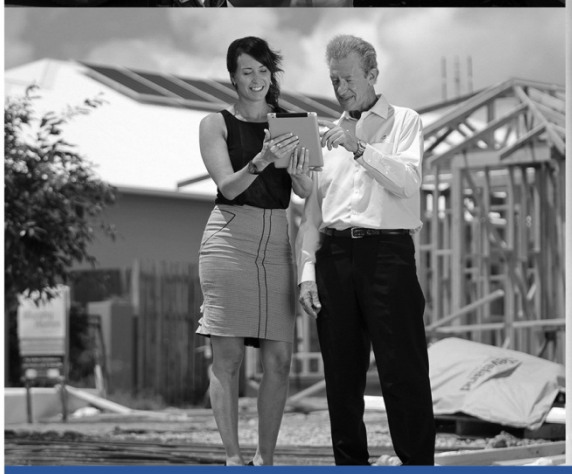


Submission to the AER on its Preliminary Determination

Rate of Return – Cost of Equity

ERGON ENERGY

Summary

Our approach to estimating the expected return on equity continues to differ from the Australian Energy Regulator's (AER). Estimating the return on equity must take into account all relevant evidence, and where that evidence is relevant and probative as to the required return on equity, give it a direct role in the estimation process.

The AER's approach does not do this.

Rather, it relies on its foundation model both to set the rate of return and to justify the rejection of other approaches. This is despite recent changes that were made to the NER with the explicit intention of allowing evidence and models other than the Sharpe-Lintner Capital Asset Pricing Model (SL CAPM) to be considered.

Contents

1. Background

The National Electricity Rules (NER) require the AER to set an allowed rate of return that is commensurate with prevailing market conditions.[1] While real world equity returns have remained virtually constant, the AER's regulatory allowance has declined radically, in lock-step with unprecedented falls in base interest rates.

In the words of the Governor of the Reserve Bank of Australia (RBA), Mr Glenn Stevens, equity rates have not in reality followed the unprecedented downward movement in base rates:

> "[A key] feature that catches one's eye is that, postcrisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero."[2]

Our October Regulatory Proposal established an allowed rate of return for risk adjusted equity based on advice from Professor Gray by fully estimating each of the four relevant financial models and taking a weighted average of these measures with due weight being ascribed to each model.

When specifying the SL CAPM, we used the mid-point between the Wright and Ibbotson approaches. Taking the midpoint of these approaches acknowledges that there is a degree of correlation between expected investor returns and base interest rate movements but that the correlation is considerably less than a one-for-one equal relationship.

The AER's Preliminary Determination needs to be amended to reflect our October Regulatory Proposal so that our allowed rate of return is commensurate with market-based returns and in order for the regulatory allowance to foster efficient long-term investments necessary for the supply of safe and reliable electricity in the long-term interest of consumers, as required by the National Electricity Law.

[1] NER, rule 6.5 (ver. 71)
[2] Reserve Bank of Australia; the World Economy and Australia Address to the American Australian Association luncheon hosted by Goldman Sachs, New York, USA (**RBA Speech**); 21 April 2015.

2. AER's Preliminary Determination

The AER's Preliminary Determination rejected our proposal of using a weighted average of the four relevant models and instead continued the outdated approach of predominant reliance on the SL CAPM.

The AER's approach in its Preliminary Determination is to estimate three parameters, insert them into the SL CAPM formula and then to adopt the output from that formula as the allowed return on equity. Without making any explicit adjustment to the SL CAPM, the AER's only recognition of the other models is to augment its traditional approach to rationalising the selection of beta and market risk premium with discussion that includes an idiosyncratic treatment of two of the financial models that the AER has refused to use directly in estimating the return on equity.

The Preliminary Determination persists with a preference for the SL CAPM:

- using two of the models in ways that are inconsistent with their inherent features as one of the many ways to 'inform' the selection of parameters within the SL CAPM (i.e. the Dividend Cash Flow (DCF) and Black CAPM)
    - The AER's Preliminary Determination asserts that the DCF model has been used to inform its estimate of the market risk premium implying that this is a recognised approach to using the model. However, that model is in fact designed to be used to estimate the required return on equity and that is how it is applied in the US. The AER disregards this standard application of the DCF model entirely
    - Similarly, the AER's Preliminary Determination asserts that the Black-CAPM has been considered in selecting the value for beta but again there is no recognised usage of the Black-CAPM in this way
- disregarding the third one completely (i.e. Fama French).

We presented detailed empirical work to demonstrate that this approach is dangerous. Other regulators who use the SL CAPM amongst the inputs to the return on equity (such as the Public Utilities Commissions in the U.S.) have made upward adjustments to reflect the empirical evidence that the SL CAPM performs badly and, notably, gives a structural under-estimate of the returns earned by low beta stocks.

There is a further important cyclical reason why the AER's approach is delivering record under-estimates of the required rate of return. There is a serious mismatch between prevailing equity returns and the AER's regulatory allowance. Nevertheless, the Preliminary Determination has continued to adopt the Ibbotson inspired implementation of the SL CAPM, in which a contemporaneous measure of base interest rates is combined with a long run market risk premium – simply stated, the approach mixes apples and oranges.

While this effect is cyclical, it is notable that this particular low-point in base interest rates is the lowest since the Second World War.

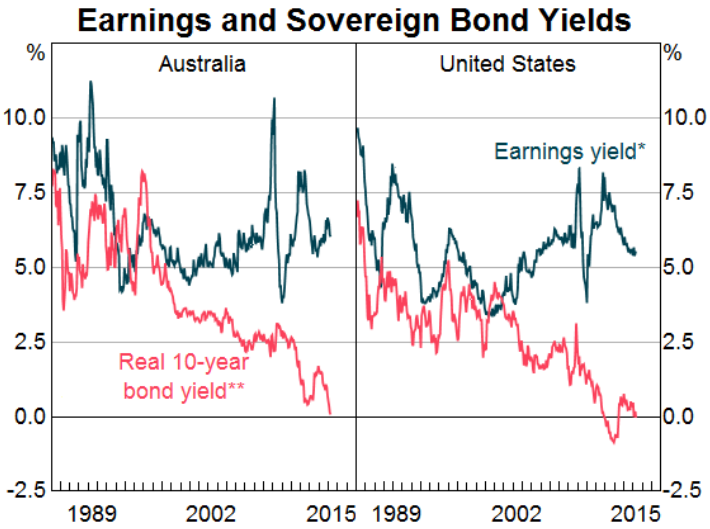
Recent speeches by the Governor of the Reserve Bank and his deputy have focused on the phenomenon that while base rates have fallen, market measures on the prevailing the equity returns have not fallen and instead have remained at almost pre-crises levels:[3]

[3] RBA Speech.

Unfortunately, … the legacy of the 2008 crisis is yet behind us. From the vantage point of most central banks, the world could hardly, in some respects, look more unusual.[4]

…Policy rates in the major advanced jurisdictions have been near zero for six years now.…

[A key] feature that catches one's eye is that, postcrisis, the earnings yield on listed companies seems to have remained where it has historically been for a long time, even as the return on safe assets has collapsed to be close to zero (Graph 2). This seems to imply that the equity risk premium observed ex-post has risen even as the riskfree rate has fallen and by about an offsetting amount.…



[T]he hurdle rates of return that boards of directors apply to investment propositions have not shifted, despite the exceptionally low returns available on lowrisk assets.

The possibility that, de-facto, the risk premium being required by those who make decisions about real capital investment has risen by the same amount that the riskless rates affected by central banks have fallen may help to explain why we observe a pickup in financial risktaking, but considerably less effect, so far, on 'real economy' risktaking."

[4] RBA Speech

The staff of the RBA (Lane and Rosewall) have published a more detailed analysis. They state:

> "Liaison and survey evidence indicate that Australian firms tend to require expected returns on capital expenditure to exceed high 'hurdle rates' of return that are often well above the cost of capital and do not change very often. In addition, many firms require the investment outlay to be recouped within a few years, requiring even greater implied rates of return. As a consequence, the capital expenditure decisions of many Australian firms are not directly sensitive to changes in interest rates.[5]
>
> …
>
> "[C]ontacts note that the hurdle rate is often held constant through time, rather than being adjusted in line with the cost of capital. Regardless of whether changes in interest rates have a *direct* effect on investment decisions, interest rates will still have a powerful *indirect* influence on firms' investment decisions through other channels, including their effect on aggregate demand."[6]
>
> …
>
> "Many liaison contacts also report that hurdle rates are not changed very often and in some instances have not been altered for at least several years. These observations are also reflected in the recent survey by Deloitte; two-thirds of corporations indicated their hurdle rate was updated less frequently than their formal review of the WACC, and nearly half reported the level of their hurdle rate was changed 'very rarely' (Graph 4). For these firms, changes in interest rates do not flow through to hurdle rates; rather, the margin between the WACC and the hurdle rate changes. One-third of firms said they update their hurdle rate when they review their WACC, which is possibly on a quarterly or annual basis; other contacts in the liaison program have also noted the WACC used in investment decisions is similarly reviewed infrequently.
>
> Liaison contacts have provided several reasons why the hurdle rate may not be sensitive to the cost of capital. A common observation is that the true cost of equity, and therefore the overall cost

[5] Kevin Lane and Tom Rosewall; 'Firms' Investment Decisions and Interest Rates' (2015) June Quarter *Bulletin*; page 1.
[6] *Ibid*; page 2.

> of capital, cannot be observed.[7] Managers have also noted that changes in the observed cost of debt owing to changes in interest rates are likely to be temporary, and so they are reluctant to react to developments that may soon be unwound. A few business contacts have argued that keeping the hurdle rate constant acts as an automatic time-varying risk adjustment: interest rates tend to be low when uncertainty is high, so the gap between the hurdle rate and the cost of capital should be higher (and vice versa)."[8]

Further, because the AER relies heavily on a single model rather than taking a blended approach, and because it uses only the simplest of the capital asset price models available, there is a higher likelihood of divergence between the AER's estimates and the return on equity that investors require.

The AER's Preliminary Determination culminates in an allowed rate of return for equity in the prevailing market conditions that is well below that which would be commensurate with the efficient financing practices of a benchmark efficient entity.

