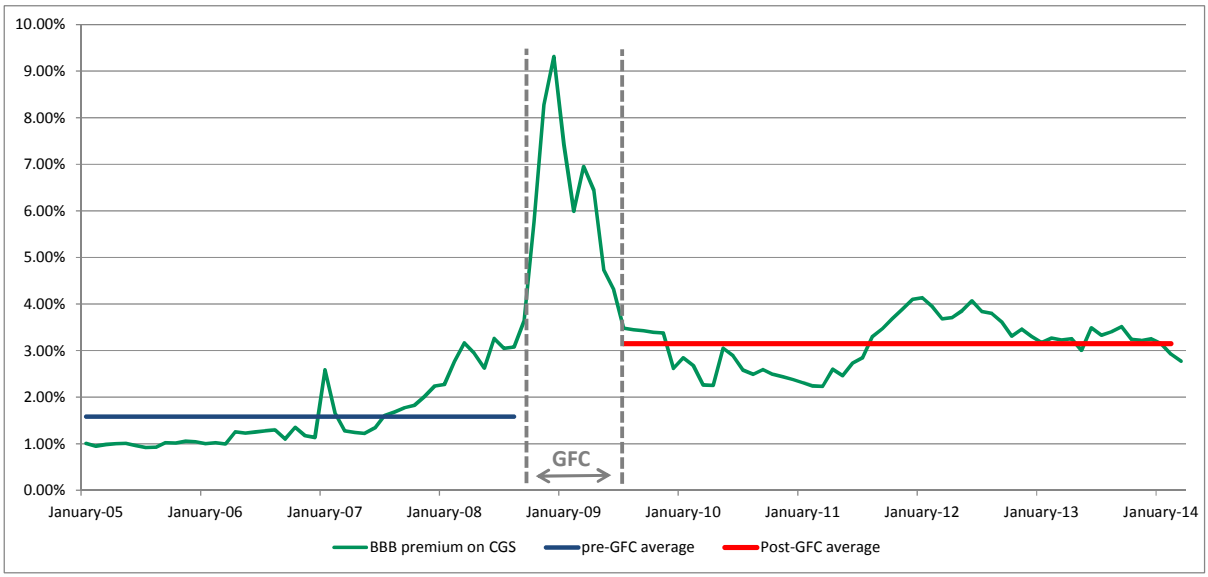
---

339 Bank for International Settlements, *BIS 79th Annual Report*, 29 June 2009, page 16.

340 CEG, *Rate of Return and the Averaging Period Under the National Electricity Rules and Law*, January 2008, page 31.

341 Grant Samuel & Associates Pty Limited, *Financial Services Guide and Independent Expert's Report to the Independent Board Sub-committee in relation to the Proposal by APA Group.* 3 March 2014, Appendix 3, page 2.

Figure B.1
The premium on the nominal yield of 10-year BBB-rated debt securities over the nominal yield of 10-year Commonwealth Government Securities from January 2005 to March 2014[342]



Source: Reserve Bank of Australia

The premium of BBB corporate bonds yields over the CGS yield averaged 158 basis points in the pre GFC period. In contrast, the premium of BBB corporate bonds yields over the CGS yield has increased to an average of 315 basis points in the post GFC period. In other words, we have observed that, in the post GFC period, debt investors require an additional debt risk premium of over 150 basis points compared to the pre GFC period.

Given the rise in the pricing of risk in the debt markets following the GFC, we would expect to see a commensurate, if not larger, increase in the premium required by equity investors.

The long-term historical average *MRP* is 6.5 per cent, so a firm with an equity beta of 0.7 would have an equity premium of 4.55 per cent. Our recommended estimate of the expected return on equity is 10.5 per cent, which implies an equity premium of 6.36 per cent. Therefore, our recommended estimate of the return on equity implies an equity premium that is approximately 180 basis points higher than the long-term historical equity premium for a firm with an equity beta of 0.7.

A 180 basis point increase in the equity risk premium is consistent with our expectation that the equity risk premium in the post GFC period will have increased by a commensurate, if not larger, amount than the debt risk premium.

[342] RBA, *Statistical Table F3 - Non-financial corporate bond yields*.

Furthermore, the insufficiency of the AER's proposed reasonable range on the return on equity (estimated for the 20 days to 31 March 2014) can also be demonstrated when it is compared to the premium (over the 10-year CGS yield) provided to BBB corporate debt.

Figure B.2
AER reasonable range and point estimate of the return on equity premium and the debt risk premium on BBB bonds

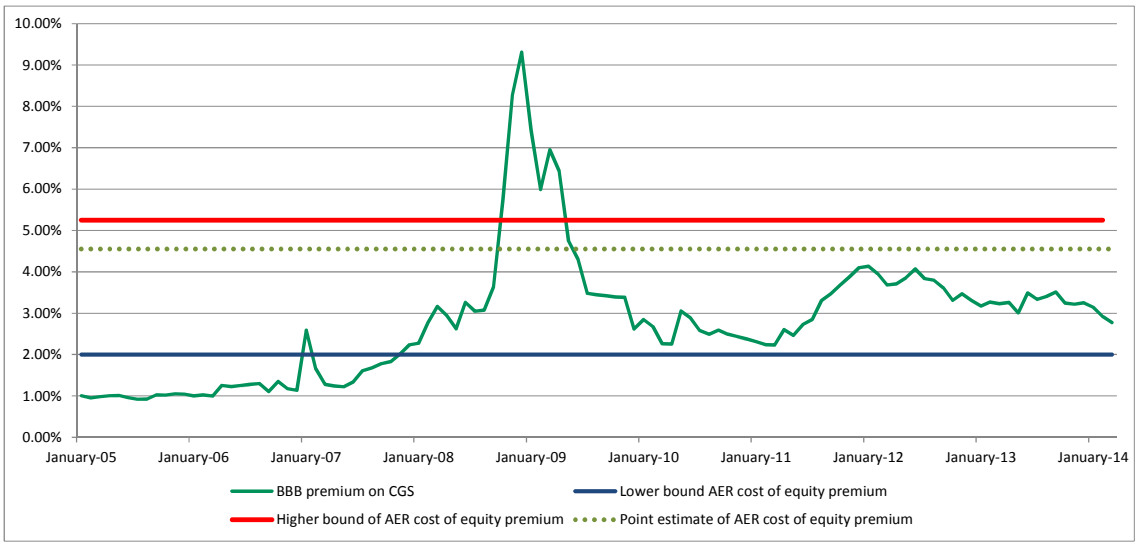


Figure B.2, illustrates that a significant portion of the AER's reasonable range for the return on equity premium falls below the allowed risk premium for BBB corporate debt. It is completely inconsistent with the core principles of financial economics that the premium required by equity investors could fall below that required by debt investors. In our opinion, the magnitude of the observed debt risk premium demonstrates that the AER's assessment of the return on equity in the guidelines is flawed.

