



Rate of return

**CAPM and alternative
return on equity models**

Final working paper

December 2020

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Shortened forms

Shortened form	Extended form
2018 Instrument	The rate of return instrument published on 17 December 2018
2022 Instrument	The rate of return instrument to be published on 16 December 2022
AER	Australian Energy Regulator
Brattle	The Brattle Group
CAPM	Capital asset pricing model (Sharpe-Lintner CAPM)
CGS	Commonwealth government securities
DGM	Dividend growth model
ERP	Equity risk premium
HER	Historical excess returns
ICAPM	International capital asset pricing model
Instrument	Rate of return instrument
MRP	Market risk premium
NEL	National electricity law
NEO	National electricity objective
NGL	National gas law
NGO	National gas objective
SL CAPM	Sharpe-Lintner Capital Asset Pricing Model (or just CAPM)
WACC	Weighted average cost of capital

1 Overview

This is the third topic in a series of working papers that we will produce as part of our pathway to the 2022 rate of return Instrument (2022 Instrument). The outcomes from these working papers will feed in to the active phase of our 2022 Instrument review. This information will assist us to develop a 2022 Instrument that sets a rate of return in line with efficient financing costs, such that consumers pay no more than is necessary for the safe and reliable delivery of electricity and gas.

1.1 What do we want to achieve through our working papers?

The aim of this working paper series is to consider technical aspects of the rate of return ahead of the active phase. It is important for stakeholders and ourselves that we make progress toward settling positions through the working papers. Clearly we cannot bind ourselves ahead of our decision on the 2022 Instrument, but we have an opportunity now to narrow and focus the issues in play.

In this paper, we consider options for how we might determine the return on equity in the 2022 Instrument. We distinguish our preferred options from options that we do not propose to pursue, and also identify areas where further analysis is required.

1.2 Why does the rate of return matter?

Investors in any business expect to receive an additional return above their initial investment (or capital). We use the phrase 'rate of return on capital'—or just 'rate of return'—to refer to this additional amount when expressed as a percentage of the initial investment.

We estimate the rate of return for regulated energy businesses by combining the returns of two sources of funds for investment: equity and debt. The rate of return provides the business funds to service the interest on its loans and give a return to shareholders.

An accurate rate of return—neither too high nor too low—will promote efficient investment in, and efficient operation and use of, energy network services. While the capital market transaction is between investors and networks/pipelines, the ultimate effects will flow through to consumers.

If the rate of return is set too high:

- Investors will be over compensated for the risk involved in supplying capital to networks, so will show increased willingness to invest.
- Networks will have an incentive to over-invest in regulated assets over the longer term, increasing the regulatory asset base above the efficient level.
- Consumers of energy will pay inefficiently higher prices. As energy is an essential input to all aspects of social and economic activity, this will also distort downstream investment decisions. That is, if prices are higher than necessary consumers will use less energy-consuming services and over-invest in energy efficiency and management.

If the rate of return is set too low:

- Investors will be under compensated for the risk involved in supplying capital to networks, so will show reduced willingness to invest.
- Networks will not be able to attract sufficient funds to be able to make required investments in the network. Over the longer term there will be declines in quality, reliability, safety and/or security of supply of electricity or gas.
- Consumers of energy will pay lower prices, at least in the short term; but will wear the detriment of adverse outcomes for quality, reliability, safety and/or security of supply. There will also be distortion away from efficient outcomes in downstream markets (though in the opposite direction to the previous case).

Hence, an accurate estimate of the rate of return is necessary to promote efficient prices in the long term interests of consumers. We evaluate the two sources of funds for investment--debt and equity--to determine what return is just sufficient to attract the necessary capital investment.

1.3 Why this topic?

We can directly observe the return on debt, but it is more difficult to observe the expected return on equity. As a result a variety of return on equity models have been proposed, informed by varying types of evidence. Estimating the return on equity is complex and contentious, with experts and regulators reaching different positions on the strengths and weaknesses of different models, how those models should be implemented, and return on equity outcomes. There is no one 'right answer' to be found.

In developing the 2018 Instrument, we used the standard (Sharpe-Lintner) Capital Asset Pricing Model (SL CAPM) as the 'foundation model' and given a primary role in the determination of the return on equity. We had regard to other models, however we placed less reliance upon them than in the 2013 Guidelines as our confidence in their informative power had diminished.

We have selected this topic as a working paper because it goes to the foundation of our return on equity approach. Resolving which return on equity model (or models) are appropriate for regulatory use ahead of the main review would allow efficient consideration of subsequent matters, such as the input parameters for the chosen model/s.

1.4 What key issues were raised in the draft working paper?

Our draft working paper proposed that we should carefully examine a broad set of return on equity models to determine which model/s we should use in the 2022 Instrument. For each model, we wanted to assess its reliability, relevance to the Australian benchmark, suitability for use in our regulated environment and its simplicity. We engaged Professors Graham Partington and Stephen Satchell to provide expert advice to accompany the draft working

paper.¹ At the same time we also released a report by The Brattle Group, which provided relevant information on the use of return on equity models by international regulators.²

The key issues identified in our draft working paper were:

- The role for the SL CAPM, which was the foundation model in our 2018 instrument. We also raised possible changes to the implementation of the SL CAPM, noting the Brattle report suggested that we should consider more 'forward-looking' parameters, in particular:
 - the market risk premium
 - the relationship between the risk free rate and the market risk premium
 - equity beta.
- The role for any alternative candidate models, most prominently the dividend growth model. The dividend growth model could be used to estimate the return on equity, or the market risk premium (as an input to the SL CAPM)
 - If multiple models were to be used, an approach for combining their outputs.

The draft working paper noted that we did not need to resolve all model input questions as part of this topic, since they could be sequentially considered later in the review.

In response to the draft working paper, most stakeholders supported the use of the SL CAPM as the primary model to estimate the return on equity.³ However the network businesses and investors did raise concerns over the inputs used to estimate the return on equity.

In terms of forward looking inputs, networks and investors raised concerns over our approach to estimating the market risk premium and proposed that a more forward looking approach such as the dividend growth model should be considered. However, consumers agreed with the current position adopted by the AER.

In terms of a relationship between the risk-free rate and market risk premium, most stakeholders submitted that the one-for-one relationship between the risk-free rate and return on equity is questionable particularly given the volatility of risk free rates and relative stability of return on equity expectations. The network businesses stated that AER should investigate a suitable methodology to estimate the relationship between the risk free rate and market risk premium in the context of a long-term asset-based regulated business.

In regards to equity beta, networks raised concerns over the methods used by the AER to update beta and stated that shorter return periods and international comparator firms should be used, whereas the consumer groups agreed with AER's current approach.

¹ Partington and Satchell, *Report to the AER, Alternative asset pricing models*, 30 June 2020.

² The Brattle Group, *A review of international approaches to regulated rates of return, Prepared for the Australian Energy Regulator*, 30 June 2020.

³ Nyrstar was the only stakeholder to raise major concerns regarding the use of the SL CAPM. Nyrstar, *Re: Nyrstar submission on the AER draft working paper on CAPM and alternative return on equity models*, pp. 1-2.

1.5 What are we proposing for the 2022 Instrument?

After reviewing submissions and conducting further analysis we developed the following preferred options.

The use of the SL CAPM vs other models

We have carefully considered the empirical evidence, including:

- The empirical evidence both for and against the CAPM
- The empirical evidence for and against models that are often compared against the CAPM (such as the Black CAPM and Fama-French factor models)
- The need to carefully interpret the empirical testing of asset pricing models, given the limitations of our available testing approaches.

We consider the SL CAPM is the preeminent model; it has a strong theoretical basis, and is widely used by market practitioners. This is reflected in its use by all international regulators reviewed—and for most, it is the only model used.

Our preferred option is therefore to maintain the use of the SL CAPM as the primary model for estimating the return on equity.

However, we acknowledge that the implementation of the SL CAPM matters, in that different methods for calculating input parameters can lead to substantially different rate of return outcomes.

We do not propose to include the dividend growth model (at the return on equity level) as a secondary model. We also do not endorse the use of a multiple model approach.

A forward looking market risk premium

One of the perspectives coming from the Brattle Group report was the suggestion we consider explicit forward-looking elements in our construction of the rate of return on equity. The Brattle report characterised the AER's current method as using a 'backwards-looking' market risk premium informed by historical outcomes, and suggested we should consider combining this approach with a more forward-looking market risk premium as an input to the SL CAPM.

The AER does not consider its current method to be 'backwards-looking'. However, after reviewing stakeholder submissions, our preferred option is to maintain the use of historical excess returns data to inform our market risk premium, and to undertake further consideration of measures to use alongside this method. In particular, we are open to considering the use of the dividend growth model at the market risk premium level (rather than the overall return on equity) alongside the historical excess returns approach.

Relationship between risk free rate and market risk premium

Another area where Brattle suggested our current approach might not reflect forward-looking market conditions was with regard to the relationship between the risk free rate and market risk premium.

Our current assessment is that there is no support for a negative and perfect correlation between the risk free rate and market risk premium. However, there is some evidence to suggest a potential relationship between the two parameters. Therefore we intend to further investigate the merits of this relationship either in a future working paper or in the active phase of the review.

Estimation of equity beta

The Brattle report also suggested that we should adjust our method for estimating equity beta to ensure we give sufficient weight to current financial conditions. This went to both the selection of the comparator set (domestic vs international firms) and the econometric approach used to analyse the data (length of data period; observation frequency). On both issues, the Partington and Satchell report provided contrasting views.

After reviewing stakeholder submissions, our preferred option is to leave these equity beta issues (both comparator set and econometric approach) open for further consideration during the review process.