[7] In general, managers of listed firms appear to use the capital asset pricing model (CAPM) as their primary measure of the cost of equity. Similar results have been found for US and European firms (Graham and Harvey 2001; Brounen, de Jong and Koedijk 2004). As several liaison contacts have noted, the cost of equity implied by CAPM will be sensitive to the estimation sample period and method. In addition, other measures of the cost of equity could provide different results.

[8] Kevin Lane and Tom Rosewall; 'Firms' Investment Decisions and Interest Rates' (2015) June Quarter *Bulletin*; pages 3-4.

3. Our response to the Preliminary Determination

We remain of the view that the approach to establishing the allowed return on equity that was set out in our October Regulatory Proposal is correct and materially preferable to that which appears in the Preliminary Determination. Indeed it is necessary for the Preliminary Determination to be revoked and substituted in this respect for the Substitute Determination to accord with the rate of return objective in the National Electricity Law.

3.1. The evidence base underpinning our submission

Although the AER was not persuaded by the original expert reports that we submitted in support of our October Regulatory Proposal, they should be reconsidered by the AER before making the Final Determination for our business because they provide thorough analysis of why the 'multi-model' approach is preferable to the 'foundation model' approach. In many cases the AER has not properly recognised the insights they provide into equity markets generally and the flaws with the AER's approach in particular.

Since the October Regulatory Proposal and before the Preliminary Determination was published, Ergon Energy jointly procured the following additional reports that support the original proposal:

1. NERA; *Review of the Literature in Support of the Sharpe-Lintner CAPM; the Black CAPM and the Fama-French Three-Factor Model*, March 2015. This report discusses material previously before the AER and provides a thorough investigation of consideration by a wide range of experts on models identified in the Guideline as those models to which the AER will have regard in identifying the return on equity.
2. SFG Consulting; *The foundation model approach of the Australian Energy Regulator to estimating the cost of equity*; March 2015. This report by Gray and Hall details a series of evidence that demonstrates that the "Foundation Model" is significantly flawed. This evidence even includes some aspects of the material that the AER's own expert, Handley, presents.
3. SFG Consulting; *The required return on equity for the benchmark efficient entity;* February 2015. This report by Gray and Hall considers a range of criticisms, that the AER and its consultants, make in relation to Gray and Hall's multi-model approach. This report answers these criticisms and finds that there is no reason to depart from their original multi model approach.
4. NERA; *Historical Estimates of the Market Risk Premium*; February 2015. This report by Wheatley explains when geometric averages are inappropriate where the AER's regulatory arrangements do not provide for compounding. This report also investigates the flawed adjustment that Brailsford, Handley and Maheswaran rely on and reiterates that their approach is flawed.
5. NERA; *Empirical Performance of the Sharpe-Lintner and Black CAPM;* February 2015. This report by Wheatley undertakes a "state of the art" empirical analysis of the performance of the SL CAPM (as implemented by the AER) the Black-CAPM and a "naive model" in which no adjustment is made to risk. This report demonstrates that the AER's SL CAPM performs even worse than the "naive model". By contrast the Black-CAPM performs comparatively well.
6. SFG Consulting; *Beta and the Black Capital Asset Pricing Model;* 13 February 2015. This report by Gray and Hall assesses the best estimate of beta to be 0.82, applicable to both the SL CAPM and the Black-CAPM. Additionally it calculates the best estimate of the zero-beta premium for use in the Black-CAPM to be 3.34%. The report also identifies an estimate for beta of 0.91 for use in the SL CAPM if that model is to be the only one used.

7. SFG Consulting; *Using the Fama-French model to estimate the required return on equity;* February 2015. This report by Gray and Hall comprehensively responds to the AER's stated reasons for excluding the Fama French model from being used in calculating the allowed rate of return for equity.
8. SFG Consulting; *Share prices, the dividend discount model and the cost of equity for the market and a benchmark energy network;* 18 February 2015. This report by Gray and Hall examines a range of issues as to how to implement the Dividend Growth Model (DGM) in Australia, correcting some misconceptions of the AER in relation to implementing the DGM.
9. Incenta Economic Consulting; *Further update on the required return on equity from Independent expert reports*; February 2015. This report corroborates Grant Samuels' views as the usual approach of finance professionals to capital asset pricing models.

These reports were lodged by other businesses with the AER prior to the AER's Preliminary Determination but they have not yet formed a formal part of our submissions. In a significant number of cases this material was before the AER at the time of our Preliminary Determination as part of the decisions being made by the AER for the NSW and ACT electricity distribution determinations and the Jemena Gas Networks determination.

However, there are quite a number of instances in which the AER has failed to engage with the details of these experts' work and the significance of their conclusions a combined 'sounding of the alarm' that from a theoretical and empirical perspective the foundation model approach is seriously out of step with the prevailing cost of equity.

In particular, it is difficult to understand how the AER can continue to adhere to the 'foundation model' SL CAPM based approach in light of NERA's literature review concerning the theoretical flaws of the SL CAPM and the model's poor performance as detailed in NERA's empirical testing (see reports 1 and 5 in the above list). It is also concerning that in light of the requirement in the rules to have regard to all the relevant models "relevant estimation methods, financial models, market data and other evidence", the Preliminary Determination asserts that the well-founded adjustments that Incenta Economic Consulting recommend could possibly be beyond power.

It is important for the AER to (re-)consider and fully engage with all the material in the above reports and to make changes to its approach in response to the findings in those reports.

Additionally, since that time, we have procured a number of additional reports and have the benefit of reviewing other evidence provided through other distribution processes[9]. Important primary evidence we rely on for our revised proposal and submission includes:

- A report by the authors of Frontier Economics' 2013 report for the AER concerning the analysis of risk. As detailed in the report and summarised below, the AER has misinterpreted the original 2013 report in key respects and this has significantly contributed to erroneous conclusions concerning the quantum and nature of the risks our business carries. This report also explains that the level of risk has significantly increased since 2013.[10]
- A report by Professor Gray and Dr Hall (**"Gray and Hall"**), of SFG (now of Frontier Economics) who analyse all the key flaws with the AER's Preliminary Determination's approach to setting the allowed rate of return for equity.
- Two further reports by Frontier Economics :

[9] A more exhaustive list of primary and secondary evidence relied on by Ergon Energy and included as part of our Revised Regulatory Proposal and Submission documentation is provided at the end of this document

[10] Frontier; *Review of the AER's conceptual analysis for equity beta, Report prepared for ActewAGL Distribution, AGN, AusNet Services, Citipower, Ergon, Energex, Jemena Electricity Networks, Powercor Australia, SA Power Networks and United Energy*; June 2015.

- One which updates the reports by SFG on 6 June 2014 and 25 February 2015, the latter one being titled *the required return on equity for the benchmark efficient entity.* Frontier Economics update the estimates from this previous report to account for new data that has become available since the previous report was prepared and uses an updated estimate of the risk-free rate based on a 20-day averaging period that ends on 22 May 2015.[11]
- The second report *Cost of equity estimates over time* complements the Gray and Hall report which provides estimates of the expected market return, and the cost of equity for a benchmark energy network as a historical time series. Frontier documents what the cost of equity estimates would have been, over an extended period, using different approaches to estimating the market return from equity prices (the dividend discount models), different ways this market return estimate could be factored into a decision (the MRP decision rules), and different ways of arriving at a final estimate of the cost of equity for a network service provider (the cost of equity approaches).

- A report by NERA; *The Cost of Equity: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks, A report for ActewAGL Distribution, AGN, APA, AusNet Services, CitiPower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks, and United Energy*; June 2015. Mr Wheatley addresses criticisms that have been made by the AER's consultants of his previous work. As is evident from his report, the AER's consultants have failed to give any material consideration of, or have regard to, the key points previously presented by Mr Wheatley and submitted to the AER.
- A report by Dr Robert Malko, a leading U.S. regulatory professional who has been working as a specialist on energy regulation since the 1970s and whose report is significant in three main respects – it shows that the DCF *can* be used very effectively in energy regulation; that U.S. regulators do commonly use an Empirical CAPM that is to the same effect as the Black CAPM and why the multi-model approach is strongly preferable to a single or foundation model approach.[12]
- SFG Consulting; Updated estimate of the required return on equity, Report for SA Power Networks; 19 May 2015. This report by Gray and Hall provides an update to previous reports on the basis of new data, in particular an updated estimate of the risk free rate based on the 20-day averaging period beginning on 9 February 2015.

In particular, Frontier has reviewed all the material that the AER has now generated in support of its "Foundation Model" approach and identified four key issues.

First, the AER's approach fails to have regard to all of the relevant material and proceeds as if there had been no amendment to the NER in 2012.

Second, although the AER's documents refer to a broad range of materials, the "Foundation Model" approach imposes arbitrary binding constraints that severely limit or prevent these other inputs being given weight according to their own terms.

Third, the AER has, in several instances, failed to recognise that contradictions in evidence before them logically requires them to make a decision as to which of the evidence is correct and which is incorrect. Instead, the AER appears to consider it appropriate to adopt a range of values, including values which are inconsistent in terms and values which are not supported by any material, rather than correctly identifying which values are to be preferred from amongst the conflicting evidence.

[11] Frontier: *An updated estimate of the required return on equity*, June 2015.
[12] Malko, JR; *Statement*; 16 June 2015 (**Malko**).

Finally, the report highlights it is inappropriate for the AER to continue to give the SL CAPM a position of primacy when it demonstrably fails to address issues that other models successfully address.