We note that the FERC removes low end return on equity estimates that are within 100 basis points of the average yield on public utility bonds over a six month period. [343] The average yield on BBB corporate bonds reported by the RBA is 7.17 per cent,[344] while the reasonable range adopted in the guidelines results in a range from 6.14 per cent to 9.39 per cent and a point estimate of 8.69 per cent for the 20 days ending 31 March 2014. As a result, if the FERC were to have regard to prevailing debt yields, it would reject any estimate of the return on equity that is below 8.17 per cent. In other words, over 60 per cent of the AER's reasonable range would be rejected by the FERC as unreasonably low.

---

343 *Order on Transmission Rate Incentives and Formula Rate Proposal*, 126 FERC ¶ 61,281 (27 March 2009), paragraph 84.

344 This average has been calculated over the six months from November 2013 to March 2014, using 10-year BBB non-financial corporate bond yields, as reported by the RBA in statistical Table F3.

Finally, we note that, when valuing Envestra in March 2014, Grant Samuel implicitly adopts a return on equity of 10.5 per cent, which is substantially higher than that provided by the guidelines.

In contrast, our recommended approach has regard to estimates derived from more than one financial model and, as a result, reduces the extent to which the bias in the Sharpe-Lintner CAPM, or any one model, affects the estimate of the expected return on equity.

Appendix C. Letter of Instruction

Our ref: LIZC\RIJR\02 3002 0887
Partner: Liza Carver
Direct line: +61 2 9258 5897
Email: liza.carver@ashurst.com
Contact: Richard Robinson, Senior Associate
Direct line: +61 7 3259 7219
Email: richard.robinson@ashurst.com

Ashurst Australia
Level 36, Grosvenor Place
225 George Street
Sydney NSW 2000
Australia

GPO Box 9938
Sydney NSW 2001
Australia

Tel +61 2 9258 6000
Fax +61 2 9258 6999
DX 388 Sydney
www.ashurst.com

27 May 2014

CONFIDENTIAL & PRIVILEGED

Greg Houston
NERA Economic Consulting
201 Sussex Street
Sydney NSW 2000

Dear Greg

Letter of engagement

This letter confirms your engagement in relation to TransGrid's allowed rate of return in respect of TransGrid's revenue proposal for the regulatory control period commencing on 1 July 2015, but including the transitional year commencing on 1 July 2014 (**Proposal**).

1. SCOPE OF ENGAGEMENT

You are engaged by TransGrid to provide advice in relation to calculating the allowed rate of return to be used in the determination of TransGrid's allowed revenue for the regulatory control period commencing on 1 July 2015, but including the transitional year commencing on 1 July 2014 and any other associated regulatory issues that Ashurst Australia may instruct you. In particular, you are engaged by TransGrid to prepare a written expert report on the allowed rate of return for submission to the Australian Energy Regulator as part of TransGrid's Proposal.

Your written expert report should recommend an allowed rate of return for TransGrid that achieves the national electricity objective in section 7 of the National Electricity Law (**NEL**) and the allowed rate of return objective in clause 6A.6.2(c) of the National Electricity Rules (**NER**) having regard to the provisions of the NER for the regulatory control period commencing on 1 July 2015, but including the transitional year commencing on 1 July 2014. In recommending an allowed rate of return, your report should:

(a) advise on the connection between the allowed rate of return objective in clause 6A.6.2(c) of the NER and the national electricity objective;

(b) advise on the level of gearing that should be applied in determining the allowed rate of return;

(c) advise on the return on debt that should be applied in determining the allowed rate of return and, in particular, advise on the application of the transition mechanism for the return on debt in the Rate of Return Guidelines published by the Australian Energy Regulator (**AER**) in December 2013 (**Guidelines**) identifying any differences in the approach for determining the return on debt from the Guidelines and the reasons for those differences; and

(d) advise on the return on equity that should be applied in determining the allowed rate of return identifying any differences in the approach for determining the return on equity from the Guidelines and the reasons for those differences.

Your report should address the questions identified above having regard to the alternative formulations of the "benchmark efficient entity" for the purposes of the application of the transition mechanism for the return on debt set out in the Guidelines being:

(a) a benchmark efficient entity formulated to mimic the outcomes of a competitive market; and

(b) a benchmark efficient entity formulated to mimic the efficient financing practices of an entity subject to the previous regulatory regime.

In addition, your report should assume a gamma value of 0.25 and you should adjust your return on equity estimates by dividing by 0.9032 where appropriate.

The purpose of your advice is to enable Ashurst Australia to provide legal advice to TransGrid in relation to the determination of TransGrid's allowed revenue for the next regulatory control period commencing on 1 July 2015, but including the transitional year commencing on 1 July 2014.

2. BACKGROUND

TransGrid is the owner, operator and manager of the high voltage electricity network in New South Wales and the Australian Capital Territory. As such, TransGrid is a transmission network service provider (**TNSP**) regulated under the NEL and the NER.

Chapter 6A of the NER sets out rules for the economic regulation of prescribed transmission services and negotiated transmission services provided by TNSPs. This regime requires the AER to determine the revenue allowed to be earned by TransGrid for prescribed transmission services during each regulatory year, in accordance with the post tax revenue model, described in Chapter 6A of the NER for each regulatory control period. In addition, a pricing methodology, negotiating framework and negotiated transmission service criteria must also be determined by the AER. The process for making a transmission determination is set out in Part E of Chapter 6A of the NER.