1.6 Next steps

This working paper marks the end of the formal working paper process for this topic, and there will not be a round of stakeholder submissions for this paper. There are aspects of this paper that we will consult on further as we extend our analysis and approach the 2022 Rate of Return Instrument Review.

We have also published working papers on two other topics in 2020. Our debt data final working paper was published ahead of this paper. A working paper focusing on international regulatory approaches to rate of return has been released at the same time as this paper. Table 1.1 shows dates for these working papers.

Table 1.1 Timeline for key stages of the 2020 working papers

Topic	Energy network debt data	CAPM and alternative return on equity Models	International regulatory approaches to rate of return
Draft Paper	26 June 2020	27 August 2020	27 August 2020
Stakeholder Forum	29 July 2020	16 September 2020	16 September 2020
Submissions Due	14 August 2020	9 October 2020	9 October 2020
Final Paper	18 November 2020	16 December 2020	16 December 2020

We will undertake further work on the issues raised in this paper during the 2022 Instrument process. Therefore, we are not inviting submissions on this paper at this time.

2 Process background

2.1 What is the rate of return Instrument?

The rate of return Instrument specifies how we determine the allowed rate of return on capital in regulatory determinations for energy networks. It specifies the mathematical formulae we will use to calculate the rate of return, and how we will obtain inputs for those formulae. It specifies some inputs (fixed for the duration of the Instrument) and for others specifies the process by which we will measure market data and use it as an input at the time of a decision.

The current rate of return Instrument was published on 17 December 2018 (the 2018 Instrument). In December 2022 we will publish the next rate of return Instrument (the 2022 Instrument). This binding Instrument will determine the allowed rate of return on capital for the following four year period.

Estimating the rate of return is a complex task. We estimate the returns required by investors in view of the risks associated with energy network companies compared to their other investment opportunities. We make this judgement by examining a broad range of evidence including financial market data, models of financial returns, the latest investment knowledge and the views of all stakeholders.

2.2 What is our 'Pathway to 2022'?

We use the term 'Pathway to 2022' to describe the process by which we will develop the 2022 Instrument. We consulted with stakeholders about what steps should be included and what role various reference groups should play.⁴ We issued a position paper in May 2020 setting out our high level plan.⁵

The active phase of the 2022 review will commence in mid-2021. Prior to this, our pathway to 2022 includes:

- Rate of return annual updates—to provide information on rate of return data in the years between reviews; particularly updated times series data used in the 2018 Instrument (or used to inform the development of the 2018 Instrument).
- Establishing reference groups—to ensure we hear stakeholder perspectives from consumers, investors and retailers.
- Working papers—such as this paper.

Outcomes from our 2020 Inflation review will also flow into the development of the 2022 Instrument.⁶

⁴ AER, *Consultation paper, Pathway to the 2022 rate of return Instrument*, November 2019; see also The Brattle Group, *Stakeholder feedback on the AER's process for the 2018 rate of return Instrument*, 27 June 2019.

⁵ AER, *Position paper, Pathway to the 2022 rate of return Instrument*, 29 May 2020.

⁶ AER, *Initiation notice, 2020 review of inflation approach*, 7 April 2020; AER, *Discussion paper, Regulatory treatment of inflation*, 25 May 2020, p. 14.

We will consult further on the process for the active phase of the review, including lower-level details not addressed in our May 2020 position paper, as we get closer to 2022.

2.3 What is the intent of the working papers series?

Our rate of return working papers discuss issues and evidence on key rate of return topics, and allow us to hear from stakeholders in response.

On each chosen topic, we expect to release a draft working paper (usually accompanied by an expert report), before a submission period. We will facilitate discussion with stakeholders within the restrictions arising from the COVID-19 pandemic, such as by hosting an online meeting. We will then release a final working paper with our response to submissions. These working positions will describe our preferred option (or options) and identify where further work is required.

In selecting topics for working papers, we have had regard to whether topics could be constructively considered as discrete issues in advance of the active phase of the review.⁷ We have also taken into account stakeholder feedback on the topics of interest or importance.⁸

We intend that all this material will feed in to the main phase of the review, providing a foundation for constructive discussion and helping alleviate time pressure in the active phase.

As noted in section 1.3, the topic of this paper (CAPM and alternative return on equity models) goes to the foundation of our return on equity approach. Stakeholders submitted (in response to the pathway to 2022 consultation paper) that the AER should evaluate its use of the SL CAPM in the 2018 Instrument.⁹ We considered that this topic could be appropriately addressed ahead of the active phase of the review. Furthermore, addressing fundamental issues ahead of the main review might lead to other work in sequence (e.g. parameters for use within chosen models).

2.4 How does this interact with other working papers?

We have published the draft and final working papers on this topic at the same time as draft and final working papers on another topic, on *International regulatory approaches to the rate of return*.¹⁰ It provides a framework for comparing overseas regulatory approaches to the AER's approach, and identifies some key differences that suggest possible changes to our approach.

We have aligned the schedules for these working papers because there are areas of overlap between the two topics. In particular, consideration of international rate of return approaches

⁷ AER, *Position paper, Pathway to the 2022 rate of return Instrument*, 29 May 2020, pp. 9–10.

⁸ AER, *Position paper, Pathway to the 2022 rate of return Instrument*, 29 May 2020, p. 22.

⁹ See for example ENA, *Pathway to the rate of return instrument, Response to consultation paper and rate of return annual update*, 20 December 2019; and APGA, *Submission to the AER, Pathway to 2022 rate of return instrument*, 17 January 2020, p. 13.

¹⁰ AER, *Rate of return, International regulatory approaches to the rate of return, Final working paper*, 17 December 2020.

necessarily includes their method for estimating the return on equity and use of return on equity models (as well as return on debt, gearing, tax, and the overall rate of return).

To reduce duplication, we discuss overlapping material in one location only. This working paper contains our primary discussion on:

- return on equity models (whether prompted by the Partington and Satchell report, the international review conducted by The Brattle Group, or stakeholder submissions).
- the technical methodology for estimating return on equity model parameters, including the use of international comparators and international data.

Our first working paper topic was on the energy networks' debt data.¹¹ It looked at evidence on actual debt costs incurred by regulated networks and discussed how this data might be used to inform the 2022 instrument. It complements this paper because it deals with the other source of investment (debt). The final working paper on debt data was released in November 2020, and identified a preferred option for using the index of actual debt costs to inform the regulated return on debt.

¹¹ AER, *Rate of return, Energy Networks Debt data, Final working paper*, 18 November 2020.

3 Previous work

3.1 Background to the rate of return framework

We apply a ‘building block’ model to set regulated revenues for electricity and gas network service providers. The building blocks—return on capital, return of capital, operating expenditure and tax—reflect the expected costs that would be incurred by a benchmark efficient entity operating the network. This is a form of incentive regulation, as building blocks are estimated in advance for a regulatory control period (typically five years) and the network retains any benefit (or bears any detriment) where it is able to reduce costs below the AER’s estimates. Revealed costs are then used to inform building block estimates for the following control period, so that efficiency gains are passed on to consumers. We also operate a number of incentive schemes in conjunction with the building block framework.

The return on capital building block is set by applying a rate of return on capital to the regulatory asset base each year. The AER currently estimates the allowed rate of return for regulated businesses using the approach set out in the 2018 Instrument.¹² The rate of return instrument is binding under the National Electricity Law and National Gas Law. This means that the AER and network businesses are required to set the rate of return according to the current Instrument.

The 2018 Instrument applies the following key characteristics when estimating a businesses’ allowed rate of return:¹³

1. It use a nominal vanilla weighted average cost of capital (WACC) formulation.¹⁴
2. It assumes a 40% equity and 60% debt capital structure.
3. It uses a domestic CAPM to estimate the return on equity. This is implemented as:
 - The risk free rate (RFR) is estimated from the yield on 10 year to maturity Commonwealth Government Securities (CGS) over a short averaging period (20 to 60 business days) prior to the commencement of the regulatory control period.
 - Equity beta of 0.6 (fixed for the life of the 2018 Instrument).
 - Market risk premium of 6.1 per cent (also fixed for the life of the 2018 Instrument).
 - The return on equity is therefore the RFR plus a fixed equity risk premium of 3.66%.¹⁵
4. It uses a trailing average portfolio for the allowed return on debt, updating 10 per cent of the portfolio estimate annually (i.e. a 10 year rolling window of annual debt observations).
5. The annual return on debt is based on debt costs for the benchmark BBB+ credit rating at a 10 year term, estimated by weighting A rated and BBB rated benchmark curves (from a number of providers) over an averaging period.

¹² AER, *Rate of return instrument*, 17 December 2018 (v1.02 as amended on 4 April 2019).

¹³ AER, *Rate of return instrument, Explanatory Statement*, December 2018, pp. 13–16.

¹⁴ Used in a post-tax revenue model, i.e. effect of the interest tax shield is considered in cashflows.

¹⁵ The equity risk premium is the product of beta and the market risk premium.

6. Market data for the return on debt and risk free rate is sourced from averaging periods nominated by the network businesses in advance.

3.2 Overall return on equity

3.2.1 Foundation model approach

In 2018, the foundation model approach (six step process) provided a framework for systematically considering relevant information and then exercising our judgement on the appropriate regulated return on equity. It did not require information to be used if it did not satisfy our assessment criteria. Therefore our approach was to assess all information and employ it according to its merits. Figure 1 (on the following page) presents the six steps used in 2018 graphically.