3.2. Analysing the level of risk our business faces

The AER needs to completely re-work its analysis of risk. In the Preliminary Determination, the AER's analysis is based in significant part on a report it commissioned from Frontier Economics. Frontier Economics has now reviewed the use to which its work has been put by the AER and it states:

> The fact that the precise relationship between leverage and equity beta is not known with certainty does not mean that the effect of leverage on beta should be disregarded when making comparisons between estimated equity betas. Such an approach would be at odds with accepted finance and regulatory practice.
>
> The "financial risks" that we considered in our 2013 report for the AER are not the same as financial leverage and do not substitute for the leverage component of equity beta. The AER appears to have misunderstood this point in our 2013 report."
>
> The evidence that the AER presents in relation to US utility betas supports a re-levered equity beta estimate of close to 1."[13]
>
> "There have been developments in the roll-out and adoption of disruptive technologies since our 2013 report. There is more uncertainty about the future of the industry now than there was even two years ago, and it is not unreasonable to think that investors would take this into account when allocating scarce capital to this industry.
>
> The AER suggests that any systematic component of disruptive technology risk would be captured in its equity beta estimates. Our view is that this is very unlikely.
>
> The AER suggests that to the extent that the risks are non-systematic in nature, those risks would more appropriately be compensated through regulated cash flows (such as accelerated depreciation of assets). However, notwithstanding that the AER recognises that disruptive

[13] Frontier; *Review of the AER's conceptual analysis for equity beta*; paragraph [10]; page 2.

> technologies may increase the risks faced by NSPs, the AER has made no allowances for these risks either through the rate of return or through regulated cash flows."[14]

As clearly evidenced by this additional work, the AER has failed to properly recognise the effect of a 60% leverage on the beta. Even if our business did have a low operating risk the AER has failed correctly to recognise the effect of the 60% leverage on the equity beta. As discussed below, our business must not be regarded as a business that has low operating risk.

We made submissions concerning the substantial change in the risk profile we face in our October Regulatory Proposal. Our supporting document *"A Changing Industry and Marketplace"* noted:

> The electricity sector is undergoing a fundamental transformation and new market participants and emerging technologies (i.e. diversified energy assets, control systems and end-user technologies at or near the customer's premise) are impacting and interacting with the distribution network in ways that have not been seen before at a global and national level.

…

> These changes represent significant challenges for Ergon Energy, operationally and financially.

We noted that, in addition to the new (and existing appliances) that consumers are connecting to the grid, there has also been an increase in the range of energy services available to consumers. The growth in these services has been positively impacted by increasing energy prices, the desire of consumers to manage their consumption and to connect their renewable energy options. In turn, this has led to changes in the way that consumers engage – or want to engage – with the energy market.

Businesses – both traditional (retailers and distribution businesses) and non-traditional market participants, such as energy service companies, information service providers, demand aggregators and micro grid managers - have responded to these changes in expectations and technology, by developing new and innovative ways of selling electricity.

We noted that as the cost of distributed generation solutions decrease and the use of distributed generation is 'normalised', a 'tipping point' could ultimately be reached where some consumers may no longer see value in being connected to the grid (i.e. opt to bypass the network) or continue to be connected to the grid but only for back-up power supply (i.e. when they are unable to generate on-site or store sufficient electricity to meet their energy needs).

On 4 and 5 May 2015 respectively, Business Spectator and Indaily reported that Tesla had released a home-use power storage device that was gaining a great deal of attention globally:

[14] *Ibid*; [11]; page 3.

"Tesla's plans to use its new battery storage system to power homes will provide households with more opportunities to reduce bills…But it will also cause headaches for the electricity distribution companies.

The company s founder, Elon Musk, announced last week that it had developed the Powerwall batteries that could store electricity generated from solar panels. The idea is to store the energy generated during the day, when demand is relatively low, that can then be used to power a home during the evening when the demand is higher. It can also act as a backup supply during any power cuts. The Powerwall battery packs come in 7kWh or 10kWh units and cost US$3,000 or US$3,500 respectively. Up to nine units can be stacked together to give a maximum 90kWh. Musk made the announcement at a press conference that was powered entirely by batteries. Musk told the audience that it was possible to place orders now for the units with delivery expected in the next three months."

The AER is only very slowly accepting that disruptive technologies have resulted in increased risk in the recent term:

"ActewAGL submitted that UBS has been conducting research into solar PV, battery storage and electric vehicles for over two years. We recognise our empirical equity beta estimates are measured over a relatively long estimation period. However, we also consider estimates measured over the last five years. This is consistent with ActewAGL's submission that disruptive technologies have increased risk for Australian energy distribution businesses over the last five years.

Further, we recognise the development of disruptive technologies in the Australian energy sector may create some non-systematic risk to the cash flows of energy network businesses. We consider these can be more appropriately compensated through regulatory cashflows (such as accelerated depreciation of assets)." [15]

The above treatment of the issue is demonstrably inadequate on its own terms. The above passage notes that the shortest time frame for the AER's beta estimates is five years, while acknowledging that this effect has only really begun to be recognised in the last two years. Although the AER acknowledges that its five year estimates show increased risk (and obviously if the effect has only begun in a significant way over the last two years it will show up in a diluted way in this five year estimate), the AER continues to give weight to beta estimates measured over a relatively long period

[15] AER Preliminary Determination, Attachment 3 at [3-343].

of time. Additionally, the AER's comparator firms are mainly gas businesses that are not directly affected by the risks of disruptive technologies that we have explained.

Despite acknowledging this increased risk, the AER's Preliminary Determination imposes a *lower* equity beta than ever before.

3.3. The multi-model approach vs the foundation model approach

The new NER requirements for the setting of equity returns were intended to broaden the inputs that the AER used when setting the return on equity and enable an allowance to be set that better reflected prevailing market rates rather than the quirks of a particular financial model.

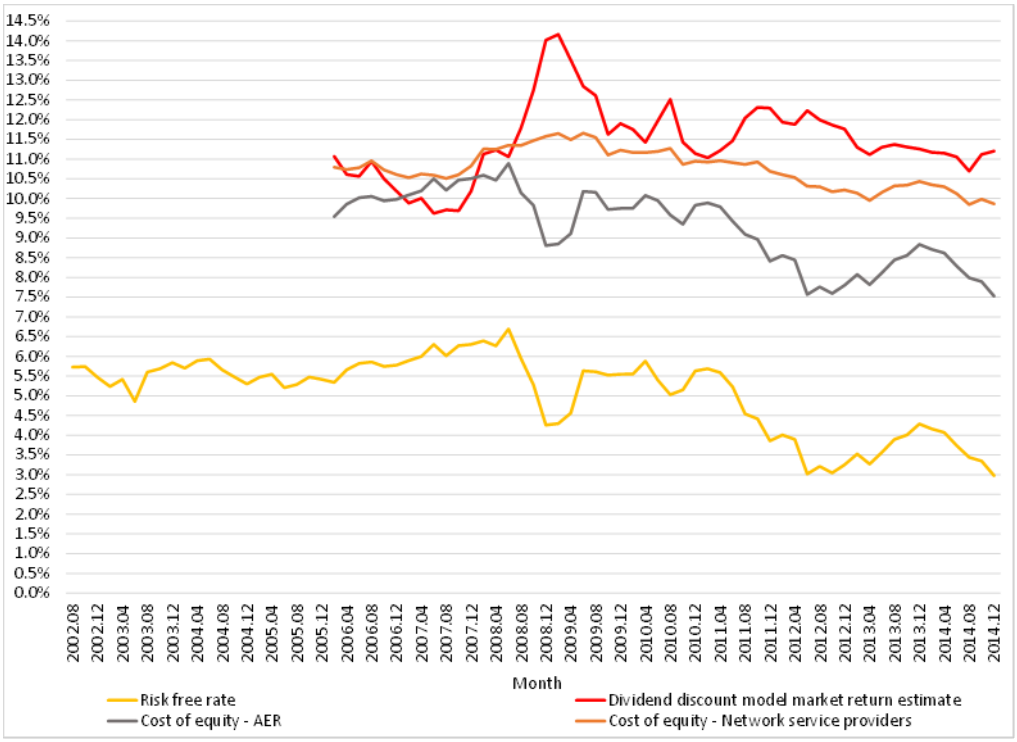
However, the AER has effectively made no substantive change to its approach by continuing to exclusively use the SL CAPM, calling it a 'foundation model,' to dictate the range of equity returns it is willing to countenance. Even within the constraints of this model, the use of any other relevant evidence is compared with the AER's "primary" evidence and if the other relevant evidence deviates too much from the SL CAPM it is wholly disregarded. As Gray and Hall's report illustrates, despite evidence from the Reserve Bank that rates in equity markets have not fallen, the AER's adherence to an unrealistic static implementation of the SL CAPM foundation model is delivering erroneous downward estimates of the required return on equity.

We asked Frontier to analyse this quantitatively by providing estimates of the expected market return, and the cost of equity for a benchmark energy network as an historical time series using:

- the rationale of the AER to estimating the market risk premium and the approach used by the AER to estimate the cost of equity
- the rationale of the network service providers to estimating the market risk premium and the approach used by the network service providers to estimate the cost of equity.

The figure below shows the cost of equity estimates that would be generated from the AER's approach to estimating the market return and the AER's approach to estimating the cost of equity (the grey line) and the network service providers' decision rule on the market return and the network service providers' approach to estimating the cost of equity (the orange line). In all cases the dividend discount model estimate of the market return is based upon the AER's approach to the dividend discount model (the red line). The figure demonstrates that the AER's approach to the cost of equity for the NSP moves almost in lock step with government bond yields.

Figure 1. Cost of equity estimates implied by the AER's dividend discount model



Source: Frontier Economics: Cost of Equity estimates over time

Frontier conclude:

The clear indication from this analysis is that, under the AER MRP decision rule and cost of equity approach, all that really matters for estimating the cost of equity over time is movements in the government bond yield. This would generate reliable estimates of the cost of equity if, in fact, the cost of equity implied by stock prices moved in the same direction as government bond yields. But this is not the case. Under all three dividend discount model approaches – that of the AER, us, and Bloomberg – there is not a one-for-one relationship between movements in government bond yields and the cost of equity. Sometimes the risk free rate and the market return move in the same direction; sometimes they move in the opposite direction

…both government bond yields and equity prices should both be influential in estimating the allowed equity return to a network service provider. Under the network service providers' decision rule on the market return, and cost of equity approach, this is the case. Using the weighted average approach, most of the time the final estimate of the cost of equity will move in the same direction as the signal from the equity market; and most of the time the final estimate of the cost of equity will move in the same direction as government bond yields….