Chapter 6A was amended on 29 November 2012 by the National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012 No 9 (**Rule Change**). The current transmission determination for TransGrid expires on 30 June 2014 and it will be the first TNSP for which a transmission determination will be made under Chapter 6A following the Rule Change (along with Transend Networks Pty Ltd, the TNSP in Tasmania).

TransGrid has a right to apply to the Australian Competition Tribunal (**Tribunal**) for merits review of a "reviewable regulatory decision" under section 71B of the NEL. The scope of and process for a merits review of a reviewable regulatory decision is set out in Division 3A of Part 6 of the NEL. The transmission determination that the AER is required to make in relation to TransGrid's revenue is a "reviewable regulatory decision" amenable to review.

3. DOCUMENTS

3.1 Background documents

We will provide you with relevant documents required in the course of your engagement.

3.2 Documents provided by TransGrid

If TransGrid provides any documents directly to you, we would be grateful if you let us know as soon as possible in the interests of ensuring that legal professional privilege is maintained (where appropriate).

4. TERMS OF ENGAGEMENT

The key terms of your engagement are as follows.

(a) You will provide your services as an independent expert for the purpose of assisting us to provide legal advice in relation to the determination of TransGrid's allowed revenue for the next regulatory control period commencing on 1 July 2015, but including the transitional year commencing on 1 July 2014.

(b) You will provide your services through, and with the resources available to you at NERA. We understand that you have recently resigned from NERA and that you have been contracted by NERA separately to complete this work. You will be personally available to provide advice in this matter.

(c) You must not accept any other appointment or retainer to provide assistance or services to any other party in relation to this matter or the events surrounding this matter. You must at all times avoid any real or apparent conflict of interest between TransGrid's interests in relation to this matter and the interests of any other person.

(d) You confirm that you have disclosed to us all information that is material to your engagement as an expert in this matter, including but not limited to:

(i) the nature of any services that NERA is currently providing, or may have previously provided, to TransGrid to the extent relevant to this engagement;

(ii) any holding of securities in TransGrid or any of its related bodies corporate that are held by you or your immediate family or any company in which you or a member of your immediate family has a material financial interest; and

(iii) your qualifications and experience, in so far as they are relevant to this matter.

(e) You will tell us about any matters of the sort listed above that arise, become known to you or significantly change after the date of this letter.

(f) All communications (including reports) which you are to provide to us pursuant to this letter must be in the form and manner we advise you from time to time.

(g) We acknowledge that your own opinions in relation to testimony or work-product are your opinion and not those of NERA, its other employees or affiliates.

4.2 Remuneration

TransGrid will pay you for time spent on this matter in accordance with the instructions of TransGrid or Ashurst Australia, at the rates separately agreed between you and TransGrid.

ashurst

4.3 **Confidentiality**

TransGrid requires you to agree to keep strictly confidential all Confidential Information disclosed to you during the course of your engagement on this matter. This obligation survives the conclusion of your engagement under this letter.

You acknowledge that the Confidential Information is secret, confidential and of value to TransGrid, and its unauthorised use or disclosure may significantly damage TransGrid's business.

You agree that you must:

(a) keep the Confidential Information secret and confidential at all times;

(b) not disclose, directly or indirectly, any Confidential Information to any person other than Ashurst Australia, TransGrid or Counsel engaged by us for the purpose of the possible proceedings in the Tribunal, unless you have prior written consent from TransGrid;

(c) not use the Confidential Information other than for the purpose of carrying out your engagement in accordance with this letter and our instructions; and

(d) ensure that each person to whom you disclose Confidential Information with the prior permission of TransGrid, including each member of your staff working with you in connection with this engagement, makes the same acknowledgment, agrees to comply with, and does comply with, (a), (b) and (c) above.

Nothing in this document prohibits the disclosure of information where:

(a) that disclosure is required by law (you will give us notice of any such requirement as soon as practicable after learning that it may apply, and will co-operate with any efforts by us or TransGrid to remove or restrict the legal requirement); or

(b) at the time of the disclosure the information is in the public domain (unless the information or material came into the public domain through a breach by any person of a confidentiality obligation, including a breach by you of the terms of this letter).

4.4 **Intellectual Property Rights**

You agree:

(a) that TransGrid retains all Intellectual Property Rights in any Materials which may be disclosed to you in the course of your engagement; and

(b) to transfer to TransGrid all Intellectual Property Rights in any Materials created by you in the course of your engagement.

4.5 **Return of Confidential Documents**

On request by TransGrid, you must:

(a) return to TransGrid any documents or other Materials containing Confidential Information, or, if they are in electronic form, erase or destroy them and provide evidence of erasure or destruction to the satisfaction of TransGrid; and

(b) provide to TransGrid or destroy any Materials created by you in connection with this engagement that contain Confidential Information, or, if they are in electronic form,

erase or destroy them and provide evidence of erasure or destruction to the satisfaction of TransGrid.

5. **INTERPRETATION**

In this letter:

(a) **Confidential Information** includes all information in any form or medium relating to TransGrid, which is disclosed to you by TransGrid or its officers, employees, advisers or agents, any brief or other Materials we send you, any communication we have with you (whether alone or with others) about this matter but does not include any information which you can show:

(i) is in the public domain, otherwise than as a result of a breach of the contents of this letter; or

(ii) is already known to you prior to the disclosure or which is subsequently known to you as a result of disclosure by another source which was not, to the best of your knowledge, subject to any agreement for confidentiality.

(b) **Intellectual Property Rights** means all present and future rights conferred by statute, common law or equity in or in relation to copyright, trade marks, designs, patents, circuit layouts, plant varieties, business and domain names, inventions and confidential information, and other results of intellectual activity in the industrial, commercial, scientific, literary or artistic fields whether or not registrable, registered or patentable. These rights include:

(i) all rights in all applications to register these rights;

(ii) all renewals and extensions of these rights; and

(iii) all rights in the nature of these rights, such as moral rights.

(c) **Materials** means works, ideas, concepts, designs, inventions, developments, improvements, systems or other material or information, created, made or discovered by you (either alone or with others and whether before or after the date of this document) in the course of your employment or as a result of using the resources of TransGrid or in any way relating to any business of TransGrid.

Please indicate your acceptance of these terms by signing the **enclosed** duplicate of this letter in the space provided, and then returning it to us.