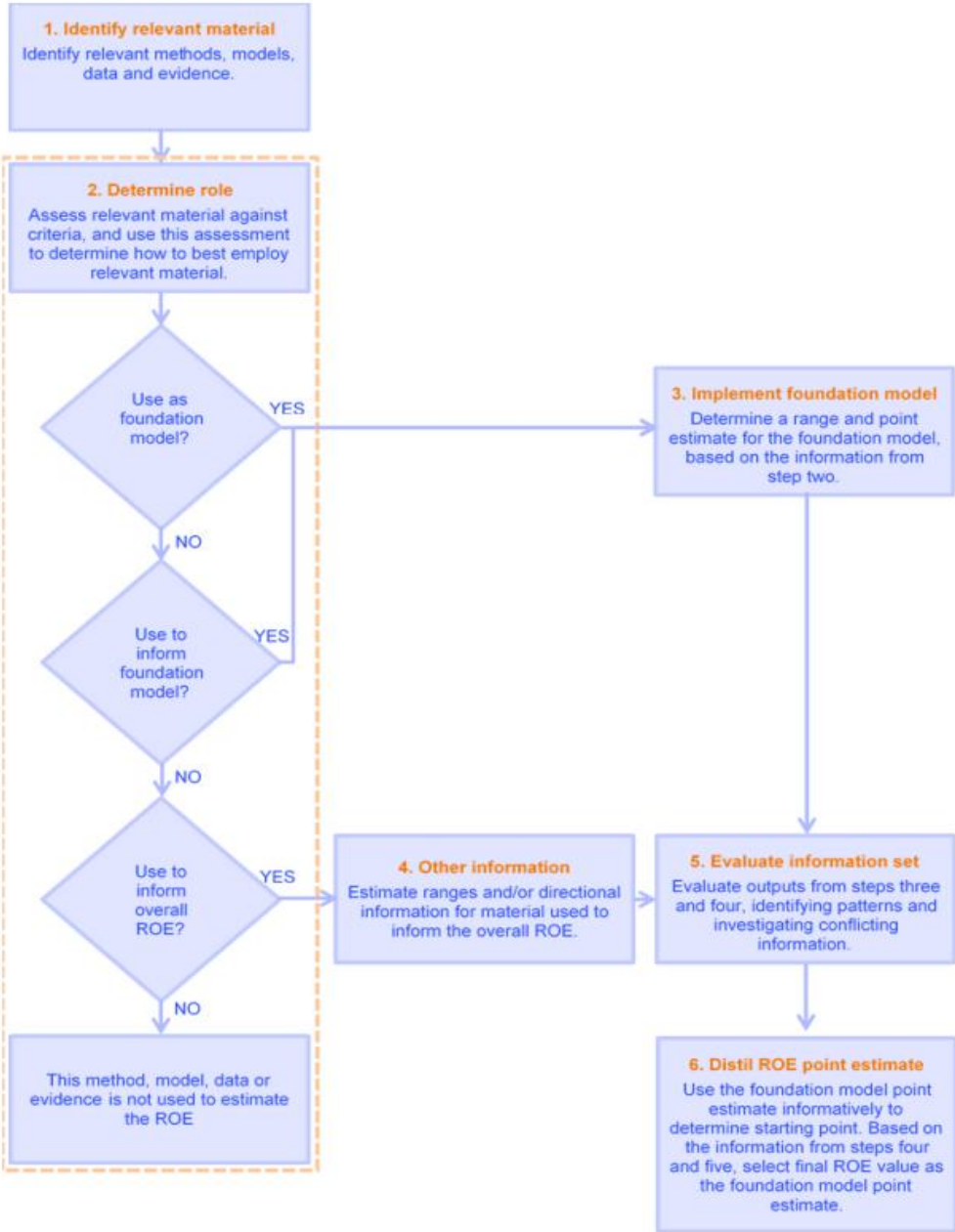
We identified the relevant material and the roles assigned to each piece of material under step 1 and 2 of our foundation model approach. This is summarised in Table 3.1.

Table 3.1 Relevant material and role

Material (Step 1)	Role in 2018 and relevant merit (Step 2)
Sharpe-Lintner Capital Asset Pricing Model (SL CAPM)	Foundation model.
Black CAPM	Related to the overall return on equity. However at the time of finalising the 2018 instrument we had diminished confidence in the robustness of the Black CAPM. We were not persuaded to adjust the SL CAPM estimate for the theory of the Black CAPM.
Dividend growth models (DGMs)	Can be used to inform the market risk premium. However at the time of the finalising the 2018 instrument we had diminished confidence in the robustness of the dividend growth models. We were not persuaded to select a market risk premium toward the top of the observed empirical estimates of historical excess returns.
Fama-French three factor model	No role.
Wright approach	We have diminished confidence in the robustness of the Wright approach leading us to place no reliance on it.

Source: AER, *Rate of return instrument, Explanatory Statement*, December 2018, pp. 82–83.

Figure 1 Foundation model approach flowchart



The description of roles for return on equity models in Table 3.1 is best understood within the context of our 2013 rate of return guidelines (2013 Guidelines). In our 2013 review, we gave weight to the dividend growth model and the theory of the Black CAPM when implementing steps 2 to 4 of our foundation model approach. These were used to inform us of the appropriate point estimate for the market risk premium and equity beta, respectively. In the 2018 review, we had regard to these two models in the application of our foundation model approach but our confidence in their informative power to determine the appropriate market risk premium and equity beta point estimate had diminished.¹⁶

¹⁶ AER, *Rate of return instrument, Explanatory Statement*, December 2018, p. 79.

In 2018, we considered the SL CAPM to be the most appropriate model to reflect the systematic risk. Therefore we decided to use the SL CAPM as the principal model for determining an initial range and point estimate for the return on equity.

In the 2018 Instrument, our final decision was to calculate the return on equity using the SL CAPM with a market risk premium of 6.1 per cent and an equity beta of 0.6 resulting in an equity risk premium of 3.66 per cent. We combine this equity risk premium with a risk free rate observed at the time the 2018 Instrument is applied.

3.3 Draft working paper

The *CAPM and alternative return on equity models* draft working paper evaluated a number of models that could be used to inform our estimate of the return on equity, which is one component of the overall rate of return. This included the Capital Asset Pricing Model (CAPM), which was the primary model used in the 2018 rate of return instrument. The draft working paper identified strengths and weaknesses of the candidate models and asked for stakeholder feedback on which model/s should be used in the 2022 Instrument.

We engaged Professors Graham Partington and Stephen Satchell to provide expert advice on this matter.¹⁷ A second report, by The Brattle Group, also provided relevant information on the use of return on equity models by international regulators.¹⁸

3.3.1 Summary of Partington and Satchell report

The Partington and Satchell report assessed asset pricing models against a set of criteria prescribed by the AER.¹⁹ These criteria were reliability, relevance to the Australian benchmark, suitability for use in regulated environment and simplicity. Partington and Satchell expanded these criteria to include theoretical support for the model, extensive practical use in estimating the cost of capital, limited opportunities for gaming, and empirical validation.

The Partington and Satchell report recommended the following:²⁰

1. Use the SL CAPM only for estimating the return on equity in a regulatory environment
2. Do not use a multi-model approach or the dividend growth model for estimating return on equity
3. When updating beta, use longer return periods and do not add international firms as comparators for domestic regulated networks without adjustments.

The report also commented briefly on the Wright approach, a model that assumes a stable total market return and perfect negative correlation between the risk free rate and the market risk premium. Partington and Satchell stated that they found this implausible—for example, where the risk free rate was above the historical average return (as has been the case) it would lead to a negative market risk premium.

¹⁷ Partington and Satchell, *Report to the AER, Alternative asset pricing models*, 30 June 2020.

¹⁸ Brattle, *A review of international approaches to regulated rates of return, Prepared for the AER*, 30 June 2020.

¹⁹ Partington and Satchell, *Report to the AER, Alternative asset pricing models*, 30 June 2020.

²⁰ Partington and Satchell, *Report to the AER, Alternative asset pricing models*, 30 June 2020, pp. 6–8.

3.3.2 Summary of Brattle report

Brattle applied a broad framework to compare how seven international regulators (plus the AER) set the allowed rate of return for their respective jurisdictions. The seven international regulators determine a rate of return as part of their revenue/price regulation and most regulate the gas and electricity distribution and transmission industries (with some regulating additional industries).²¹ To improve comparability, Brattle adjusted the form of rate of return to be aligned between regulators.²²

The Brattle report highlighted four key suggestions:²³

1. Incorporate more 'forward-looking' evidence in the determination of the return on equity.
2. Use a multi-model approach for estimating the return on equity.
3. Apply an estimation window of 2–5 years using daily or weekly return data to estimate the equity beta; and to use international firms in the beta comparator set.
4. Increase the frequency of rate of return reviews and apply outcomes immediately to all businesses. In addition, update all return on equity parameters jointly (rather than one equity parameter in isolation) and apply this update immediately to all businesses.

The draft working paper discussed Brattle's first three suggestions while the fourth option was explored in our *International regulatory approaches to rate of return* working paper.

3.3.3 Our initial view of options for the 2022 rate of return review

Our initial assessment was that the SL CAPM should play a major role in our determination of the return on equity in the 2022 Instrument. The SL CAPM was the preeminent model; it had a strong theoretical basis, was widely used by market practitioners, and was more reliable than any of the alternatives identified. This was reflected in its use by all international regulators reviewed—and for most, it was the only model used.

However, the implementation of the SL CAPM mattered, in that different methods for calculating input parameters could lead to substantially different rate of return outcomes. There was expert disagreement on how best to apply the SL CAPM, and variation in how it was applied by overseas regulators.

One of the perspectives coming from the Brattle Group report was the suggestion we consider including an explicit forward-looking element in our construction of the return on equity. Our draft working paper assessment was that our 2018 return on equity approach already included some forward-looking information. Drawing from the two expert reports we identified two categories of changes to consider:

- Adopting a more 'forward-looking' return on equity model

²¹ Brattle, *A review of international approaches to regulated rates of return*, June 2020, p. 18.