…In contrast, under the AER MRP decision rule and cost of equity approach, if government bond yields fall then allowed returns fall; and if government bond yields rise then allowed returns rise. Allowed returns move in the same direction as the signal from the equity market only about half

the time. This means that if one business happens to have a decision handed down when government bond yields are low, then that business earns a low return (even if equity prices suggest the cost of capital is high); and if another business happens to have a decision handed down when government bond yields are high, then that business earns a high return (even if equity prices suggest that the cost of capital is low).[16]

Gray and Hall summarise as follows:

"The AER's approach of setting the allowed return on equity by adding a fixed premium to the government bond yield is the same as its approach under the previous Rules. This approach produces the same outcomes as under the previous Rules – the allowed return on equity is a lucky dip for regulated firms that depends entirely on the level of government bond yields over 20 days at the beginning of their regulatory period." [17]

The above analysis clearly demonstrates the foundation model imposes restrictive constraints that effectively deprive other evidence from affecting the allowed rate of return.

- First, the functional form of the SL CAPM restricts how this other information is being used.
- Second, the AER's approach of ranking the information as primary or secondary information and effectively giving the primary information a dominant role ensures that the result hardly deviates from the AER's mechanistic implementation of the SL CAPM.

Gray and Hall state:

"The AER's consideration of parameter inputs for beta and the market risk premium results from the application of binding constraints, despite the AER's statements to the contrary. Throughout the AER's Guideline process, and since, we have objected to the AER's use of a "primary" subset of the relevant evidence to produce apparently immutable ranges for parameter estimates, with all other relevant evidence relegated to the role of (at most) informing the selection of a point estimate from within the primary range." [18]

In support of the SL CAPM's use as the foundation model for determining the allowed rate of return for equity, the AER has stated that:

[16] Frontier: Cost of equity estimates over time, p28
[17] Frontier; *Key issues in estimating the return on equity for the benchmark efficient entity*; June 2015; paragraph 114; page 37.
[18] *Ibid*; paragraph [118]; page 39.

"We consider there is overwhelming evidence that the SLCAPM is the current standard bearer for estimating expected equity returns." [19]

In real armies, standard bearers are merely one of many soldiers comprising a company who go into battle together. Similarly, we support using the combined strength of multiple models – including the AER's preferred 'standard bearing' SL CAPM, despite the fact that it has been shown to deliver less accurate results than the other models. Where all the measures are imperfect, the benefits of diversity are strong and what we propose in relation to determining the allowed rate of return for equity is similar to the AER's own approach of taking a 50:50 average of the Bloomberg and RBA quotations for debt benchmarks and supported by the reasons the AER itself advances when taking an average of the two third party debt providers.

In the U.S., regulators have long had the discretion to use a range of models and the views of experts from that jurisdiction are therefore persuasive. As Malko explains:[20]

"**Which models are useful for economic regulatory purposes?**

In my opinion, all of the models discussed above are useful in establishing a zone of reasonableness for the determination of allowed return on equity, but each model has both strengths and drawbacks and should not be used alone, nor as a primary or sole principal model. In particular, the models can be grouped into two 'families': the DGM on the one hand and all the capital asset pricing models or interest rate sensitive models on the other based on how they explain and predict returns. Both major groupings, and all the variants discussed above, provide useful insights into what returns that risks-adverse investors expect to receive when making investments.

Multiple Model Approaches are Preferable

In my opinion, no one single financial model is sufficient to estimate the rate of return in every economic circumstance. All models suffer a range of theoretical and/or empirical weaknesses of different kinds. If only one model is used, or if one model is given excessive pre-eminent weight, investors' returns will be highly dependent on the extent to which that model's particular weaknesses lead to over- or under-returns. If multiple models are used, then the returns will vary

[19] AER Preliminary Determination, Attachment 3 at [3-122].
[20] Malko; paragraphs [8.1-8.2]; pages 9-10.

in response to all the weaknesses but to a smaller extent than if one model is used. It also stands to reason that where the weaknesses of different approaches are directionally different, they will to some degree cancel each other out. Additionally, where only one model is used there is insufficient corroborating evidence or ability to cross-check the results. By contrast, the consideration of multiple models enables the decision maker to either become comfortable that different methodologies are corroborative or, where they are not, to question why it is that one or more models may be delivering significant different results at a particular time or in particular economic circumstances. This, in turn, can give an insight into whether results should be adjusted or altering the weighting or influence accorded to particular models and their results.

In my opinion, to ensure the most appropriate decision, it is important to consider the results of several models. In my opinion, using several models helps compensate for the drawbacks in any single model and increases the probability that the appropriate and reasonable range is identified.

I have observed that in the United States regulators and expert financial witnesses generally use multiple methods, at least two, when determining a reasonable range and reasonable point estimate for the cost of common equity for a regulated energy utility."

Knecht agrees that capital asset pricing models should be used together with the DGM:

"Long-term market trends will tend to drive the estimates of one model higher than another for some years and then lower for another stretch of time. This fact justifies both the use of a wide range of models and also the continuation of the same set of models through these variations.

Using a number of different models is superior to relying on a more limited selection of models. This is because the CAPM, ECAPM, FF3F, and CA+I estimates use basic cost of capital data in a different manner to the DCF models. The CAPM, ECAPM, FF3F and CA+I models extract information from the Cost of Capital data that the DCF models miss – and vice versa. Using multiple models provides additional perspectives and information, yielding a more accurate, reliable, and robust estimate."[21]

The AER should adopt the multi-model approach for the same reasons. Locally, Gray and Hall have a similar view:

[21] Knecht, RL; *Statement*; 19 June 2015 (**Knecht**); paragraphs [4.4-4.5]; page 3.

> "[W]hat the Rules require is an identification of all estimation methods, financial models and other evidence that may be relevant to estimating the return on equity. Following that identification, and assuming that there is more than one information source that is relevant, some weight will need to be ascribed to the information sources or they will somehow need to be combined to produce a point estimate. The Rules do not specify that the Sharpe-Lintner CAPM is to be used unless a model about which there is no debate or potential weaknesses is identified. Each of the information sources, including the Sharpe-Lintner CAPM must be fairly assessed if the estimate of the return on equity is to be arrived at on a reasonable basis and be the best forecast or estimate possible in the circumstances. The evidence supports a finding that the best forecast or estimate is one that is properly informed by estimates from a range of evidence, including the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French model." [22]

Further, as explained below, some models are better able to address certain market circumstances.

In summary:

- the "foundation model" concept as implemented by the AER delivers significantly sub-optimal outcomes
- choosing the SL CAPM as the foundation model is a serious flaw. At the very least there should be two models – one drawn from each predominant "family" of models to allow each to balance the other's strengths and weaknesses
- the capital asset pricing contribution must either include models that are free of the low beta and book-to-market biases or corrections need to be made to off-set those biases. It is wrong to suggest that giving the DGM, or DCF model, a 25% weighting in establishing the return on equity allowance would constitute a dangerous regulatory experiment. To the contrary, wherever the debate concerning capital asset pricing models ends, the DGM or DCF definitely should be employed (ideally concurrently) when establishing an allowed rate of return for equity. A decision not to give one entire family of models any weight foregoes the only available "counter-weight" to the limitations that apply to capital asset pricing models as a group.

In each of the subsequent sections, we make additional submissions in relation to each of the models that should be used in a multi-model approach that is well implemented.

3.4. The DGM or DCF

Handley's most recent report states the following in relation to the DGM or DCF:

[22] SFG Consulting; *The foundation model approach of the Australian Energy Regulator to re-estimating the cost of equity, Report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA Power Networks, and United Energy*; 27 March 2015; paragraph [107]; page 22.

> "the regulatory environment involving an aggregate regulatory asset base measured in the tens of billions of dollars is not an appropriate setting to trial a new model whose widespread use and acceptance is yet to be established." [23]

This statement effectively advances the highly conservative proposition that a national energy regulator should never move away from the sum total of its own specific experience or it is an assertion that is ignorant of international practice. If we accepted that approach, improvements in the approach could never be adopted and this would be contrary to the rules requiring that regard be had to all the relevant information in seeking to set an allowance that is commensurate with the efficient costs that a benchmark business would face.

In any event, Handley's statement is wrong. A discussion of economic models used for economic regulation of energy network businesses would logically begin before the SL CAPM began to be used at a time when only the U.S. was engaged in the use of economic models to establish permitted returns for profit making energy networks. The first model to be used for this purpose was the DGM or DCF in the U.S. where it continues to be regarded as the most tried and true of methods for establishing a market based return on equity. As Malko explains:

> "The dividend growth model (DGM), also the discounted cash flow (DCF), is based upon the works of Irving Fisher and John Williams in the 1930s and was introduced for estimating the cost of common equity for regulated energy utilities by state regulatory authorities during the 1960s and early 1970s. Professor Myron J. Gordon is frequently recognized to be the "pioneer" or "father" of the DCF model for application in estimating the cost of common equity for a regulated energy utility. .... Its adoption constituted a significant advance in the science of what constitutes a fair market reflective rate of return. **This model is still considered and almost universally used, alone or in a multi-model approach (as I discuss further below), by almost all energy regulators in the United States.**" [24]

In dismissing the DGM or DCF for use in directly estimating the cost of equity for benchmark businesses in this country, the AER has stated that:

> "We also considered that the sensitivity of DGMs to input assumptions would limit our ability to use a DGM as the foundation model. For example, estimates of simple DGMs (such as those previously proposed by CEG) have provided implausible estimates of the returns on equity for the

[23] Handley J; *Advice on the Rate of Return for the 2015 AER Energy Network Determination for Jemena Gas Networks, Report prepared for the Australian Energy Regulator*; 20 May 2015.
[24] Malko; paragraphs [3.1] to [3.2]; page 4.

benchmark efficient entity. For example, in the Guideline we found that simple DGMs generate average returns on equity for energy infrastructure businesses over an extended period that significant exceeded the average return on equity for the market. This did not make sense as the systematic risk of network businesses is less than the overall market." [25]

However, Malko advises that these potential difficulties are much exaggerated. Having reviewed the above statement by the AER he responds as follows:

Certainly the DGM is sensitive to its input assumptions and if it would be inappropriately implemented, it could deliver implausible results. In this regard, I see no difference between this and other models. If inappropriate inputs are used, any of the models can produce implausible results.