Yours faithfully

Ashurst Australia

Ashurst Australia

Acceptance of engagement on the terms of this letter acknowledged:

Signed: .....

Name: Greg Houston

Date: 27/5/14

ashurst

Appendix D. Curriculum Vitae

Greg Houston

Partner

Houston Kemp
PO Box Q933
Queen Victoria Building
Sydney NSW 1230
Tel: +61 417 237 563
E-mail: greg.houston@houstonkemp.com
Website: www.houstonkemp.com

Overview

Greg Houston is a founding partner of the firm of expert economists, Houston Kemp. He has twenty five years' experience in the economic analysis of markets and the provision of expert advice in litigation, business strategy, and policy contexts. His career as a consulting economist was preceded by periods working in a financial institution and for government.

Greg has directed a wide range of competition, regulatory and financial economics assignments during this consulting career. His work in the Asia Pacific region principally revolves around the activities of the enforcement and regulatory agencies responsible for these areas, many of whom also number amongst his clients. In his securities and finance work Greg has advised clients on a number of securities class action, market manipulation and insider trading proceedings, as well as on cost of capital estimation. On competition and antitrust matters he has advised clients on merger clearance processes, competition proceedings involving allegations of anticompetitive conduct ranging from predatory pricing, anti-competitive agreements, anti-competitive bundling and price fixing. Greg also has deep experience of infrastructure access regulation matters, and intellectual property and damages valuation.

Greg's industry experience spans the aviation, beverages, building products, cement, e-commerce, electricity and gas, forest products, grains, medical waste, mining, payments networks, petroleum, ports, rail transport, retailing, scrap metal, securities markets, steel, telecommunications, thoroughbred racing, waste processing and water sectors.

Greg has acted as expert witness in valuation, antitrust and regulatory proceedings before the courts, in various arbitration and mediation processes, and before regulatory and judicial bodies in Australia, Fiji, New Zealand, the Philippines, Singapore, the United Kingdom and the United States.

Greg was until recently a Director of the global firm of consulting economists, NERA Economic Consulting where, for twelve years he served on its United State Board of Directors, for five years on its global Management Committee and for sixteen years as head of its Australian operations. Greg also serves on the Competition and Consumer Committee of the Law Council of Australia.

Qualifications

1982	**UNIVERSITY OF CANTERBURY, NEW ZEALAND**
	B.Sc. (First Class Honours) in Economics

Prizes and Scholarships

1980	University Junior Scholarship, New Zealand

Career Details

1989-2014	**NERA ECONOMIC CONSULTING**
	Director (2000-2014), London, United Kingdom (1989-1997), and Sydney, Australia (1998-2014)
1987-89	**HAMBROS BANK, TREASURY AND CAPITAL MARKETS**
	Financial Economist, London, United Kingdom
1983-86	**THE TREASURY, FINANCE SECTOR POLICY**
	Investigating Officer, Wellington, New Zealand

Project Experience

Regulatory Analysis

2013	**Actew Corporation** **Interpretation of economic terms** Advice on economic aspects of the draft and final decisions of the Independent Competition and Regulatory Commission in relation to the price controls applying to Actew.
2012-13	**Gilbert + Tobin/Rio Tinto Coal Australia** **Price review arbitration** Analysis and expert reports prepared in the context of an arbitration concerning the price to be charged for use of the coal loading facilities at Abbott Point Coal Terminal.
2012-13	**Ashurst/Brisbane Airport Corporation** **Draft access undertaking** Advice, analysis and expert reports in the context of the preparation of a draft access undertaking specifying the basis for determining a ten year price path for landing charges necessary to finance a new parallel runway at Brisbane airport.
2012	**King & Wood Mallesons/Origin Energy** **Interpretation of economic terms** Expert reports and testimony in the context of judicial review proceedings before the Supreme Court of Queensland on the electricity retail price determination of the Queensland Competition Authority.
2012	**Contact Energy, New Zealand** **Transmission pricing methodology** Advice on reforms to the Transmission Pricing Methodology proposed by Electricity Authority.
2011-12	**Energy Networks Association** **Network pricing rules** Advice and expert reports submitted to the Australian Energy Market Commission on wide-ranging reforms to the network pricing rules applying to electricity and gas transmission and distribution businesses, as proposed by the Australian Energy Regulator.
2010-12	**QR National** **Regulatory and competition matters** Advisor on the competition and regulatory matters, including: a range of potential structural options arising in the context of the privatisation of QR National's coal and freight haulage businesses, particularly those arising in the context of a 'club ownership model' proposed by a group of major coal mine owners; and an assessment of competitive implications of proposed reforms to access charges for use of the electrified network.

2002-12	**Orion New Zealand Ltd, New Zealand** **Electricity lines regulation** Advisor on regulatory and economic aspects of the implementation by the Commerce Commission of the evolving regimes for the regulation of New Zealand electricity lines businesses. This role has included assistance with the drafting submissions, the provision of expert reports, and the giving of expert evidence before the Commerce Commission.
2011	**Meridian Energy, New Zealand** **Undesirable trading situation** Advice to Meridian Energy on the economic interpretation and implications of the New Zealand electricity rule provisions that define an 'undesirable trading situation' in the wholesale electricity market.
2011	**Ausgrid** **Demand side management** Prepared a report on incentives, constraints and options for reform of the regulatory arrangements governing the role of demand side management in electricity markets.
2010-11	**Transnet Corporation, South Africa** **Regulatory and competition policy** Retained to advise on the preparation of a white paper on future policy and institutional reforms to the competitive and regulatory environment applying to the ports, rail and oil and gas pipeline sectors of South Africa.
2010-11	**Minter Ellison/UNELCO, Vanuatu** **Arbitral review of decision by the Vanuatu regulator** Expert report and evidence before arbitrators on a range of matters arising from the Vanuatu regulator's decision on the base price to apply under four electricity concession contracts entered into by UNELCO and the Vanuatu government. These included the estimation of the allowed rate of return including its country risk component, and the decision retrospectively to bring to account events from the prior regulatory period.
2007-11	**Powerco/CitiPower** **Regulatory advice** Wide ranging advice on matters arising under the national electricity law and rules, such as the framework for reviewing electricity distribution price caps, the treatment of related party outsourcing arrangements, an expert report on application of the AER's efficiency benefit sharing scheme, the potential application of total factor productivity measures in CPI-X regulation, and arrangements for the state-wide roll out of advanced metering infrastructure.
1999-2004, 2010-11	**Sydney Airports Corporation** **Aeronautical pricing notification** Wide ranging advice on regulatory matters. This includes advice and expert reports in relation to SACL's notification to the ACCC of substantial reforms to aeronautical charges at Sydney Airport in 2001. This involved the analysis and presentation of pricing principles and their detailed application, through to discussion of such matters at SACL's board, with the ACCC, and in public consultation forums. Subsequent advice on two Productivity Commission reviews of airport charging, and notifications to the ACCC on revised charges for regional airlines.
2010	**Industry Funds Management/Queensland Investment Corporation** **Due diligence, Port of Brisbane** Retained to advise on regulatory and competition matters likely to affect the future financial and business performance of the Port of Brisbane, in the context of its sale by the Queensland government.