²² Brattle, *A review of international approaches to regulated rates of return*, June 2020, p. 47.

²³ Brattle, *A review of international approaches to regulated rates of return*, June 2020, pp. 59–62.

- Improving how the SL CAPM is implemented—that is, whether we could draw on more forward-looking inputs when we populate the model.

For a forward-looking model, the Brattle report suggested using the dividend growth model at the overall return on equity level. However, there were many different specifications of the dividend growth model with different formulae and inputs. The Partington and Satchell report did not recommend any use of the dividend growth model, primarily because of implementation problems. Our draft working paper assessment of the dividend growth model was that there were significant challenges to overcome before it could be used as an alternative or companion to the SL CAPM.

For forward-looking inputs to the SL CAPM, there were a number of options around the way we estimated the market risk premium, equity beta and the risk free rate. The dividend growth model could be used to estimate a 'forward-looking' market risk premium (instead of the overall return on equity), and the Brattle report noted this was done by some international regulators. There was variation in how the dividend growth model output was used—for instance, the Bank of England focuses not on the precise level of the market risk premium estimated using its dividend growth model, but on changes in the market risk premium over time and relative to historic averages. Against this, Partington and Satchell's assessment that the dividend growth model was unreliable would also apply to this use of the model.

Another option related to the relationship between the risk free rate and the market risk premium in the standard SL CAPM. Different models posited different relationships between these parameters. Under the 2018 instrument, we make no adjustment to the market risk premium when the risk free rate changes. The Brattle report notes the use of a total market return approach (also known as the Wright approach) by UK regulators, where it is assumed that there is an offsetting movement in the market risk premium (equal magnitude, opposite sign) when the risk free rate changes. We consider the total market return approach is unlikely to reflect conditions in financial markets.

Another option suggested by Brattle was the potential to estimate equity beta using a shorter series of more recent data with frequent (daily or weekly) return observations. This would be more reflective of recent market conditions and so make the SL CAPM less 'backward-looking'. However, Partington and Satchell suggested that longer return periods (monthly or quarterly) would provide a more reliable estimate of equity beta, and this means we need a longer data window as well. Alongside this, there was also disagreement on whether to use international firms in the comparator set for estimating equity beta.

Another perspective raised by the Brattle Group was the suggestion that we might employ multiple return on equity models. Aside from the standard SL CAPM and dividend growth model discussed above, our draft working paper assessment of the other candidate models was that they had substantial limitations (the Black CAPM, international CAPM, consumption CAPM, Fama-French factor models, and a fixed-rate-plus-margin model). They saw almost no use by overseas regulators. On the information available to us it was not clear how these models could have a role in setting our regulated return on equity. Our draft working paper assessment was that using multiple models was difficult to justify. In particular we needed to carefully consider whether using one model in isolation (the best available candidate) or multiple models would lead to a more or less reliable return on equity.

4 Stakeholder submissions

This section summarises key feedback from stakeholder submissions on the draft working paper. Additional feedback raised in these submissions can be found in Table of Stakeholder submissions. In total 14 submissions were received from network, consumer and investor groups. While no written submissions were received from retailers, the Australian Energy Council (AEC) did make a presentation at our stakeholder forum on behalf of the Retailer Reference Group (RRG).²⁴

4.1 Use of the SL CAPM vs other models

4.1.1 Network feedback

In response to our draft working paper, all of the network business supported the use of the SL CAPM as the primary model to estimate the return on equity. However a broader range of evidence should be considered, particularly more forward-looking evidence, when implementing the SL CAPM.²⁵

The network businesses in their submissions provided no support for a multi-model approach or any other model when setting the overall return on equity.

However, network submissions raised the need to implement meaningful cross-checks in the 2022 Instrument. Energy Networks Australia (ENA) submitted that it was important to identify the cross-checks that will be used, and the way in which they will be used, well in advance of the 2022 Instrument.²⁶ This view was endorsed by Ausgrid, Endeavour Energy, Energy Queensland, SA Power Networks (SAPN) and TransGrid.

The Australian Pipelines and Gas Association (APGA) stated that the AER should broaden the range of cross-checks it considers and recommended that we should consult on cross checks (along with robustness) as part of our rate of return working papers.²⁷

4.1.2 Consumer feedback

In response to our draft working paper, most consumer groups supported the use of the SL CAPM as a primary model,²⁸ with exception of Nyrstar who raised concerns over the

²⁴ AEC, *Presentation, AER Retailer reference group, International approaches and equity models*, 16 September 2020.

²⁵ APA, *APA submission on CAPM and alternative return on equity models*, 12 October 2020, pp. 1, 4; APGA, *Submission to the AER, Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, pp. 16–17; Ausgrid, *Submission, International regulatory approaches to rate of return and CAPM*, 9 October 2020, p. 3; ENA, *Best practice framework for setting the allowed return on equity, Response to AER's Pathway to 2022 rate of return instrument, Return on equity working papers*, 9 October 2020, p. 4; Endeavour Energy, *Draft working papers, Return on equity*, 9 October 2020, p. 2; Energy Queensland, *Pathway to rate of return 2022 instrument, Return on equity*, 9 October 2020, p. 2; SA Power Networks, *Submission on AER draft working paper, Rate of return CAPM and alternative return on equity models*, 7 October 2020, p. 2; TransGrid, *AER's pathway to 2022 rate of return instrument, Draft return on equity working papers*, 12 October 2020, p. 2.

²⁶ ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, p. 42.

²⁷ APGA, *Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, pp. 6–7.

²⁸ CRG, *Submission to AER, Return on equity*, 9 October 2020, p. 35; EUAA, *Submission, CAPM and alternative return on*

foundation model used by the AER to inform the overall return on equity.²⁹ We have addressed the Nyrstar submission in section 4.5.

The Consumer reference group (CRG) agreed with the assessment of the Partington and Satchell report which concluded that "the only model that satisfies the criteria of reliability, relevance, suitability and simplicity is the SL CAPM". The CRG also stated that the SL CAPM appeared to be the model that best satisfied the CRG's consumer principles.³⁰

The Energy Users Association of Australia (EUAA) also agreed with the assessment of the Partington and Satchell report and our draft working paper and saw no reason to change from the current approach of using the SL CAPM model as set out in the 2018 instrument.³¹

Major Energy Users Inc (MEU) considered the SL CAPM was an appropriate tool to be used to set the return on equity for the networks, subject to the availability of data sets to inform the parameters.³²

The CRG, EUAA and MEU did not support using a multi-model approach or any other model when setting the overall return on equity. The CRG stated that a multi-model approach significantly reduced transparency and reliability of return on equity estimates and it would be difficult to interpret as the models come from different theoretical frameworks. The EUAA agreed with the AER's conclusion that the use of multiple models was difficult to justify. The MEU considered that the current AER approach of using a single proven model (the SL CAPM) was sound.

4.1.3 Investor feedback

In response to our draft working paper, investor groups were of the view that the SL CAPM should play a significant role in estimating the return on equity. However a broader range of evidence should be considered, particularly more forward-looking and contemporary evidence, when implementing the SL CAPM.³³

The Network Shareholder Group (NSG) supported the AER's view that the standard SL CAPM should play a major role in the AER's determination of the return on equity in the 2022 Instrument. The NSG was of the view that the SL CAPM provided a degree of stability and predictability in the regulatory process and aligned with the estimation approach adopted by most economics regulators and market practitioners globally. However, in the implementation of the SL CAPM parameters must be forward-looking and contemporary to enable prevailing risk to be reflected in the estimate of equity returns, and cross-checks must be applied.³⁴

equity models, 9 October 2020, p. 1; MEU, *Rate of return, CAPM and alternative RoE models, International regulatory approaches to RoR, Draft working papers*, 7 October 2020, pp. 6–7.

²⁹ Nyrstar, *Submission on the AER draft working paper on CAPM and alternative return on equity models*, 14 October 2020.

³⁰ CRG, *Submission to AER, Return on equity*, 9 October 2020, pp. 35–38.

³¹ EUAA, *Submission, CAPM and alternative return on equity models*, 9 October 2020, p. 1.

³² MEU, *Rate of return, CAPM and alternative RoE models, International regulatory approaches to RoR, Draft working papers*, 7 October 2020, pp. 6–8, 9.

³³ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, 9 October 2020, pp. 1–3; QTC, *Pathway to the 2022 rate of return instrument*, 12 October 2020, pp. 2–8.

³⁴ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, 9 October 2020, pp. 1–3.

The NSG also supported the establishment of an independent panel of experienced practitioners, with equal representation selected by consumers and regulated businesses, to verify cross-checks and market reasonableness tests.³⁵

The Queensland Treasury Corporation (QTC) supported the continued use of the SL CAPM to determine the allowed return on equity and focused its discussion on how best to estimate the parameters of such a model.³⁶

4.1.4 Retailer feedback

The Retailer Reference Group (RRG) agreed with the AER's assessment of the SL CAPM.³⁷

4.2 A forward-looking market risk premium

4.2.1 Network feedback

ENA considered that the historical excess returns approach adopted by the AER was backwards-looking in that it used historical data only.³⁸ Therefore there was an important role for forward-looking evidence in relation to market risk premium, to be used alongside consideration of the historical evidence. ENA agreed with Brattle's recommendation that the dividend growth model evidence was relevant and could usefully inform an estimate of the forward-looking market risk premium.

ENA submitted that there are different ways of specifying and implementing the dividend growth model and consideration could be given to:³⁹

- Using a range of well-accepted approaches to the dividend growth model such that no one specification has a determinative impact.⁴⁰
- Using specifications of the dividend growth model that produce estimates of the market risk premium that equate to the historical excess returns estimate on average; and
- At a minimum, having regard to evidence about whether the prevailing market risk premium is above or below its long-run average.