It is common in U.S. regulatory determination processes for there to be debate between businesses, customers and the regulators concerning which inputs to use but these debates occur with a context in which expert testimony has regard to whether the inputs used deliver plausible results and decision making is guided by a body of court and regulatory precedent.

Over-all, the wide acceptance and use of the DGM in the U.S. demonstrates that this model is sufficiently robust for it to be useful in economic regulatory decision making.[26]

The AER also asserts that there may be issues that are specific to Australia as to why the DGM or DCF is inappropriate and in that regard it is appropriate to consider the views of Australian experts. In its previous papers rejecting the use of the DGM or DCF the AER asserted that a Grant Samuel report valuing Envestra provided support for several key features of the AER's approach. However, Grant Samuel has reacted with a vigorous rebuttal of the AER's use of its work and more generally Grant Samuel explains its very significant disagreement with almost every aspect of the AER's equity analysis. In particular, before turning specifically to the merits of using the DGM or DCF, Grant Samuel explains why it is important in their work to look beyond the SL CAPM:

"In this case, it seems that the AER's approach has been to avoid changing its existing (single) formula "foundation model" and proceed on the basis that as long as it can show that the model is

[25] AER Preliminary Determination, Attachment 3 at [3-224].
[26] Malko; paragraph [3.7]; page 5.

widely used and the individual inputs can be justified, there is no need to concern itself with whether or not the final output is commercially realistic."[27]

Grant Samuel expresses a considerable degree of frustration that the AER applies 'double standards' when rejecting the use of the DGM to directly estimate the cost of equity and concurrently resolving to adhere primarily to the SL CAPM. Grant Samuel states:

"The DGM, in its simplest form, has only two components to estimate – current dividend yield and the long term growth rate for dividends. The current yield is a parameter that can be estimated with a reasonably high level of accuracy, particularly in industries such as infrastructure and utilities. We accept that the question of the long term dividend growth rate becomes the central issue and is subject to a much higher level of uncertainty (including potential bias from sources such as analysts) and we do not dispute the comments by Handley on page 3-61.

However, there is no way in which the issues, uncertainties and sensitivity of outcome are any greater for the DGM than they are with the CAPM which involves two variables subject to significant measurement issues (beta and MRP). The uncertainties attached to MRP estimates in particular are widely known yet are glossed over in the AER's analysis of the relative merits. Section D of Attachment 3 of the Draft Decision contains almost 40 pages discussing the most esoteric aspects of methodologies for calculating beta but in the end the AER's choice of 0.7 is, in reality, an arbitrary selection rather than a direct outcome of the evidence.

Moreover:

- the plausible beta range nominated by the AER (0.4-0.7) creates a 2 percentage point swing factor for the CAPM-based cost of equity. Its own expert nominated an even wider range (0.3-0.8);

- the 40 pages contain little meaningful discussion of issues such as standard errors or stability over time (as opposed to different time periods). Data on these aspects would be important to properly evaluate the overall reliability of the statistics; and

- the publication of only averages for individual companies and not the range hides the underlying level of variability in these measures.

[27] Letter from Grant Samuel & Associates Pty Limited (Grant Samuel) to the Directors of Transgrid; 12th January 2015 (**Grant Samuel Letter**); page 2.

In short, the claim of superiority for the CAPM is unfounded." [28]

The Grant Samuel letter adds:

"It is also difficult to fathom why the AER states that the DGM is highly sensitive to interest rates but makes no mention of the sensitivity of CAPM to interest rates." [29]

And Grant Samuel points out:

"The AER also seeks to distinguish discount rates for valuations from discount rates for regulatory purposes by the fact that valuations have a perpetuity timeframe (and must reflect expectations of investors over that timeframe) while the regulator sets the return on equity only for the length of that regulatory period (typically five years). We do not believe this distinction is valid. For a start, the AER adopts a 10 year term for its overall rate of return (page 3-25) including a 10 year risk free year rate so if the five year timeframe of the Draft Decision was paramount then its own methodology is inconsistent with the return objective. In any event, it is our view that the relevant period is always a perpetuity, even in the context of a five year regulatory period. The rate of return over the five year period can only be realised if the capital value is sustained at the end of the period. The sustainability of the capital value at the end of year five is in turn dependent on cash flows beyond year five (i.e. the cash flows in perpetuity)." [30]

Gray and Hall state:

"The AER applies different standards to its assessment of the SL CAPM relative to other models. By way of some examples:

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

[28] *Ibid*; page 3.
[29] *Ibid*; page 2.
[30] *Ibid*; page 5.

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

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

Lane and Rosewall of the RBA state:

"DCF analysis is a standard method recommended by finance theory to evaluate investment opportunities.[31]

…

Because it provides a natural threshold to accept or reject investment decisions, the discount rate used in DCF analysis is often called the 'hurdle rate'.[32]

…

A typical firm in the Bank's liaison program evaluates discretionary capital expenditure by using DCF analysis, and also by considering the payback period as a supporting consideration. This is in line with the evidence from other advanced economies such as the United States and the United Kingdom (see below) and is also in line with earlier survey evidence for Australia.[33]

…

The available evidence suggests that firms in other advanced economies undertake investment decisions using similar criteria employed by Australian firms. Surveys have found that firms in the United States and Europe tend to evaluate proposed investments using discounted cash flow

[31] Kevin Lane and Tom Rosewall; 'Firms' Investment Decisions and Interest Rates' (2015) June Quarter *Bulletin*; page 2.
[32] *Ibid*.
[33] *Ibid*; page 3.

techniques, which have become more popular over the past few decades, and the payback period."[34]

In summary, the DGM or DCF could be regarded as the safest, most tried and true model of all.

3.5. The SL CAPM

Ergon Energy does not object to the use of the SL CAPM concurrently blended with the estimation of other relevant (and arguably superior) models when establishing an allowed rate of return for equity. However, we do object to the Preliminary Determination's approach of:

- elevating the SL CAPM to being the 'foundation model' that constrains the contribution other models can make; and
- implementing the SL CAPM in an idiosyncratic way with particular reliance on historical long-run average estimates of the MRP (which can only reflect the long-run average market conditions over the period of estimation) and combining that with a very short averaging period for the risk free rate. The AER also takes an unprecedented approach to parameter selection (for example, in relation to beta as discussed below) that is inherently unable to deliver an adequate allowed rate of return.

In relation to the first issue, NERA states:

"The model tends to underestimate the mean returns to low-beta assets, value stocks and, in the US and some other countries, low-cap stocks. A value stock is a stock that has a high book value relative to its market value or, identically, a low market value relative to its book value. A growth stock is a stock that has a low book value relative to its market value or, identically, a high market value relative to its book value."[35]

Handley's latest report that purports to support the AER's foundation model approach requires careful consideration. He avoids giving any support to the SL CAPM as an accurate way of establishing a commensurate market return and accepts that the SL CAPM is subject to "well-known" low beta and book-to-market biases, and that evidence of these biases is "nothing new."

The central theme of his report is to undermine the use of other capital pricing models based on the assertion that the literature does not conclusively prove that the superior conceptual and empirical performance of those models is due solely to an analysis of systematic risk. Handley effectively asserts that the only relevant factor in the rate of return objective concerns systematic risk.

[34] *Ibid*; page 5.
[35] NERA; *Review of the Literature in Support of the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French Three-Factor Model, A report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA Power Networks, and United Energy*; March 2015; page 22.

Reading latest Handley's report, a reader who was not familiar with the rate of return objective might reasonably expect the objective to direct the AER to consider systematic risk and nothing but systematic risk but the NER do not limit the AER in this way.

The focus of the rate of return objective is to set a regulatory rate that is commensurate with the efficient financing practices of a benchmark firm. It is unsurprisingly that the objective notes that the assessment needs to be for a firm "with a similar degree of risk"[36] but the task is to establish a commensurate return. There is nothing to suggest that models that provide valuable insights on how to establish an accurate commensurate return should be dismissed regardless of whether or not the model is limited to an assessment of risks.

It would be completely perverse if any factor that significantly affected the required rates of return for investors were ignored. The result would be that efficient investments would not occur (if excluding the relevant factor led to a below market return) or prices would be inflated (if excluding the relevant factor led to an above market return).

Nevertheless, of all the possible reasons that Handley lists to explain why real world observed returns might differ from the SL CAPM the most plausible is that it is a measure of risk.

Handley's approach is clearly not practical in the real world or in regulatory processes. By contrast, Grant Samuel explains that real world valuations need to be informed by a range of additional material to over-come the significant limitations of solely relying on a plain or "SL- CAPM":

> "[O]ur approach … is to form an overall judgment as to a reasonable discount rate rather than mechanistically applying a formula. The fact is that, particularly in some market circumstances, the CAPM produces a result that is not commercially realistic. When this occurs it is necessary and appropriate to step away from the methodology and use alternative sources of information to provide insight as to what is, after all, an unobservable number that can only be inferred. In our view, Envestra was clearly a case in point.
>
> In using the Envestra report, the AER seems to be to trying to co-opt the parameters that we used for calculating the initial CAPM based rate to bolster its own case while trying to find ways to justify not having to recognise the fact that for the valuation of Envestra Limited's assets, we actually selected a different rate (i.e. 6.5-7.0% or, more correctly 6.5-8.0%, rather than 5.9-6.5%)."[37]

The allowed rate of return used in Australia effectively codifies long standing U.S. case law.

[36] NER, clause 6.5.2(c).
[37] Grant Samuel Letter; pages 4-5.

> "[T]he return to the equity owner should be commensurate with the returns on investments in other enterprises having corresponding risks."[38]

In doing so, the same U.S. case law also includes the requirement in the Australian revenue and pricing principles concerning the necessity for the business to have a reasonable opportunity to recover its efficient costs:

> "In particular, when base interest rates were high, there was a concern (legitimate in my view) that the DGM did not at the time adequately reflect the increased returns that equity investors expected to receive and this led some regulators to start to have regard to the capital asset pricing models concurrently with the DGM or DCF."[39]

Of the SL CAPM, he notes:

> "In my opinion:
>
> The Sharpe CAPM has important strengths, including:
>
> - It incorporates a first principals concept of risk and return.
> - It is an interest-rate sensitive model that complements a stock price sensitive model.
> - It is simple.
>
> The Sharpe CAPM model has important limitations, including:
>
> - It is a single factor (beta) model and it does not incorporate other factors that finance literature demonstrates are known to affect equity returns.
> - The model suffers from a theoretical limitation in that it assumes that investors can borrow and lend at the risk free rate which is not the case. Due to the simple mathematical specification of the model, the effect of this implausible assumption is that it under-estimates the returns for

[38] *Federal Power Commission v Hope Gas Co* 320 US 591 (1944) at 603.
[39] Malko; paragraph [3.8]; page 6.

investments of below average risk and over-estimates the returns for investments of above average risk.