2009-10	**New Zealand Electricity Industry Working Group, New Zealand** **Transmission pricing project** Advice to a working group comprising representatives from lines companies, generators, major users and Transpower on potential improvements to the efficiency of New Zealand's electricity transmission pricing arrangements.
2007-09	**GDSE, Macau** **Electricity tariff reform** Advice to the regulator of electricity tariffs in Macau on a series of potential reforms to the structure of electricity supply tariffs.
2001-09	**Auckland International Airport Limited, New Zealand** **Aeronautical price regulation** Advice and various expert reports in relation to: the review by the Commerce Commission of the case for introducing price control at Auckland airport; a fundamental review of airport charges implemented in 2007; and the modified provisions of Part IV of the Commerce Act concerning the economic regulation of airports and other infrastructure service providers.
2008	**Western Power** **Optimal treatment and application of capital contributions** Advice on the optimal regulatory treatment of capital contributions, taking into account the effect of alternative approaches on tariffs, regulatory asset values, and network connection by new customers.
2000-08	**TransGrid** **National electricity market and revenue cap reset** Regulatory advisor to TransGrid on a range of issues arising in the context of the national electricity market (NEM), including: the economics of transmission pricing and investment and its integration with the wholesale energy market, regulatory asset valuation, the cost of capital and TransGrid's 2004 revenue cap reset by the ACCC.
2007	**Johnson Winter & Slattery/Multinet** **Review of outsourced asset management contracts** Expert report developing a framework for assessing the prudence of outsourcing contracts in the context of the Gas Code, and evaluating the arrangements between Multinet and Alinta Asset Management by reference to that framework.
2007	**Ministerial Council on Energy** **Review of Chapter 5 of the National Electricity Rules** Advice on the development of a national framework for connection applications and capital contributions in the context of the National Electricity Rules.
2006-07	**Ministerial Council on Energy** **Demand side response and distributed generation incentives** Conducted a review of the MCE's proposed initial national electricity distribution network revenue and pricing rules to identify the implications for the efficient use of demand side response and distributed generation by electricity network owners and customers.
2006	**Ministerial Council on Energy** **Electricity network pricing rules** Advice on the framework for the development of the initial national electricity distribution network pricing rules, in the context of the transition to a single, national economic regulator.

2005-06	**Minister for Industry** **Expert Panel** Appointment by Hon Ian Macfarlane, Minister for Industry, Tourism and Resources, to an Expert Panel to advise the Ministerial Council on Energy on achieving harmonisation of the approach to regulation of electricity and gas transmission and distribution infrastructure.
2005-06	**Australian Energy Markets Commission** **Transmission pricing regime** Advice to the AEMC on its review of the transmission revenue and pricing rules as required by the new National Electricity Law.
1998-2006	**Essential Services Commission of Victoria** **Price cap reviews** Wide ranging advice to the Essential Services Commission (formerly the Office of the Regulator-General), on regulatory, financial and strategic issues arising in the context of five separate reviews of price controls/access arrangements applying in the electricity, gas distribution, ports, rail and water sectors in Victoria. This work encompassed advice on the development of the Commission's work program and public consultation strategy for each review, direct assistance with the drafting of papers for public consultation, the provision of internal papers and analysis on specific aspects of the review, drafting of decision documents, and acting as expert witness in hearings before the Appeal Panel and Victorian Supreme Court.
2004-05	**Ministerial Council of Energy** **Reform of the National Electricity Law** Retained in two separate advisory roles in relation to the reform of the institutions and legal framework underpinning the national energy markets. These roles include the appropriate specification of the objectives and rule making test for the national electricity market, and the development of a harmonised framework for distribution and retail regulation.
2004-05	**Johnson Winter Slattery, ETSA Utilities** **Price determination** Advice on a wide range of economic and financial issues in the context of ETSA Utilities' application for review of ESCOSA's determination of a five year electricity distribution price cap.
2004	**Deacons/ACCC** **Implementation of DORC valuation** Prepared a report on the implementation of a cost-based DORC valuation, for submission to the Australian Competition Tribunal in connection with proceedings on the appropriate gas transportation tariffs for the Moomba to Sydney gas pipeline.
2003-04	**Natural Gas Corporation, New Zealand** **Gas pipeline regulation** Advisor in relation to the inquiry by the Commerce Commission into the case for formal economic regulation of gas pipelines. This role included assistance with the drafting of submissions, the provision of expert reports, and the giving of evidence before the Commerce Commission.
2001-03	**Rail Infrastructure Corporation** **Preparation of access undertaking** Advised on all economic aspects arising in the preparation of an access undertaking for the New South Wales rail network. Issues arising included: pricing principles under a `negotiate and arbitrate' framework, asset valuation, efficient costs, capacity allocation and trading, and cost of capital.