This view was endorsed by Ausgrid, Endeavour Energy, Energy Queensland, SAPN and TransGrid.⁴¹

³⁵ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, October 2020, p. 3.

³⁶ QTC, *Pathway to the 2022 rate of return instrument*, 12 October 2020, pp. 2–9.

³⁷ AEC, *Presentation, AER Retailer reference group, International approaches and equity models*, 16 September 2020, p. 3.

³⁸ ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, pp. 35, 43.

³⁹ ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, p. 43.

⁴⁰ ENA noted that IPART adopts such an approach.

⁴¹ Ausgrid, *Submission, International regulatory approaches to rate of return and CAPM*, 9 October 2020, p. 1; Endeavour Energy, *Draft working papers, Return on equity*, 9 October 2020, p. 1; Energy Queensland, *Pathway to rate of return 2022 instrument, Return on equity*, 9 October 2020, p. 1; SA Power Networks, *Submission on AER draft working paper, Rate of return CAPM and alternative return on equity models*, 7 October 2020, p. 1; TransGrid, *AER's pathway to 2022 rate of return instrument, Draft return on equity working papers*, 12 October 2020, p. 1.

Furthermore, ENA did not consider surveys had any direct role to play when estimating the market risk premium, as the quality of the survey data available was extremely poor. The APGA also shared a similar view with regards to using survey data to inform a forward-looking market risk premium.⁴²

The APGA proposed using dividend growth model estimates to inform the market risk premium in the 2022 Instrument. They also suggested that other approaches such as prices of options or forward contracts could be useful, however they may be better suited as cross-checks.⁴³

APA acknowledged the implementation problems which have led the AER to reject the use of the dividend growth model, but still saw that model as having an important role to play, not as an alternative to the SL CAPM, but as a companion to it. It was one of a small number of ways of estimating a forward-looking expected return on the market at a time when past data are unlikely to provide a satisfactory estimate of that parameter.⁴⁴

4.2.2 Consumer feedback

The consumer submissions agreed that the existing approach to estimating a forward-looking market risk premium based on the analysis of historical excess returns remained appropriate.

The CRG considered that the use of historical excess returns with some cross-checks remained the most appropriate basis for estimating the market risk premium. Surveys and other market data might serve as a cross-check to the AER's assessment of the historical excess returns, however it was not clear which cross-checks were appropriate and how they might inform the AER's decision on a point estimate of the market risk premium. The CRG stressed that the AER must ensure there were clear theoretical links between the market-based cross-checks (market volatility, dividend yields) and the market risk premium / overall return on equity.⁴⁵

The MEU considered that that the current approach to setting the rate of return did, in fact, reflect a forward-looking approach to the cost of capital. The MEU noted that the market risk premium can show significant variation year-on-year and because of this any forward-looking assessment is likely to be wrong within a year or two. As investors in networks had invested for the long term, it was more appropriate for their return on equity to be moderated by long term assessments of market risk premium rather than the extremely volatile short-term observations and forecasts used in other models. The MEU therefore did not consider that forward looking assessments of market risk premium were necessarily appropriate or even advisable for setting the return on equity for long term investments like energy networks.⁴⁶

⁴² ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, p. 44; APGA, *Submission to the AER, Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, p. 9.

⁴³ APGA, *Submission to the AER, Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, p. 9.

⁴⁴ APA, *APA submission on CAPM and alternative return on equity models*, 12 October 2020, p. 4.

⁴⁵ CRG, *Submission to AER, Return on equity*, 9 October 2020, p. 39–45.

⁴⁶ MEU, *Rate of return, CAPM and alternative RoE models, International regulatory approaches to RoR, Draft working papers*, 7 October 2020, pp. 3–5.

The CRG and EUAA did not recommend the use of the dividend growth model as a forward-looking estimate of the market risk premium.

The CRG considered that the dividend growth model did not meet the AER's model selection criteria, was subject to gaming, not widely used and did not satisfy the consumer principles proposed by the CRG. The use of such models alone or in combination with historical excess returns would not contribute to the NEO or the NGO.⁴⁷

The EUAA agreed with the assessment of the Partington and Satchell report on the limitations of the dividend growth model (in general, and in particular to estimate the market risk premium) and therefore did not support its use.⁴⁸

4.2.3 Investor feedback

In response to our draft working paper, investor groups highlighted the importance of using relevant and forward looking market information.

The NSG and the QTC in their submissions supported the use of the Dividend Growth Model to inform the choice of market risk premium. The QTC recommended that the 2022 Instrument should include an approach that gives fixed and meaningful weight to multiple approaches, such as the dividend growth model, Wright approach and historical excess returns for estimating the market risk premium. Given that future market conditions cannot be known when the 2022 Instrument is made, a weighted average approach should produce a more robust estimate than any single approach.⁴⁹

4.2.4 Retailer feedback

The RRG considered that the use of forward looking assumptions and data should be narrowed to estimation of the market risk premium. It suggested that surveys and historical excess returns could inform the AER's selection of the market risk premium.⁵⁰

4.3 Relationship between risk free rate and market risk premium

4.3.1 Network feedback

ENA considered that regard should be given to the Wright approach when estimating the market risk premium at the time of 2022 Instrument.⁵¹ ENA agreed with the AER that it was implausible that the required real return in equity remains constant in all market conditions. However, the assumption that the market risk premium remained constant in all market conditions was equally implausible. ENA did not consider that there was a perfect negative correlation between the market risk premium and the risk-free rate, however the Wright

⁴⁷ CRG, *Submission to AER, Return on equity*, 9 October 2020, pp. 15-19, 39-43.

⁴⁸ EUAA, *Submission, CAPM and alternative return on equity models*, 9 October 2020, p. 2.

⁴⁹ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, 9 October 2020, pp. 3-5; QTC, *Pathway to the 2022 rate of return instrument*, 12 October 2020, pp. 2-9.

⁵⁰ AEC, *Presentation, AER Retailer reference group, International approaches and equity models*, 16 September 2020, p. 3.

⁵¹ ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, pp. 43-45.

approach provided relevant information that should be used to inform the market risk premium at a point in time.

ENA considered that it would be unbalanced to eliminate the Wright approach on the basis of the implausibility of its assumption about the relationship between the market risk premium and risk-free rate, while not subjecting the historical excess returns approach to the same test. This is particularly so in light of the acceptance of the Wright approach in other regulatory jurisdictions.

The ENA submission was endorsed by Ausgrid, Endeavour Energy, Energy Queensland, SAPN and TransGrid.⁵²

The APGA considered the Wright approach provided useful information about how the SL CAPM should be applied. Whilst the APGA agreed that it was unlikely that there was a negative and perfect correlation between the risk free rate and market risk premium, it did provide insight as to why it was inappropriate to assume that the difference between the expected return on the market and the risk-free rate was fixed.⁵³

4.3.2 Consumer feedback

The consumer submissions provided no support for the use of the Wright approach.

The CRG recommended that AER not utilise the Wright approach, or any modification of this approach, to determine or constrain the estimate of the market risk premium or the overall return on equity.⁵⁴

The CRG considered the assumption of a one-for-one inverse relationship between the risk-free rate and market risk premium was not supported in any consistent way by the empirical data and would lead to market risk premium results that did not make sense from either a practical or theoretical perspective. It also stated that the AER's historical excess returns analysis proved to be stable over many sampling periods, suggesting the claimed inverse relationship of the market risk premium with the risk-free rate does not exist in practice.

The EUAA agreed with the AER's view on the limitations of the Wright approach and therefore did not support its use.⁵⁵

4.3.3 Investor feedback

⁵² Ausgrid, *Submission, International regulatory approaches to rate of return and CAPM*, 9 October 2020, p. 1; Endeavour Energy, *Draft working papers, Return on equity*, 9 October 2020, p. 1; Energy Queensland, *Pathway to rate of return 2022 instrument, Return on equity*, 9 October 2020, p. 1; SA Power Networks, *Submission on AER draft working paper, Rate of return CAPM and alternative return on equity models*, 7 October 2020, p. 1; TransGrid, *AER's pathway to 2022 rate of return instrument, Draft return on equity working papers*, 12 October 2020, p. 1.

⁵³ APGA, *Submission to the AER, Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, p. 10–13.

⁵⁴ CRG, *Submission to AER, Return on equity*, 9 October 2020, pp. 8, 37.

⁵⁵ EUAA, *Submission, CAPM and alternative return on equity models*, 9 October 2020, p. 2.

In response to our draft working paper, investor groups such as the NSG and QTC provided support for the use of the Wright approach, along with other approaches, as it provided relevant information that should be used to inform the market risk premium at a point in time.

The NSG considered the inverse relationship between the market risk premium and risk-free rate must feature in the estimation of equity returns.⁵⁶ The QTC considered that combining estimates from the Wright approach with other approaches was likely to produce more plausible estimates compared to each individual approach on a stand-alone basis.⁵⁷

4.3.4 Retailer feedback

The RRG stated that, based on the consultant report, the Wright approach needed no further consideration.⁵⁸

4.4 Estimation of equity beta

4.4.1 Network feedback

ENA agreed with Brattle's recommendation that the additional data that underpins longer-term beta estimates was not a substitute for ensuring that a reasonable number of firms was included in the comparator set.⁵⁹ Re-computing estimate after estimate for the same firm was no substitute for having a reasonable number of comparator firms. ENA considered that international evidence was relevant and should be used to inform the AER's estimate of beta. This submission was endorsed by Ausgrid, Endeavour Energy, Energy Queensland, SAPN and TransGrid.⁶⁰

The APGA suggested the AER should:⁶¹

- Reconsider the assumption in the 2018 Instrument that the same equity beta should be applied to both gas pipelines and electricity networks.
- Look at equity betas from gas pipelines in other jurisdictions to see whether these can help augment the limited Australian sample.
- Place more weight on equity betas estimated using data from shorter and more recent estimation windows.