- Empirical work shows that there are limitations associated with its ability to explain past stock price movements and equally its predictive capabilities both associated with the theoretical limitations mentioned above and more generally." [40]

Reflecting these weaknesses, Malko notes that even when the SL CAPM is used in conjunction with the traditional DGM method, the contemporary approach is to make adjustments to account for the significant limitations of the SL CAPM:

"I have observed that during the recent past (10 years or less), financial analysts have attempted to address some of the shortcomings of the Sharpe CAPM by:

- using the Empirical CAPM (discussed below);

- making an adjustment by adding the small size risk premium. This premium reflects that small companies have higher returns on average than larger companies (which is also relevant to the discussion of the Fama French model below);

- applying the Hamada adjustment for a leveraged beta. This adjustment reflects a changing capital structure. For example, if a utility's current or planned capital structure reflects an increased debt level and debt percentage, then the leveraged beta is increased to reflect the increased financial risk. To make the Hamada adjustment, a comparison of the capital structure of a specific utility to a comparable group is undertaken and appropriate mathematical models are applied." [41]

A further important consideration is how to implement the SL CAPM and in particular whether to use the Ibbotson approach, the Wright approach or a combination of the two. Each of these approaches takes an extreme position on a continuum of how movements in the market risk premium may be related to movements in the base interest rate. The Ibbotson approach takes the position that the market risk premium remains wholly unchanged as interest rates vary while the Wright approach takes the position that movements in the market risk premium are exactly offset by equal movements in the risk free rate.

In fact, both of these extreme positions are unrealistic. Instead, in reality, equity returns are observed to vary when the base rate varies but the movements in equity returns are smaller than the

[40] *Ibid*; paragraphs [4.3] to [4.4]; pages 5-6.
[41] *Ibid*; paragraph [4.5]; page 6.

movements in base rates. In other words the market risk premium is observed to counteract or "cushion" movements in the base rate.

A flaw of the AER's foundation model approach is that, like the Ibbotson approach, it takes the extreme position that market risk premiums is an unmoving constant in the face of changes in the base rate. By contrast, Ergon Energy equally weights the contribution of the two extremes on the continuum and in this regard our proposal is both moderate and better reflective of the way markets actually behave.

In summary:

- while the SL CAPM can be used to achieve the rate of return objective, a midpoint approach between the Ibbotson and Wright approaches to specifying the SL CAPM must be taken to avoid significant unwarranted cyclical under-estimates in times of low base interest rates; and
- the model cannot be used alone and its estimate of the efficient allowed rate of return should be blended with similar estimates from each other relevant model.

3.6. Parameter selection within the SL CAPM

As discussed above, the AER has misunderstood how to assign a beta to an electricity network business with a 60:40 debt to equity capital structure facing an onslaught of disruptive technologies.

The AER does not even adopt the range of 0.3 to 0.8 that its own advisor Henry has provided. Instead, it uses the more constrained range of 0.4 to 0.7. Despite acknowledging that other inputs deliver a broader range (e.g. empirical estimates of international energy networks which range from 0.3 to 1.0 or 1.3) the AER is unmoving in its adherence to the tightly limited, low beta range.

Its process of selecting a point estimate from within the range is a muddled one. For example, one of the key considerations that the AER uses in selecting a value at the upper end of the range is the "theoretical principles underlying the Black-CAPM".[42] On the basis of evidence provided by Gray and Hall, we are strongly of the view that the beta needs to be not only at the high end of the AER's range but higher still. However, the idea that the "theoretical principles" of the Black-CAPM supports a beta uplift betrays a misunderstanding of those principles.

The point of the Black-CAPM is not that the SL CAPM estimates a beta that is too low; rather these principles indicate that the intercept (ie return on the risk free asset) should be higher than the SL CAPM predicts and the slope of the risk-return curve are likely to differ from that specified in the SL CAPM. In other words, for any given beta, the returns should be higher – the principles do not support the notation that the beta itself should be adjusted.

Gray and Hall summarise this issue as follows:

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

[42] AER Preliminary Determination, Attachment 3 at [3-384] to [3-386].

The AER's use of the theoretical underpinnings of the Black CAPM to adjust the equity beta in the SL CAPM is unique to the AER and has the disadvantages that (a) the outcome is an estimate that is not true to either model, and (b) it is impossible to determine whether the size of the adjustment was appropriate.

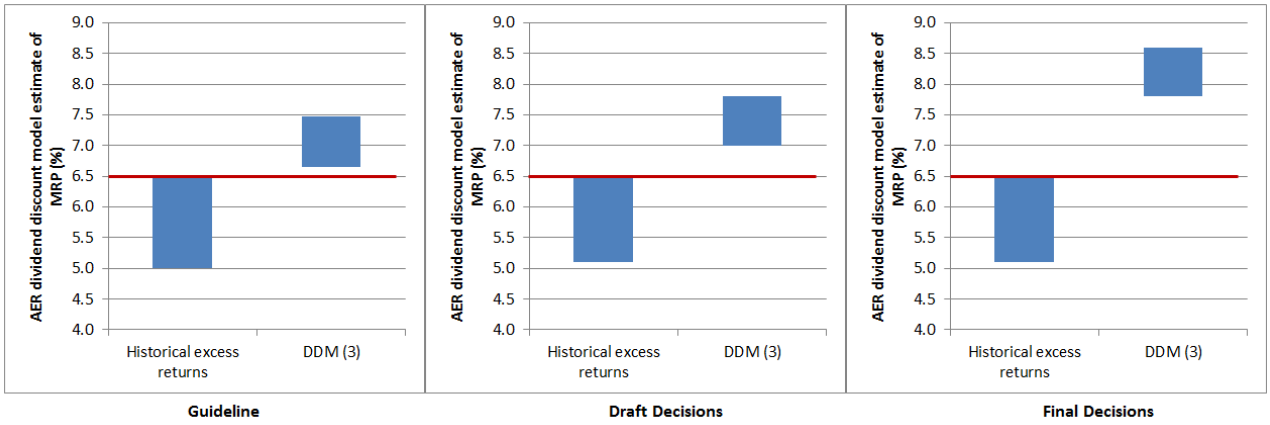
Equally erroneous is the AER's approach to selecting the market risk premium to be used in the SL CAPM. The key flaws are that:

- geometric averages are inappropriate to use because the AER's equity model is a non-compounding model, and even if it was appropriate to use them, there is no basis for the AER's approach of adding 20 basis points to its geometric estimate and defining the result to be the bottom of the reasonable range for MRP in all possible market conditions
- the long run estimate that the AER insists on using is based on data that has been arbitrarily adjusted downwards to account for missing data from almost a hundred years ago. This is done on the basis of a very narrow 'back of the envelope' calculation which has been inaccurately attributed to the Australian Stock Exchange rather than using a study that covers many times as many observations to develop a more considered adjustment factor[43]
- despite evidence to the contrary,[44] the AER continues to rely on the Brailsford, Handley and Maheswaran historic returns data set which relies on a dividend yields services calculated by Lamberton later adjusted. [45] NERA has recreated Lamberton's series and "overall the match between our results and those that Lamberton provides is good. Using the data in Table 2.3, the correlation between our estimate of the equally weighted average yield to dividend paying issues (firms) and his estimate is 1.00 (0.98) (rounded to two decimal places"[46]
- the AER does not take full account of a broad range of other inputs (such as the DGM analysis) that show the market risk premium must be higher than the high point of the range that is produced by historical mean excess returns. Indeed the AER's updated DGM estimate in the Preliminary Decision increases the upper bound of the MRP range materially but there is no change to the point estimate
- there is no basis for the AER's approach of limiting the MRP to a maximum of 6.5% in the prevailing market conditions, when for conceptual reasons and having regard to market data, it is known that the prevailing MRP is higher than the long run average.[47]

Gray and Hall's charts illustrate the third of these points well.

[43] NERA; *Historical Estimates of the market risk premium*; February 2015.
[44] *Ibid*.
[45] Handley, JC; *Further Advice on the Return of Equity, Report prepared for the Australian Energy Regulator*; 16 April 2015; page 7.
[46] NERA; *Further Assessment of the Historical MRP: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors, A report for United Energy*; June 2015; page 10.
[47] *Ibid*; paragraph [128]; page 41.

Figure 2: AER estimates of MRP from historical excess returns and the dividend discount model



Source: (Gray) AER Rate of Return Guideline, AER draft decisions, AER final decisions

3.7. Addressing the downward bias for low beta stocks in the SL CAPM

Not only is the AER's selection of beta inappropriate but having selected a beta the AER fails to take the necessary steps to address the downward bias in returns that the model delivers for betas of below 1.

As noted above, Handley's latest report for the AER effectively asserts that if there is any doubt that a model's explanatory power is not focused wholly on risk, he would disregard it and he does exactly this in relation to the Black-CAPM and Fama French Three Factor Model:

> "[E]mpirical evidence of a low beta bias is not sufficient on its own to justify a claim for additional compensation relative to the Sharpe-CAPM.
>
> The key point is that there are multiple possible (but not necessarily mutually exclusive) explanations for the low beta bias.6 In other words, we do not have a clear understanding of what the low beta bias represents. This uncertainty is critically important in the current context because it means that the low beta bias does not necessarily reflect risk, whereas the allowed rate of return objective is clear that risk is the key determinant of the rate of return." [48]

For the reasons set out above, that approach is far too limited. The allowed rate of return seeks a return that is commensurate with the efficient costs of a benchmark firm and other capital asset pricing models improve upon the SL CAPM, they should be employed.