2002	**Clayton Utz/TransGrid** **National Electricity Tribunal hearing** Retained as the principal economic expert in the appeal brought by Murraylink Transmission Company of NEMMCO's decision that TransGrid's proposed South Australia to New South Wales Electricity Interconnector was justified under the national electricity code's 'regulatory test'.
2001-02	**SPI PowerNet** **Revenue cap reset** Advisor on all regulatory and economic aspects of SPI PowerNet's application to the ACCC for review of its revenue cap applying from January 2003. This included assistance on regulatory strategy, asset valuation in the context of the transitional provisions of the national electricity code, drafting and editorial support for the application document, and the conduct of a `devil's advocate' review.
2002	**Corrs Chambers Westgarth/Ofgar** **Economic interpretation of the gas code** Provision of expert report and sworn testimony in the matter of Epic Energy v Office of the Independent Gas Access Regulator, before the Supreme Court of Western Australia, on the economic interpretation of certain phrases in the natural gas pipelines access code.

Sworn Testimony, Transcribed Evidence[345]

2013

Expert evidence before the Supreme Court of Victoria on behalf of Maddingley Brown Coal in the matter of Maddingley Brown Coal v Environment Protection Agency of Victoria
Expert reports, sworn evidence, Melbourne, 12 August 2013

Expert evidence before the Federal Court on behalf of Modtech v GPT Management and Others
Expert reports, sworn evidence, Melbourne, 27 March 2013

2012

Expert evidence before the Supreme Court of Queensland on behalf of Origin Energy Electricity Ltd and Others v Queensland Competition Authority and Others
Expert reports, sworn evidence, Brisbane, 3 December 2012

2011

Expert evidence before the Federal Court on behalf of the Australian Turf Club and Australian Racing Board in the matter of Bruce McHugh v ATC and Others
Expert report, transcribed evidence, Sydney, 12 and 14 October 2011

Expert evidence in arbitration proceedings before J von Doussa, QC, on behalf of Santos in the matter of Santos and Others v Government of South Australia
Expert report, transcribed evidence, Adelaide, 13-15 September 2011

Expert evidence before a panel of arbitrators on behalf of UNELCO in the matter of UNELCO v Government of Vanuatu
Expert report, transcribed evidence, Melbourne, 23 March and 21 April 2011

Expert evidence before the Federal Court on behalf of ActewAGL in the matter of ActewAGL v Australian Energy Regulator
Expert report, sworn evidence, Sydney, 17 March 2011

Deposition Testimony in Re Payment Care Interchange and Merchant Discount Litigation, in the United States District Court for the Eastern District of New York
Deposition testimony, District of Colombia, 18 January 2011

2010

Expert evidence before the Federal Court in behalf of the Australia Competition and Consumer Commission in the matter of ACCC v Cement Australia and others
Expert report, sworn evidence, Brisbane, 19-21 October 2010

Expert evidence on behalf of Orion NZ, at the Commerce Commission's Conference on its Input Methodologies Emerging View Paper
Transcribed evidence, public hearings, Wellington, 24 February 2010

Deposition Testimony in *Re Payment Card Interchange and Merchant Discount Antitrust Litigation*, in the United States District Court for the Eastern District of New York
Deposition Testimony, District of Columbia, 18 February 2010

[345] Past ten years.

2009	**Expert evidence before the Australian Competition Tribunal on behalf of Fortescue Metals Group Ltd, in the matter of Application for Review of Decision in Relation to Declaration of Services Provided by the Robe, Hamersley, Mt Newman and Goldsworthy Railways** Expert report, sworn evidence, Melbourne, 12-13 October and 5-6 November 2009
	Expert evidence on behalf of Orion NZ, at the Commerce Commission's Conference on its Input Methodologies Discussion Paper Transcribed evidence, public hearings, Wellington, 16 September 2009
	Expert evidence before the Federal Court on behalf of Fortescue Metals Group Ltd, in the matter of ASIC v Fortescue Metals Group and Andrew Forrest Expert report, sworn evidence, Perth, 29 April–1 May 2009
	Expert report and evidence in arbitration proceedings before Hon Michael McHugh, AC QC, and Roger Gyles, QC, between Origin Energy and AGL Expert report, sworn evidence, Sydney, 19-24 March 2009
2008	**Expert evidence on behalf of Orion NZ, at the Commerce Commission's Conference on its Draft Decision on Authorisation for the Control of Natural Gas Pipeline Services** Transcribed evidence, public hearings, Wellington, 21 February 2008
2007	**Expert report and evidence in arbitration proceedings before Sir Daryl Dawson between SteriCorp and Stericycle Inc.** Expert report, sworn evidence, 11 July 2007
2006	**Expert report and evidence in arbitration proceedings before Sir Daryl Dawson and David Jackson, QC, between Santos and others, and AGL** Expert report, sworn evidence, November 2006
	Expert report and evidence before the Federal Court on behalf of Fortescue Metals Group in the matter of BHP Billiton v National Competition Council and Others Expert report, sworn evidence, November 2006
	Expert report and evidence in arbitration proceedings before Sir Daryl Dawson and David Jackson, QC, between Santos and Others, and Xstrata Queensland Expert report, sworn evidence, September 2006
	Expert report and evidence before the Copyright Tribunal on behalf of the Australian Hotels Association and others in the matter of PPCA v AHA and Others Expert report, sworn evidence, May 2006
	Expert report and evidence in arbitration proceedings before Hon Michael McHugh, AC QC, on the matter of AWB Limited v ABB Grain Limited Expert report, sworn evidence, 24 May 2006
	Expert report and evidence to Victorian Appeal Panel, in the matter of the appeal by United Energy Distribution of the Electricity Price Determination of the Essential Services Commission Expert report, sworn evidence, 10 February 2006

Brendan Quach

Senior Consultant

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Tel: +61 2 8864 6502
Fax: +61 2 8864 6549
E-mail: brendan.quach@nera.com
Website: www.nera.com

Overview

Brendan Quach has fifteen years experience as an economist, specialising in network economics, and competition policy in Australia, New Zealand and Asia Pacific. Since joining NERA in 2001, Brendan has advised clients on the application of competition policy in Australia, in such industries as aviation, airports, electricity, rail and natural gas. Brendan specialises in regulatory and financial modelling and the cost of capital for network businesses. Prior to joining NERA, Brendan worked at the Australian Chamber of Commerce and Industry, advising on a number of business issues including tax policy, national wage claims and small business reforms.

Qualifications

1991-1995	**AUSTRALIAN NATIONAL UNIVERSITY** Bachelor of Economics. (High Second Class Honours)
1991-1997	**AUSTRALIAN NATIONAL UNIVERSITY** Bachelor of Laws.