⁵⁶ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, 9 October 2020, pp. 4–5.

⁵⁷ QTC, *Pathway to the 2022 rate of return instrument*, 12 October 2020, pp. 2–4.

⁵⁸ AEC, *Presentation, AER Retailer reference group, International approaches and equity models*, 16 September 2020, p. 3.

⁵⁹ ENA, *Best practice framework for setting the allowed return on equity*, 9 October 2020, p. 45.

⁶⁰ Ausgrid, *Submission, International regulatory approaches to rate of return and CAPM*, 9 October 2020, p. 1; Endeavour Energy, *Draft working papers, Return on equity*, 9 October 2020, p. 1; Energy Queensland, *Pathway to rate of return 2022 instrument, Return on equity*, 9 October 2020, p. 1; SA Power Networks, *Submission on AER draft working paper, Rate of return CAPM and alternative return on equity models*, 7 October 2020, p. 1; TransGrid, *AER's pathway to 2022 rate of return instrument, Draft return on equity working papers*, 12 October 2020, p. 1.

⁶¹ APGA, *Submission to the AER, Draft working papers on return on equity models and international approaches to the rate of return*, 9 October 2020, pp. 10–15, (appendix) 13–15.

APA also supported shorter time frames for estimating equity beta as older data ceased to reflect prevailing market conditions.⁶²

In terms of the use of international comparators, APA agreed with the conclusion of the equity working paper that, on balance, there continued to be a range of issues which limited the use of international comparators for rates of return. However, the careful use of the data for electricity network and gas pipeline businesses operating in other jurisdictions might assist in overcoming the problem of the small Australian sample.⁶³

4.4.2 Consumer feedback

Most consumer groups supported the use of longer time frames for the collection of beta data and had significant concerns with the use of international data to support the AER's estimation of equity beta.

The CRG considered that the AER should not seek to be more reflective of current market conditions or to rely on a shorter analysis period for estimating a forward-looking equity beta.⁶⁴ The CRG also mentioned that the AER's role is not to react to current market conditions that are likely to be temporary, but to estimate the average equity beta relevant to a 5-10 year plus investment horizon.

The CRG also had significant concerns with the use of international data to support the AER's analysis of the equity beta.⁶⁵ More international data may produce statistically robust results however it will not enhance the beta estimate if the additional data is not relevant to estimating equity beta for the benchmark efficient regulated network in Australia.

The MEU suggested that the network owners make their investment decisions with a long term investment horizon, consistent with the long lives of the physical network assets.⁶⁶ It was therefore appropriate to use longer term data sets that smooth out the short term influences seen in the stock market.

The MEU also noted that while there might be some benefit in using international data to expand the data set where such is limited in Australia, there needs to be a very careful analysis to ensure that the international data acquired is really equivalent to the local environment.⁶⁷ As the adjustments necessary to reflect differences in the regulatory environment would require significant assumptions, the MEU did not consider international data should be used to generate inputs to the SL CAPM.

⁶² APA, *APA submission on CAPM and alternative return on equity models*, 12 October 2020, pp. 4–5.

⁶³ APA, *APA submission on CAPM and alternative return on equity models*, 12 October 2020, p. 5.

⁶⁴ CRG, *Submission to AER, Return on equity*, 9 October 2020, pp. 9, 47–50.

⁶⁵ CRG, *Submission to AER, Return on equity*, 9 October 2020, pp. 9, 51–52.

⁶⁶ MEU, *Rate of return, CAPM and alternative RoE models, International regulatory approaches to RoR, Draft working papers*, 7 October 2020, p. 7.

⁶⁷ MEU, *Rate of return, CAPM and alternative RoE models, International regulatory approaches to RoR, Draft working papers*, 7 October 2020, p. 8.

4.4.3 Investor feedback

In response to our draft working paper, investor groups supported developing equity beta estimates that are representative of the prevailing risks associated with regulated entities.

The NSG stated in its submission that there were several rising risks being faced by electricity networks not compensated for by the AER's method of beta estimation. These included regulatory, sovereign, technological and low inflation risk.⁶⁸ The NSG also considered that the AER's method for estimating equity beta did not enable changes in risk to influence equity beta estimates as it relied on long and obsolete data points. The NSG recommended a much shorter time frame to estimate beta to give greater weight to current financial conditions, such as three years.⁶⁹

4.5 Econometric limitations of the SL CAPM

In response to our draft working paper, Nyrstar submitted that the SL CAPM had known flaws and listed a number of econometric limitations of the SL CAPM.⁷⁰ The submission noted that a number of assumptions or simplifications underlying the model (e.g. investors have homogenous expectations and no transaction costs) were not realistic. Nyrstar also noted empirical evidence against the SL CAPM, and that the predicted relationship between beta and returns was not found. Nyrstar also suggested the use of arbitrage pricing models (such as the Fama-French models), perhaps alongside the SL CAPM, to provide guidance in establishing the cost of equity.

We have carefully considered this material. Our assessment of all the candidate models has regard to each model's strengths and weaknesses. We recognise that the SL CAPM—like all asset pricing models—does have its limitations, and necessarily relies on simplifications that will not capture all aspects of real-world complexity. The list of concerns in the Nyrstar submission aligns with material previously considered by the AER.⁷¹ The latest Partington and Satchell report also considered the implications of recent developments in academic literature and financial practice for the SL CAPM.

Our assessment of the (standard) SL CAPM as the preeminent model has appropriate regard to the SL CAPM's weaknesses, but also its strengths—as well as the strengths and weaknesses of the alternative candidate models. However, we agree with the Nyrstar position that the implementation of the SL CAPM matters, in that different methods for calculating input parameters can lead to substantially different rate of return outcome. As outlined later in this paper, we propose further work on SL CAPM input parameters as part of our development of the 2022 Instrument.

⁶⁸ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, October 2020, p. 5.

⁶⁹ NSG, *Response to the 2022 Rate of return instrument working paper on return on equity*, October 2020, p. 5.

⁷⁰ Nyrstar, *Nyrstar submission on the AER draft working paper on CAPM and alternative return on equity models*, 14 October 2020, p. 2.

⁷¹ See, for example, AER, *Explanatory statement, Rate of return guideline*, 17 December 2013, section 5; AER, *Explanatory statement appendices, Rate of return guideline*, 17 December 2013, Appendix A – Assessment of models; Partington and Satchell, *Report to the AER, Allowed rate of return, 2018 guideline review*, 25 May 2018; AER, *Draft rate of return guidelines, Explanatory statement*, July 2018, pp. 96–99;

5 Use in the 2022 rate of return review

5.1 Use of the SL CAPM vs other models

We propose to maintain the use of the standard SL CAPM as the foundation model.

We consider that the SL CAPM is the preeminent model. This is because:

- It has a strong theoretical basis.
- It is widely used by market practitioners, including in Australia. This points to its reliability and relevance to the Australian benchmark.
- It is used by all international regulators reviewed—and for five of the seven, it is the only model used.

We have carefully considered:

- The empirical evidence both for and against the SL CAPM.
- The empirical evidence for and against models that are often compared against the SL CAPM (such as the Black CAPM).
- The need to carefully interpret the empirical testing of asset pricing models, given the limitations of our available testing approaches.

We do not propose to include the dividend growth model as a secondary model at the return on equity level. We consider there are substantial challenges to be overcome before the dividend growth model could be used as an alternative or companion to the SL CAPM. Furthermore, there is no stakeholder support for the use of the dividend growth model at the overall return on equity level (distinct from use of the dividend growth model to estimate the market risk premium, as discussed in the next section).

We also do not endorse the use of a multiple model approach. Our current assessment is that using multiple models in combination appears difficult to justify and there are a number of significant challenges to be overcome before a multiple model approach could be employed. Furthermore, there is no stakeholder support for the use of a multiple model approach.

We recognise and agree with stakeholder submissions on the importance of how the SL CAPM is implemented. We will undertake further work on the estimation of input parameters for the SL CAPM, including the potential for a more forward-looking SL CAPM.

5.2 Forward looking market risk premium

We propose to maintain the use of historical excess returns data to inform our market risk premium, and intend to further consider measures to use alongside this method.

The Brattle report characterises the AER's current method as using a 'backwards-looking' market risk premium informed by historical outcomes. Brattle suggests we should consider combining this approach with a forward-looking input to create a more forward-looking market risk premium.

We do not consider our current estimate is backward-looking. We estimate a consistent forward-looking market risk premium within a forward-looking rate of return.⁷² In our 2018 review, in addition to historical excess returns data, we also:⁷³

- Calculated the market risk premium using two dividend growth model constructions and different input ranges, to assess the overall range of outcomes.
- Had regard to several other forward-looking methods to estimate the market risk premium, including surveys of market participants' expectations.
- Included in our consideration market data on dividend yields, volatility and credit spreads, which were 'conditioning variables' used to provide directional information around changing market conditions and the forward-looking market risk premium.

As we develop the 2022 Instrument, we will analyse and evaluate all relevant evidence on measures to use alongside historical excess returns, to determine whether any measures will assist in making the market risk premium more forward-looking. In particular, we are open to considering the use of the dividend growth model alongside historical excess returns. We propose to explore the alternative approaches proposed by ENA (see section 4.2.1). We also intend to consider additional measures including (but are not limited to) survey evidence and conditioning variables such as those used in the 2018 review.