[48] Handley, JC; *Advice on the Rate of Return for the 2015 AER Energy Network Determination for Jemena Gas Networks, a report prepared for the Australian Energy Regulator*; 20 May 2015; page 5.

For the reasons set out above, that approach is far too limited. The allowed rate of return seeks a return that is commensurate with the efficient costs of a benchmark firm and if other capital asset pricing models improve upon the SL CAPM, they should be employed.

Gray and Hall,[49] and NERA, have consistently explained that the SL CAPM has a low beta bias.[50] This is not surprising because the model relies on a wholly unrealistic assumption that investors can borrow and lend at the risk free rate. NERA states that:

> "The data indicate that there is a negative rather than a positive relation between returns and estimates of beta. As a result, the evidence indicates that the SL CAPM significantly underestimates the returns generated by low-beta portfolios and overestimates the returns generated by high-beta portfolios. In other words, the model has a low-beta bias. The extent to which the SL CAPM underestimates returns to low-beta portfolios is both statistically and economically significant.
>
> As an example, we estimate that the lowest-beta portfolio of the 10 portfolios that we construct to have a beta of 0.54 – marginally below the midpoint of the AER's range for the equity beta of a regulated energy utility of 0.4 to 0.7. Our in-sample results suggest that the SL CAPM underestimates the return to the portfolio by 4.90 per cent per annum." [51]

As Malko's report explains, there are two paths that can be followed to get to the bottom of why and how the SL CAPM under-estimates the return for low beta stocks and both paths lead to the same place.

The first path is to consider the theoretical considerations to identify the problem, propose a solution and then test it empirically. The AER's initial discussion paper for the Rate of Return Guidelines articulated a firm preference for approaches with a sound theoretical explanation rather than an empirical one and we therefore consider this path first.[52] SFG have explained how the Black-CAPM relaxes the unrealistic assumption of the SL CAPM that investors can borrow and lend at the risk free rate. When this theoretical improvement is made and the model is implemented, the effect is to raise the intercept (i.e., the return on a risk free asset) and flatten the curve depicting the returns related to risk.

In the U.S., regulators have been content to take another path, focusing on empirical observations that the SL CAPM under rewards low beta stocks and making adjustments reconciles the SL CAPM with the observed results. Malko explains that:

[49] For example see Frontier; *Key issues in estimating the return on equity for the benchmark efficient entity, a report prepared for ACTEWAGL Distribution, AGN, AusNet Services, CitiPower, Ergon, Energex, Jemena Electricity Networks, Powercor, SA Power Networks and Untied Energy*; June 2015 and SFG Consulting; *The required return on equity for regulated gas and electricity network businesses*; May 2014.

[50] CEG Consulting; *Estimation of, and correction for, biases inherent in the Sharpe CAPM formula, A report for the Energy Networks Association Grid Australia and APIA*; September 2008; page 21.

[51] NERA; *Empirical Performance of the Sharpe-Lintner and Black CAPM*; February 2015.

[52] AER; *Better Regulation, Rate of Return Guidelines, Issues Paper*; 18 December 2012 (word version); page 15.

I have been asked to comment on the correctness or otherwise of the statement in the Australian Energy Regulator's (AER) Final Decision, ActewAGL distribution determination 2015-16 to 2018 - 19 - Attachment 3 - Rate of Return document:

"There is little evidence that other regulators, academics or market practitioners use the Black CAPM to estimate the return on equity. In particular, regulators rarely have recourse to the Black CAPM" at page 3-256.

As I have explained above, although there is little explicit reference to the Black CAPM, in practice the use in the U.S. of the Empirical CAPM by financial analysts both within and outside energy regulatory processes is essentially to the same effect." [53]

Marko explains how the regulators give effect to the Empirical CAPM as follows:

"The regulators who have been presented with Empirical CAPM evidence have considered it along with evidence from the DGM and Sharpe CAPM. The results from all these approaches have been recorded in the decisions and the selection of a particular figure has been made following that consideration." [54]

The following are examples of regulatory processes in which models with a higher intercept and flatter curve have been considered:

Table 1: Use made by regulators of the Zero-Beta and Empirical CAPM

Regulator	Industry	Application	Citation
New York Public Service Commission, 2009	Electricity distribution	50/50 weighting. "Traditional" CAPM/zero-beta CAPM paragraph 56.	Proceeding on Motion of the 2009 Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service; Petition for Approval, Pursuant to Public Service Law, Section 113(2), of a Proposed Allocation of Certain Tax Refunds between Consolidated Edison Company of New York, Inc. and

[53] Malko; paragraphs [6.4] and [6.5]; page 8.
[54] *Ibid*; paragraph [5.5]; page 7.

Regulator	Industry	Application	Citation
			Ratepayers 2009 N.Y. PUC LEXIS 507.[55]
New York Public Service Commission, 2007	Gas distribution	50/50 weighting. Average of traditional CAPM results and zero beta CAPM result paragraph 20.	Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of National Fuel Gas Distribution Corporation for Gas Service 2007 N.Y. PUC LEXIS 449; 262 P.U.R. 4th 233.[56]
New York Public Service Commission, 2006	Gas and electricity distribution	50/50 weighting. Average of traditional CAPM result and zero beta CAPM result paragraph 19. NB: this decision changed the weighting from 75/25 to 50/50, the previously accepted weighting following the approach in the Generic Finance case.	Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Electric Service; Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Gas Service 2006 N.Y. PUC LEXIS 227; 251 P.U.R. 4th 20.[57]
Oregon Public Utility Commission, 2001	Electricity distribution	Zero-beta is used to identify contrast with S-L "as beta decreases, the cost of equity decreases by less than the Sharpe-Lintner CAPM model suggests …as beta decreases, the cost of equity decreases by less than the Sharpe-Lintner CAPM model suggests. This is important, …, because it means the costs of equity for utilities with betas of less than 1 are closer to the cost of equity for an average risk stock than is shown by the Sharpe-Lintner CAPM model. Under this model, the required return for the risk-free asset is expected to be higher than the return on Treasury bills." Paragraph 20 "While the results in this case cast further doubt on the validity of Staff's CAPM methodology, we do not believe that CAPM should be rejected in its entirety. We continue to believe that, in	In the matter of PacifiCorp's Proposal to Restructure and Reprise its Services in Accordance with the provisions of SB 1149. 2001 Ore. PUC LEXIS 418; 212 P.U.R. 4th 379.[58]

[55] *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Consolidated Edison Company of New York, Inc. for Electric Service; Petition for Approval, Pursuant to Public Service Law, Section 113(2), of a Proposed Allocation of Certain Tax Refunds between Consolidated Edison Company of New York, Inc. and Ratepayers* 2009 N.Y. PUC LEXIS 507.

[56] *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of National Fuel Gas Distribution Corporation for Gas Service* 2007 N.Y. PUC LEXIS 449; 262 P.U.R. 4th 233.

[57] *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Electric Service; Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Central Hudson Gas & Electric Corporation for Gas Service* 2006 N.Y. PUC LEXIS 227; 251 P.U.R. 4th 20.

[58] *In the matter of PacifiCorp's Proposal to Restructure and Re-price its Services in Accordance with the provisions of SB 1149.* 2001 Ore. PUC LEXIS 418; 212 P.U.R. 4th 379.

Regulator	Industry	Application	Citation
		certain cases, CAPM analyses may provide a useful and reliable addition to the DCF results for determining cost of equity." Paragraph 23. CAPM given no weight, DCF preferred.	

An empirical inspired correction is sufficient for the U.S. regulators. However, if a theoretical explanation were sought for what the Empirical CAPM does, it is that the SL CAPM suffers from the unrealistic assumption detailed above concerning the ability for investors to borrow and lend at the risk free rate.

In summary, whether the Black-CAPM or an Empirical CAPM nomenclature is used, the estimated return on equity for our business should give weight to a capital asset pricing model that raises the intercept and flattens the risk-return curve relative to the SL CAPM. By including the Black-CAPM, Gray and Hall's multi-model approach does this appropriately and we continue to consider that to be the appropriate approach to take.

3.8. Fama French and Continuous improvement in CAPM methods

This model in relation to which a Nobel prize[59] has been awarded, is newer than the other two CAPM models.

The AER's Preliminary Determination gives no weight at all to the Fama French model. Handley again justifies the AER's approach by asserting that the rate of return is concerned only with variables that are unequivocally proved to be ways to quantify risk and not with a more general search for a commensurate return:

> "[E]mpirical evidence of a value effect is not sufficient on its own to justify a claim for additional compensation relative to the Sharpe-CAPM.
>
> The key point is that we do not have a clear understanding of what the value effect represents. This uncertainty is critically important in the current context because it means that the value effect does not necessarily reflect risk, whereas the allowed rate of return objective is clear that risk is the key determinant of the rate of return." [60]

For the reasons discussed above, Handley's approach construes the rate of return objective too narrowly and a model that behaves strongly in quantifying the market rate of return is ideal for setting a commensurate rate of return and should not be excluded on the basis that there is some argument as to whether or not its parameters are solely a measure of risk.

[59] Eugene Fama is the 2013 recipient of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel the Nobel Prize in Economics), Eugene F. Fama- French". *Nobelprize.org.* Nobel Media AB 2014. Web. 15 Mar 2015. <http://www.nobelprize.org/nobel_prizes/economic-sciencesllaureatesl20 131fama-facts.html>

[60] Handley, JC; *Advice on the Rate of Return for the 2015 AER Energy Network Determination for Jemena Gas Networks, a report prepared for the Australian Energy Regulator*; 20 May 2015; page 6.