Career Details

2001 -	**NERA ECONOMIC CONSULTING** Economist, Sydney
1998-1999	**AUSTRALIAN CHAMBER OF COMMERCE AND INDUSTRY** Economist, Canberra
1996	**AUSTRALIAN BUREAU OF STATISTICS** Research Officer, Canberra

Project Experience

Regulatory and Financial Analysis

2013	**Sydney Water Corporation** **Cost of capital estimation** Preparation of two expert reports for submission to the Independent Pricing and Regulatory Tribunal (IPART) on the framework for determining the weighted average cost of capital for infrastructure service providers.
2013	**Queensland Competition Authority** **Price review arbitration** Undertook an independent quality assurance assessment of the models used to calculate regulated revenues for Queensland water utilities. The review considered: the formulation of the WACC; the intra year timing of cashflows; and the structural, computational and economic integrity of the models.
2013	**Actew Corporation** **Interpretation of economic terms** Advice on economic aspects of the draft and final decisions of the Independent Competition and Regulatory Commission in relation to the price controls applying to Actew.
2012-13	**Gilbert + Tobin/Rio Tinto Coal Australia** **Assistance in drafting cost of capital submission** Analysis and expert reports prepared in the context of an arbitration concerning the price to be charged for use of the coal loading facilities at Abbott Point Coal Terminal.
2012-13	**Ashurst/Brisbane Airport Corporation** **Draft access undertaking** Advice, analysis and expert report on the weighted average cost of capital (WACC) in the context of the preparation of a draft access undertaking specifying the basis for determining a ten year price path for landing charges necessary to finance a new parallel runway at Brisbane airport.
2012	**APA GasNet** **Assistance in drafting cost of capital submission** Brendan provided drafting assistance to APA GasNet in developing its cost of capital submission to the AER.
2012	**APA Brisbane to Roma Pipeline** **Assistance in drafting cost of capital submission** Brendan provided drafting assistance to APA BRP in developing its cost of capital submission to the AER.
2012	**ACTEW Water, ACT** **Review of regulatory models** Brendan provided strategic and analytical advice to ACTEW on its regulatory models. The analysis included analysis of the risks and challenges of adopting a post-tax revenue model and the application of expenditure incentive mechanisms.
2012	**Energy Networks Association** **Rate of return framework guideline** Co-authored a number of expert reports submitted to the Australian Energy Regulator on the rate of return framework guideline. These report considered a range of financial issues including: the applicability of various financial models to the estimation of the cost of equity; the estimates of the cost of equity from the Black CAPM; estimates of the historic market, size and value premiums; and the payout ratio of created imputation credits.

2012	**Energy Networks Association** **Advice on the new rate of return framework** Advice to the Energy Networks Association on the appropriate the implications of the new allowed rate of return framework to apply to electricity and gas transmission and distribution businesses. This report considered a range of financial models and other information that the regulator should have regard to when setting the regulated return on equity.
2012	**Victorian Gas Networks** **Black Capital Asset Pricing Model** Brendan co-authored a report that examined whether a version of the Black CAPM is better able than an empirical version of the Sharpe-Lintner (SL) CAPM to produce an estimate of the cost of equity that meets the requirements of Rule 87 (1) of the National Gas Rules (NGR). Following an examination of Australian financial data we concluded that an empirical version of the Black CAPM is better able than an empirical version the SL CAPM.
2012	**Queensland Competition Authority** **Review of the retail water regulatory models** Brendan undertook an independent quality assurance assessment of the financial models relied on by the QCA to set the regulated revenues of SunWater. The review considered: SunWater's Financial model, a model used by SunWater to calculate future electricity prices, an renewals annuity model, as well as the QCA's regulatory model. These models established a set of recommended prices for each of the 30 irrigation schemes operated by SunWater for the period 2014 to 2019.
2011-12	**Energy Networks Association** **Review of Economic Regulation of Network Service Providers** Advice and expert reports submitted to the Australian Energy Market Commission on the new allowed rate of return framework to apply to electricity and gas transmission and distribution businesses, as proposed by the Australian Energy Regulator and the Energy Users Rule Change Committee.
2011-12	**Energy Networks Association** **Review of Economic Regulation of Network Service Providers** Advice and expert reports submitted to the Australian Energy Market Commission on the expenditure and incentive frameworks to apply to electricity transmission and distribution businesses, as proposed by the Australian Energy Regulator.
2011	**Queensland Competition Authority** **Review of the retail water regulatory models** Undertook an independent quality assurance assessment of the models used to calculate regulated revenues for Queensland Urban Utilities, Allconnex Water, and Unitywater. The review considered: the formulation of the WACC; the intra year timing of cashflows; and the structural, computational and economic integrity of the models.
2011	**Queensland Competition Authority** **Review of the wholesale water regulatory models** Undertook an independent quality assurance assessment of the models used to calculate regulated revenues for LinkWater, Seqwater; and WaterSecure. The review considered: the formulation of the WACC; the intra year timing of cashflows; and the structural, computational and economic integrity of the models.
2011	**Multinet Gas and SP AusNet - Gas Distribution** **Report on the market risk premium** Co-authored a report that examined a number of issues arising from the draft decision on Envestra's access proposal for the SA gas network. The report considered whether: the historical evidence supported the use of a long term average of 6 per cent; there is any evidence to warrant a MRP at it long term average; and the evidence relied on by the AER to justify its return to a MRP of 6 per cent.