5.3 Relationship between the risk free rate and market risk premium

Stakeholders submitted that it is unlikely that there is a perfect, negative correlation between the risk free rate and market risk premium, however the assumption that the market risk premium remains constant in all market conditions is implausible.

We will further investigate the merits of the relationship between the risk free rate and market risk premium either in a future working paper or in the active phase of the review.

5.4 Equity beta

We propose to leave the comparator set open for further consideration.

Whilst networks and investors supported Brattle's recommendation to add international comparators instead of lengthening the estimation window, consumers supported Partington and Satchell's view, which suggested not adding international firms as comparators for a domestic regulated network without adjustments.

Resolution of these issues will require detailed consideration and we therefore propose to leave the comparator set open for further consideration during the review process.

Furthermore, we will examine the differences between gas pipelines and electricity networks. The APGA submission stated that the difference in risk between the two sectors is material while Brattle noted that overseas regulators apply different approaches to the two sectors. Hence, our subsequent processes will investigate the evidentiary basis for a different allowed

⁷² See, for example, AER, *Rate of return instrument, Explanatory statement*, December 2018, pp. 41, 73–74, 89.

⁷³ AER, *Rate of return instrument, Explanatory statement*, December 2018, pp. 89–94, 270–275.

rate of return between gas pipelines and electricity networks. In particular, we will consider the possible impact of the different sectors (and different comparator firms) on equity beta.

6 Glossary

Below are accessible explanations of the more specialised financial terms used in this draft working paper.

- **Commonwealth Government Securities (CGS)** – Bonds and notes issued by the Australian federal government to borrow money from investors.
- **Benchmark term** – This is the term to maturity of government bonds or debt we set that is used to calculate specific rate of return parameters. The term to maturity at issuance is the time between when an instrument is issued and its maturity date.
- **Capital asset pricing model (CAPM)** – The CAPM is a model that estimates the required return on equity using three parameters: the risk free rate, equity beta and the market risk premium. It says that the required return on an investment will be related to the systematic risk of the investment. Here 'systematic risk' means risk that cannot be diversified away (by multiple investments in different companies across the market). An investment with higher risk will have a higher required return.
- **Comparator firms** – Comparator firms are firms considered to be sufficiently similar to the regulated energy businesses such that market data on the firm's performance (for example, movements in share prices) can be used to inform estimation of regulated rate of return parameters.
- **Debt raising costs** - These costs are the transaction costs incurred each time debt is raised or refinanced. These costs may include underwriting fees, legal fees, company credit rating fees and other transaction costs.
- **Dividend** – A sum of money paid (typically semi-annually or annually) by a company to its shareholders (equity investors) to compensate them for their ongoing investment of capital in the business.
- **Dividend growth model (DGM)** – The Dividend Growth Model is a valuation model which uses the share price, dividend (or cash flow) forecasts and the expected growth rate of the dividends to infer the required return on equity.
- **Equity beta** – This is a key parameter within the standard (Sharpe- Lintner) CAPM. It measures the 'riskiness' of a firm compared with that of the market and should only reflect the systematic risk. Systematic risk is risk that is inherent to the entire market and cannot be eliminated through holding a well-diversified portfolio (i.e. diversified away).
- **Gearing** – the proportion of debt in total financing.
- **Government securities** – Bonds and notes issued by governments to borrow money from investors.
- **Historical excess returns (HER)** – The Historical Excess Returns (HER) method works by measuring realised market returns above the annualised risk free rate during an historical period. These are then averaged over varying time periods to give an estimate of a forward looking market risk premium.
- **Market risk premium (MRP)** – This is the difference between the expected return on a market portfolio and the return on the risk free asset. It compensates an investor for the systematic risk of investing in the market portfolio or the 'average firm' in the market.

- **Nominal Vanilla WACC** - The weighted average of the post-tax nominal return on equity and the pre-tax nominal return on debt.
- **Rate of return (or weighted average cost of capital)** – The rate of return on capital is a forecast of the additional return (above the initial investment amount) required to induce investment in its network. It is a combination of the return on debt and return on equity, weighted according to the proportions of debt and equity investment. In the current rate of return instrument, we estimate a make-up of 60% debt and 40% equity. As such, the WACC is formed of 60% return on debt and 40% return on equity. From the investor's perspective it is the return on the funds invested, but from the network's perspective this is the cost of obtaining the funds.
- **Rate of return instrument** – The Instrument is a binding document which sets out the way the AER will calculate the rate of return in regulatory determinations. Neither the AER nor the regulated businesses have the ability to depart from the instrument. The current instrument was published in December 2018 and its replacement is scheduled for December 2022.
- **Regulated network (or entity)** – a business providing a direct control network service for the purposes of the National Electricity Law or a reference service for the purposes of the National Gas Law. Essentially energy businesses that the AER sets revenue allowances for.
- **Regulated control period** – We set the revenues regulated businesses can earn over a certain timeframe in our regulatory determinations which is typically for a 5 year period. This period is called the 'regulatory control period' under the National Electricity Rules or an 'access arrangement period' under the National Gas Rules.
- **Regulatory determinations** – Regulatory determinations are decisions published by the AER and specify the amount of allowed revenue that network businesses can recover from customers during a regulatory control period.
- **Return on debt** – The return on debt is the AER's forecast of the interest costs of maintaining a debt portfolio for a regulated energy network.
- **Return on equity** – The return on equity is the AER's forecast of the return that equity investors (e.g. shareholders) require in order to induce them to invest in a regulated energy network.
- **Risk free rate (RFR)** – This is a parameter within the SL CAPM which is a model for estimating the return on equity. The risk free rate measures the return an investor would expect from a 'riskless' investment where there is guaranteed return on the invested capital.
- **Total market return** – The total market return is the overall return expected by investors from investing in a diversified benchmark stock market index.
- **Weighted average cost of capital (WACC)** – See rate of return.

7 Table of Stakeholder submissions

This section provides additional feedback from each of the 14 submissions the AER received on the draft working paper. Refer to each submission individually for further information. Page references are supplied.

Category	Feedback	Page No.
APA Group (APA)		
Use of the SL CAPM	The SL CAPM has clear theoretical foundations based on finance and economic principles, and methods for its implementation which are well-established. It is also widely used because it is simple, can be understood by a wide audience, and data required for its implementation are easily obtained. It is, as the equity models working paper advises, predominant. But this is not because the model provides good estimates of rates of return.	2
A forward-looking MRP	The dividend growth model (DGM) has an important role to play, not as an alternative to the SL CAPM, but as a companion to it, including when estimating the market risk premium (MRP).	4
Estimation of equity beta	<p>Estimates of realised betas may not be best estimates of the ex-ante betas to be used in a “forward-looking” asset pricing model like the SL CAPM. If statistical estimation of realised betas is to inform beta estimates, that estimation should use five years of monthly data.</p> <p>APA remains of the view that beta variation over time cannot be ignored, and older data (before five years) cease to reflect prevailing financial market conditions. This will, however, have the implication that estimates made using 2022 and earlier data will be obsolete by 2026.</p> <p>Data for similar businesses operating in other jurisdictions may, if used carefully, assist in overcoming the problem of a small Australian sample.</p>	4
Ausgrid		
Use of the SL CAPM	<p>The SL CAPM is the preferred model to estimate return on equity because it is widely used and has strong theoretical foundations.</p> <p>The AER should consider the approaches to cross-checks taken in the UK and New Zealand, where failed cross-checks are acted upon.</p>	3-4
A forward-looking MRP	While there are challenges to be resolved about assumptions to be used when estimating the market risk premium (MRP) using dividend growth models (DGMs), these are surmountable and the NSW Independent Pricing and Regulatory Tribunal’s (IPART)	3

methodology could be considered as a starting point. While the AER considers its estimate of MRP as forward looking, it does not use data that forecasts what may happen in the future; rather it solely uses historical data which does not reflect market expectations and may become out of date quickly when markets are changing.

Relationship between RFR and MRP	The one-for-one relationship between the risk free rate (RFR) and return on equity is questionable, particularly given the volatility of risk-free rates and relative stability of return on equity expectations. It would be reasonable for the AER to investigate a suitable method to estimate the relationship between the RFR and MRP in the context of a long-term asset based regulated business.	4
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Estimation of equity beta	To address the insufficient weight given to current market conditions in the domestic comparator set, international comparators in comparable markets should be given consideration.	4
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Australian Pipelines and Gas Association (APGA)

Use of the SL CAPM	Use of the SL CAPM should produce a result that is robust to a wide range of market conditions. This could be achieved by looking at alternative approaches when implementing the SL CAPM, looking at a broader information set when estimating the SL CAPM, and utilising cross-checks.	16
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A forward-looking MRP	Dividend growth model (DGM) based estimates of the market risk premium (MRP) should be at least considered when developing the 2022 Instrument. Other approaches such as prices of options or forward contracts could also be useful, although use of survey data is probably inappropriate.	9
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Relationship between RFR and MRP	There are a wide range of potential market conditions where different relationships between the MRP and risk free rate (RFR) may apply – it could be positive, negative, or non-existent.	13
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Estimation of equity beta	The AER should also look at equity betas from gas pipelines in other jurisdictions to see whether these can help augment the limited Australian sample as well as placing more weight on equity betas estimated using data from shorter and more recent estimation windows (five years of monthly data, or three years of weekly data). The AER should reconsider the assumption in the 2018 Instrument that the same equity beta should be applied to both gas pipelines and electricity networks.	13-15
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TransGrid