Knecht states:

> "[W]hile there is still some apprehension about the use of the FF3F Model it has been recognised in at least three states, Massachusetts, Delaware and Nevada, when used in conjunction with other models to produce an arithmetic mean as an estimate. This approach ensures that factors that are ignored by one model are adequately addressed. Because the FF3F model is fairly new relative to other models I am not aware of any jurisdiction that has endorsed it exclusively or adopted allowed rates of return based expressly on it. Instead, the tradition in the United States is for regulatory decisions to review (or even just list) all the evidence in the record and then, subjectively balancing the merits and results of all of it, to arrive at a final conclusion as either a range of reasonableness or a point estimate."[61]

Despite being the newer model, since the turn of the century the Fama French Three Factor model has been part of the evidence in a number of state regulatory proceedings in the United States, including:

- Before the Massachusetts Department of Telecommunications, Mr Hunt (an expert witness) cites the Fama French study as demonstrating the relationship between company size and stock returns.
- Before the California Public Utilities Commission, Mr Hunt (an expert witness), used the Fama French Three Factor model and calculated a cost of equity of 14.0 percent in September 2005; using the CAPM, Mr Hunt calculated a cost of equity of 12.55 percent. In this proceeding, the Fama French Three Factor model returned a result that was 145 basis points above that from the CAPM.
- Before the Delaware Public Service Commissioner, Artesian Water Company led evidence that included Fama French model results. The Commissioner accepted that evidence without reservation.
- Mr Ronald Knecht (an expert witness for the Nevada Public Utilities Commission) proposed a return on equity of 10.28% that was calculated as an arithmetic mean of four components. He applied two discounted cash flow (DCF) estimates, a 2CAPM/FF3F model average, and one risk premium estimate. A hearing was held before the Public Utilities Commission of Nevada in April 2006. Mr Knecht stated that this approach was superior to relying only on the average of DCF models, because the CAPM, FF3F, and "capital appreciation and income" (CA + I risk premium) methods used basic cost of capital input data differently from the DCF models. The overall result for the 2CAPM/FF3F was reported to be 10.13%. The outcome of 10.13% was comprised of a result from the CAPM with a "Value Line" beta of 10.45%, a result from the CAPM using an Ibbotson beta (with size adjustment) of 8.25%and a result from the Fama French Three Factor model of 11.63%. The evidence was considered by the Public Utilities Commission of Nevada in April 2006.

[61] Knecht; paragraph [4.6]; page 3.

- On a separate occasion, in July 2007, Mr Knecht acted on behalf of the Nevada Public Utilities Commission and again used the Fama French Three Factor Model to assess the rate of return on equity. He obtained a result for an average energy utility of 11.39%. The average of two CAPM methods and the FF3F model was 11.13%. On both of these occasions, the Nevada Public Utilities Commission accepted Mr Knecht's Fama French evidence without reservation.
- On another occasion in December 2014, Mt Knecht gave expert evidence (which included results from the Fama French model) before the California Public Utilities Commission. Whilst the Commission observed that the Fama French model had previously been rejected by the California Public Utilities Commission, the Commission recognised that the Fama French model has "gained great currency in investment practice".
- Mr Hayes an expert from San Diego Gas & Electric used the FFM model in his testimony before the California Public Utilities Commission in May 2007. Hayes calculated a return on equity of 13.89% using the FFM, with a value of 11.73% obtained using the CAPM.

In his testimony before the Californian Public Utilities Commission Gary Hayes notes:

> "[T]he California Public Utilities Commissioner Bohn stated after the January 2007 cost-of-capital workshop: The commission should remain open to receiving evidence from new additional models should parties wish to provide such. We should always welcome new and better tools and ways of tackling problems."
>
> …
>
> "First, the FF model is not a new, untested formula dropping in from academia. It has behind it a solid track record of research and has been the topic of extensive debate ... Nowadays, the FF model is used routinely by financial economists as they research investments, returns, and relative performance, as it is a useful tool with which to interpret return data on a wide number of asset types ... Use of the FF model is not limited to just the halls of the academy; it has expanded into the investing world as well . .... Other professional practitioners have begun to utilize the FF model. Valuation experts now add FF results to fairness opinions issued in mergers-and acquisitions transactions. Noteworthy is the Delaware courts' acceptance - and in one case, utilization- of FF evidence in asset-valuation disputes .... From the perspective of the everyday ROE analyst, the FF model is very accessible ... . Aside from its three California appearances, the FF method has also made its debut in Massachusetts and Nevada .... The Commissioner asked [the witness] whether FF is more accurate or useful than old standards. Accuracy, when measured as an equation's ability to predict returns (called R2 by statisticians) is improved by the FF factors ... Therein lies the model's usefulness as a cross check on its sibling, the CAPM."[62]

[62] *Ibid*; pages 12-15.

The cases on point suggest that increasingly more companies are using the Fama French model as a source of additional data.

The Guideline, however, takes the approach that although the Fama French model is "relevant", it should play no part whatsoever in the establishment of the allowed rate of return. In our view, the AER's rejection of the model is unfounded.

If the Fama French Three Factor model is wholly excluded from the analysis, then there will be no other model that specifically addresses the downward bias for value stocks. As SFG Consulting notes:

> "Our view is that if the Fama-French model is not given any consideration by the AER, then the estimated cost of equity will be understated. If we were to rely solely upon the Sharpe-Lintner CAPM, populated with a regression-based estimate of beta, we would adopt a second-best solution, because we would ignore the empirical evidence that the HML factor proxies for risk."[63]

Finally, we note that the AER's consultants have sought to suggest that because Fama and French continue to build on their previous work[64] by seeking further refinements the three factor model should be rejected in favour of the original SL CAPM. Maintenance of this position is illogical. It is equivalent to suggesting that even though improvements in safety and performance are continually being found, the aviation industry should continue to use only the Wright Brothers' original aircraft.

3.9. Summary

This submission summarises significant additional evidence to support our view that it is necessary for the AER to move away from the sole or predominant reliance on the SL CAPM when setting our allowed rate of return for equity. There is extensive support for the use of each of the DGM/DCF, Black-CAPM and Fama French Three Factor Model *concurrently with* the SL CAPM.

In this respect we do not consider there to be any concrete reason to depart from our October Regulatory Proposal. When the Preliminary Determination is revoked and substituted with the Substitute Determination, that determination should employ Frontier Economics' multi-model approach as we initially proposed.

[63] SFG Consulting; *The Fama-French Model; Report for Jemena Gas Networks, ActewAGL, Ergon, Transend, TransGrid and SA Power Networks*; 13 May 2014; page 3.
[64] Eugene F. Famma and Kenneth R. French; 'A five-factor asset pricing model' (2015) 116 *Journal of Financial Economics*.

Supporting documents

Following document were in attached with our October Regulatory Proposal:

Name
SFG: cost of equity report October 2014
SFG Consulting: Updated estimate of the required return on equity, October 2014
Synergies: Response to Issues Raised by the CCP, October 2014

For our Revised Proposal, Ergon Energy sought an addendum to the the return on equity estimate which is now entitled:

(Revised) Frontier Economics Addendum to Cost of Equity Report, June 2015

The following additional primary documents support our Revised Proposal and submission to the AER's draft determination on the cost of equity :

Name
Frontier: Cost of equity estimates over time June 2015
Frontier: Cost of equity estimates over time (model) June 2015
Frontier: Key issues in estimating the return on equity for the benchmark efficient entity, June 2015
Frontier: Review of the AER's concepual analysis for equity beta June 2015
Grant Samuel: Letter to the Directors of Transgrid (report for Transgrid) January 2015
Incenta: Further update on the required return on equity from Independent expert reports, February 2015
Knecht: Statement, 19 June 2015
Malko: Statement, 16 June 2015
NERA: Empirical Performance of Sharpe-Lintner and Black CAPMs, February 2015
NERA: Further Assessment of the Historical MRP Response to the AER's Fina Decisions for the NSW and ACT Electricity Distributors
NERA: Historical Estimates of the Market Risk Premium, February 2015
NERA: Review of the Literature in Support of the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French Three-Factor Model, March 2015
NERA: The Cost of Equity Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors, and for Jemena Gas Networks, June 2015
RBA: Speech The World Economy and Australia, April 2015
SFG: Beta and the Black Capital Asset Pricing Model, February 2015
SFG: Share Prices, the dividend discount model and the cost of equity for the market and a benchmark energy network, February 2015
SFG: The foundation model approach of the Asutralian Energy Regulator to estimating the cost of equity, March 2015

SFG: The required return on equity for the benchmark efficient entity, February 2015
SFG Using the Fama-French model to estimate the required return on equity, February 2015

We have also provided a number of secondary supporting documents with our submission:

Name
2001 Ore. PUC Lexis 418 212 P.U.R 4th 379
2003 Del. PSC Lexis 51 225 PUR 4th 81
2005 Cal. PUC Lexis 537, 245 P.U.R 4th 442
2006 N.Y. PUC Lexis 227 251 P.U.R. 4th 20
2006 Nev. PUC Lexis 91
2007 Cal. PUC LEXIS 593;, 262 P.U.R.4th 53
2007 N.Y. PUC Lexis 449 262 P.U.R. 4th 233
2007 WL 217450 (Nev P.U.C.)
2009 N.Y. PUC Lexis 507
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Brouen, de Jong and Koedijk 2004
Business Spectator: In awe of Elon Musk's wonderwall - a utility killer 4 May 2015
CEG: Estimation of and correction for biases inherent in the Sharpe CAPM formula, September 2015
CEG: Measuring risk free rates and expeced inflation, April 2015
Davis: Cost of Equity Issues a further report for the AER, May 2011
Davis: Cost of Equity Issues a report for AER, January 2011
Fama and French (2015)
Federal Power Commission v. Hope Natural Gas Co. _1
Graham and Harvey
Handley: Advice on the Rate of Return for the 2015 AER decision JGN 20 May 2015
Handley: Advice on the Return on Equity, October 2014
Handley: Further advice on return on equity, April 2015
InDaily: Developers want housing estates off grid
InDaily: Winners and losers in solar battery plan
Lane and Rosewall in RBA Bulletin June 15

Paul R Moul Massachusetts
Re Dr Ken Micheal
Sveriges Riksbank Prize 2013
Testimony G Hayes 2007

The following supporting documents to the NERA literature review are provided for ease of reference:

Name
AER, Better Regulation Rate of Return Guideline, December 2013.pdf
AER, Consultation paper Rate of return guidelines, May 2013.pdf
AER, Draft decision Jemena Gas Networks (NSW) Access arrangements 2015-20 Attachment 3-Rate of Return, November 2014.pdf
AER, Final decision Envestra Ltd Access arrangement proposal for the SA gas network 1 July 2011 – 30 June 2016, June 2011.pdf
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