2011	**Dampier to Bunbury Natural Gas Pipeline - Gas Transmission** **Cost of Equity** Co-authored two reports that updated the cost of equity for a gas transmission business and responded to issues raised by the regulator in its draft decision. The report re-estimated the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and a zero beta version of the Fama-French three-factor model.
2010-11	**Queensland Competition Authority** **Weighted Average Cost of Capital (WACC) for SunWater** Retained to provide two expert reports on the WACC for SunWater a Queensland rural infrastructure business. The first report considered issues pertaining to whether a single or multiple rates of return can be applied across SunWater's network segments. The second report focuses market evidence on the appropriate rate of return for SunWater.
2011	**Mallesons Stephens Jaques, on behalf of ActewAGL Distribution** **Determining the averaging period** Assisted in the development of an expert report that considered the economic and financial matters arising from the Australian Energy Regulator's decision to reject ActewAGL's proposed risk free rate averaging period.
2010	**Orion Energy, New Zealand** **Information disclosure regime** Provided advice and assistance in preparing submissions by Orion to the New Zealand Commerce Commission, in relation to the Commission's proposed weighted average cost of capital for an electricity lines businesses. Issues addressed included the financial model used to calculate the required return on equity, the appropriate term for the risk free rate and the WACC parameter values proposed by the Commission.
2010	**Ministerial Council on Energy, Smart Meter Working Group, The costs and benefits of electricity smart metering infrastructure in rural and remote communities** This report extends NERA's earlier analysis of the costs and benefits of a mandatory roll out of smart meters, by consider the implications of a roll out in rural and remote communities in the Northern Territory, Western Australia and Queensland. The project has focused on eight case study communities and has examined the implications of prepayment metering and remoteness on the overall costs and benefits of a roll out.
2010	**Grid Australia, Submission to the AER on the proposed amendments to the transmission revenue and asset value models** Developed and drafted a submission to the AER on the proposed amendments to the AER's post-tax revenue model (PTRM) and roll forward model (RFM). The proposal focused on a number of suggestions to simplify and increase the usability of the existing models.
2010	**Dampier to Bunbury Natural Gas Pipeline (DBNGP) - Gas Transmission** **Cost of Equity** Co-authored a report that examined four well accepted financial models to estimate the cost of equity for a gas transmission business. The report of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and a zero beta version of the Fama-French three-factor model.
2009-10	**Jemena - Gas Distribution** **Cost of Equity** Co-authored two reports on the use of the Fama-French three-factor model to estimate the cost of equity for regulated gas distribution business. The report examined whether the Fama-French three-factor model met the dual requirements of the National Gas Code to provide an accurate estimate of the cost of equity and be a well accepted financial model. Using Australian financial data the report also provided a current estimate of the cost of equity for Jemena.

2009	**WA Gas Networks - Gas Distribution** **Cost of Equity** Co-authored a report that examined a range of financial models that could be used to estimate the cost of equity for a gas distribution business. The report of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and Fama-French two-factor model. The report examined both the domestic and international data.
2009	**CitiPower and Powercor – Victorian Electricity Distribution** **Network Reliability Incentive Mechanism (S-factor)** Brendan provided advice to CitiPower and Powercor on the proposed changes to the operation of the reliability incentive mechanism. The advice considered the effects of the proposed changes to the operation of the two distribution network service providers. Specifically, how the 'S-factors' would be changed and implications this has to the revenue streams of the two businesses. A comparison was also made with the current ESC arrangements to highlight the changes to the mechanism.
2009	**CitiPower and Powercor – Victorian Electricity Distribution** **Network Reliability Incentive Mechanism (S-factor)** Brendan provided advice to CitiPower and Powercor on the proposed changes to the operation of the reliability incentive mechanism. The advice considered the effects of the new arrangements on the business case for undertaking a series of reliability projects. Specifically, the project estimated the net benefit to the businesses of three reliability programs.
2009	**Jemena and ActewAGL - Gas Distribution** **Cost of Equity** Co-authored a report on alternative financial models for estimating the cost of equity. The report examined the implication of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM and Fama-French models. The report examined both the domestic and international data.
2008	**Joint Industry Associations - APIA, ENA and Grid Australia** **Weighted Average Cost of Capital** Assisted in the drafting of the Joint Industry Associations submission to the Australian Energy Regulator's weighted average cost of capital review. The submission examined the current market evidence of the cost of capital for Australian regulated electricity transmission and distribution businesses.
2008	**Joint Industry Associations - APIA, ENA and Grid Australia** **Weighted Average Cost of Capital** Expert report for the Joint Industry Associations on the value of imputation credits. The expert report was attached to their submission to the Australian Energy Regulator's weighted average cost of capital review. The report examined the current evidence of the market value of imputation credits (gamma) created by Australian regulated electricity transmission and distribution businesses.
2007-08	**Smart Meter Working Group, Ministerial Council on Energy – Assessment of the costs and benefits of a national mandated rollout of smart metering and direct load control** Part of a project team that considered the costs and benefits of a national mandated rollout of electricity smart meters. Brendan was primarily responsible for the collection of data and the modelling of the overall costs and benefits of smart metering functions and scenarios. The analysis also considering the likely costs and benefits associated with the likely demand responses from consumers and impacts on vulnerable customers.
2007	**Electricity Transmission Network Owners Forum (ETNOF),** **Submission to the AER on the proposed transmission revenue and asset value models** Developed and drafted a submission to the AER on the proposed post-tax revenue model (PTRM) and roll forward model (RFM) that would apply to all electricity transmission network service providers (TNSPs). The proposal focused ensuring that the regulatory models gave effect to the AER's regulatory decisions and insures that TNSPs have a reasonable opportunity to recover their efficient costs.

Report qualifications/assumptions and limiting conditions

This report is for the exclusive use of the NERA Economic Consulting client named herein. There are no third party beneficiaries with respect to this report, and NERA Economic Consulting does not accept any liability to any third party.

Information furnished by others, upon which all or portions of this report are based, is believed to be reliable but has not been independently verified, unless otherwise expressly indicated. Public information and industry and statistical data are from sources we deem to be reliable; however, we make no representation as to the accuracy or completeness of such information. The findings contained in this report may contain predictions based on current data and historical trends. Any such predictions are subject to inherent risks and uncertainties. NERA Economic Consulting accepts no responsibility for actual results or future events.

The opinions expressed in this report are valid only for the purpose stated herein and as of the date of this report. No obligation is assumed to revise this report to reflect changes, events or conditions, which occur subsequent to the date hereof.

All decisions in connection with the implementation or use of advice or recommendations contained in this report are the sole responsibility of the client. This report does not represent investment advice nor does it provide an opinion regarding the fairness of any transaction to any and all parties.

NERA
ECONOMIC CONSULTING

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Tel: 61 2 8864 6500 Fax: 61 2 8864 6549
www.nera.com

NERA Australia Pty Ltd, ABN 34 092 959 665