Use of the SL CAPM	The AER should continue the use of the SL CAPM, noting it is the most commonly used estimation approach by economic regulators	2
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	and market practitioners globally. However, a clear focus on the how parameters are determined is necessary.	
A forward-looking MRP	The historical excess returns (HER) data has an important role to play in determining the market risk premium (MRP). The premiums that investors have earned in the past are relevant to the premiums they might require in the future. However, Brattle's recommendation that the dividend growth model (DGM) evidence is relevant and can usefully ensure the MRP reflects the prevailing market conditions, which might vary from historical market conditions.	3
Relationship between RFR and MRP	The AER should consider the relationship between the MRP and risk free rate (RFR) during the term of the 2022 Instrument.	3
Estimation of equity beta	The AER should use a shorter time frame to estimate equity beta to give greater weight to current financial conditions. Beta should be estimated using a range of methods. International evidence is relevant and should be used to inform the AER's estimate of beta.	3
SA Power Networks (SAPN)		
Use of the SL CAPM	SAPN strongly endorse Brattle's recommendation that the AER should consider a broader range of relevant evidence, particularly more forward-looking evidence, when implementing the SL CAPM. SAPN also endorses ENA's submission that the next stage of engagement for the 2022 Instrument should include a process in relation to cross-checks.	3
A forward-looking MRP	The AER should have regard to forward-looking estimates, particularly in relation to the market risk premium (MRP).	4
Estimation of equity beta	The AER should have regard to international comparators when estimating beta, given the paucity of domestic evidence in relation to that parameter.	4
Energy Networks Australia (ENA)		
Use of the SL CAPM	ENA supports the use of the SL CAPM but mentions that there needs to be a clear focus on how the parameters which form inputs to the SL CAPM are estimated. ENA puts forward several suggested approaches to the calculation of SL CAPM parameters including having regard to all forward-looking and relevant domestic and international evidence. In addition, the 2022 Instrument should be designed in such a way to recognise that it is unsafe to update one parameter to reflect prevailing market conditions while holding another fixed to reflect historical market conditions	42, 45

It is important to identify the cross-checks that will be used, and the way in which they will be used, well in advance of the 2022 Instrument.

A forward-looking MRP	Forward-looking information that reflects financial market conditions at the time, particularly dividend growth model (DGM) evidence, should be used when estimating the market risk premium (MRP) alongside the consideration of historical evidence. ENA does not support the use of survey data when estimating the MRP.	42, 44
Relationship between RFR and MRP	The ENA does not argue that there is a perfect negative correlation between the MRP and the risk free rate (RFR), which appeared to be the implicit basis of some previous considerations and discussions around the Wright approach.	44
Estimation of equity beta	International evidence should feature in the AER's calculation of equity beta. The sample size for domestic listed firms is too small. Additional data that underpins longer-term beta estimates is not a substitute for ensuring that a reasonable number of firms is included in the comparator set	45

Energy Queensland

Use of the SL CAPM	The SL CAPM should be used to determine the return on equity, however the AER must genuinely widen its sources of evidence in informing the SL CAPM parameters.	2
A forward-looking MRP	The AER continues to unfairly dismiss the use of the dividend growth model (DGM) for estimating the market risk premium (MRP). The AER lists issues with the DGM, however the same issues equally apply to the SL CAPM.	2

Endeavour Energy

Use of the SL CAPM	<p>The SL CAPM should be relied upon as the primary model.</p> <p>The AER should implement meaningful cross-checks and give weight to a broader set of evidence (particularly forward-looking information and international comparators).</p> <p>Endeavour Energy further notes that legislation prevents the AER from updating all equity parameters throughout a determination period, and cautions against only partially updating the return on equity.</p>	2
A forward-looking MRP	Endeavour Energy support the use of historical excess returns data but consider it is backward-looking and should be complemented by forward-looking evidence – most notably the dividend growth model (DGM). Consideration should also be given to the Wright approach when estimating the market risk premium (MRP) given the implausibility of assuming the MRP remains constant in all conditions.	2

Relationship between RFR and MRP	Endeavour Energy supports adopting a formulaic approach to update the MRP for changes in the risk-free rate (MRP) or other market evidence such as particular DGM estimates.	2
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Estimation of equity beta	Estimating beta using a long term period does not correct for the limitation of only having a small sample of domestic firms. In addition the AER could use international data to assist, looking at comparable firms adopted by comparable regulators.	2
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Network Shareholders Group (NSG)

Use of the SL CAPM	The NSG support the AER's view that the standard SL CAPM should play a major role in the AER's determination of the return on equity in the 2022 Instrument. The SL CAPM should also be used to guide (not set) estimates of the return on equity to aid stability and predictability. NSG disagree with the AER's assessment of key SL CAPM parameters and that SL CAPM parameters should be forward-looking and contemporary. NSG support appropriately applied cross-checks that will underscore the reasonableness of the 2022 Instrument outcome.	1, 3
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A forward-looking MRP	The AER should use the dividend growth model (DGM) to inform the choice of market risk premium (MRP) to include relevant and forward-looking market information.	3
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Relationship between RFR and MRP	The inverse relationship between the MRP and risk free rate (RFR) must feature in the estimation of equity returns.	4, 5
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Estimation of equity beta	There are several rising risks that are not compensated for in the regulated rate of return such as regulatory, sovereign, technological and low inflation risk. The current parameters underestimate the risk of investing in regulated networks.	5
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Queensland Treasury Corporation (QTC)

Use of the SL CAPM	The SL CAPM is the most appropriate model to estimate return on equity. The SL CAPM also uses largely backward-looking information, whereas the dividend growth model (DGM) uses forward-looking information. During periods of volatility in markets, it is important to consider both historical and forward-looking information.	1, 2
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A forward-looking MRP	Combining the historical excess returns approach with other approaches has the potential to produce estimates of the market risk premium (MRP) that are forward looking.	3
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Relationship between RFR and MRP	However, econometric tests of the relationship between the MRP and the risk free rate (RFR) lack statistical power, which undermines the inferences that can be drawn from the data.	1, 4
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Nyrstar

Use of the SL CAPM	<p>There is a significant body of empirical evidence that suggests SL CAPM does not provide an adequate description of the economic reality of equity returns.</p> <p>Multi-factor arbitrage pricing models (APM) should be considered as alternative approaches to the CAPM (noting that the CAPM is a special case of APM). APMs make no assumptions about the distribution of asset returns, make only one assumption about an investors utility function, can be applied to a multi-period framework, and can be empirically tested.</p>	1, 2
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Estimation of equity beta	<p>Forward looking (predictive) betas would be more preferable than static backward looking parameters which leads to estimation issues.</p> <p>The domestic comparator set for estimating betas has also diminished, so the sample is not statistically relevant anymore. A wider comparator set should be used to compensate for this.</p> <p>The AER should also recognise that different firms have different beta profiles. Otherwise, some firms are penalised while others are provided with excess regulatory returns.</p>	2
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Consumer Reference Group (CRG)

Use of the SL CAPM	<p>The CRG agrees with Partington and Satchell that "the only model that satisfies the criteria listed by the AER is the SL CAPM, and recent evidence strengthens this recommendation" and would add that the SL CAPM appears to be the model that best satisfies the CRG's consumer principles. The inclusion of additional models significantly reduces transparency and reliability of the return on equity estimate and the result is difficult to interpret as the models come from different theoretical frameworks.</p>	4, 7, 9
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A forward-looking MRP	<p>The existing approach to estimating a forward-looking market risk premium (MRP) based on the analysis of historical excess returns (HER) with some cross-checks remains the most appropriate basis for estimating this component of a forward-looking return on equity.</p>	7
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Relationship between RFR and MRP	<p>Ultimately, the evidence for imposing some direct relationship between the risk free rate (RFR) and the MRP (instead of treating them as independent observations) requires the AER to make arbitrary decisions on this relationship at different points of time. As such it is not suitable for regulatory purposes.</p>	8
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Estimation of equity beta	<p>The evidence to date is that beta estimates based on a longer period and taken monthly rather than daily or weekly provide more reliable and stable estimates of beta.</p> <p>The CRG has significant concerns with the use of international data to support the AER's analysis of the equity beta as it may not be relevant.</p>	8, 9
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Major Energy Users Inc (MEU)

Use of the SL CAPM	MEU considers SL CAPM is sound and the only major drawback of continuing with this approach is the market data available from publicly listed network firms to identify the equity beta and gearing is possibly too small for providing an accurate assessment of these inputs for the SL CAPM. To counter this limited data set, the MEU considers that longer time frames for data collection increases the confidence in the outcome, when recognising the relative long-term stability observed in these parameters.	7
A forward-looking MRP	<p>The market risk premium (MRP) can show significant variation year on year and because of this any forward-looking assessment is likely to be wrong within a year or two.</p> <p>The dividend growth model (DGM) suffers from the same limitations as the SL CAPM but also in the arbitrariness of the development of some other inputs.</p>	4, 6
Estimation of equity beta	<p>The AER should give consideration to using longer time frames for the collection of beta data. This recognises the relative long-term stability of this parameter, and will increase confidence in the outcome.</p> <p>International regulatory environments are likely to be considerably different to the Australian regulatory environment. As such, extreme caution should be taken when using international comparators.</p>	7-8
Energy Users Association of Australia (EUAA)		
Use of the SL CAPM	There is no apparent reason to change from the current approach of using the SL CAPM as set out in the AER's draft working paper, which notes that the SL CAPM has a strong theoretical basis, is widely used by market practitioners, and is more reliable than any of the alternatives identified.	1
A forward-looking MRP	EUAA mentions the limitations of the dividend growth model (DGM) in particular to estimate the market risk premium (MRP), and does not support its use.	
Relationship between RFR and MRP	EUAA agrees with the AER on the limitations of the Wright approach and thus the Wright approach should not be used.	2
Estimation of equity beta	The benefits of longer return periods, as outlined by Partington and Satchell, are convincing in relation to beta estimation without using international firms as comparators.	2